35th AESOP Annual Congress

INTEGRATED PLANNING IN A WORLD OF TURBULENCE

BOOK OF PROCEEDINGS

Łódź - Poland // 11-15.07.2023

Edited by Beata BANACHOWICZ
(Faculty of Management, University of Lodz)

Cover Iwona PIELESIAK
Typesetting Joanna ULAŃSKA

ISBN: 978-90-82-81919-9

Published by AESOP
Lodz, 2023

In recent years, the modern world has been facing growing civilization challenges related to the effects of climate change, progressive degradation of the natural environment resources and values, internal and external migrations resulting from economic crises and political tensions, as well as shortening product life cycles, automation and autonomization of management processes in business and the public sector.

Development processes are going to be difficult to predict, such as the outbreak of the COVID-19 pandemic in 2019 appearance, for example. Uncertain forecasts for the future force us to expect further development disruptions. Importantly, these phenomena have their consequences in the sphere of spatial development patterns and ways of using it by various stakeholders. These consequences are revealed on a local, regional, national and transnational scale, implying the need to develop methods of cooperation between various planning entities and planning systems.

Space is becoming - on the one hand - an increasingly valuable resource, and its values and territorial dimension become an important factor of the development and growth processes - on the other hand, it requires more and more flexible adaptation of its development patterns to changing trends and forecasted challenges and problems.

This raises the question of the effectiveness and legitimacy of using the existing, more traditional planning approaches based on the methodology of long-term strategic planning aimed at building stable foundations for the development of society and - in contrast to this - searching for new approaches corresponding to the indicated planning challenges in conditions of high uncertainty of events, risks and anthropogenic and natural hazards. A particular challenge seems to be the need to use planning tools in international cooperation to reduce the negative externalities related to the side effects of globalization processes.

The Congress aimed to create a space to discuss the importance and role of **Integrated Planning in a World of Turbulence**. With this Book of Proceedings Congress Attendees provided a valuable contribution to this discourse!

Local Organizing Committee
AESOP 2023 Annual Congress Lodz

AESOP Annual Congress
Integrated Planning in a World of Turbulence
Lodz, 11-15 July 2023

HEALTH IMPACT ASSESSMENT IN URBAN DEVELOPMENT: MODEL APPROACH, POTENTIALS AND LIMITATIONS FOR THE SYSTEMATIC INTEGRATION OF HEALTH ASPECTS IN URBAN PLANNING PROCESSES. CASE STUDY GERA, GERMANY (1094)

Heidi Sinning[1*], Christian Bojahr[1], Astrid Benneckenstein[2], Arne Sibilis[2], Boris Tolg[2], Joachim Westenhöfer[2]

[1] Institute of Urban Research, Planning and Communication (ISP) of Erfurt University of Applied Sciences, Erfurt, Germany; [*]sinning@fh-erfurt.de
[2] Competence Center Health (CCG) of the Hamburg University of Applied Sciences, Hamburg, Germany

Abstract. This paper addresses the increasing importance of integrating health aspects into urban development, particularly in light of environmental impacts and the COVID-19 pandemic. The paper focuses on the Health Impact Assessment (HIA) as a tool to assess the potential health effects of policies, programmes and projects. It explores the integration of HIAs into the German administrative structure and urban development processes, with a specific case study of an urban development framework plan.

The paper presents a model that systematically integrates health aspects into urban planning and discusses the roles and tasks of public health services and urban planning departments in the HIA process. It also considers the potentials and challenges of implementing HIAs in municipal administrations in Germany and their contribution to urban resilience. The paper concludes with recommendations for supplementary tools and emphasizes the need to adapt HIAs to specific planning tasks and local contexts.

Keywords: health impact assessment, urban planning, public health sector, urban development, urban resilience.

1. Initial situation and issue of the paper

Environmental impacts, such as increasing heat periods and other climate-related changes, noise, air pollution or land consumption, lead to impairments of human health, so that integrated urban development, which also takes health aspects into account, is increasingly in focus. Recently, the Covid 19 pandemic and its direct and indirect consequences have made the issue of health promotion in urban development more important. Municipalities are confronted with the challenge of integrating health aspects

more intensively in the various areas of urban planning and development. In order to be able to implement this in the long term and sustainably, health-relevant framework conditions must be recognized and promoted accordingly through programmes and projects (Elvers, 2017, p. 13). A variety of areas of urban development, such as the built environment, green structures, transport and the economy, which are beyond the health sector, have a direct or indirect influence on health determinants as well as the living environments of urban residents (Fehr et al., 2014, p. 93; WHO, 2017). Furthermore, another long-term challenge is to create conditions that enable all city dwellers to participate in social life and access health services, regardless of their social status. These findings and requirements have prompted the WHO to formulate the Health in All Policies approach as a goal, understood as a strengthened cross-thematic, health- and society-oriented policy. This was already defined in outlines in the Ottawa Charter on Health Promotion of 1986 (WHO, 2014 pp. 7-8; Stahl et al., p.27).

A tool that addresses and attempts to solve the aforementioned challenges of communities is the Health Impact Assessment (HIA). This comprises a "combination of procedures, methods and tools by which a policy, program or project may be judged as to its potential effects on the health of a population, and the distribution of those effects within the population" (WHO, 1999, p.4). The goal of HIAs is to consider health aspects in various policy and action areas, including urban development. HIAs thus support the Health in All Policies approach (WHO, 2023c). The application of HIAs is intended to help establish healthy living environments for urban dwellers as well as to maintain them in the long term (WHO, 2023b). HIAs have been used and implemented in numerous regions and countries worldwide since the early 2000s, for example in Australia, East Asia, the Pacific, North America, and Europe. In the European and North American context, various guides, checklists or recommendations for action already exist for practical application (Winkler et al., 2014 pp. 1-2).

Although there are legal arrangements and foundations in Germany that enable the application of the HIA and the participation of public health actors, these take place in urban development projects only sporadically and without a defined agreement regarding the procedure, methodology and applied instruments (Mekel, 2015, p. 8).

Given this context, this paper explores the following research questions:

- How can a model look like that systematically integrates health aspects in urban planning programmes and projects?
- How can this model be effectively integrated into the German administrative structure and typical administrative procedures of urban development processes and the public health sector?
- What are the possibilities and limitations for practical application?

The interdisciplinary research project “GFA_Stadt: Gesundheitsfolgenabschätzung in der

Stadtentwicklung" (HIA_City: Health Impact Assessement in Urban Development; https://www.gfa-stadt.de/) serves as research background. The research project was funded by German Federal Ministry of Education and Research (BMBF; grant number 13FH021SB8). The research questions are discussed both in terms of typical planning procedures in Germany and on the basis of the case study of the urban development framework plan "Neighbourhood Centre Lusan" in the eastern German municipality of Gera. The main objective is to systematically link the instrument of HIA with the help of the developed model utilizing the usual procedural steps of urban planning in order to take health concerns more into account in planning and to establish a structured cooperation between public health services and urban development. Methodologically, the paper is based on guided interviews, expert workshops with actors from science, professional institutions and municipal administration, site visits, household surveys, extensive literature and document analyses as well as the case study on the framework plan of the Lusan district of the East German City of Gera.

Finally, the article summarizes the potentials and challenges of implementing the HIA in municipal administrations in Germany, especially in urban planning and public health departments. It also reflects on the extent to which the instruments can contribute to urban resilience.

2. Health Impact Assessment and walkability in urban development

In urban development, HIA is to be understood as an instrument or practice that deals with programmes, measures and projects that are expected to have impact on health in cities, but are taken outside the actual health sector (WHO, 1999, p. 1). The WHO defines HIA as a tool that can be used to assess potential health impacts, particularly on disadvantaged or vulnerable target groups, of development projects in various thematic areas, and to help policy makers and planning actors enhance expected positive impacts while minimizing negative health effects (WHO, 2023c). Successful HIA can directly and indirectly influence health determinants as well as the living environments of urban residents. According to the WHO (WHO, 2017), these include:

- the social and economic environment,
- individual characteristics and behaviours of a person,
- the design of a person's physical environment.

The health determinants are also influenced by factors such as place of residence, condition of the physical living environment, income and social status, level of education and social support networks (WHO, 2017). The aim is to increase opportunities for social participation and a healthy and fulfilling life, as well as to reduce social disparities (WHO, 2023d). To achieve this, changes are required on at least two levels: a rethinking of the

perception of health is essential in urban planning, and health services must be enabled to take a well-founded position in the urban development process and to be able to introduce health issues (Elvers, 2017. pp. 13,15). Currently, there is no binding, standardised method for conducting an HIA. However, a general structure with several stages has emerged, which basically include the steps screening, scoping, appraisal, reporting and monitoring activities and are partially combined (WHO, 2023c).

An important component for the integration of HIAs in urban development processes is the promotion of walkability. By planning and developing urban neighbourhoods and districts according to the approaches of movement promotion (walkability), health-promoting urban structures and living environments can be created. The following factors are relevant for the creation of such urban neighbourhoods that promote physical activity (Lo, 2009, p.154; Buksch and Schneider, 2014, p. 20):

- existing, continuous and well-maintained pedestrian and cycle paths of sufficient width,
- a narrow, well-connected network of paths,
- the safety of traffic routes as well as crossings,
- the absence of high-speed traffic or strict separation of pedestrian and cycle traffic from motor traffic,
- diversity, mix and increased density of building and land uses,
- an aesthetically attractive and varied environment; and
- reasonable distances to relevant, high-quality destinations in the neighbourhood, such as green spaces, public transport stops or shopping facilities.

3. Model: integration of the HIA into urban planning processes

The typical phase model developed within the framework of the HIA_City research project contains a procedure for cooperation between public health services and urban planning, and systematically links the HIA with the procedural steps of urban planning. The research team developed this model based on interviews and examined it in the case study “framework plan ‘Neighbourhood Centre Gera-Lusan’“ (see chapter 4). The purpose is to integrate the instrument into existing standard procedures of urban planning in an effective and resource efficient way. This should lead to standardisation and provide the administration with a uniform model of such interdepartmental cooperation. Furthermore, a recommendation is given on the distribution of tasks and roles of the actors of the public health services and the urban planning department in the process of HIA development. The developed typical model for the integration of an HIA in urban development projects and processes envisages three strands (Figure 1).

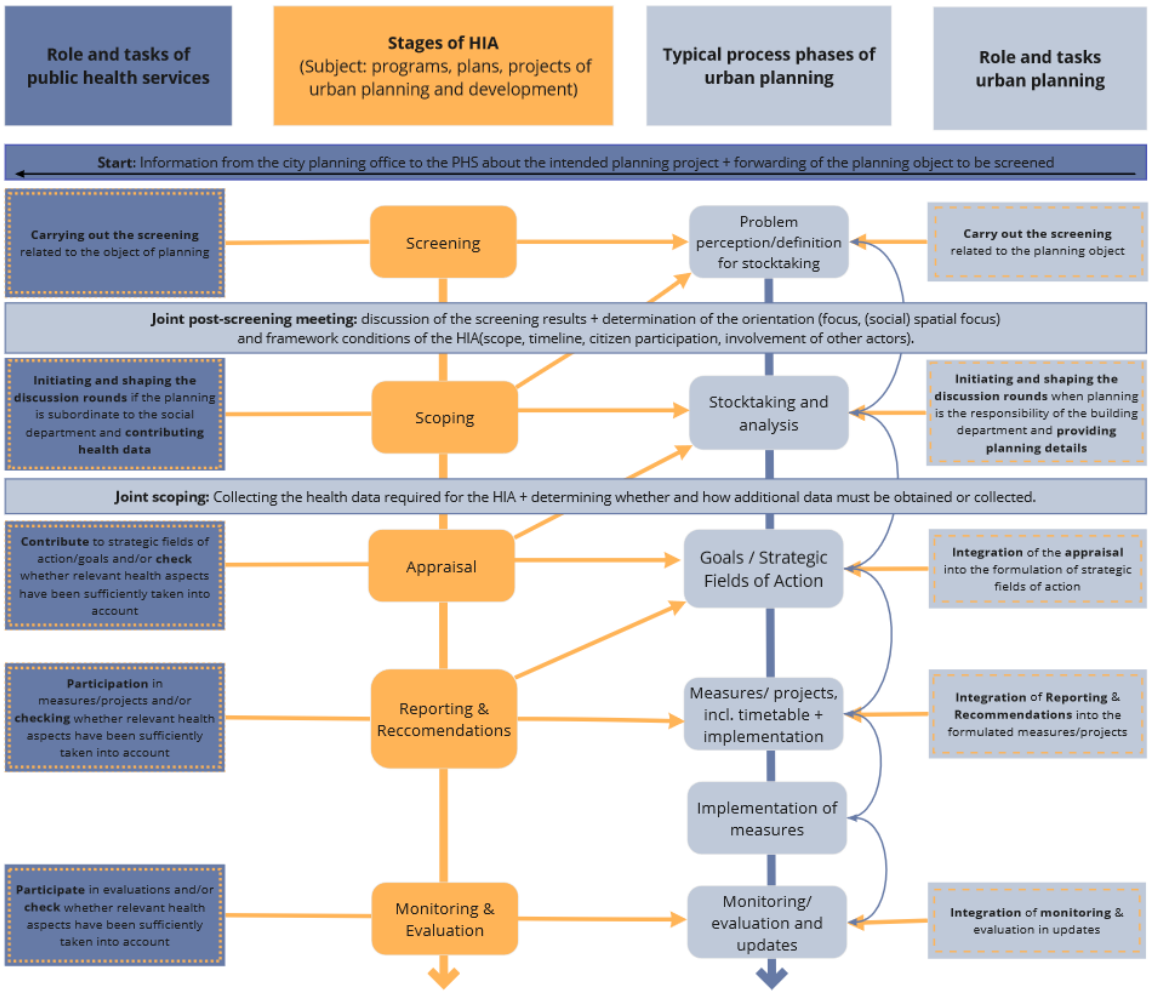


Figure 1. Stage model of a health impact assessment (HIA) integrated into urban planning

- The five stages of the HIA (orange) in conjunction with the typical process stages in urban planning and development (grey), as envisaged for different planning procedures, form the centre point. This typical sequence of HIA phases in combination with planning phases can be applied to different informal and formal urban planning and development procedures.
- The left strand (blue) shows the roles and possible tasks to be performed by the public health service and its actors in the individual phases of the model of a health impact assessment integrated into urban planning.
- The right-hand side (grey) shows the roles and tasks of urban planning, which are to be carried out or assumed by the implementing actors in the individual process phases of a project.

The typical process for the practical application of the model proceeds as follows:

- The HIA is initiated by the urban planning department informing the health department that a planning project is starting. For this purpose, ideally an advance phase of problem perception or definition is carried out for the inventory. This could be necessary, for example, if a development or neighbourhood concept is to be updated because new or changed problem situations have emerged.
- The initial stage takes place in parallel with the screening of the HIA, i.e., the sifting or preliminary examination of health-related impact contexts. The role of the public health department is to provide existing health data and to identify interrelationships from a health perspective. In the preliminary assessment, the health department takes on an accompanying role and is in an open dialogue with the urban planning department. The screening phase concludes with a decision as to whether a further HIA is expedient and should be implemented.
- In the next step of the planning process, roles and framework conditions as well as responsibilities and procedures of the HIA are defined. Joint discussion rounds are held with stakeholders from the health sector and the relevant planning administrative units, and it is agreed who is to be involved in the further process and how. For example, the environment and/or social services departments can also be involved.
- With the scoping process, a joint assessment takes place with regard to relevant health aspects. The results of the scoping are in turn incorporated into the stocktaking and analysis of the planning process. In this stage, it must be determined which additional health aspects and data bases are to be collected and considered in the subsequent analysis.
- In the appraisal or analysis phase, the collected health data and impacts are compiled and evaluated. This analysis and its results flow into the planning phase, which formulates the relevant, strategic fields of action and objectives of the planning project. At this point, the public health services are responsible for reviewing the formulated fields of action and included objectives, and to what extent they contribute positively to an improvement of the health determinants of the target groups concerned.
- The reporting and recommendation phase includes the task of the Public Health Service to review and ensure the predefined project objectives and fields of action. For this purpose, the planned measures should be examined with regard to their effect on the consideration and improvement of health aspects. If the formulated objectives are not achieved, suggestions for improvement should be made, which are then to be integrated into the planning by the urban planning department.
- The two elements of the final stage of the HIA, monitoring and evaluation, begin as soon as the planning project has been implemented. These provide for a review by the public health services, which will determine whether and to what extent the project

has achieved positive health promotion. The experience gained can be used in further applications of HIA and the improvement of the present typical model.

In order to ensure the presented model as well as its integration into the German planning routine, supplementary tools have been provided, which are listed below:

- A website that can be used as a common platform for information and documents on the topics of planning and health (e.g., relevant spatial data or interactions between health and physical activity).
- A health checklist to help identify planning procedures, development concepts or projects that are prioritised to promote health aspects, with special attention to the impact on disadvantaged groups with the help of a HIA.
- By using the HEAT questionnaire, impact relationships between health and physical activity can be presented transparently (WHO, 2023a).
- As a participation tool, the StadtRaumMonitor (City-Space-Monitor), which was developed by a German research project and is based on the Scottish Place Standard Tool, can be used to assess places in terms of health in order to additionally consider the residents' perspective (Bundeszentrale für gesundheitliche Aufklärung, n.d.).

This typical model for the integration of HIA into urban planning practice in Germany forms an orientation framework that can serve to increase the consideration of health aspects in urban development programmes and projects. However, its application must always be adapted to the specific planning project, as the initial situation, the target groups concerned, and the internal administrative structures and processes may differ from municipality to municipality.

4. Case Study framework plan “Neighbourhood Centre Gera Lusan“

The research project HIA_City examined the HIA exemplarily on walkability (promotion of physical activity) in cities and the associated health effects on residents in neighbourhoods. Specifically, this is being researched using the selected case study of the urban development framework plan "Neighbourhood Centre Gera-Lusan". There, it is examined how a HIA can be implemented in urban planning and how walkability affects the quality of life and health of the residential population in the neighbourhood. The district of Lusan in the City of Gera has been a programme neighbourhood of the German Socially Integrative City funding programme since 2015. In this way, the federal government and the state of Thuringia support the stabilisation and upgrading of urban, economically and socially disadvantaged and structurally weak urban and local districts. In the context of the integrated development concept for Gera-Lusan, the structurally weak district characterised by prefab housing estates primarily derives requirements for action to improve the living environment and promote health (Buhtz, Gerth, Marsch, 2017). The

target group for the application of the HIA to the "Neighbourhood Centre Gera-Lusan" framework plan are the actors of the municipal administration as well as the local resident population. The focus of the study is to improve the quality of life and health of the entire resident population. Special attention is paid to older people, people with physical disabilities and the socially disadvantaged. Since the political turnaround in 1990, the city of Gera (about 93.000 inhabitants, 2022) has experienced a steady population decline (minus 18,6% since 2000), with a simultaneous decrease in the proportion of young age groups and a steady increase in the proportion of older age groups (Buhtz, Gerth, Marsch, 2017).

The framework plan under consideration covers the approx. 10.5-hectare area of the former district centre with brownfield sites, retail and commercial areas as well as an educational institution, the development of which is to be prepared taking into account private and urban interests. The stated objective of the framework planning is to harmonise the activities of the developer, a non-municipal investor, with other private as well as municipal interests, and to coordinate the various ideas and approaches for effective site development. The commissioned private planning office has the task to provide possible variants of site development in the framework planning that are both flexibly designed and contribute to activating the site.

The HIA to be conducted with regard to the framework plan should take special account of the walkability of the urban planning and design environment of the neighbourhood. This is because the built environment affects the walkability in many ways and thus has significant health consequences. Adaptations in the immediate living environment can increase the ease of movement and improve health conditions - especially for an ageing urban society. The process of testing the HIA for the framework plan is shown in Figure 2.

For the application of the HIA model to the case study Gera-Lusan, a web-based screening tool developed within the research project was used and tested. The involved actors of the urban planning and health department were asked to give their assessment of the possible impacts of the planning project on different topics (e.g., mobility and accessibility quality, public open spaces, environment and health, ...). The assessment yielded the following results:

- Issue a comprehensive screening report. This contains the recommendation for conducting a further HIA to consider health aspects in the further planning process, due to expected impacts in different thematic areas.
- The report is supplemented by comments and remarks from the stakeholders. These reveal differences in the perception and assessment of possible health-relevant impacts by the various stakeholders.
- Results of the screening as well as the formulated assessments of the urban planning and health department are discussed in detail in a subsequent post-screening

discussion round. Other municipal and local actors, such as the environmental and social authorities and housing companies, should be included in this discussion.

- Preparation for the subsequent scoping process should be initiated. For this purpose, existing data from the participating authorities should be collected in order to be able to carry out a detailed analysis and assessment in subject areas in which health-relevant impacts are to be expected. Furthermore, it is to be determined which additional data are to be collected.
- In the context of the application process, a successful activation and promotion of inter-communal cooperation and networking between the involved actors of the urban planning and the health department is of high relevance to guarantee integration.

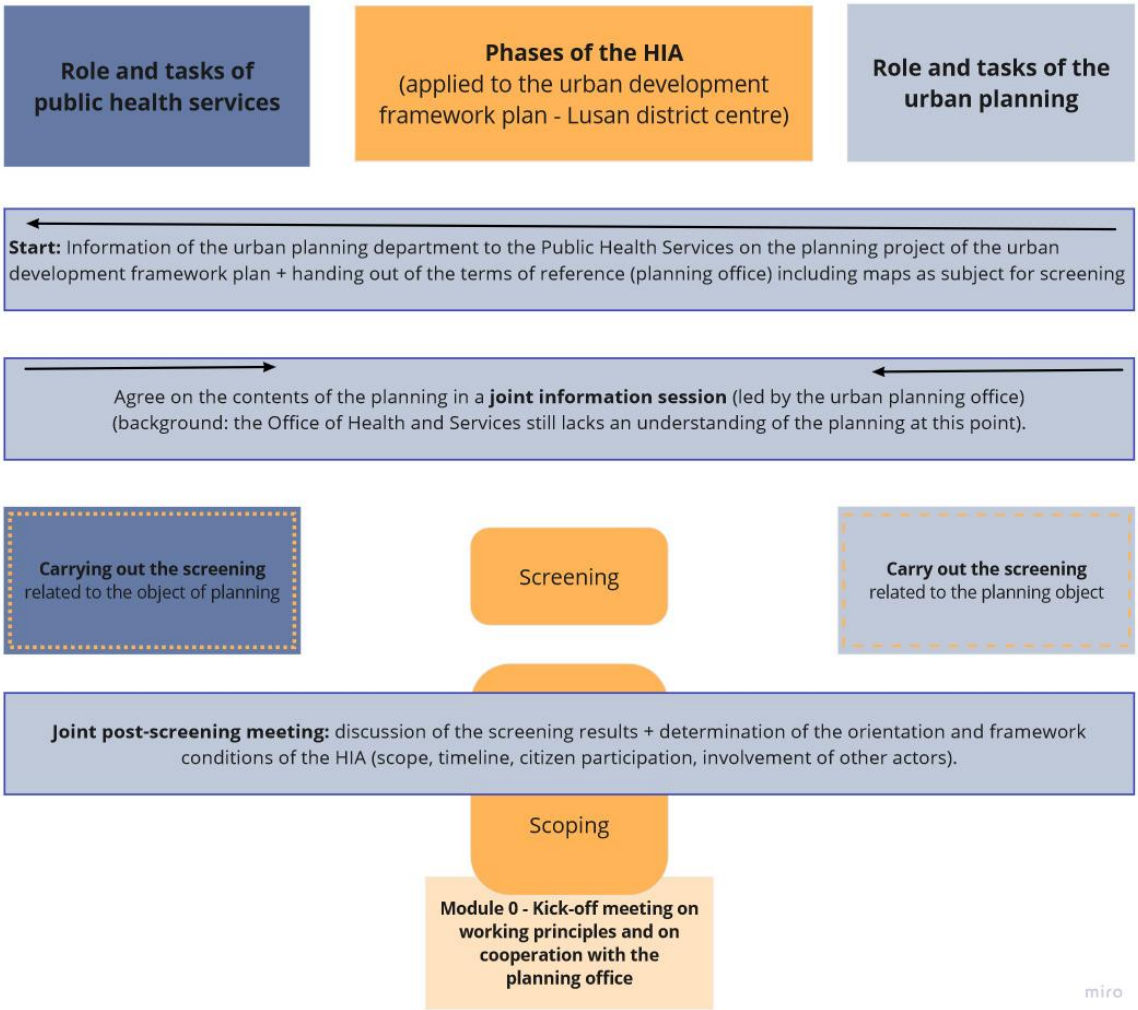


Figure 2. Integration of HIA into urban planning, case study of the “Neighbourhood Centre Lusan” framework plan

For the adaptation of the HIA phase model, the findings from the practical application as well as the feedback from the stakeholders involved are to be used.

5. Potentials and challenges of the model – an interim summary

The empirical research in the HIA_City research project shows that the integration of an HIA into urban planning and development, such as the preparation of the framework plan "Neighbourhood Center Gera-Lusan" shows synergies for the departments involved which are supportive for both sides. This applies, for example, to the protection and development of green and blue infrastructure, questions of movement promotion (walkability) or urban infrastructures in the area of local recreation and leisure. Existing legal regulations for strengthening healthy cities, such as the German Building Code or the German Law on Prevention, emphasise the need for an integrative approach in planning projects. With the help of HIAs, fields of action with the aim of developing healthy, liveable cities and neighbourhoods can be given higher priority, and health impacts are given greater transparency in development projects. This could contribute to shifting priorities in local politics towards health-promoting urban planning and Health in All Policies, as well as supporting the implementation of corresponding concepts and measures. Especially under the massively changing conditions, such as climate change, demographic developments, increasing social, health-related and environmental disparities, the importance of health prevention and promotion is growing and with it the need for implementation.

Limitations of the HIA occur when relevant health aspects are already taken up and highlighted in other sectoral planning as part of the investigations. An example are existing environmental assessment procedures that are firmly anchored in law and take into account the conservation and protection of the protected common goods air, water, soil and human health. The HIA procedure and instrument may be perceived as less relevant, obsolete or even unnecessary additional planning effort if health aspects are already illuminated and considered in connection with other topics relevant to urban development, albeit not in the intended systematic manner.

However, there is no existing legal basis that obliges the consideration of potential health impacts, both positive and negative. There is a risk that health aspects will be given less importance in the consideration process than problems and challenges that are perceived as more urgent, such as the need for housing. In addition, employees and actors of the public health service are often overburdened with planning projects and the associated questions, formulations, technical terms used and workflows, which limit the effectiveness of a HIA. This is further complicated by the lack of will on the part of decision-makers, staff and resource bottlenecks, as well as the lack of financial means to train administrative staff in the context of education and training programmes in such a

way that HIA can be successfully applied in everyday planning.

Further obstacles arise from different approaches and procedures in the various administrative departments, which require a high degree of communication skills and interface work in the context of an interdisciplinary and integrated HIA. In addition, different understandings of health among the actors, and questions of professional qualifications represent further obstacles, as a result of which health-related concerns in urban land use planning are often given little argumentative support and are not heard enough.

6. Discussion

This paper deals with the instrument HIA for promoting health issues in urban planning and development. It examines the transferability of a typical model for integration into everyday planning in Germany on the basis of a case study on the urban development framework plan " Neighbourhood Centre Lusan" in the East German municipality of Gera. In the following, both potential contributions and limitations of HIAs to the planning and development of healthy cities are discussed on the basis of three theses.

1. HIA as a practice-applied model - research as pathfinder for practice

The HIA can support the WHO's health policy strategy that health needs to be taken up in all policies and that health is brought into all areas of life of the urban population. With the help of the HIA instrument, urban development can be more closely interlinked with the health sector and cooperation can be supported in such a way that potentials for health promotion are taken up and health burdens are reduced. Furthermore, the HIA and its implementation can strengthen municipal environmental and green space authorities by providing another tool that highlights the positive effects of environmental aspects. In order to achieve this, HIAs should be systematically integrated into urban planning procedures. The model of the HIA_City research that has been presented refers in particular to the practical feasibility that can help municipalities to successfully integrate HIAs in Germany. The additional tools shown are supportive to facilitate the process and provide assistance. Here, research can make an important contribution to target-oriented integration by using existing international and national findings and incorporating them for the successful application of HIA in practice.

2. Systemic integration in administrative procedures and legal frameworks – Living lab-approach with model neighbourhoods

For the introduction of HIA in Germany, legal foundations and administrative procedural rules are necessary as conditions as well as supportive framework requirements. These should be developed and balanced by science and practice in interaction with each other. In this context, interdepartmental cooperation, in particular between the public health

service, urban planning and environmental authorities, is particularly expedient. In addition to health aspects, this can also contribute to increased awareness and implementation of environmental issues that are important for climate adaptation. The model presented is based on existing procedures, strategies, instruments and concepts and is thus suitable for integration into everyday planning in Germany. The approach of the living lab with testing in sample cities makes it possible to develop knowledge that can be transferred, but at the same time identify obstacles and conditions for success to meet challenges.

3. Qualification of the departments involved and personnel resources for interface work - science and practice work hand in hand

With the HIA, politics and administration can be sensitised to health promotion, for example by providing health-related background information as part of the implementation process. Thus, the HIA contributes to political decision-making and supports that health-promoting urban development gains weight. Simultaneously, there is a need for targeted qualification of the health and urban planning authorities in order to be able to introduce health concerns into planning procedures and, conversely, to integrate health aspects more strongly into planning procedures. In the daily routine of municipal administration, the specific instruments, standards, technical terms and language of the respective offices pose a great challenge for interdisciplinary cooperation. Thus, the required qualification of the administration aims at reducing knowledge gaps and obstacles in comprehension. HIAs have the potential to serve as a motor for innovation in health-promoting urban development through a wider impact, but require the appropriate resources, personnel, time and knowledge, without which the process cannot be implemented sufficiently.

References

Buhtz Martina, Heike Gerth, Stephanie Marsch (2017) Integriertes Entwicklungskonzept (IEK) für den Stadtteil Gera-Lusan. Programm Soziale Stadt. Berlin: Weeber+Partner; Gera.

Bundeszentrale für gesundheitliche Aufklärung (ed.) (n.d.), Wie lebenswert finde ich meine Umgebung? Der Stadtraummonitor. [Online] Available from: https://stadtraummonitor.bzga.de/. Accessed [25/4/2023].

Elvers, Horst (2017) Mehr Gesundheitsförderung in der Stadtplanung.In: Nachrichten der ARL Raum und Gesundheit (ed.). 03, pp. 13-16. [Online] Available from: https://www.arl-net.de/system/files/media-shop/pdf/nachrichten/2017-3/nachrichten-2017-3.pdf Accessed [03/05/2023].

Fehr, Rainer; Francesca Viliani; Julia Nowacki; Marco Martuzzi, (ed.) (2014) Health in Impact Assessments: Opportunities not to be missed. Kopenhagen: WHO Regional

Office for Europe. [Online] Available from: https://www.euro.who.int/__data/assets/pdf_file/0011/261929/Health-in-Impact-Assessments-final-version.pdf Accessed. [02/05/2023].

Giles-Corti, Billie; Anna Timperio, Fiona Bull; Terri Pikora (2005) Understanding physical activity environmental correlates: Increased specificity for ecological models. In: Exercise and sport sciences reviews, 33(4), pp. 175–181. [Online] Available from: https://doi.org/10.1097/00003677-200510000-00005. Accessed [02/05/2023].

Mekel, Odile (2015), Health Impact Assessment / Gesundheitsfolgenabschätzung (HIA/GFA) als Baustein zur Umsetzung von HiaP. [Online] Available from: https://www.lzg.nrw.de/_php/login/dl.php?u=/_media/pdf/service/Pub/mitarbeiter/mekel_hiap_kongress_armut_und_gesundheit_2015_berlin.pdf. Accessed [01/05/2023].

Orstad, Stephanie L.; Meghan H McDonough.; Shauna Stapleton, Ceren Altincekic; Philip J Troped, (2016): A Systematic Review of Agreement Between Perceived and Objective Neighborhood Environment Measures and Associations With Physical Activity Outcomes. In: Environment and Behavior, 8, pp. 904–932. [Online] Available from: https://doi.org/10.1177/001391651667098. Accessed [02/05/2023].

Ria Hutabarat Lo (2009) Walkability: what is it? Journal of Urbanism: International Research on Placemaking and Urban Sustainability, 2(2), pp. 145-166. [Online] Available from: https://doi.org/10.1080/17549170903092867 Accessed [03/05/2023].

Saelens, Brian; Susan L. Handy (2008) Built environment correlates of walking. In: Medicine and science in sports and exercise, 40(7), pp. 550-566.

Ståhl, Timo; Matthias, Wismar; Eeva Ollila; Eero, Lahtinen; Kimmo Lepp (eds.) (2006) Health in All Policies. Prospcects and potentials.Finland: Ministry of Social Affairs and Health. [Online] Available from: https://eurohealthobservatory.who.int/publications/m/health-in-all-policies-prospects-and-potentials. Accessed [30/04/2023].

Winkler, Mirko S., Peter Furu, Francesca Viliani, Ben Cave, Mark Divall, Geetha Ramesh, Ben Harris-Roxas and Astrid M. Knoblauch A M (2020) Current Global Health Impact Assessment Practice International. In: Journal of Environmental Research and Public Health, 17(9). [Online] Available from: http://dx.doi.org/10.3390/ijerph17092988 Accessed [02/05/2023].

WHO - World Health Organisation, Regional office for Europe (ed.) (1999) Health Impact Assessment. Main concepts and suggested approach. [Online] Available from: http://www.healthedpartners.org/ceu/hia/hia01/01_02_gothenburg_paper_on_hia_1999.pdf Accessed [01/05/2023].

WHO (ed.) (2014) The Helsinki Statement on Health in All Policies. 2013. [Online] Available from: https://www.who.int/publications/i/item/9789241506908 Accessed [01/05/2023].

WHO (ed.) (2017) Determinants of health. [Online] Available from:

https://www.who.int/news-room/questions-and-answers/item/determinants-of-health# Accessed [30/04/2023].

WHO (ed.) (2023a) Health Economic Assessment Tool (HEAT) for walking and cycling. [Online] Available from: https://www.who.int/tools/heat-for-walking-and-cycling Accessed [30/04/2023].

WHO (ed.) (2023b) Health impact assessment. [Online] Available From: https://www.who.int/health-topics/health-impact-assessment#tab=tab_1. Accessed [01/05/2023].

WHO (ed.) (2023c) Health impact assessment (HIA) tools and methods. [Online] Available from: https://www.who.int/tools/health-impact-assessments Accessed [01/05/2023].

WHO (ed.) (2023d) Urban Health. [Online] Available from: https://www.who.int/health-topics/urban-health#tab=tab_3 Accessed [01/05/2023].

Zuniga-Teran, Adriana A. 2015: From Neighborhoods To Wellbeing And Conservation: Enhancing The Use Of Greenspace Through Walkability. Dissertation. Arizona: The University of Arizona.

Zuniga-Teran, Adriana A.; Barron J. Orr; Randy H. Gimblett,; Nader V. Chalfoun, Stuart E. Marsh, Scott Going, David P., Guertin (2017) Designing healthy communities: Testing the walkability model. In: Frontiers of Architectural Research, 6, pp. 63 - 73.

EVALUATING OF NEW TOWN PLANNING IN SOUTH KOREA: NEW URBANISM PERSPECTIVE (1100)

Oh Ji Woon[1*], Mun Hansol[1], Seong Jin[1], Jung Juchul[1]

[1] Pusan National University, Department of Urban Planning & Engineering, Pusan, Republic of Korea; junejwoh@pusan.ac.kr

Abstract. New Urbanism is to create a specific social pattern in the city and improve the quality of urban life through urban physical infrastructure planning. However, New Urbanism was criticized for being regard as a planning technique that could only be applied in new vacant land like a new town, not in the old city place. Nonetheless, New Urbanists have been creating and popularizing many now-common development patterns and strategies. South Korea is one of the countries with many large-scale new town developments, but there was a lack of reflection on the planning principles on New Urbanism. Accordingly, this study is evaluating new town planning through New Urbanism and we derived the trends and implications of new town planning in South Korea.

Keywords: New Urbanism, New Town Planning, Urban Planning.

1. Introduction

1.1. Background Information

Since the 21st century, cities are undergoing rapid urbanisation due to population growth, and various urban problems due to urban overcrowding and reckless expansion. As part of an effort to solve these urban problems, a new concept of urban movement called ‘New Urbanism’ was developed in the United States in the 1980s. New Urbanism started from the belief that planning the city's physical infrastructure can create or influence a specific social pattern within the city, although it cannot directly solve various problems in the city. It is noteworthy in that it is a planning theory created by the collaboration of experts in various fields such as urban, landscaping, and architecture. Although there is no case of directly applying New Urbanism's planning theory and approach to urban planning in South Korea, recent trends in urban planning show that the publicity and pedestrian-friendly strategies of the city that New Urbanism emphasises are mainly used. Therefore, in this study, we reviewed the planning theories and approaches of New Urbanism, and analysed how these planning theories were implemented in the physical dimension of urban planning, focusing on recent cases of new urban planning in South Korea.

1.2. Method of the Study

In order to analyse the trend of South Korea's New town planning in this study, We analysed the winning works of the 'Third-Generation New towns basic concept and three-dimensional urban space planning competition(3rd New Town Competition)'. The competition, which was conducted in 2020 by the Ministry of Land, Infrastructure and Transport and Korea Land and Housing Corporation (LH), is an urban planning contest led by the central government. It is representative of the domestic urban planning trend in that it reflects the new vision and trend led by the state in the new town planning of South Korea.

First, we reviewed previous studies on the background, concept, and main principles of New Urbanism to explore the essential meaning and practical purpose of the New Urbanism movement. And we reviewed previous studies on urban planning theories that influenced New Urbanism and similar urban planning theories that emerged after New Urbanism. In addition, in order to compare and analyse the main principles of New Urbanism and new town plans in South Korea, this study reviewed previous studies on the main principles of New Urbanism and the composition of guidelines for the new town planning contest, and prepared a comprehensive table for comparative analysis. Utilising this, we tried to explore implications for the future development direction of South Korea's urban planning by conducting an analysis of each winning work and examining the trend of new town planning in South Korea viewed from a New Urbanism.

2. The concept of New Urbanism and the theory of urban planning

2.1. Background and Concept of New Urbanism

New Urbanism was raised in the United States in the 1980s as a counterargument against the indiscriminate expansion of cities, that is, the existing suburban development methods. It supports planning theories similar to neo-traditional planning and transit-oriented development (TOD). As New Urbanists are experts in various fields, they have different values for urban planning. However, through several years of discussion, New Urbanism derived two common goals : "securing public areas" and "creating pedestrian-specific environment". And tried to realise them through physical planning. Discussions were made on the changing family composition, land use that does not consider natural characteristics and physical limitations, government policies that encourage low-density growth, street systems that ignore the human scale, and uniform communities that ignore local climate and traditions. Six architects : Peter Calthorpe, Andres Duany, Elizabeth Moule, Elizabeth Peter-Zyberk, Stefanos Polyzoides, Daniel Solomon (Daniel Solomon) started to work by founding the New Urbanism Association (CNU; Congress for the New Urbanism), a non-profit organization that advocates general changes in New Urbanism

principles and community formation methods(Bae et al., 2014). New Urbanism emerged in this social background, and can be seen as a concept of urban planning to design a city by presenting new plans and guidelines to solve the city's problems.

2.2. Basic Principles of New Urbanism

New Urbanism started from the belief that designing a community, that is, planning a city's 'physical infrastructure', can create or influence a specific social pattern within a city. After numerous discussions, experts in various fields such as urban, landscaping, and architecture announced a statement called The Ahwahnee Principles in 1991 at a meeting of the California Local Government Committee held at the Ahwahnee Hotel in Yosemite National Park, USA. It became the basis for New Urbanism planning principles. There are four ideological themes of New Urbanism outlined in The Ahwahnee Principles : integrated communities, mixed land uses, walkability, and conservation of resources. Afterwards, CNU was officially held in 1993, and theoretical principles were proposed in the form of a charter in 2000. This principle is still used as the main theoretical concept and basic principle of New Urbanism **(Table 1).** The basic principles of New Urbanism focus on building a high-density city centered on traditional communities, and there are differences in interpretation of the theoretical content of New Urbanism depending on the perspectives of researchers.

Table 1. Principles of New Urbanism

Principle	Contents
Walkability	- Most things within a 10-minute walk of home and work - Pedestrian friendly street design - Pedestrian streets free of cars in special cases
Connectivity	- Interconnected street grid network disperses traffic & eases walking - A hierarchy of narrow streets, boulevards, and alleys - High quality pedestrian network and public realm makes walking pleasurable
Mixed-Use & Diversity	- A mix of shops, offices, apartments, and homes on site. Mixed-use within neighborhoods, within blocks, and within buildings - Diversity of people - of ages, income levels, cultures, and races
Mixed Housing	- A range of types, sizes and prices in closer proximity
Quality Architecture & Urban Design	- Emphasis on beauty, aesthetics, human comfort, and creating a sense of place - Special placement of civic uses and sites within community. Human scale architecture & beautiful surroundings nourish the human spirit
Traditional Neighborhood	- Discernable center and edge - Public space at center

Structure	- Importance of quality public realm; public open space designed as civic art - Contains a range of uses and densities within 10-minute walk - Transect planning: Highest densities at town center; progressively less dense towards the edge
Increased Density	- More buildings, residences, shops, and services closer together for ease of walking, to enable a more efficient use of services and resources, and to create a more convenient, enjoyable place to live - New Urbanism design principles are applied at the full range of densities from small towns, to large cities
Green Transportation	- A network of high-quality trains connecting cities, towns, and neighborhoods together - Pedestrian-friendly design that encourages a greater use of bicycles, rollerblades, scooters, and walking as daily transportation
Sustainability	- Minimal environmental impact of development and its operations - Eco-friendly technologies, respect for ecology and value of natural systems - Energy efficiency / Less use of finite fuels / More local production / More walking, less driving
Quality of Life	- Taken together these add up to a high quality of life well worth living, and create places that enrich, uplift, and inspire the human spirit

Source : http:/www.newurbanism.org

2.3. Similar Urban Planning Theories of New Urbanism

2.3.1. The City Beautiful Movement

The City Beautiful Movement is an urban movement in the late 19th and early 20th centuries. This movement emphasised the arrangement of public buildings, squares and parks in the city. The second half of the 19th century was a time when the growth of cities in the United States reached its peak due to immigrants from South America and Europe. As a result, the racial and cultural heterogeneity of the city amplified, and environmental problems such as housing, sanitation, and pollution, and moral problems such as social division and increased crime occurred. In accordance with these social problems, politicians, intellectuals, and businessmen began to consider the preservation of urban social organizations as a city's immediate task. Two movements have begun, centering on the middle and upper classes of the US: the Progressivism movement, which aimed to reform the existing urban planning regulations, laws and systems, and the City Beautiful movement, which is a practical movement to improve the aesthetics of cities(Park et al., 2012).

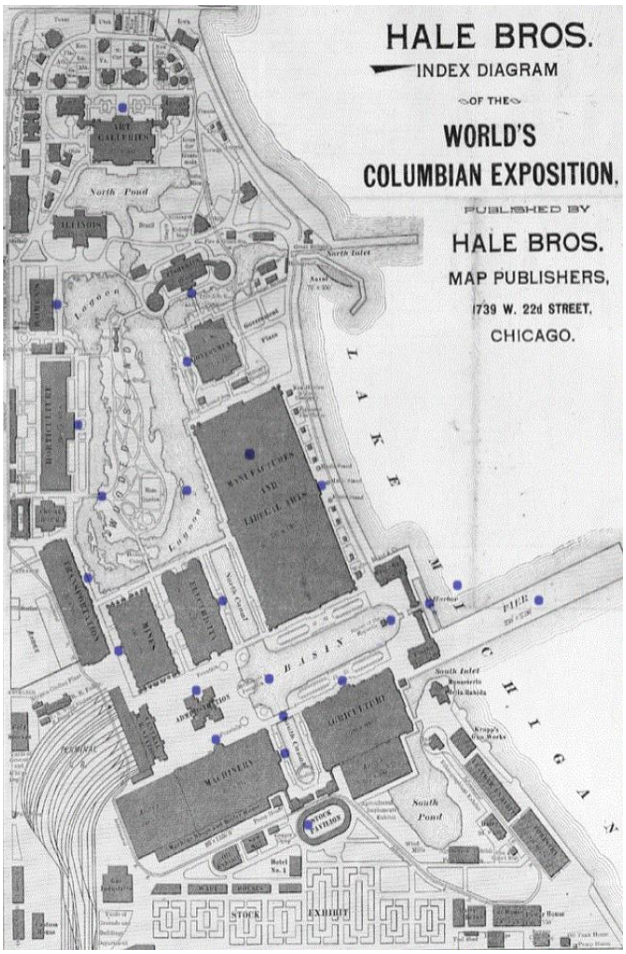


Figure 1. Plans of the 1893 Chicago Exposition
Source: www.chicagohs.org

The City Beautiful Movement planned the World's Columbian Exposition held in Chicago, USA in 1893 to commemorate the 400th anniversary of Columbus' discovery of the New World. At this time, under the direction of architect Daniel Burnham, landscape architect Frederick Law Olmsted planned the project together (Figure 1).

After the World's Columbian Exposition, urban planning reflecting the City Beautiful Movement was actively carried out in major cities in the US, such as Washington, San Francisco, and Cleveland. It was also used in many British colonial city plans, such as India and Southeast Asia, which were created between 1910 and 1935. The ideological background of the City Beautiful Movement starts from environmental determinism, which has similarities with the main ideas of New Urbanism that appeared later. Activists believed that the pursuit of the beauty of the environment was important in solving urban

problems because the urban environment had a great influence on people's thoughts and actions, and pursued the combination of beauty and utility. In addition, they believed that physical changes in the urban environment, such as the collective arrangement of public buildings and the creation of open spaces, would attract the population to the city and increase wealth, thereby increasing the city's assets and improving the quality of life. It was an attempt to alleviate the problem of rapid urban growth through the intervention of the state and capitalists.

2.3.2. The Garden City Movement

The Garden City Movement is an urban planning theory initiated by British urban planner Ebenezer Howard. It was a plan to create a “new town” designed for the poor workers who flocked to the cities because of the Industrial Revolution. Howard did not judge the urban problems of the time simply as the influx of population and the construction of dwellings for the poor. Through the Garden City Movement model, he tried to reform the contradictory results of the industrial modernisation period, such as solving unemployment problems through job creation, improving workers' quality of life, revitalising com-munities, and securing self-sufficiency.

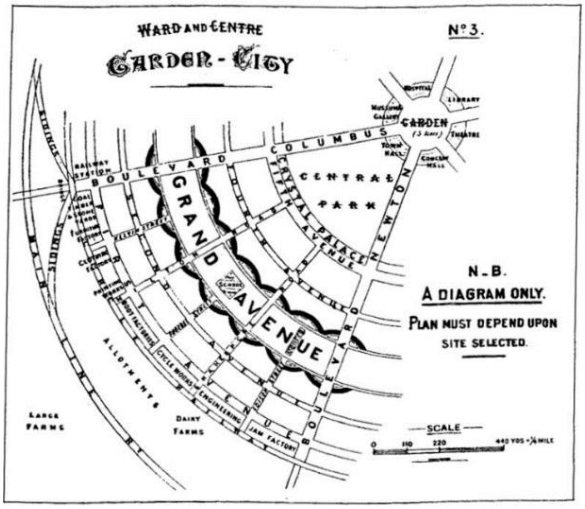


Figure 2. Howard's concept of garden city

The garden city's core concept is the central garden. The center of the city is composed of a garden, as a central park, and public facilities are placed around it. In addition, a safe and beautiful pedestrian center street and commercial area are arranged around it, and a residential area is arranged in the nearby pedestrian zone to realise an open view and pedestrian-friendly space. In the outskirts of the garden city, industrial areas and agricultural areas are arranged, and a green belt called Grand Avenue is arranged together to function as a public park in the suburbs (Figure 2).

The key point of the Garden City Movement was to create a car-friendly city while maintaining the atmosphere of a ‘village’. Therefore, the separation of the pedestrian space and the driving space is one of the key elements of the plan. It also emphasises the neighborhood unit as one of the main planning concepts, which avoids through traffic and is intended to form a large block based on schools and green spaces. What was

emphasised in this movement was to restore 'village life' by avoiding an urban approach to community formation.

2.4. Evaluation of Urban Planning viewed from New Urbanism

In this study, we analysis the trends of new town planning in South Korea viewed from New Urbanism. For this analysis, we matched each elements of New Urbanism's planning principles are reflected in the winning works of '3rd New Town Competition'. Therefore, among the planning principles, elements that can be judged physically or conceptually in the design description and measurement methods are summarised in a table (Table 2). It was based on the design description expressed on each winning artwork panel. Among a total of 25 indicators, 10 items that could not be objectively interpreted or were not expressed in the design description were excluded, and finally 15 items in 8 fields were selected. It is divided into items that can be conceptual evaluation(C) and items that can be physical evaluation(P). We specified the method of determining whether each detailed item was reflected or not, and described the method of reflection for each winning work in the analysis stage**.**

Table 2. The framework of urban planning evaluation viewed from New Urbanism

Principle	Details	Evaluation Methods	Results
Walkability	· Easy to walking between work and home (EW)	· Adjacent arrangement of residential and business area	P
	· Pedestrian-specialised street (PSS)	· Install pedestrian-friendly streets (pedestrian-friendly alleys, streets, etc.)	P
	· Pedestrian-only street (POS)	· Install a pedestrian-only street with restricted vehicle	P
Connectivity	· Grid-type road network (GRN)	· More than 50% of the road network is planned in the form of a grid	P
	· Setting the Road Hierarchy (RH)	· Road system divided into main, middle, and small	P
	· Quality of public area and pedestrian network(QP/PN)	· Whether public areas (parks, plazas, etc.) and walking networks are connected	C
Mixed-Use & Diversity	· Mixed-use planning (MUP)	· mixed-land use planning	P
	· Population diversity	-	-
Mixed Housing	· Diversity of housing size, shape and price (DH)	· Diversity of household composition type (single/multi-family house)	P

		· Diversity of housing scale (~ 60 / 60~85 / 85 ㎡~)	
Quality Arch. & Urban Design	· Placeness of space and usability of citizens	-	-
Traditional Neighborhood Structure	· Ambiguity between center and boundary	-	-
	· Central arrangement of public spaces(CP)	· Parks, public institutions, transportation stations are centrally located	P
	· Importance of public domain	-	
	· Transect Planning(TP)	· High-density center and low-density outer areas are applied	P
Increased Density	· Easy to walking between residential and commercial area (EWRC)	· Adjacent arrangement of residential and commercial/business facilities	P
	· Application of New Urbanism principles to all urban spaces	-	
Green Transportation	· Connection with other cities (CC)	· Whether public transportation is connected	P
	· Convenience of using bicycles, scooters,etc (CB)	· Bicycle roads are installed	P
Sustainability	· Minimisation of environmental impact during development	-	-
	· Applying eco-friendly tech(EF)	· Eco-friendly tech. is applied in the design manual	P
	· Energy Efficiency/ Minimisation of fossil fuel / Utilisation of local products	-	-
	· Promote walking rather than using a vehicle (PW)	· Walking is promoted rather than vehicle use according into the design manual	C
Quality of Life	· Improving the quality of life of city residents	-	-

C: Conceptual evaluation, P: Physical evaluation

3. Trend of New Town Planning in South Korea and its Analysis from the perspective of New Urbanism

3.1. History of New Town Development in South Korea

New Town development is a policy to bring other spaces(; New Town) into the center of the real estate market to solve the problem, considering that the cause of the serious spatial problem in the central city is due to the demand-supply mismatch regarding limited land resources(Kim, 2014). Development of new towns began in earnest in the 1990s with five major new towns and continued in the form of developments such as multifunctional administrative cities, innovative cities, and corporate cities and second generation new towns. In 2018, five additional cities were designated as the 3rd generation new city.

New town development in South Korea is actively progressing to the extent and there are some negative views about it. In the first and second generation of new town construction, a city with a planned population of 200,000 to 300,000 was built in a only few years by the government's one-way policy decision method. As a result, it achieved the desired goal, such as mass housing supply, but also caused other urban problems, such as the lack of securing self-sufficiency of the city and the cause of environmental problems. On the other hand, there is also a positive view, which is that it could be a good opportunity to accumulate technology related to New Town, export skilled technology, and participate in development nation's projects. Therefore, in the 3rd generation new town plan, problems such as traffic problems and securing self-sufficiency pointed out in the previous new town development process and evaluation after creation are supplemented and promoted, and public housing supply.

The 3rd generation new town is located adjacent to Seoul, has a size of 32.74 million square meters, and a total of 173,000 units are expected to be supplied. The four strategies of the 3rd generation New Town are selecting a geographical location close to Seoul, securing self-sufficiency, improving public welfare, and cooperating with region government. First of all, as a response to the traffic problem that was a problem in the previous new town development, a plan to build public transportation was established before moving in. And as a strategy for securing the self-sufficiency of the city, the main goal was to secure more than twice the amount of land for urban support facilities than before. In addition, in order to improve the public welfare of the city, along with a plan to expand the park site by 1.5 times the existing standard, the goal was to operate 100% national and public kindergartens. Lastly, in order to promote coexistence with the region, local governments participate as implementers, and the company that won the 'New Town Basic Concept Contest' has the right to carry out urban planning projects as a master planner for each development district and participates in the overall planning process. Through this, the consistency of the New Town Plan and development will be managed and comprehensively customised development will be implemented for the region.

3.2. Overview and Results of the 3rd New Town Competition

In 2020, the '3rd New Town Competition' co-hosted by the Ministry of Land, Infrastructure and Transport(MOLIT) and Korea Land and Housing Corporation(LH) was held in a general design contest, and 11 specialised companies in the urban planning and architecture sectors participated. Experts in each field, such as urban planning and architecture, participated in the first document review (technical review) and the second main review (discussion/presentation) to select the best winning work, and the winning company received the right to perform the three-dimensional urban space planning project and the Master Planner status was granted. The purpose of the contest is to create the 3rd Generation New Town to meet the future vision, such as traffic-friendly, job creation, eco-friendliness, and coexistence with the surrounding area. Under the big theme of “A symbiotic city of coexistent and win-win that develops together,” basic concept ideas for the spatial structure of each new town and three-dimensional urban spatial planning were proposed. The core of this competition is to go beyond the existing method of establishing a flat blueprint, to set up a specialised area within New Town, and to establish a three-dimensional(3D) urban space plan for it. The best works by district are Namyangju-Wangsuk District : 'Coexistent City', Hanam-Gyosan District : Co-Living Platform', Incheon-Gyeyang District: 'Hyper Terra City' was selected.

The common spatial guideline for the winning works is to arrange districts so that public transportation such as subway and S-BRT can be used within 10 minutes on foot. In particular, transportation hubs such as GTX-B and S-BRT stations are designated as specialised zones to secure transportation convenience and self-sufficiency, and specialised designs for resting spaces(adjacent arrangement of residential and park sites, etc.), landmark buildings, etc. all shown in 3D. In addition, in order to respond to various future demands such as attracting anchor companies, the land use is not fixed, and a multi-use site (White Zone) is planned that can be flexibly applied to building plans. Various specialised elements reflecting the shape of the future city were also proposed; Future transportation infrastructure such as self-driving vehicles, roads traveled by S-BRTs, roads driven by drones, advanced logistics distribution (unmanned delivery system, etc.), energy saving systems (zero energy town, building-integrated solar power generation system, etc.), city life Smart management system by cycle (moving the entire city into 3D space), etc.

3.3. Analysis of the Winning Projects

3.3.1. Namyangju-Wangsuk District: Coexistent City

The winning project of the Namyangju -Wangsuk District Competition presen-ted four development directions : economy, ecology, hyper-connectivity, and happy city, with the vision of a Coexistent City that has complete urban functions, interacts with neigh-boring cities, complements and grows. A plan was proposed to set up three central living areas, eco-cultural, socio-economic, and business complex, and 9 neighborhood living areas, including public facilities such as parks and schools within 500m of residence, and to connect all living areas to parks and green areas. GTX-B station and S-BRT were built so that public transportation can be used within 10 minutes by foot from home, and minimised travel times in connection with personal mobility.

Figure 3. Namyangju-Wangsuk District Winning project
Source: www.newcity2019.org

In addition, an urban plan was proposed that harmonises transportation, cultural, and commercial functions, such as creating an integrated platform of the GTX and Gyeongchun Line, which is the gateway to New Town, as a landmark, and connecting surrounding buildings and parks with a walking deck (Figure 3).

Comparing the basic principles of New Urbanism with the plans of the Namyangju-Wangsuk district's winning project, the Namyangju - Wangsuk district uses TOD (Transit Oriented Development) as its main focus, so it includes planning elements related to pedestrian-friendly improvement along with the traditional neighborhood structure. In particular, by constructing a walking network of 100m×100m units throughout the site, pedestrian spaces of various sizes formed through various block sizes are connected to the park and green network. In addition, five types of mixed-use land (residential-commercial complex, low-rise complex, self-sufficient complex, modular complex, and public space complex) were designated and multi-use buildings were placed near the station to realise the value of work-residential proximity. By arranging public housing and small housing together in the area adjacent to the transportation station, the diversity of housing size and form was met. In addition, as a plan for three-dimensional urban planning, which was the main guideline of the competition, a three-dimensional symbolic tower was planned in the complex transportation hub section, a drone airport in the

building, a three-dimensional pedestrian space, and a community space were planned, and spaces and functions were vertically connected. This plan can be seen as an alternative that can simultaneously satisfy the mixed use plan and the expansion of pedestrian-friendly spaces pursued in the basic principles of New Urbanism.

On the other hand, the main road network was planned as a curved road network that is different from the orthogonal grid type road network pursued by New Urbanism, but a network that circulates throughout the site is built, and three separate living zones are built around the two main streets. It was intended to respond to the city's step-by-step expansion by forming a circulation loop (Table 3).

Table 3. Analysis of the Namyangju-Wangsuk District winning project

N.U.Principle	Details	Plan
Walkability	EW	- Formation of a walking network in units of 100m × 100m throughout the site
	PSS	- Vertical Movement and Three-dimensional Community, Pedestrian Space Planning
	POS	- Curved grid patterns associated with cluster units rather than typical grid shapes
Connectivity	GRN	- Establishment of 5 levels of road hierarchy and flexible use of road space
	RH	- Three-dimensional walking space
	QP/PN	- Designation of five mixed use sites (residential commercial complex, low-rise complex, self-sufficient complex, modular complex, and public space complex)
Mixed-Use & Diversity	MUP	- Plans for single houses, multi-family houses, general rental and public rental housing
Mixed Housing	DH	- Public rental housing rate 66.7%
Traditional Neighborhood Structure	CP	- TOD
	TP	- Mixed use areas and commercial areas are placed to concentrate the floating population in the center, and residential facilities are placed in the outer area,Nature Edge Planning
Increased Density	EWRC	- Arrange commercial and business facilities centered on public transportation, and arrange residential facilities adjacent to them
Green Transportation	CC	- Designate key transportation hubs such as GTX-B and S-BRT stops as special zones
	CB	- Installation of bicycle and personal mobility network
Sustainability	EF	- Installation of zero energy special zones

	PW	- Induce activation of street space by arranging small block units toward the center

3.3.2. Hanam-Gyosan District: Co-Living Platform

The winning project of the Hanam-Gyosan District Competition is based on the vision of " Co-Living Platform" and proposed urban development directions such as "eco-friendly," "traffic-friendly," "nursing-friendly environment," "job and self-sufficiency," and "diversity of living environments." Gyosan New Town is largely divided into self-sufficiency-centered living areas and residential-centered living areas, and is subdivided into 12 small living areas centered on pedestrians.

Figure 4. Hanam-Gyosan District Winning project
Source: www.newcity2019.org

The self-sufficiency-centered living area was divided into 4 areas along the road network, and the residential-centered living area was subdivided into 8 areas centered on transportation nodes such as schools and public transportation stations. Centering around the new subway station, three stations were planned as station area complex sites where commercial, cultural, and living SOCs were integrated. In order to connect the north and south of the self-sufficient centered living area disconnected by the Jungbu Expressway, the area was designated as a specialised area and an artificial urban plateau was installed to connect the disconnected living area. Based on this, it planned a future-type Urban Hybrid Land that combines commerce, business, housing, and culture. Advanced transportation logistics functions such as BRT, underground roads, and shared parking lots were included in the specialised under-ground area, and natural networks such as Deokpungcheon Stream and parks were formed on the ground floor. Finally, on the upper floor, various urban landscapes such as landmark buildings were proposed while over-coming road breaks through artificial deck parks. A city that coexists with nature and history was proposed, such as the creation of a Deokpungcheon waterside park and a plan to preserve historical and cultural resources (Figure 4).

The basic principles of New Urbanism and the plans of the Hanam-Gyosan district winning project were compared. It can be seen that it was planned in a context very similar to the main planning principle of New Urbanism by actively arranging mixed use land in the

center of the city and connecting residential, commercial, and business areas with a three-dimensional pedestrian-only space. In particular, in the Hanam-Gyosan district winning project, an underground corridor was built to link the existing old downtown area and the wide-area transportation system, and an urban plateau was created on top of the space that was disconnected by the Jungbu Expressway to link the pedestrian network and create a space for floating population focused on. Accordingly, the area adjacent to the old city center was developed as a high-density commercial area, and residential areas were placed in the outskirts adjacent to nature. It is contrary to the basic principle of New Urbanism that a park using the existing green area was created in the central part of the new town planning site and residential areas such as apartment houses were placed in the boundary part. However, this was intentionally planned so that more residents can feel nature in their dwellings. In addition, it seems that the hierarchy of roads was not greatly considered in the overall urban division by planning mainly arterial roads (Table 4).

Table 4. Analysis of the Hanam-Gyosan District winning project

N.U.Principle	Details	Plan
Walkability	EW	- Arrange residential, commercial, and business sites by concentrating white zones in the center of the city
	PSS	- Creating a Green Approach Walking Space around the Waterfront and Residential Complex - Planning a walking arcade on the street and building interface space
	POS	- Install an urban plateau, a three-dimensional circulation, and connect commercial and business facilities
Connectivity	GRN	- a grid-type road system
	RH	- Planned on 24m and 22m main roads
	QP/PN	- Connected to each residential area around the green axis near the river
Mixed-Use & Diversity	MUP	- Arrangement of mixed use lands for residential, commercial, cultural, and living SOC spaces around main roads and central living areas
Mixed Housing	DH	- Site development for single houses, block detached houses, and multi-family houses
Traditional Neighborhood Structure	CP	- The entire site is arranged around the park, and public business areas are placed at the center of each living area
	TP	- Create high-density commercial areas in areas adjacent to the old city center and place residential areas in outlying areas adjacent to nature
Increased Density	EWRC	- Arrange residential, commercial, and business sites by concentrating white zones in the center of the city

Green Transportation	CC	- Creation of an urban plateau connected to the old city center - Strengthen wide area transportation BRT accessibility by creating an underground corridor under the main road
	CB	- Establishment of bicycle and personal mobility network
Sustainability	EF	- Establishment of a future green transportation system through the creation of an underground corridor
	PW	- Establishment of a pedestrian-oriented network that connects schools and living SOCs in the center of small living areas and connects them to residential areas

3.3.3. Incheon-Gyeyang District : Hyper Terra City

The winning project of the Incheon-Gyeyang District Competition pre-sented the direction of urban develop-ment to realise Hyper Terra City through 'inclusion', 'connection', and 'convergence and sharing' under the vision of 'New town in the super era that connects hearts'. A three dimen-sional route was proposed so that the S-BRT, which connects Gimpo Airport Station (Lines 9 and 5) and Bucheon Sports Complex Station (GTX-B, Line 7, and Daegok-Sosa Line) in Gyeyang New City, runs smoothly at inter-sections. A station plan was prepared so that S-BRT can be used within 8 minutes (600m) on foot from residential complexes. In addition, it was proposed to build a pedestrian-oriented trans-portation network through under-grounding of automobile roads. A green axis connecting Incheon Gye-yang from east to west (Mt. Gyeyang on the west axis and Gulpocheon on the east axis) is set in a diagonal line, and the complex is arranged so that parks and green areas can be used within 200m from all living areas. Ecological wetlands and waterside trails were also presented, centering on Gulpocheon. The intersection of the north-south S-BRT route and the east-west green axis (connecting Gyeyangsan Mountain and Gulpocheon) is set as a specialised area, and it is planned to create a high-tech industrial cluster where a complex transfer center, corporate/commercial land, and a startup campus harmonise (Figure 5).

Figure 5. Hanam-Gyosan District Winning project
Source: www.newcity2019.org

Many elements of the planning principle pursued by New Urbanism were used in that Walkability, Mixed Use Planning, the public space was placed at the center, and the quality of the pedestrian environment was improved by linking the seven landscape axes

with the creation of specialised pedestrian-only streets in connection with it. In particular, the 'car-free city' was set as one of the planning goals, and a long-term step-by-step pedestrian priority city was planned by separating the S-BRT line and connecting green belts after undergrounding roads and publicizing pedestrian paths.

On the other hand, in the grid-type road network part pursued by New Urbanism, a diagonal grid was used instead of a rectangular grid. According to the planning description, as the intermediate space (P-Path) of Route 2 takes the form of a diagonal line in the same space, it has the advantage of increasing accessibility by linking with more areas. When the azimuth of the sun approaches the angle of the road as it is planned to be 261 degrees due north, the location of the sunset is located at the end of the street, so you can experience 'Gyeyang-henge'. It will be possible to build a city festival and city brand using this. The oblique landscape axis penetrating the main axis of the city forms a unique visual landscape unique to the Incheon-Gyeyang district, and has the advantage of planning a creative road axis beyond the traditional grid form. However, as the walking and access space due to roads increases, the overall road occupancy rate increases, and there is a concern that idle sites generated due to the formation of acute-angled roads may increase (Table 5).

Table 5. Analysis of the Incheon-Gyeyang District winning project

Principle	Details	Plan
Walkability	EW	· Planning a specialised area (district 2) where business and residential facilities coexist, and creating a pleasant walking environment by bringing the surrounding nature into the building
	PSS	· Urban Square and Central Greenway near the complex transfer center
	POS	· Plan a thousand parks(p-paths) to induce various activities
Connectivity	GRN	· The North-South road axis is formed along the natural terrain, and the plan is to use a diagonal grid called "Route 2 Mediation Space" to access more areas with roads
	RH	· Establishment of three stages of road hierarchy, creation of ground and underground road spaces, and linkage
	QP/PN	· By creating seven scenic axes (vista) in the right-angled direction of Gulpocheon Stream, which is formed in the north-south direction of the city, securing a sense of visual openness and strengthening the walking network
Mixed-Use & Diversity	MUP	· Comprehensive planning of commercial, residential, and business areas as urban residential areas near work area
Mixed Housing	DH	· Planning 8 Housing Types according to Lifestyle;

		Medium type, road noise response type, community street response type, living street response type, waterfront park specialised type, social cooperative house, Soho type/workroom type house, BRT type
Traditional Neighborhood Structure	CP	· A complex transfer center was placed in the center of the city and an urban plaza and a street park axis were built nearby
	TP	· Place high-density areas in the center and lower-density areas toward the outskirts
Increased Density	EWRC	· Planning a specialised area (district 1) where general commercial areas and residential areas coexist, and forming a neighborhood commercial area
Green Transportation	CC	· Establishing a road system that connects Gimpo Airport and the old city center nearby · Building a complex transfer center in the center of the city
	CB	· Establishing a Bicycle and Personal Mobility Network
Sustainability	EF	· Eco-friendly tech. is applied in the design manual
	PW	· Pedestrian priority plan through road undergrounding and publicization of pedestrian paths, etc

4. Discussion and conclusions

New Urbanism is an urban movement that began in the United States in the 1980s, and is a planning concept developed with the aim of improving the quality of urban life and solving the problems of existing cities by creating and influencing specific social patterns in cities. The starting point of New town planning in the United States can be seen as the start of Howard's Garden City. The plan was to create a new town designed for poor workers who flocked to the city due to the industrial revolution, and to reform the contradictory results of the capitalist social structure of modern industrialization, such as solving unemployment through job creation, improving workers' quality of life, revitalizing communities, and securing self-sufficiency. The concept of the garden city has been developed in the same context as the urban beautification movement and New Urbanism, and has been used as a major principle for creating new cities such as new towns. South Korea's new town plan is also a concept of developing a new city by selecting an appropriate area to solve the physical limitations of the existing city. It pursues the form of an ideal city that is different from the existing city, and in many elements of the new town plan, the publicity of the city and the pedestrian-friendly strategy emphasised in the concept of New Urbanism are mainly used.

In order to examine recent urban planning trends in South Korea from the perspective of New Urbanism, three winning works of the '3rd New Town Basic Concept and Three-dimensional Urban Space Plan Contest' were analysed from the New Urbanism perspective. Common guidelines for the competition were workplace-housing proximity, public transportation-centered planning, three-dimensional urban space planning, and complex site planning. It was a planned feature common to the three districts in terms of pedestrian friendliness, multi-use, housing mix, high density, smart transportation system, and sustainability. On the other hand, in terms of connectivity, New Urbanism insists on building a grid-type road network as a planning principle, but the Namyangju-Wangsuk district and Incheon-Gyeyang district proposed a modified plan in the form of a curved circulation system and a diagonal grid. In the case of the Namyangju-Wangsuk district, it was intended to respond to the city's step-by-step expansion by forming a circulation loop for each of the three living zones centered on the two main streets. And in the Incheon-Gyeyang district, it is explained that accessibility is improved by linking with more regions through a diagonal grid, and city branding using this is possible. However, it remains open to debate whether it will be able to meet other values beyond that. This is because the transformed road network gives up the economic advantages of the existing grid system, such as shortening of travel distance, minimising road space, and increasing efficiency in land use. Regarding the planning principle of transaction planning in terms of traditional neighborhood structure (that is, whether a high-density area is placed in the center and a low-density plan is taken toward the periphery), In the Namyangju-Wangsuk district and Incheon-Gyeyang district, it was observed that the development density decreases as the distance from the center of the city, such as the station, to the outskirts using the TOD development method. However, in the case of the Hanam-Gyosan district, the area around the river in the center was created as a specialised waterside space, parks and plazas were placed, and the new town border area adjacent to the outer nature was created as a residential area, so some areas are far away from the outskirts. It was observed that the development density increased with the increase. Through this, the quality of life in residential areas can be improved by placing residential areas, natural areas, and parks adjacent to each other, and sales can be made well, but there is a risk of a new urban sprawl in the new city. If residential areas are dispersed to the outskirts, a road system that circulates only within the complex is formed for each residential complex, increasing the road occupation rate in the city, while there is a concern that the road sharing rate may decrease (Table 6).

Table 6. Comprehensive analysis of new town planning viewed from New Urbanism

Principle	Details	Reflected Plan or not		
		Namyangju-Wangsuk	Hanam-Gyosan	Incheon-Gyeyang
Walkability	· Easy to walking between work and home	●	●	●
	· Pedestrian-specialised street	●	●	●
	· Pedestrian-only street	●	●	●
Connectivity	· Grid-type road network	◯	●	◯
	· Setting the road hierarchy	●	◯	●
	· Quality of public area and pedestrian network	●	●	●
Mixed-Use & Diversity	· Mixed-use planning	●	●	●
Mixed Housing	· Diversity of housing size, shape and price	●	●	●
Traditional Neighborhood Structure	· Central arrangement of public spaces	●	●	●
	· Transect Planning	●	◯	●
Increased Density	· Easy to walking between resi-dential and commercial area	●	●	●
Green Transportation	· Connection with other cities	●	●	●
	· Convenience of using bicycles, scooters, etc.	●	●	●
Sustainability	· Applying eco-friendly tech.	●	●	●
	· Promote walking rather than using a vehicle	●	●	●

(● : plan, ◯ : transform and reflect)

In this study, a literature study was conducted on the planning principles of New Urbanism and the urban movement before and after it in order to examine the trends of

domestic New Town planning from the New Urbanism perspective. New Urbanism has been developed as a physical planning principle to solve the problems of existing cities, and in the context of garden cities, urban beautification movements, and compact cities, it pursues the improvement of the quality of life of citizens through urban environment and structural changes. In this respect, it was found that it is an urban planning concept that has the same context. Focusing on the winning works of the 3rd new town planning contest co-hosted by the Ministry of Land, Infrastructure and Transport and the Land and Housing Corporation, this study tried to analyse the trend of new town planning in South Korea from the perspective of New Urbanism by comparing them with the planning principles of New Urbanism. This study has a limitation in that it was limited to the target of analysis only for the 3rd new town plan. After the actual implementation of the 3rd new town in the future, it is judged that it is necessary to analyse and monitor the correspondence between the plan and the actual implementation of the city, and whether the physical implementation is being used to meet the goal of the plan. In this way, by activating the evaluation and analysis of the South Korean new town plan, it will be a good opportunity to accumulate the know-how of the South Korean new town development project, which is actively under way, and to export related technologies and participate in the development project.

Acknowledgement. This work was supported by the National Research Foundation(NRF), Korea, under project BK21 FOUR.

References

Ajay M. Garde (2004) New Urbanism as Sustainable Growth? *Journal of Planning Education and research*, 24, pp.154-170.

Bae, J., S. Baek and Y. Kim (2014) An Analysis of Urban Structure of New Urbanism in Calgary of Canada: Focused on analysis of the case of early American. *Journal of the architectural institute of Korea : Planning & design*, 30 (7), pp.11-20.

Bryson, John (2007) Arts, dance, cultural infrastructure, and city regeneration: Knowledge, audience development, networks, and conventions, and the relocation of a Royal Ballet company from London to Birmingham. *Norsk Geografisk Tidsskrift - Norwegian Journal of Geography*, 61 (3), pp.98-110.

Chicago History Museum www.chicagohs.org Accessed [19/05/2023]

Choi, H., E. Seo and H. Jun (2020) Social Diversity and Quality of Life among People Living in Seoul: An Application of Multilevel Model. *Journal of the Korean Regional Science Association*, 36 (1), pp.69-88.

Chung, J., and M. Oh (2011) A Study on Sustainable Development of Urban Area in Green Belt: Focused on City Development of Sustainable Compact City Method. *Journal of the*

Korea Academia-Industrial Cooperation Society, 12 (12), pp.5917-5930.
Congress for the New Urbanism www.cnu.org Accessed [19/05/2023]
Florida, R (2002) *The Rise of the Creative Class: And How It's Transforming Work, Leisure, Community, and Everyday Life*. New York: Basic Books.
Fulton William (1996) *The New Urbanism: Hope or Hype for American Communities?* Cambridge: Lincoln Institute of Land Policy.
Han, S., K. Park, E. Park, Y. Seo, D. Kang and S. Park (2009) *The Policy Directions to relieve the Inter-regional Cultural Disparities on Gyeongsangnam-do: Focusing on the expansion of cultural infrastructure*. GyeongNam Institute.
Hwang, S., and K. Kim (2007) A Design Proposal of Four Season Resort Based on the Urban Spatial Structure of the New Urbanism as a Sustainable Urban Theory. *Conference Journal of the architectural institute of Korea*, 2007 (10), pp.489-494.
Jabareen Rafeq Yosef (2006) Sustainable Urban Form: Their Typologies, Models and Concepts. *Journal of Planning Education and research*, 26 (1), pp.38-52.
Jeon, G., M. Choi and M. Jeong (2015) A Study on the Relationship between Community Activities, Culture and Regional Development: Focused on the Cases of Coin street, Nagahama, and Samdeok-dong. *Korean Public Administration Quarterly*, 27 (1), pp.87-113.
Jung, C., and O. Kwon (2010) Study on Supply Standards of Cultural Infrastructure. *Journal of the architectural institute of Korea : Planning & design*, 26 (2), pp.61-68.
Kim, K., and S. Hong (2021) Analysis on Regional Disparities in Culture & Arts Infrastructure: Focused on Gyeonggi Province. *The Journal of Korean Policy Studies*, 21 (2), pp.27-50.
Kim, Y (2004) *A Study on the Characteristics of Spatial Structure of the New Urbanism City*. Daegu, Korea: Graduate School, Kyungpook National University.
Ko, D., and S. Park (2019) A Study on the Influences of the Built Environment around Parks on Pedestrian Traffic Accidents. *Journal of Korea Planning Association*, 54 (5), pp.65-75.
Lee, B (2021) Standardization and Policy Modeling to Support Vulnerable areas in the Cultural Environment. *Journal of the Korean Geographical Society*, 56 (6), pp.623-638.
Lee, H., and J. Sim (2011) *GIS Geomatics*. Seoul: Bobmunsa.
Lee, J., and S. Choi (2018) Spatial Distribution Characteristics Analysis of Cultural Infrastructure in Seoul: A Focus on Distribution of Population and Density of Use. *Journal of Tourism Studies*, 30 (4), pp.61-80.
Lee, S (2014) Understanding Spatial Dependence and Using Spatial Regression Analysis. *Korean policy sciences review*, 18 (3), pp.39-79.
Ministry of Culture, Sports and Tourism (2018) *2030 Cultural Vision.*
Ministry of Culture, Sports and Tourism (2017) *2017 National Cultural Infrastructure comprehensive bibliography.*
Ministry of Culture, Sports and Tourism (2020) *2020 National Cultural Infrastructure comprehensive bibliography.*
Moon, H., and N. Song (2020) Influence of Living Infrastructures on the Distribution of

Single-person Households and Quality of Life. *Seoul Studies*, 21 (4), pp.157-175.
New Urbanism www.newurbanism.org Accessed [19/05/2023]
Oh, D., and K. Kwon (2007) A Case Study on the Regions Where Urban Regenerations were Tried by City Marketing through Culture. *Journal of Korea Planning Association,* 42 (5), pp.109-128.
Oh, M., and J. Chung (2011) A Study on the Urban Development Direction of Overseas and Domestic Sustainable Compact City. *Journal of the architectural institute of Korea : Planning & design*, 27 (12), pp.291-306.
Park, J., J. Sung and H. Cho (2017) A Study on the Progress and Implication of Garden Cities for the Sustainable Development. *Journal of The Urban Design Insitute of Korea,* 18 (2), pp.21-36.
Park, K., and J. Pae (2012) Implication of the City Beautiful Movement on Landscape Architectural History and Contemporary Urban Regeneration. *Journal of the Korea Landscape Council*, 2012 (6), pp.41-60.
Park, Y., and J. Ryu (2000) Prospects and Limitations of Urban Design Prototypes in New Urbanism. *Journal of the architectural institute of Korea : Planning & design,* 16 (5), pp.77-86.
Revko, A., M. Butko and O. Popelo (2020) Methodology for Assessing the Influence of Cultural Infrastructure on Regional Development in Poland and Ukraine, Comparative Economic Research. *Central and Eastern Europe*, 23 (2), pp.21-39.
Yang, J., and J. Park (2019) The Effect of Regional Culture Level on the Quality of Life of Residents. *Journal of Arts and Cultural Management*, 12 (1), pp.77-104.

ATLANTE DEL CIBO DELLA LAGUNA DI VENEZIA: TOWARDS A FOOD POLICY FOR THE VENICE LAGOON (1126)

Marta De Marchi[1], Cristina Catalanotti[2], Chiara Spadaro[3], Amina Chouairi[1*]

[1] Università Iuav di Venezia, Venice, Italy, *achouairi@iuav.it
[2] Politecnico di Milano, Milano, Italy
[3] Università di Udine, Udine, Italy

Abstract. Food systems and food-related policies are gaining unprecedented recognition in planning, advocating for more integrated practices: food is both a system subject to contemporary global transformations, and a territorial and urban flow capable of transforming the environment, economy, and society. Moreover, there is a renewed interest in food-related bottom-up practices, which imposes to take into account issues related to collective forms of knowledge production, exchange and extraction.

This contribution reflects on the process of designing the Food Atlas of the Venice Lagoon as an attempt to give voice to the multiplicity of stakeholders and to non-human agents of the Venice Lagoon. The Atlas calls attention to the existing network of bottom-up practices while stressing the urgency for an effective food policy for the Venice Lagoon, to test transdisciplinary, integrated methodologies that intersect local – human and non-human – actors and collectively produce food policies in the muds of practice.

Keywords: Venice Lagoon, Food Policy, Living Lab, Food Atlas.

1. Introduction

Food is acquiring increasing relevance in spatial governance tools, because of a widespread understanding of the food system as a territorial and urban flow able to transform the environment, economy, and society. Evidence of this recognition can be found in the multiplication of European programs to reorient agricultural production models, free market rules and trade agreements, the design of logistics and mobility infrastructures as well as commercial platforms. Those programs often set goals related to land consumption and water, energy and waste flows management.

Observing the three pillars of the new urban question, outlined by Bernardo Secchi (2010) – environmental threat, social injustice, and accessibility crisis – when looked at through the lens of food, they reveal specific criticalities and challenges for the city and the territory: pollution of natural resources, ecosystem fragility, loss of biodiversity; food injustice, power imbalances along the supply chain, health risks; energy crisis, scale of

distribution, conditioning of logistics (Figure 1).

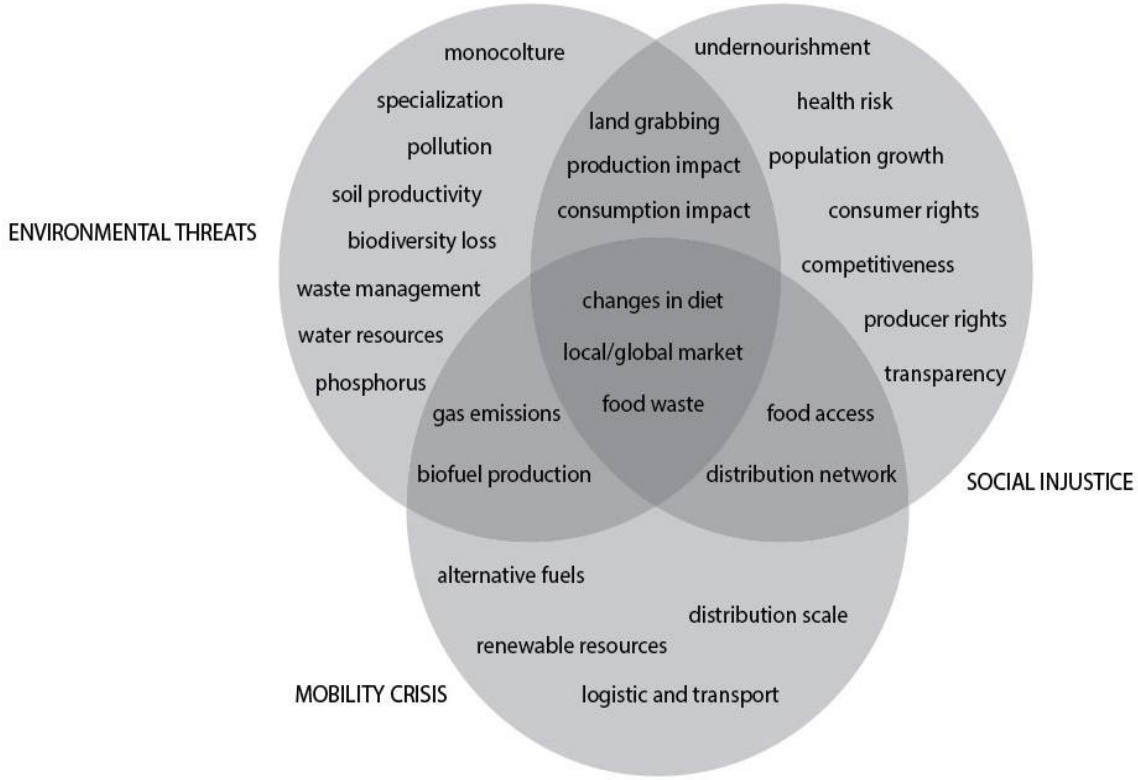


Figure 1. Food related issues, at the intersection of environmental threats, social injustice, and mobility crisis, the three aspects of Secchi's New Urban Question theory
Source: M. De Marchi (2018).

Food forces us to look at urgent challenges and local needs (Pothukuchi and Kaufman, 2000), such as public health, social equity and the process of transition taking place in contemporary territories. To tackle those urgent challenges literature focuses on *food systems* – i.e. 'the chain of activities connecting food production, processing, distribution, consumption and waste management, as well as all the associated regulatory institutions' (Pothukuchi and Kaufman, 2000, p. 113). Recently, City Region Food System have emerged as the territorial scale able to

> 'encompass the complex network of actors, processes and relationships to do geographical region that includes a more or less concentrated urban centre and its surrounding peri-urban and rural hinterland; a regional landscape across which flows of people, goods and ecosystem services are managed' (FAO, 2017).

Scholars tend to converge in interpreting city region food systems as the appropriate scale, able to include all the phases, spaces, infrastructure and socio-economic territorial relations inside the complex system of the supply chain (Blay-Palmer *et al.*, 2018).

Despite the vagueness of city region food system in addressing what *food's spaces* are highlighted by some scholars (Tecco *et al.*, 2017), food systems, as they consist in a set of practices and processes, can reveal unprecedented geographies of place and flows, useful for deciphering the territory whose logic of operation we increasingly struggle to understand. In this sense *Local Territorial Food System* (ibid.) are an interpretative tool and spatial dimension able to analytically represent the local food system as a network of agents able to mobilise: (i) local resources that are commonly recognized (e.g. soil fertility, specialised productions, local identities and international recognition connected to high quality eno-gastronomy); (ii) energies and potential projects existing in different territorial contexts that can be activated and lead to a (at least partial) local regulation of the local food system.

Food is thus a driver for looking at complexity, a transcalar tool that manages to hold together everyday practices, space and global processes. And planning for the local food systems inevitably implies a trans-sectoral and trans-versal perspective that is needed to design integrated projects, in which, environment, economy, community and innovation merge (Fanfani *et al.*, 2015). Exploring and planning for the food systems, can thus produce integrated and innovative tools and strategies that act in a complex context unveiling unexpected alliances and potentials.

To explore this potentials, we propose to look at an extremely peculiar territorial context, that of the Venetian lagoon (fig. 2), which also has a relevant historical legacy in terms of food resource production and management, since for centuries the city was able to rely on its lagoon to achieve a very high level of food autonomy (Pitteri, 2015). At the same time, Venice and its lagoon suffer anthropogenic and environmental pressures that threaten the whole socio-ecosystemic balance of the territory: climate and environmental crisis; production, commercial and tourism pressures; social fragilities (De Marchi, 2020b; Vianello, 2020).

Figure 2. The Venice Lagoon. The dry land is in white, the light grey lines represent the land mobility network, the darker lines the surface water network, in light grey the water surfaces and in dark grey the network of waterways

The lagoon of Venice is a potentially self-sufficient territory, rich in food culture and variety, with a still strong food-related economy whose food security does not seem to be in danger; however, the city is threatened by global issues such as climate change, migration flows, and the availability of fresh water and energy resources, all variables that can impact its food system. It has even strong dysfunctions within its food system in terms of social and spatial justice and in terms of economic and territorial resilience. It underestimates, in some cases, its own potential in terms of economic and social innovation that in the future could, if properly developed, ensure and improve not only food security, but also the optimal use of resources, the balance of power among system actors, the protection of landscapes and the environment, and gastronomic cultural identity.

Almost thirty years after being proclaimed a UNESCO World Heritage Site (1987), the city of Venice signed the Milan Urban Food Policy Pact (2015). A recognition and a commitment that, however, failed to develop a serious reflection on a different future for

Venice and its Lagoon.

Today, if we dwell on the food system of this complex *aquapelago* (Hayward, 2012) we can hardly trace the supply chains that in the past made it almost completely food-self-sufficient. Indeed, the Lagoon seems to find itself at the centre of two opposing and complementary forces: on one hand, the high demand for food from mass tourism is putting a strain on the competitiveness of the island's small producers. On the other, the few inhabitants remaining in the historical centre no longer seem to be the main consumer to be catered for. In this context, cultural initiatives about the foodscape of the Venetian Lagoon have multiplied in recent years, even becoming very fashionable, but perhaps not very effective in terms of awareness-raising and policy-making.

However, those initiatives claim for the recognition of food as a transversal tool that allows us to reconnect 'to the tidal and seasonal time of the lagoon, to re-attune to the specific ecology of a constantly changing place' (Perdibon, 2023, p. 60). In this sense, they represent an innovative *milieu* of bottom-up practices trying to re-engage the Venice Lagoon Food System with its political representatives and human and non-human inhabitants of the lagoon.

Such an operation of restoring old linkages as much as creating new ones within the Venice Lagoon food system comes on top of a context already undermined by a conflictual relation between the civil society, the experts and the public administration and a generalised disbelief toward the effectiveness of citizen participation (Foster and Iaione, 2016).

In this challenging panorama we question how to collectively develop transdisciplinary integrated methodologies to intersect local – human and non-human – actors and collectively produce food policies while dealing with a complex context and its contradictions.

In search for new tools and instruments, we – a multidisciplinary team from IUAV University and Ca' Foscari University involved in the EU funded project Cities2030 – are developing the "Atlante del Cibo della Laguna di Venezia", i.e. the Venice Lagoon Food Atlas, by using several participatory methods and dealing with contingent resources. This contribution discusses the potential role of active citizens in the transition of food systems (par. 02); presents the result of the first student and community workshop held in summer 2022 in the Venice Lagoon (par. 03); and drives critical reflections upon the workshop results and our actions in consideration of open critical issues that relate to participatory processes and the role of experts in the lagoon. Conclusion (par. 04) will outline partial results and highlight the critical elements of practising in the muds of the Venice lagoon as well as working perspectives for the design of the Venice Lagoon Food Atlas.

2. Bottom-up(s): Participatory planning and proactive forms of citizenship toward sustainable food systems.

The strong – yet not naive – connection between the concept of *local* and food policies and planning practices (Born and Purcell, 2006) sustained the establishment of a bioregional approach in which place-based processes aimed at developing (bio)economies could evolve together with a wide set of sustainable goals, including community self-reliance and resilience design (Norgaard, 1994; Thayer, 2012; Magnaghi, 2014). According to Fanfani et al. '[i]n such a prospect food production recovery or enhancement practices often represent the 'generative' factor in triggering and supporting bottom-up processes of agri-urban spaces protection, stewardship and improvement.' (2015, p. 146).

This relation between food and bottom-up processes is a biunivocal one.

On the one hand, if we assume that food is a territorial and urban flow able to discuss multiple contemporary challenges (De Marchi, 2020a), *the food issue* represents an evocative tool to organise broader socio-environmental claims and bottom-up practices addressing the regeneration of fragile and vulnerable territories.

On the other hand, we can interpret bottom-up practices as self-organised and co-produced initiatives addressing sustainable and equitable transformations that can trigger empowerment and self-sufficiency among the involved communities. They drive accumulation of individual and collective knowledge used to face continuous struggles and develop endurance in vulnerable contexts (Allen et al. 2017) and they are potentially able to challenge power and economic relationships from which social and environmental vulnerability can emerge (Catalanotti, Prisco and Visconti, 2020). In this sense, socio-environmental claims carry a very specific local knowledge related – for what regard us – to food systems and territories that help in readdressing local policies and might trigger political responsiveness lacking in the Venice Lagoon.

Not just focusing on food policies, there is nowadays a shared recognition of the role that bottom-up processes and socio-environmental claims can play in the design of policies and territorial and urban plans and projects, which has recently brought to the definition of more effective design and policy instruments at the intersection of the formal and the informal (Pacchi, 2020).

As Campagnari and Ranzini (2022) note, the growing horizontality of social and – in some cases – political relations among actors (Boltanski and Chiapello, 1999) led to the emergence of reticular and project-oriented governance systems as a way to design and implement public policies. This system has been reinforced by a renewed interest of the (civil) society toward the spaces we inhabit (Bang, 2005; Manzini, 2018).

Such emerging forms of dialogue between bottom-up initiatives and local administrations

can be also described as collaboration and co-production policies to define and share the management of public/communal goods and/or the co-production of services (Allegretti *et al.*, 2021). They relate to a set of recent, experimental and innovative policies born with the aim of including a wider range of citizens in decision-making processes at the local level, i.e. participatory processes and practices.

Food-related bottom-up practices, as any other participatory processes, are not without their challenges and criticalities. The process of transition from the bottom-up niches to the mainstream urban and territorial policies has been deeply examined to highlight challenges and threats that lay both in the (i) institutionalisation mechanisms of bottom-up initiatives and in the (ii) objectives of citizen participation.

The former is a process of production of norms, protocols and procedures (De Leonardis, 2001; Salet, 2018) incipient in every social situation that endures in time (Gualini, 2001) and that allows the reproduction of those situations. Main risks for socio-environmental claims lay in the loss of transformative stances (Catalanotti, Prisco and Visconti, 2020; Pacchi, 2020).

The latter refers to a multiplicity of possible critics related to the uses and misuses of participation as a tool for conflict resolution, both in terms of *who* can participate – only those who can afford it and that feel empowered enough (Mitlin and Thompson, 1995; Cornwall, 2003) –, and in terms of *why* governments can promote participation to legitimate choices, often being ineffective and, thus, enlarging the lack of trust between public institutions and citizens (Petrescu and Petcou, 2013; Foster and Iaione, 2016). While the main risk lies in the potential manipulation of participation (Arnstein, 1969; Petrescu and Petcou, 2013; Coppola, 2023), several critical elements related to the uses of participatory processes should be highlighted.

In particular, Coppola (2023) highlights that participation can challenge existing orders by incorporating previously marginalised knowledge coming from socio-environmental claims into decision-making processes and thus disrupting the dominant discourses and epistemic orders. It can also (i) aim to shift power dynamics by giving voice to marginalised groups and weakening the influence of more powerful actors, or (ii) re-legitimize political institutions and establish partnerships between the political class and civil society.

However, Coppola (ibidem) specifically refers to an extractivist approach toward the ways in which we use participation and involve bottom-up practices and agents in order to grasp their local knowledge to *produce innovation through a laboratorial approach* without producing any change in power relations and epistemic orders. The diffusion of so-called lab-like forms (such as urban living labs) generally oriented towards addressing emerging issues, such as environmental and climate-related problems, is based on the idea that deep and accelerated innovations are needed to tackle these issues. These participation techniques allow to extract specialised knowledge essentially for free,

leveraging the desire for distinction, recognition, and protagonism among urban populations who possess this knowledge. In this case, the rationale for participation is innovation, and these practices are legitimised not so much for explicitly seeking to disrupt the epistemic order of a given policy, but rather because such participation allows for innovation.

These forms of participation raise different questions and issues when promoted and appropriated by public actors, researchers and practitioners, such as the risk of a "solutionist" approach to inherently political problems or excessive emphasis on the process as a guarantee of desirable outcomes.

Concluding this brief excursus about the relation between food policies and bottom up practices, with a specific attention to challenges and risks related to the inclusion of local communities and innovative processes, we can now sink into the swampy lowlands of practice – the first steps of producing the Venice Lagoon Food Atlas. The aim is to understand how to design an integrated instrument to intersect local actors (researchers, economic actors, government, civil society and the non-humans) to collectively produce a food policy for the Venice Lagoon toward more inclusive, sustainable and resilient futures.

3. The Venice lagoon food atlas: A participatory and experimental living lab approach toward food policies

Despite the mentioned concerns, living lab methodology is commonly considered a tool to foster innovation (Bergvall-Kareborn and Stahlbrost, 2009; Almirall, Lee and Wareham, 2012; Concilio, De Bonis and Trapani, 2012), also through the involvement of active citizens. Moving from this hypothesis, several projects funded by the European Union are working to set up living labs[2], also in regard to food policies. In fact, within the Food2030 strategy – the EU programme addressing Urban Food System (UFS) transformation in the period 2014-2020 – several projects were financed not only to foster a sustainable transition of existing food systems, but also to develop UFS policies and to produce innovation, often by using a multistakeholder approach represented by Living Labs[3].

Within this panorama, there is the project 'Cities2030 Co-creating Resilient and Sustainable Food Systems towards Food2030', funded by the European Union Horizon2020 programme. Iuav University is partner of Cities 2030 and, together with Ca' Foscari University, is engaged in the activation of living and policy labs in the Venice Lagoon.

[2] For an overview on Living Labs in Europe, see: https://enoll.org/.

[3] See, for example, the Fusilli Project: https://fusilli-project.eu/.

Cities2030's main objective is to develop new food policies capable of reorienting existing systems towards more sustainable, resilient and fair models. The project promotes the involvement of all stakeholder groups and actors engaged in the food system arena, through the installation of urban Policy (PL) and Living Lab (LL) (Almirall et al., 2012; Bergvall-Kåreborn, 2009) at the scale of the city region food system (CRFS Labs). According to the methodology agreed upon by the project partners, during the funding period (2021-2024), partners have to address the construction of urban policies and pilot projects able to trigger innovation processes in the city-region food system(s).

Exploration, co-creation, implementation and evaluation are central concepts that guide the planning of local objectives and actions. In addition to that, the production of actionable and transferable solutions are also expected.

As partner of Cities2030, Iuav University proposed the Venice Lagoon as a case study and a testing bed for the project. Reasons for this proposal lay in the complex physical and political environment of the Venice Lagoon. As mentioned above, the City of Venice signed the Milan Urban Food Policy Pact in 2015, but such a formal act was never followed by a programmatic agenda, even though several sectoral initiatives have been launched by the public administrations part of the Venice Lagoon [4]. Moreover, the unique and non-repeatable situation that iconically represents, concentrates and accelerates contemporary socio-environmental challenges, as well as the high demand for fresh food products induced by overtourism and the vulnerable wetland ecosystem, call for an innovative approach to drive change which, according to the CRFS methodology, proposed by Cities2030, is the setting up of a Living and Policy lab.

To activate the Living Lab, the first needed activity is to explore the food system of the lagoon. To do so, a multidisciplinary team of researchers from the Iuav University and Ca' Foscari University launched the project of the Venice Lagoon Food Atlas, as a process of collaborative mapping of the local food system able to collect and promote innovation[5].

In Italy, several Food Atlases have been developed in recent years to map local food systems. Those initiatives are often developed within the Italian Local Food Policies Network, a group of almost 500 academics, researchers, administrators and activists involved, for research or professional purposes, in the planning of sustainable territorial food systems. The Atlases are proposed as a fundamental tool for representation of the pretexts, contexts and effects of the local food policies within the National Observatory of

[4] The Venice Lagoon has a very complex administrative organisation; it includes 1 metropolitan city (The Metropolitan City of Venice), of which 9 municipalities overlook the lagoon, and 1 more municipality that belongs to the Padua province.

[5] See, for example, the case of Turin (https://atlantedelcibo.it/) and Matera (http://www.atlantedelcibomatera.it/intro).

the Food Atlases, initiated by the Network.

Food Atlases are commonly open and interactive tools that can collect data and information on the food system, but also highlight innovative bottom-up experiences and promote new local food policies. In line with this perspective, the Venice Lagoon Food Atlas aims to be a governance tool that not only collects data about the local food system but also produces innovation by fostering interaction among local citizens and institutions, to support the city in reorienting more resiliently and justly its food system.

The Venice Lagoon Food Atlas wishes to engage multiple forms of knowledge to act on spatial transformations and policy design. It aims at bridging multiple disciplines (social sciences, economics, spatial planning, environmental sciences, biology etc.) and situated knowledge to explore potential innovations. Its ambition is to connect the actors of the food arena, producing a participatory platform based on collective knowledge and practices. The Atlas, as part of the living lab that is being set up, recognizes the existence of niches of innovation and forms of experiential knowledge not collected and deposited within traditionals scientific research; it also aims at uncovering micro-stories that challenge traditional forms of participatory planning to include emerging and marginalised communities.

The process of making the Atlas consists of several activities that range from public seminars and workshops to pedagogical experiments that involve university students to intercept existing local networks of citizen scientists operating in the Venice lagoon, not only in the food system but in and on the entire ecosystem. In parallel with mapping activities, we use the methodologies of oral history, moving around the islands of this *aquapelago* (Hayward, 2012) to collect the voices of those who live in the Venetian territory and who work there with land, with water, with other animals. We include vegetable growers, fishermen, beekeepers, for example, but also cooks, researchers who deal with these issues, responsible consumers involved in Solidarity Purchasing Groups, and other, human and non-human, hybrid combinations of these activities.

3.1. Cibo E Laguna. Towards An Atlas: A Pedagogical Experiment And A Community Workshop

To launch the process of making the Atlas and engaging the inhabitants of the lagoon, in June 2022, we organised a workshop for university students on food issues, in collaboration with the M9 Museo del Novecento in Mestre,

The workshop ‘Cibo e Laguna. Towards an Atlas’ aimed at both investigating the complex food system of the Venice Lagoon – defining places, spaces, actors and flows’ circularity – and prompting the active participation of actors in the food arena during moments of collective discussion and fieldwork.

The workshop was organised by Marta De Marchi (Iuav), Amina Chouairi (Iuav), Chiara Spadaro (Ca' Foscari) and Cristina Catalanotti (Iuav) with prof. Maria Chiara Tosi (Iuav), prof. Francesco Vallerani (Ca' Foscari) and prof. Shaul Bassi (Ca' Foscari)

Figure 3. Exploration of the Northern Lagoon, 28 June - Participants with Anna Sarzetto in Valle Falconera

Source photo by A. Chouairi.

The main questions that drove the quest where: What is an atlas? What is a food atlas? What elements and forms should the Food Atlas of the Venice Lagoon take?

To answer them, participants were invited to investigate characteristics, topics, categories, subdivisions, descriptive mappings while acknowledging and assimilating virtuous examples of atlases. The goal was to start drafting and building up the complex reasoning behind a territorial food atlas of the Venice Lagoon.

To engage the microcosm of practices and local human and non-human actors, we invited participants to explore food microstories in the Venice Lagoon area. Participants were asked to discover and narrate origins, cultivation processes, infrastructures, environments, interactions of products and producers, consumers, restaurants and hotels, supply chains, food tourisms, institutions, municipalities and consortia etc. within the Venice Lagoon. The goal was to map and describe parts of the food territory and its dynamics through a

palimpsest of lectures, seminars, on site exploration and exchange with local actors.

This, in consideration of the differences and the variety of situations in the Venice Lagoon. Thus, the explorative surveys (28-29 June) were organised in order to understand the different dynamics in the Northern lagoon and in the Southern Lagoon (Figure 3).

Figure 4. Exploration of the Northern Lagoon, 28 June - on board with chef Marco Bravetti 'Tocia! Cucina e Comunità'
Source: photo by C. Spadaro.

After introducing the concept of Food Atlas and presenting several examples, students and tutors moved to the exploration of the Northern Lagoon (28 June), travelling across the small islands where agricultural and fishing practices deal with changing temperatures, water levels, salinity (Figure 4).[6] We engaged in discussions with local organic food

[6] Lecture "On Food Atlases" with Alessia Toldo (Politecnico di Torino), Mariavaleria Mininni (University of Basilicata) and Ida Presta (University of Basilicata).

producers (I&S Farm, Sant'Erasmo) and citizens associations experimenting with sustainable and resilient agricultural practices as well as alternative products such as essential oils and fermented products (AtlantiDee, Sant'Erasmo) (fig. 5). The third stopover was to Valle Falconera, a small island privately owned and recently restored as an agricultural productive land, a fishing valley and a slow-tourism facility. Together we sailed through the northern lagoon with Marco Bravetti, chef and founder of 'Tocia! Cucina e Comunità', a local association and interdisciplinary research platform.[7] He prepared several dishes that interpreted the lagoon environment and its history; according to Tocia! concept, the meal is a relational journey with the territory that involves listening, observing, and discovering raw materials with one's own body and the stories of those who cultivate, harvest, and transform them. Eating represents a collective learning practice and circular exchange of knowledge in which you enter by sitting at the table (Spadaro, 2023).

Figure 5. Exploration of the Northern Lagoon, 28 June - with Savino Cimarosto in Sant'Erasmo

Source: photo by A. Chouairi.

The second exploratory survey (29 June) was conducted in the Southern Lagoon, focusing on fish production and trading (fig. 6). Among several visits, a meeting was held with

[7] *Tocia* in venetian dialect is the imperative form of the verb *tocìare*, *intingere* in italian and to soak in english. In venetian dialect, this term is commonly used to refer to the eating practice of soaking a piece of bread in the sauce left on a plate, collecting it.

representatives from the fish wholesale market of Chioggia, one of the most relevant hubs for the fish supply chain in Italy, where contemporary issues related to fishing – such as the presence of fish, the presence of new alien species, tools and fishing methods, global supply chains – coexist with ancient practices and traditions such as the silent auction.[8]

Figure 6. Exploration of the Southern Lagoon, 29 June - with Daniel Tiozzo, Matteo Grego, Aldino Padoan, Daniele Tiozzo, Marco Spinadin, and Elio Dall'acqua
Source: photo by A. Chouairi.

Also, on 30 June 2022 a roundtable to meet representatives of institutions involved in sectoral food-related projects was organised to intercept the public administrations (City of Venice and the Metropolitan City of Venice that formally are still two separate entities) and the president of the Venice professional association of farmers (Coldiretti Venezia).

First results of the explorations and meetings were furtherly discussed with Lili Carr (Feral Atlas Collective), an architect with a background in the natural sciences, previously involved in the Feral Atlas project.[9] The aim of this encounter was to collectively reflect about non-traditional Atlases as well as to investigate how food (atlases) and microstories are related to global dynamics and can, thus, be used to describe contemporary challenges.

[8] To the Museum of Adriatic Zoology G. Olivi, managed by the University of Padova and to the bivalve breeding facility Crame

[9] See: https://feralatlas.org/

In addition to lectures from relevant scholars, on-site explorations and meetings with institutional stakeholders, a public programme of lectures open to all citizens (and also tourists) was organised. The lectures were set in the open-air cloister of Iuav's main building, in the city centre, with the aim of bringing the themes of the workshop reserved for students into a broad, open and active discussion with the inhabitants. A second objective was to delve into some study topics on lagoon dynamics, starting for instance from some recently published books, or from the narrations of the work of some Venetians involved in different ways in the protection of the lagoon landscape – from food, geographical, cultural or socio-economic perspective.

Thus, during the public programme conversations, we talked about fishing with researchers Alberto Barausse (University of Padua) and Camilla Bertolini (Ca' Foscari University) and with the venetian photographer Paolo della Corte; about the countryside, starting from the book "I piaceri della villa", by Francesco Vallerani (Ca' Foscari University); of the possibilities of narrating lagoon life through drawings, with venetian illustrators Luigi Divari and Simone Carraro (fig. 7); of seeds, with cheffe Chiara Pavan (Venissa restaurant, in Mazzorbo) and farmer Andrea Giubilato. A chorus of voices that showed an even different approach to the study of the lagoon landscape, and offered new insights into its food planning.

The intimate nature of these dialogues facilitated an exchange between those present, activating positive discussions. On the other hand, these meetings were less attended than expected, and mainly by young students. It will therefore be necessary to rethink some aspects of the public conversations – e.g. the time (the meetings were held at 6.30 p.m.), or the advertising of them –, in order to be able to repeat them with greater participation but preserving the possibility to discuss together.

Figure 7. Participants with venetian illustrators Luigi Divari and Simone Carraro
Source: photo by A. Chouairi.

3.2. Outputs of the workshop. Reflections in action.

During the Summer School we questioned what an Atlas is, what a Food Atlas is and what a Food Atlas for the Venice Lagoon is. In order to answer those questions students and researchers worked in the field to build a resonant food map (Spadaro, 2023) using many different tools and instruments.[10]

After thirteen days, students and researchers identified several elements – products as wine, producers as bees, processes as horticulture and packaging, etc., – entangled in the food supply chains able to describe the city-region food system also in terms of cycles, resources and values. To summarise results of the work done within the summer school, we highlighted challenges and threats, starting objects or products, values, benefits, entanglements, water, objectives and invited contributors and events (Figure 8).

[10] In fact, the Summer School aimed at a disciplinary origin as heterogeneous as possible, also in order to promote final hybrid materials (maps, drawings, sketches, photographs and collages, videos, interviews, sound recordings, etc.), supporting the drafting of the Atlas.

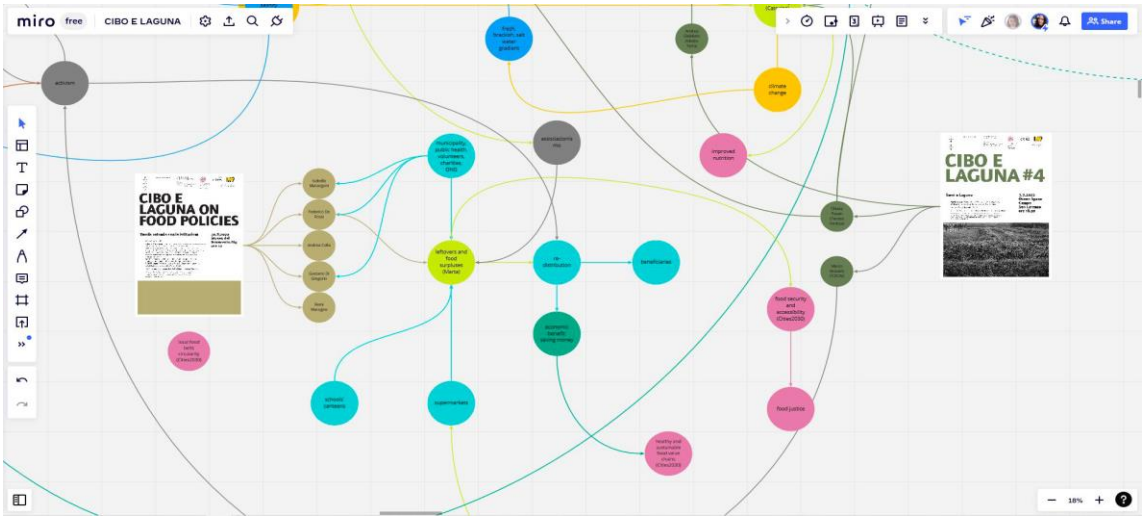


Figure 8. A graphic summary of the workshop outputs, highlighting: challenges and threats (yellow); starting objects or products (light green); values (grey); benefits (dark green); entanglements (light blue); water (dark blue); objectives (pink); invited contributors and events (public program and rountables).

Throughout the workshop, we started tracing names and competences of a growing community of people – cultural institutions and citizen associations, artists, researchers, producers, prosumers, technicians and political representatives – interested in the food issue and actively involved in the debate about food. They develop practices and projects that focus on food both as an objective (to produce and access more healthy, environmentally sustainable and just food) and as a tool (to develop more sustainable and resilient systems able to tackle poverty and climate change).

Thanks to such a composite picture, we reinforced the understanding of the Venice Lagoon Food Atlas as a shared platform able to describe not only contexts in which food is produced, processed, consumed and distributed, but also material and non-material flows in which it is embedded and that food itself influences.

> ‘The meal on your plate is more than just nourishment: it is an emissary from another world – a place we still call ‘countryside’, yet one that rarely resembles the bucolic paradise of our imagination. […] Whether or not we realise it, our bodies, homes, cities and landscapes are all shaped by food.’ (Steel, 2019, p. 1077).

Thus, the preliminary investigations of the Venice Lagoon food system highlights that food is an interpretative lens able to describe unprecedented geographies as well as material and non material flows; to reconnect with food also in terms of planning policies could help in designing policies and plans able to pay attention and develop collective

knowledge to several contemporary challenges related, e.g., to soil, water, health, climate change, biodiversity, social justice.

The flows and the objects identified by the participants, in fact, serve as microstories to detect conflicts and tensions whose value is related to local and global, environmental, social and economic dynamics. In this sense, food helps us in mapping vertical and horizontal power relations between social groups, humans and non-humans, as it happens for the wine production in the Venice lagoon or for the EPS boxes used to store fish[11].

Interestingly enough, most of the objects and products identified during the workshop are related to flows; in this sense, one of the main achievements of the workshop was to overcome the linear approach to the food system that can, sometimes, be determined by the study of supply chains (from production to consumption).

The workshop results highlighted three sets of keywords that might drive the design of the Venice Lagoon Food Atlas: Boat-market-table to reveal the physical implications and spatial scales of food flows; Salt-water-soil to understand how variations in their presence or absence shape the lagoon food landscape; Seasonality-movement-resources to frame the strict interdependence among changing climate factors, connections and products' availability. Any further attempt to work on an integrated model of planning through food should also take into account issues related to some categories that were not directly taken into account during the workshop: Waste and surplus; Care and social justice; Traditions and rituals.

If the aim was to answer what a Venice Lagoon Food Atlas could be, the summer school setted a starting point in the design of a platform for discussion that looks at the food objective and as a mean to plan for sustainable and resilient territories, in a governance process that is able to look at the multiplicity of the lagoon's human and more-than-human inhabitants.

The Atlas poses itself as the platform to collectively develop a new language, moving from on-going experiments and existing agents that are already addressing the food issue in the territory through the voice of careful producers, artists, cultural institutions, researchers.
The works produced during this initial phase were able to describe some of the objects and products part of the Venice Lagoon Food System, as well as the intricate entanglement of values, resources, challenges and possibilities.

[11] Expanded Polystyrene (EPS) is a lightweight synthetic material used in packing and packaging. EPS boxes are waterproof and ensure product protection by keeping it cold and in hygienic conditions.

3.3. The involvement of bottom-up practices and cultural institutions. Reflections upon actions.

With regard to the multiplicity of actors involved in the workshop, during the site visits and the public program, we intercepted a panorama of small scale entrepreneurs, researchers, cultural institutions, artists, and bottom-up practices aimed at restoring, improving and protecting the fragile balance of the lagunar ecosystem. They represent a pro-active milieu of humans involved in the Venice Lagoon food-system undertaking a dialogue with other economic actors and public institutions.

Notably this dialogue tends to bypass the local scale to engage with global actors; this is made possible by the peculiar condition of Venice, which allows local practices to enter global networks normally inaccessible in a small town with less than 50.000 residents (as Venice historical city).

Throughout the public program and several communicative actions (e.g. the Instagram page of the workshop, @towardsanatlas), we also welcomed interested citizens who joined students and researchers in open seminars.

We also intercepted – and started a dialogue with – bigger economic actors and representatives from the local administration of the city of Venice and the Metropolitan City of Venice.

With both groups, we used those meetings not just to map and understand the food system but to test their interest in building a longer term conversation about a Venice Lagoon food policy. In other words, the workshop represented an engagement tool addressing the activation of the Living Lab and the production of a co-designed local food policy in the long term.

This operation was fertile in producing a conversation with the bottom-up: the interactions with local innovative and experimental practices, cultural institutions and researchers kept going on in the following months and has resulted in the organisation of additional public encounters, students activities and a new summer school which will be held in summer 2023. On the other side, the relationship with public institutions and larger scale economic actors is still uncertain, this due both to the complex administrative geography of the lagoon and to the necessity to engage at a political level with the Metropolitan City of Venice.

With regard to the participatory approach, some additional consideration can be done in order to address possible challenges highlighted within the literature (paragraph 02).

We said that food-related bottom-up practices can address the regeneration of fragile territories and empower communities, challenging power and economic relationships and

that there is a recognition of the role of bottom-up processes and socio-environmental claims in policy and planning, leading to the emergence of collaborative governance systems and to the experimentation of several participatory techniques aimed at including a larger variety of stakeholders within design processes. Yet, this approach comes with several challenges associated with participation: (i) institutionalisation mechanisms of bottom-up initiatives; (ii) potential manipulation of participation done by government and local administrations; (iii) the possibility of undertaking a solutionist approach, where participatory processes focus solely on finding technical solutions to complex political problems; (iv) the incorporation of local knowledge into decision-making processes without actually disrupting power dynamics or challenging dominant discourses that until now have resulted in multiple crisis.

We did not directly take into account the first two points, but we have largely included the last two in the preliminary phases of designing the Atlas. On one hand, as it results from the previous descriptions and consideration, we constantly keep in mind the necessity of undertaking a political debate, even though – at this stage – it seems a hard-to-achieve objective. On the other hand we have constantly interpreted the Atlas as a platform for discussion, more than a fixed, material object, which could serve the communities and that could be informed, appropriated and transformed by all those who were involved in its production. While those considerations appear now still programmatic, it is also true that they informed both the organisation of the workshop and the production of its outputs: in fact, the Atlas promotes a transdisciplinary approach and recognizes situated knowledge and, thus, the summer school included students coming from diverse disciplines and backgrounds. Researches were collected by using an online and open source workspace and visual platform, and were composed by hybrid materials (maps, drawings, sketches, photographs and collages, videos, interviews, sound recordings, etc.), supporting the first compilation of the Venice Lagoon Food Atlas.

In addition to that, the laboratorial attitude is demanded by the fact that the Venice Lagoon Food Atlas is part of the activities of the Cities2030 project, yet we constantly kept in mind that our aim was not only to grasp knowledge from the participants – in an extractive way – but to initiate a dialogue with the actors of the local food system, and integrate different knowledge and experiences. The main conceptual shift, driven from the workshop, is the recognition of an existing community of practices and practitioners involved in the Venice Lagoon Food System composed also by us: this understanding somehow disrupts the boundaries between experts (we are all experts) and citizens, to recognize a community of inhabitants of the Venice Lagoon that involves students, permanent and temporary residents with diverse expertises, scholars, non-human actors.

4. Conclusions - reflection upon actions and working perspectives

The collective construction of the Venice Lagoon Food Atlas is a process that has only just begun, and is a continuing activity of the living lab proposed by Iuav for the Cities2030 project. The main objective of the working group is to consolidate the relationships and networks activated in the lagoon and to continue developing and publicise the Atlas beyond the period funded by the European Community.

In this first phase, therefore, the main results obtained are:

- the identification of certain characteristics that this Atlas should have: not only an archive of technical-scientific information, but also a place to store old and new situated knowledge, collected by, with and for the inhabitants of the lagoon;
- the recognition of an innovative role for a food atlas: not only a collection of information and data, but a tool for dialogue between different parts of society and the food arena, as well as a key for the empowerment of situated communities in the light of a possible development of a local food policy;
- the progressive awareness, among inhabitants and institutions but also among young people and students, that dealing with food does not only concern cultural and heritage aspects, but also makes it possible to become aware of the dysfunctions linked to the way we produce and feed ourselves and the effects that the current food system has on the society and the environment.

The Atlas, understood therefore as a tool facilitating confrontation between the parties participating in the food system arena, can extend its meaning and become a place or platform for enhancing and promoting forms of social innovation and exchange between actors and agents. In this sense, the Atlas is more than a container of knowledge; it becomes a concrete lever to activate the Living Lab and constitute a fulcrum around which the many activities, actions, ideas and experimentations currently at play in the Venice lagoon are organised, confronted and known.

The effort to search for and recognise innovative forms in the lagoon landscape, however, runs the risk of excluding mainstream models which, even with their criticalities, constitute the most widespread and consolidated condition of the current food system. It is therefore necessary to control a research approach that is too oriented towards the 'small and unique', but above all it is necessary to make the two scales (innovation niches and mainstream models) dialogue so that each can benefit from the comparison with the other, in a mutual growth that can enrich entrepreneurial, as well as environmental, biodiversity.

The ambition of this working group is that the situated communities can progressively take ownership of the Atlas tool, continuing to implement it and bring it to life, recognising it as a mirror of the territory within which each is represented.

To achieve this further objective, a number of activities are planned for the coming

months: to continue public activities at local events and neighbourhood fairs, in order to reach more people and make the Atlas known; to continue the campaign of collecting voices, experiences, ideas and projects to enrich the knowledge base built up so far; to dialogue with other ongoing Food Atlas experiences to exchange methodologies, approaches and strategies and strengthen this tool.

Also in dialogue with "Lagoon Atlas", a geoportal with much geographical information on the Lagoon[12], this new Atlas will draw an unprecedented food geography of the ways in which the Venice Lagoon ecosystem is involved in food production, distribution, marketing, consumption, waste and recycling. A map to make us more responsible, and active, towards its protection and future history.

Funding. This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 101000640.

References

Allegretti, Giovanni, *et al.* (2021) 'Sulla partecipazione: strumenti di attivazione e democrazia degli abitanti', in Coppola, Alessandro et al. (eds) *Ricomporre i divari.* Bologna: Il Mulino, pp. 203–213.

Almirall, Esteve, Melissa Lee, M. and Jonathan Wareham, (2012) 'Mapping Living Labs in the Landscape of Innovation Methodologies', *Technology Innovation Management Review*, (September 2012: Living Labs), pp. 12–18.

Arnstein, Sherry R. (1969) 'A Ladder Of Citizen Participation', *Journal of the American Institute of Planners*, 35(4), pp. 216–224. https://doi.org/10.1080/01944366908977225.

Bang, Henrik (2005) 'Among everyday makers and expert citizens', in Newman, Janet (ed.) *Remaking Governance: Peoples, Politics and the Public Sphere*. Bristol: Policy Press, pp. 159–178. http://policypress.universitypressscholarship.com/view/10.1332/policypress/9781861346407.001.0001/upso-9781861346407-chapter-9 (Accessed: 2 December 2018).

Bergvall-Kareborn, Birgitta and Anna Stahlbrost (2009) 'Living Lab: an open and citizen-centric approach for innovation', *International Journal of Innovation and Regional Development*, 1(4), pp. 356–370. https://doi.org/10.1504/IJIRD.2009.022727.

Blay-Palmer, Alison *et al.* (2018) 'Validating the City Region Food System Approach: Enacting Inclusive, Transformational City Region Food Systems', *Sustainability*, 10(5), p. 1680. https://doi.org/10.3390/su10051680.

[12] See https://www.atlantedellalaguna.it/.

Boltanski, Luc. and Ève Chiapello (1999) *Le nouvel esprit du capitalisme*. Parigi: Gallimard.
Born, Branden and Mark Purcell (2006) 'Avoiding the Local Trap: Scale and Food Systems in Planning Research', *Journal of Planning Education and Research*, 26(2), pp. 195–207. https://doi.org/10.1177/0739456X06291389.
Campagnari, Francesco. and Alice Ranzini (2022) 'Rigenerazione urbana dal basso tra paradigma e ambiguità: verso una agenda di ricerca', *Tracce urbane. Rivista italiana transdisciplinare di studi urbani*, 8(12). https://doi.org/10.13133/2532-6562/18258.
Catalanotti, Cristina, Marilena Prisco and Cristina Visconti (2020) 'Living together: new horizons for collective actions', *Urbanistica Informazioni*, 289(special issue "XII International INU Study Day Welfare and/or Health? 90 Years of studies, policies and plans", Round Tables), pp. 12–15.
Concilio, Grazia, Luciano De Bonis and Federica Trapani (2012) 'La dimensione territoriale nell'approccio dei Living Labs. Verso i Territorial Living Labs per il sostegno alle città e alle regioni "smart"', in *Pianeta Inu*. *Gateways, IX Biennale delle città e degli urbanisti europei. Smart planning per le città gateway in Europa. Connettere popoli, economie e luoghi. September 14-17*, Genoa, Italy.
Coppola, Alessandro (2023) 'A cosa serve la partecipazione?', *cheFare*, 25 January. Available from: https://www.che-fare.com/almanacco/politiche/a-cosa-serve-la-partecipazione/ Accessed: [26/01/2023].
Cornwall, Andrea (2003) 'Whose Voices? Whose Choices? Reflections on Gender and Participatory Development', *World Development*, 31(8), pp. 1325–1342. https://doi.org/10.1016/S0305-750X(03)00086-X.
De Marchi, Marta (2020a) 'Foodspace: leggere le trasformazioni territoriali attraverso lo spazio del cibo : il caso Veneto', *Archivio di Studi Urbani e Regionali*, pp. 80–105. https://doi.org/10.3280/ASUR2020-128006.
De Marchi, Marta (2020b) 'Praticare l'adattamento nella/alla laguna', *QU3 : iQuaderni di U3*, 26(4), pp. 77–88. https://doi.org/10.1400/288594.
Fanfani, David *et al.* (2015) 'SUSTAIN-EDIBLE CITY: CHALLENGES IN DESIGNING AGRI-URBAN LANDSCAPE FOR THE "PROXIMITY" CITY. THE CASE OF PRATO, TUSCANY', in Cinà, Giuseppe and Egidio Dansero (eds) *Localizing urban food strategies. Farming cities and performing rurality. 7 th International Aesop Sustainable Food Planning Conference Proceedings, Torino, 7-9 October 2015,*. Torino: Politecnico di Torino, p. 146-155.
FAO (2017) *Food for the Cities: Food for the cities*. Available at: https://www.fao.org/fcit/fcit-home/en Accessed [19 May 2023].
Foster, Sheila R. and Iaione, Christian (2016) 'The City as a Commons', *Yale Law & Policy Review*, 34(2), p. 281.
Hayward, Philip (2012) 'Aquapelagos and aquapelagic assemblages', *Shima: International Journal of Research Into Island Cultures*, 6(1), pp. 1–11.
Magnaghi, Alberto (ed.) (2014) *La regola e il progetto: Un approccio bioregionalista alla*

pianificazione territoriale. Firenze: Firenze University Press. https://doi.org/10.36253/978-88-6655-624-4.

Manzini, Ezio (2018) *Politiche del quotidiano*. Roma: Edizioni di Comunità (cheFare).

Mitlin, Diana and John Thompson (1995) 'Participatory approaches in urban areas: strengthening civil society or reinforcing the status quo?', *Environment and Urbanization*, 7(1), pp. 231–250. https://doi.org/10.1177/095624789500700113.

Montero Sierra, Marìa and Barbara Nardacchione (eds) (2023) *Convivial Tables. Entree The Pannier Venice Lagoon*. Madrid: Fundación TBA21.

Norgaard, Richard B. (1994) *Development Betrayed: The End of Progress and a Co-Evolutionary Revisioning of the Future*. London: Routledge. https://doi.org/10.4324/9780203012406.

Pacchi, Carolina (2020) *Iniziative dal basso e trasformazioni urbane*. Milano: Mondadori. .

Perdibon, Anna (2023) 'From invading to rooting?', in Montero Sierra, Marìa and Barbara Nardacchione (eds) *Convivial Tables. Entree The Pannier Venice Lagoon*. Madrid: Fundación TBA21, p. 60.

Petrescu, Doina and Constantin Petcou (2013) 'Tactics for a transgressive practice.', *Architectural design*, 83(6), pp. 58–65.

Pitteri, Mauro (2015) 'Alimentazione in laguna. Mulini, orti e coltivazioni', in Calabi, Donatella and Ludovica Galeazzo (eds) *Acqua e cibo a Venezia. Storie della laguna e della città*. Venezia: Marsilio, pp. 49–51.

Pothukuchi, Kameshwari and Jerome L. Kaufman (2000) 'The Food System', *Journal of the American Planning Association*, 66(2), pp. 113–124. https://doi.org/10.1080/01944360008976093.

Secchi, Bernardo (2010) 'A new urban question', *Territorio*, 52(2), pp. 2239–6330. https://doi.org/10.3280/TR2010-053002.

Spadaro, Chiara (2023) 'Le politiche del cibo nelle lagune urbane del XXI secolo. Relazioni alimentari, paesaggi anfibi e microecologie lagunari', PhD Thesis, Doctorate in Historical, Geographical and Anthropological Studies. Cà Foscari University of venice, University of Padua, University of Verona (to be defended on 29/05/2023)

Spadaro, Chiara (2023) 'Listen. Eat. Write', in M. Montero Sierra and B. Nardacchione (eds) *Convivial Tables. The Cross Between Food and Ecology*. Madrid: Fundación TBA21, pp. 11–20.

Steel, Carolyn (2019) 'Sitopia, what is it? A survey on the future of food', *Domus*, November, pp. 1076–1081.

Tecco, Nadia *et al.* (2017) 'Verso il sistema locale territoriale del cibo: spazi di analisi e di azione [Toward the Local Territorial Food System: Spaces of Analysis and Action]', *Bollettino della Società Geografica Italiana*, X(1–2), pp. 23–42.

Thayer, Robert Jr. (2012) 'The world shrinks, the world expands: Information, energy, and relocalization', in Cook, Edward and Lara Jesus (eds) *Remaking Metropolis: Global Challenges of the Urban Landscape*. London: Routledge, pp. 39–59. Available at:

https://doi.org/10.4324/9780203095485.
Vianello, Rita (2020) ‘Le risorse tra acqua, terra, barene’, in Crovato, Giorgio, Vittoria Tagliapetra, and Rita Vianello (eds) *Pellestrina*. Padova: Il Poligrafo, pp. 115–131.

CAMPUS DESIGN, WALKING PRACTICE AND SPATIAL APPROPRIATION: A PSYCHOGEOGRAPHIC COMPARISON OF THE *ALLE* AT VAN YÜZÜNCÜ YIL UNIVERSITY AND ANKARA MIDDLE EAST TECHNICAL UNIVERSITY IN TURKEY (1133)

Yasemin İLKAY

Van Yüzüncü Yıl University, Faculty of Architecture and Design, Department of City and Regional Planning, Van, Turkey; yasemin.ilkay@gmail.com

Abstract. This paper focuses on the forms of spatial appropriation at two university campuses in Turkey via a psychogeographic lens. Middle East Technical University in Ankara (the capital city) was designed in 1960s with reference to a well-defined *alle*; Van Yüzüncü Yıl University is in the eastern part of Turkey and constructed in 1980s, the *alle* is attached after several decades. *Alle*, as an extension of 'street' in university campuses, is the constructive spatial structure in campus design and as a result it should be (both physical and mental) spine of design policy. The main question of the paper is: how the spatial appropriation differentiates via walking practice at *alle* in selected two cases with reference to differentiated design policies of spatial hierarchy at campuses.

Keywords: Alle, campus design, psychogeography, spatial appropriation, Turkey.

1. Introduction

'Street' constitutes both an essential dimension of urban design and the context of walking practice in urban space; it is not only the constructive spatial unit of public space pattern but also the main artery of urban everyday life. *Psychogeography* concentrates on 'walking' and therefore the differentiated forms of (urban) streets, and as a discipline it examines *the influence of the built environment on feelings and attitudes of human beings*. This paper focuses on 'walking practice' at two university campuses in Turkey and examines the differentiated forms of spatial appropriation at the *alle* via a psychogeographic lens in relation with campus design. Middle East Technical University in Ankara (the capital city) was designed in 1960s via a well-defined alle and has a long history with a deep socio-spatial tradition; whereas Van Yüzüncü Yıl University is located in the eastern part of the country and constructed in 1980s, however the *alle* is attached after several decades of the first construction. This study assumes that the phenomenon of *alle*, as an extension of 'street' in university campuses, is the constructive spatial structure in campus design and as a result it should be (both physical and mental) spine of the design policy. The main question of this paper is: How the spatial hierarchy

penetrates the spatial appropriation at *alle*; and how it differentiates in two different cases of campus design and walking practice. This interaction indicates the conflict between spatial practice and *representations of space* in between representational spaces as Lefebvre (1991) mentions in his spatial triads. A gap is assumed among the conceived, perceived and lived spaces which is critical in urban design, although it is generally underestimated. This paper is located in a research field to grasp the meaning of such a gap. Knowledge on the interrelation between spatial appropriation and design policy would provide a relatively democrat vein of planning which considers the users' needs, differences, and demands.

The human *body* contacts *with* and *at* urban space (with other objects and subjects) via its movements and stops; this interaction occurs through the spatial pattern of *occupancy* and *vacancy* which indicates *the spatial hierarchy* of the selected urban space. Walking practice leads to a set of cognitive mental representations in relation with the repertoire of place attachment and spatial appropriation parallel to this spatial hierarchy. Urban space contains differentiated walking sub-regions with varied spatial compositions and therefore leading to differentiated spatial practices with several perceptions, actions and attachments (İlkay, 2020). As an example, university campuses are autonomous and fruitful urban spaces to investigate the mental representations of the interaction among, walking, spatial hierarchy and appropriation. There are both *physical/real* and *psychogeographic representations* on the same urban spaces and urban spatial practices (İlkay, 2022). This separation would indicate the invisible dimensions of the difference between 'what is conceived' and 'what is perceived' as Lefebvre (1991) argues in his classical study on spatial triads. This paper aims to compare the role of *alle* in both campus design and spatial appropriation via walking at two differentiated university campuses through collecting the mental representations, doing in-depth interviews and *attentive walks* with the interviewees by psychogeographic techniques. Campus design and spatial appropriation will be compared [with reference to the conception and perception of *alle*] in three scales:

1. the historical spatial development stories and design approaches of university campuses,
2. the spatial pattern of campuses on the basis of *alle*, and
3. sub-behavioural regions of the alle in campuses in relation with mental representations and psychogeographic attentive walks.

This paper questions how the spatial appropriation differentiates via walking practice at *alle* in selected two cases with reference to differentiated design policies of spatial hierarchy at campuses. The sub-questions of this main research question are:

- How and why the design approaches differentiate in two university campuses in Turkey,

- How the interrelation among *alle* design and spatial appropriation differs in these two cases, and
- What does the differentiated gaps among real and psychographic maps indicate about the interrelation between design and spatial appropriation.

METU (Middle East technical University), as a well-designed, readable campus with its *alle*, promise a rich walking practice with fruitful spatial appropriation regions; however, Van YYÜ (Yüzüncü Yıl University) limits both the practice and place attachment with its partial design with an alle which is later added to the campus. This research both displays the role of alle in the campus design, walking practice and spatial appropriation and furthermore opens a new methodological path to discover hidden knowledge within urban spaces.

2. Conceptual Framework: The *Alle* in Campus Design

University campuses are autonomous urban spaces where both career training and academic-scientific activities are conducted, and scientific and technical knowledge is produced. This urban region contains basically *university students* (who are young adults taking their education and shaping their professional future life), and *lecturers* (who are relatively elder adults both doing their research and giving lectures to students shaping the quality of their profession such as medicine, architecture, social sciences). Moreover, there is a large group of *administrative staff* and *other staff for services* such as dormitory, food and beverage, landscape management, cleaning, transportation, etc. Therefore, the population within the university is so dense and divergent. Some of this population permanently live in the campus, some are only visitors.

The character of the population in a university campus can differ with respect to the character of the university. Some universities may concentrate on education or some others on research, and some may aim at practical results and may focus on occupational training skills and some others would intend more theoretical and scientific echo. Furthermore, universities have several outputs for the cities they are located in, a university can upgrade the local economic conditions, the social atmosphere and so change the local culture of the city. As a result, a university campus or generally a university space is a very autonomous urban area which has a distinctive spatial-social character and leading to different spatial, social and economic effects on the city. The selection of the city where the university would be located is therefore a policy issue, in addition to the choice on the character of the university. To locate our cases within Turkish case, in the next sub-heading, firstly we will roughly cover the history of the development of higher education in Turkey with respect to some critical turning points focusing on the period after the establishment of Turkish Republic.

2.1. History of Campus Design in Turkey

In Turkey (literally *Turkish Republic* since 1923), the first university is established in 1933, in İstanbul, called as *İstanbul University*. Some of the other primary pioneer universities of Turkey are as follows chronologically with their locations (Kömürlü, 2019):

- ⇨ İstanbul Technical University [ITU] – *1944* [İstanbul] (Marmara Region-North West Anatolia),
- ⇨ Ankara University – *1946* [Ankara] (Central Anatolia),
- ⇨ Karadeniz (Black Sea) Technical University [KTU] – *1955* [Trabzon] (North East Anatolia),
- ⇨ Ege (Aegean) University – *1955* [İzmir] (West Anatolia),
- ⇨ Atatürk University – *1957* [Erzurum] (East Anatolia), and
- ⇨ *Middle East Technical University* [METU] – [*1956*–1959] [Ankara] (Central Anatolia).

Figure 1. The regional distribution of universities in Turkey in 1950

Source: Sargın, 2007: 137 and four more universities added after 1950s (marked by the author of the paper with orange spots).

Such a scene indicates that the first motive to establish universities were *site selection* especially with reference to the region of the country with respect to a hidden regional planning policy and the state seems to execute a planned attempt to balance the scales of development regionally through constructing universities. *The quality* with specific aims was prioritized after this site selection issue. The young republic needed its own

professionals to be raised and its own knowledge and technique to be produced. Middle East Technical University was also established with a similar impetus to raise own professionals of city planning, since 1950s is the period of rapid urbanization in Turkey and resulted in so many social and spatial problems in cities.

The number of universities exceeded 200 recently, however until 1960s Turkey had only seven universities (Kömürlü, 2019), which indicates a turning point. Another turning point may be 2000's since the AKP (*Justice and Development Party*) came to power and aimed to establish universities in each and every city of the country.

The history of higher education is generally examined under three main periods with respect to the structural shifts and characterization by the researchers (Sargın, 2007):

1) The early period between 1923 and 1946 (or in other words till 1950);
2) The development period between 1950-1980 since a policy appeared to distribute the universities apart from Ankara and İstanbul; and
3) After 1981 the period with a higher education reform in Turkey, which shaped generally by an Institution of Higher Education (YÖK) – an institution beyond all the universities of Turkey.

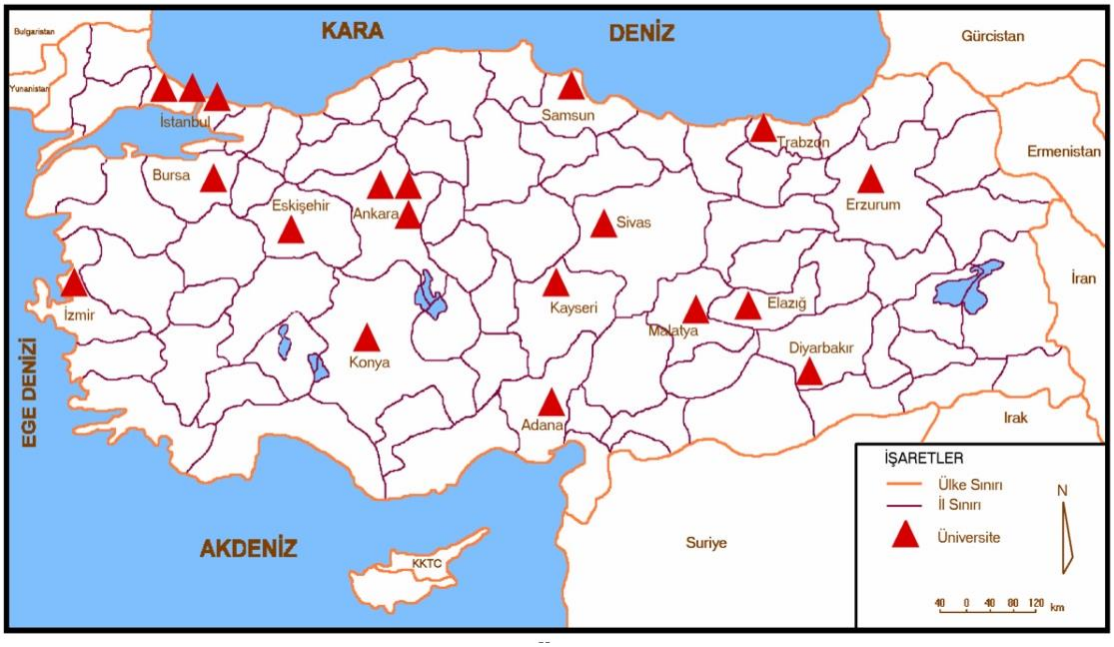


Figure 2. The regional distribution of universities in Turkey in 1980
Source: Sargın, 2007.

Table 1 demonstrates the periods of higher education in Turkish Republic with respect to the number of universities, locations (cities and regions), and basic impetus to construct university. We should add another era after 2000s to the general frame.

Table 1. The periods of higher education in Turkey (prepared by the writer of the paper via adopting the data in Ümran (2007) and Kömürlü (2019))

	Number of Universities	**Locations**	**Basic Impetus of the Higher Education Policy**
1923 – 1950 Early Period	2	İstanbul and Ankara	Constructing own higher education institutions
1951 – 1980 Planned developing period	19	İstanbul (3), Ankara (3), Bursa, Konya, Eskişehir, İzmir, Adana, Samsun, Kayseri, Sivas, Malatya, Elazığ, Diyarbakır, Erzurum, Trabzon	Preventing regional disparities
1981 – 1990 Period of YÖK (The Institution of Higher Education)	29 (at the beginning 0f 1990)	Added universitied in Edirne, Antalya and *Van* at the beginning of 1990 and some private universities in İstanbul	Standardization of the higher education after military intervention
2000 onwards Period of extensification	More than 200	All over the country in each and every city	Locating a university in each and every city

Recently, there are 208 universities in Turkey, 129 of which are state universities, and 75 of these 208 universities are private (or foundation) universities; almost each and every city has a university as a result of the higher education policy of the present government; Kömürlü (2019) mentions that "by 2008, there were no cities without a university" parallel to the government's proposal. Figure 3 shows the map of distribution of recent universities in Turkey –the reddest one is İstanbul, and second comes Ankara, İzmir and Konya, and the scale is getting lighter as the number of students decrease in the cities (https://www.yok.gov.tr/universiteler/universitelerimiz). Ankara and Van are marked with the orange boundaries by the writer of the paper.

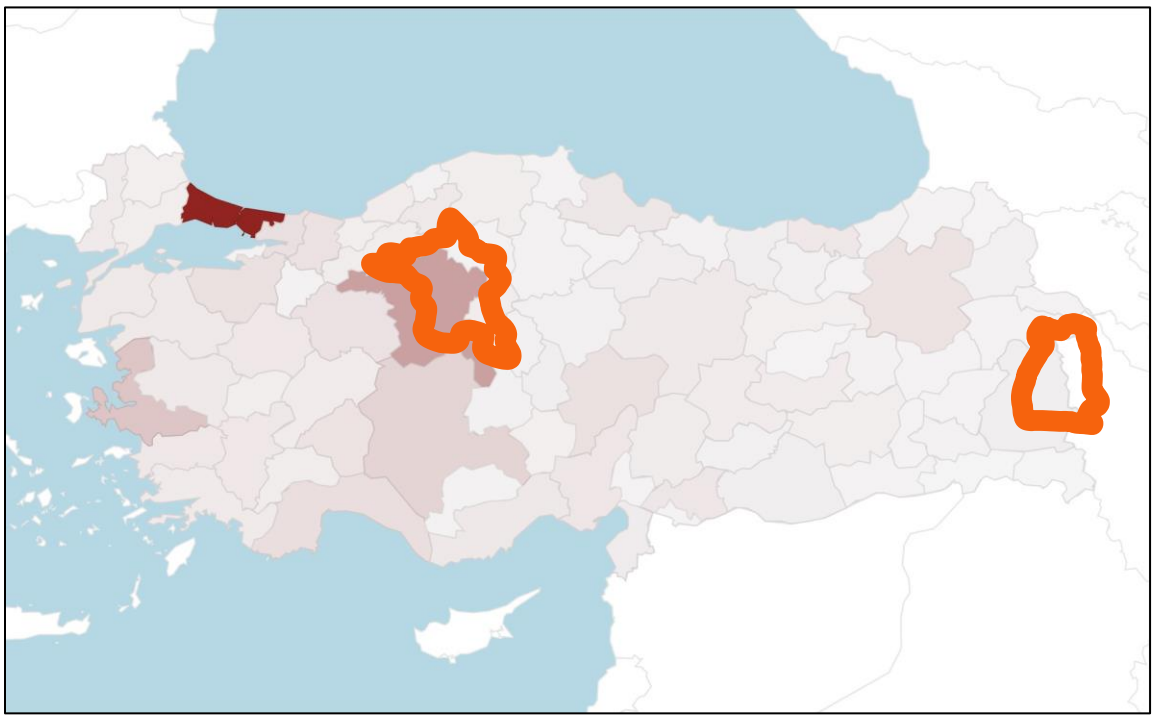


Figure 3. Universities in Turkey with respect to number of students
Source: https://www.yok.gov.tr/universiteler/universitelerimiz

Van Yüzüncü Yıl University was established on 20 July, 1982 in Van, in the relatively south-eastern region of the country as a trace of Mustafa Kemal Atatürk's (founder of the Turkish Republic) one of the major spatial and social policies [to construct a university in this region in addition to other universities in Ankara and İstanbul to enhance the socio-cultural habitat of the whole eastern region]. The university was planned to be activated in 1981, for the 100th anniversary of Atatürk's birthday; therefore, the name of the university was labelled as '100th Year-Centenial'. However, the university in Van could be activated in 1982, with one year delay (Özyıldıran, 2022). In other words, a university in Van was one of the major spatial projects of the Early Republic of Turkey, which was realized yet in 1980s – so the spatial policy of Van Yüzüncü Yıl University is based on an earlier period (early republican area, the period of *Urbanization of the State as* Şengül (2003 labels) however the realization of the project is located on a quiet different period – *Urbanization of Capital* (labelled by Şengül, 2003). Middle East Technical University on the other hand is designed and realized in late 1950s and its influence manifested itself in 1960s and later 1970s within the rising societal movements especially student protests (İlkay, 2007) in the urbanization of working class as Şengül (2003) names the decades between 1950 and 1980.

2.2. University Campus as a Walking District in the City

In the previous section, we followed the development of higher education and the history of city selections for universities in Turkey. Then, the spatial features of a university constitute the second issue we have to examine. University campuses are autonomous and fruitful urban spaces especially with respect to 'walking' phenomenon. Yıldız et.al. (2015) investigate the morphology of the university campus; with reference to Larkham (2000: 75-76), they argue the four essential points as: universities both create economic resources with new employment areas and cover large slots of urban area which can be located at the centre, periphery or out of the cities; they are long-term institutions so they are relatively persistent but dynamic spaces; since they usually grow and develop; moreover the new spaces of universities either sprawl or disperse the other parts of the city with having different typologies (Larkham, 2000, cited in Yıldız, et. al., 2015).

The *location* of the university, the *morphology* of the campus and the *spatial hierarchy* constitute three spatial dimensions of universities. Larkham (2000) argues that the preference for location of the university has symbolic, economic and practical dimensions with reference to spatial organization. Discussing the location of universities, three basic typologies are proposed by Yıldız, et.al. (2015). First, *urban universities* located partially in the city and therefore they exist with the urban daily life and spatial pattern, such as the first universities, Bologna (Italy), Cambridge and Oxford (England). Secondly, *American campus type*, which became widespread in 19th century, exist near to but apart from the city, usually surrounded by large green areas. This campus design was first seen in Virginia University, which is designed by Jefferson in 1819; and the designer here aimed at a kind of '*academic village*' with an isolation from the daily rush of the city and so enable the researcher and students to concentrate on their studies in silence. And thirdly, *megastructures* occurred after IInd World War, as the wholistic composition of the structures dispersed within a large area, which can be articulated within time (Turner, 1984, cited in Yıldız, et. al., 2015).

Figure 4. Map of METU, in Ankara, Google Earth, 2023, indicating the degree of urban texture combability, the forestry serves as a buffer zone but still the spatial interrelation can be observed

In Turkey, usually American campus type universities and a combination of campus and megastructures can be seen. Moreover, almost all the universities are located at the periphery or outside of urban spaces within a campus. This spatial preference is critical not only because of economic-social effect of the university on the city and region but also with respect to spatial design of the campus in itself and within its relation to the city (Yıldız, et.al., 2015). Looking at our cases in this paper, Middle East Technical University (METU) and Van Yüzüncü Yıl University (Van YYÜ) are both *campus type universities*; however, the interaction of the campuses with urban city and city centre differentiates. METU is located in the south-west of the city on Eskişehir Road; Van YYÜ is located on south-east of the city, on Van-Ağrı Road. METU is now adjacent to the sub-centre of the city, Söğütözü, and the metro line and main public transportation arteries are adjacent to the campus (see Figure 4.). Whereas, Van YYÜ is located at the periphery, apart from the city centre (approximately 30 minutes ride) therefore transportation is a big issue and the campus is perceived and experienced as a disconnected urban area (see Figure 5.).

Figure 5. Map of Van YYÜ, Google Earth, 2023, indicating the degree of urban texture combability and the degree of the isolation of campus can be seen

In addition to the interaction of the campus with the adjacent urban areas, the inner morphological patterning of the campus is also critical in walking practice and spatial appropriation. Yaylalı and Çil (2021: 101) introduce four basic spatial parameters in campus design as: "(1) the spatial compositions of built and un-built environments, (2) the functional zones, (3) the formal character of the gathering spaces and their locations; (4) the circulation networks". First Turkish Republican universities (Istanbul University [1933], İstanbul Technical University [1944] and Ankara University [1946]), which were established before 1950, had no campuses; rather they provided education in the old buildings at city centres at the beginning, similar to many other universities in Europe. After World War II, in 1950s, the design paradigm for universities shifted in Turkey as well as the world. Therefore, the later universities such as METU, Ege and KTU were designed and constructed in large urban areas within campuses with respect to campus master plans (Yaylalı & Çil, 2021).

In their study, Birol et.al. (2020: 233) investigate a recent campus design in İzmir with respect to the problematic of open campus spaces as public contact areas, and propose some further parameters on this interaction evaluating İzmir Demokrasi University. Some of the meaningful items are, (1) taking care of the relationship between inside-outside spaces to create a rich spatial hierarchy; (2) bonding academic, institutional and social units via central space or squares to provide efficient activity areas, (3) with respect to a

wholistic approach, creating a well-designed pattern of open and indoor spaces to separate the functions into meaningful zones and to support this pattern with streets, yards, courtyards, and sub-squares to create a lively campus; and lastly (4) pursuing a pedestrian oriented design policy, creating the spatial organization with respect to a main pedestrian axis –such as an *alle*– with both well-defined/read spaces and surprising spaces. In other words, when a campus is shaped with respect to a main pedestrian artery, the pedestrian oriented use would be supported, and moreover the spatial units and functions would be associated meaningfully to produce a wholistic urban spatial neighbourhood (Birol, et.al., 2020), which has so many advantages on walking practice and spatial appropriation.

2.3. Alle in the Design of University Campus: Cases of METU and Van YYÜ

'Street' constitutes pattern of public spaces and implies the spatial hierarchy in urban areas, and therefore acts as the main artery of urban everyday life where different activities and people flow through. Furthermore street, as a critical item of urban design, constitutes the context of *walking* in the cities. *Alle* is a type of 'street' which shapes the spatial organization and social patterning of the campuses. The walking practice is deeply influenced by the role of alle in the campus design. *Alle* provides the spatial and functional unity of the campus, implies the trace of interaction between open and indoor spaces so that the pedestrian can grasp and follow the continuity of the campus, and lastly assure the users of various and related spatial practices with pleasure and safety.

Middle East Technical University, located in Ankara, central Anatolia, was designed in 1960s with reference to a well-defined *alle* and has a long history with deep socio-spatial tradition; whereas Van Yüzüncü Yıl University, located in the eastern part of the country, is constructed in 1980s, however the *alle* is attached after several decades of the first construction. As discussed above, *alle*, as an extension of 'street' in university campuses, is (and should be) the constructive spatial structure in campus design and as a result it should be both physical and mental spine of the campus.

Middle East Technical University (METU) is founded as an institute [*Middle East High Technology Institute*] in 1956, then later in 1959, the institute is transformed to a university. But, the first location of the university was a small building on Müdaafa Street at Kızılay (https://www.metu.edu.tr/history); another building in the garden of Türkiye's National Grand Assembly (TBMM) was assigned to METU when the number of students increased. However, this was also not sufficient, then in addition to these buildings, barracks were opened for the education of METU in the same garden. These barracks resulted in an imputation of 'slum university' and 'barrack university' for METU; later in 1963 the university moved to its current campus (Kömürlü, 2019). The early campuses between 1950 and 1970s, were usually produced through architectural design

competitions. METU campus was designed by Altuğ and Behruz Çinici who won the competition in 1959 (Yaylalı & Çil, 2021).

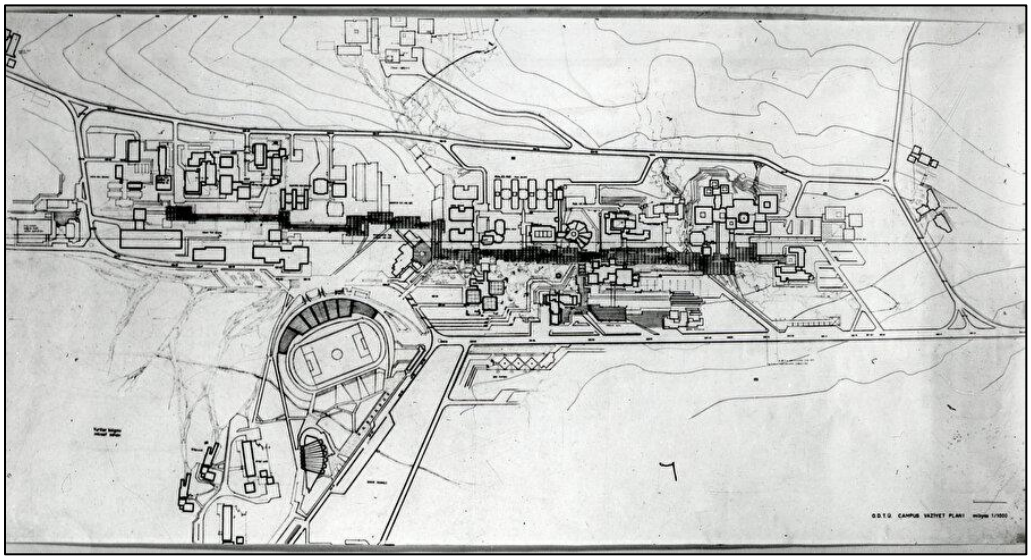


Figure 6. The layout plan of METU, by Altuğ and Behruz Çinici; the alle can be seen clearly and was designed as the main axis of pedestrian circulation
Source: https://www.gzt.com/arkitekt/bozkiri-yeserten-beton-yerleske-odtu-3592966.

Altuğ and Behruz Çinici designed the campus on the basis of a main pedestrian axis which connects academic units with the library and this circulation was isolated from the vecihcle traffic (Yıldız, et.al., 2015). Figure 6 illustrates the role of alle in their design and Figure 7 is the current situation of the campus. New buildings are located apart from the main pedestrian axis, they seem to be attached in a set of megastructures.

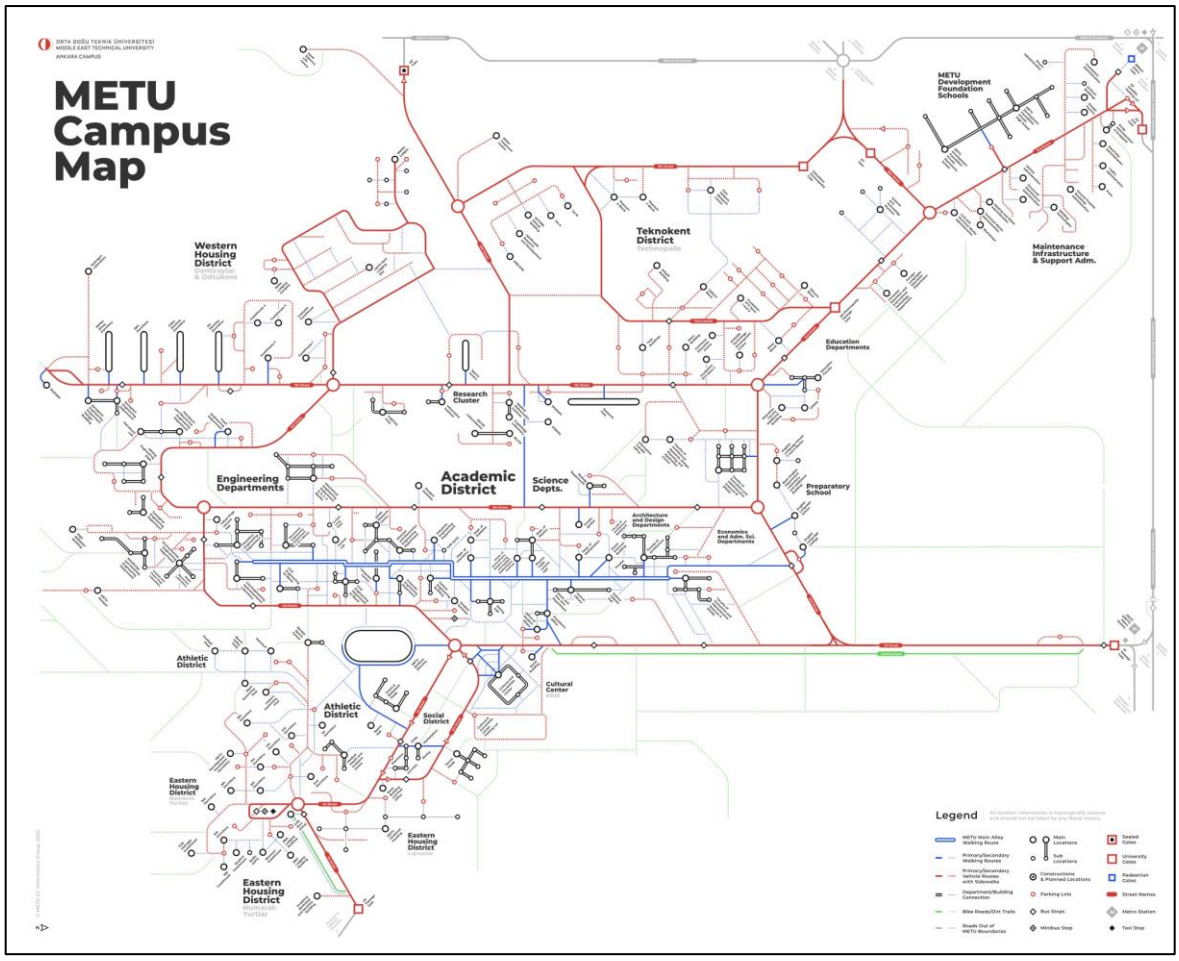


Figure 7. Map of METU Campus
Source: https://www.metu.edu.tr/system/files/odtu-kampus-haritasi.pdf.

Figure 8. Alle at METU

Source: https://haber.sol.org.tr/bilim-teknoloji/odtu-nun-mimari-behruz-cinici-nin-ardindan-haberi-47597.

Çinici's design, the alle in METU (fig 6. And 8) can be compared with the recently realized alle case in Van YYU (Yüzüncü Yıl University) (fig 9.). The lectures at Van YYU started in the first specific buildings for education at the centre of Van and Edremit. The main building was located at Kazım Karabekir Street and was consisting the Rectorate, institutes, library and dormitories. Two years after the establishment of the university, in 1984, the campus construction started at the periphery –12 km far away from the city centre– on a 700 hectare of vacant land. However, though a spatial policy reaching out 55 years ago (, Van YYU campus was not a planned campus Özyıldıran, 2022) different from METU Campus, which is attained through a public competition.

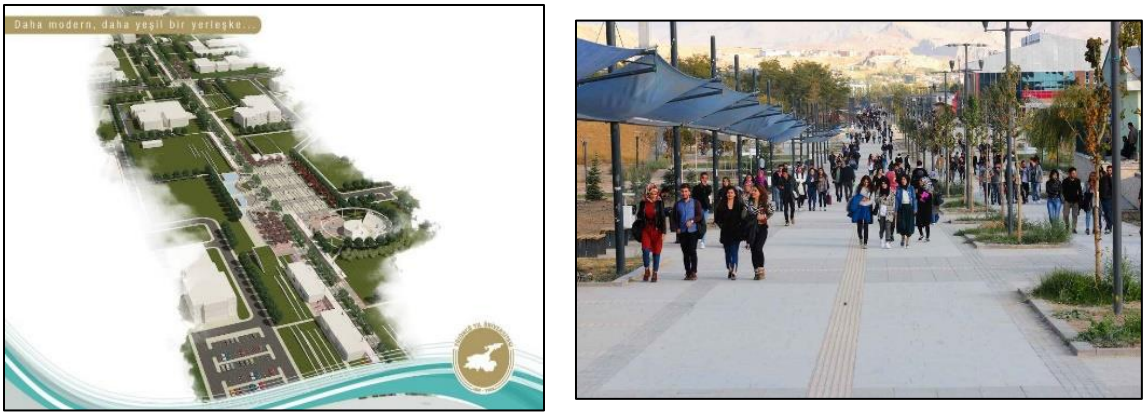


Figure 9. The alle in Van YYU

Source: Left: The design: https://wikimapia.org/37522194/tr/YY%C3%9C-Alley#/photo/7417760; Right: The street view in everyday life, https://www.yyu.edu.tr/foto-galeri.

METU Campus is a well-designed and wholistically planned university campus having a historical spatial tradition shaped within differentiated layers of spatial and political practices. On the other hand, Van YYU alle has a relatively short-term history and placed in a partially designed university campus. But as Özyıldıran (2022) examines in-depth, master plan studies are going on for the campus of Van YYU. Especially, the alle (which was added to the campus later almost 40 years after the first construction of the campus) is under conversion, especially it is discussed to be attached to the coastal area at the edge of Van Lake [the greatest lake of Turkey], which presents a fertile potential as a walking district in the campus. The difference between the role of alle in the campus design in these universities can be analysed psychogeographically via the problematic of spatial appropriation. The phenomenon of alle influences the texture, the spine and the soul of university campuses, which may shape the place attachment and spatial appropriation of both lecturers and students, and other groups living in or experiencing campuses. Therefore, owner-visitor dichotomy points a fruitful research focus based on the university campuses and especially the alle, which has

psychogeographic elements.

Figure 10. Van YYU Google Earth Map, the main arteries of the campus can be seen as traces and the highlighted pedestrian path can be seen as parallel to the lake shore and a direct path to the coast is lacking

3. Walking at the Campus via Psychogeography

Psychogeography investigates how natural or built environment impact on the feelings and attitudes of individuals; and especially focuses on 'walking'; as a result, differentiated forms of (urban) streets are one of the research themes of this field. Our paper examines the differentiated forms of walking practice at two university campuses in Turkey in relation with the spatial appropriation at the *alle* via a psychogeographic lens. *Psychogeography* developed at the intersection of geography and psychology; Covery (2011) describes the development of psychogeography especially in the field of literature. Guy Debord (1955) led posed the concept 'psychogeography' within *Situationist International Movement* in 1950s; the term flourished from their artistic motives, however the concept of *Dérive* (implying 'deviation' and 'resistance') shifted this motive to a political content and soon this term evolved to 'a political tool to transform the urban everyday life' (Covery, 2011). In her thesis, *Psychogeography as a Tool of Urban Spatial Experience*, Jale Sarı (2013: xv) defines the term 'derive' as: "saunters of individuals throwing everything in the wind within their everyday life," which implies the main technique of psychogeography while experiencing the urban space.

3.1. Methodological Framework: Psychogeography of University Campus

University campuses are fruitful urban spaces to examine within a psychogeographic methodology; since they have various walking districts and differentiated forms of spatial appropriation. However, urban space transforms so rapidly that a psychogeographic methodology within spatial analysis is difficult to formulate. Psychogeography has an elastic and ambiguous nature which results in the epistemological difficulties. This difficulty is rooted from the problem that to what extent can we use psychological projections –the knowledge and maps of individuals – as a ground of objective and general source of knowledge (İlkay, 2022). This difficulty can be exceeded through a combination of subjective and objective methods through a dialectical examination between individual and contextual scales of research.

A mixed methodology [composed of three scales] is defined through the analysis of differentiation on spatial appropriation at two university campuses. At the first scale, through systematic observations and evaluating the writer's own narrative the sub-behavioural walking districts are determined. This scale results in a *zoning* attempt. Within the second scale of research, the mental maps of the interviewees are collected with respect to *in-depth interviews* and *attentive walks*. The third scale aimed at a synthesis of (subjective) mental maps and (objective) spatial hierarchy; the observations, narratives and maps are overlapped to construct a cumulative experiential map via spatial topology technique. *Dérive* occurs at the focus of this enquiry, both as a concept and a technique; this very basic and simple psychogeographic method, enables such a construction: *walking and documenting what you perceive within your deviations*.

It was aimed to interview with approximately 30-32 people – a group composed of both students and lecturers – 10 of these people were planned to be the ones who experienced both campuses, however as a result of the earthquake in Kahramanmaraş, in February, this was not possible. Attentive walks also could not be conducted. For the first step of the research, we could interview with 1 academician (who drew mental maps of both of the universities) and 4-5 students of YYU. In addition to these maps and interviews, there are also previous studies on mental maps of students on Van YYU. Some more interviews will be held after the submission of this full paper to present in the congress in July.

The interview questions are composed of four sections. First, the demographic information, second, the relation with the city is questioned such as where the interviewee inhabits in the city, where he/she works or has education, how he/she moves through the city within an ordinary day, etc. Especially the perception of the campuses within this frame and the city space is also questioned in this part. Third, sub-behavioural

districts are achieved in relation with the image of the city. The five elements of the image are asked in relation with the relevant campus. The first map of the campus wholistically is collelcted at this point. Then, fourth and last the relationship between walking practice and spatial appropriation is asked to the interviewees ending with an attentive walk [as Kelly, (2020) proposes in her article] and another map was drawn by the interviewees after attentive walks conducted together with the researcher.

3.2. Sub-behavioural Districts and Spatial Hierarchy of the Campuses

In fact, the problem of this paper appeared as a result of the researcher's own experience and question that "experiencing both of the campuses, why I cannot feel attached to my new campus in Van, however I have a detailed mental map of my previous campus, METU, although the latter one is located near the largest lake of Turkey". While pursuing this question, the differentiation of the sub-behavioural districts and differentiated forms of walking practice appeared in relation with the concept of *alle*.

The body contacts with other subjects and objects through spatial pattern, *with* and *at* urban space. Spatial hierarchy penetrates on this contact as a physical input; moreover, sociological and psychological factors (mental and social inputs) shape the contact as well. The spatial pattern with nodes and routes and the mental representations with spatial repertoires result in a two-folded map; one is a physical map, which is relatively more concrete and objective; and the other is a psychogeographic map which is more personal and abstract (İlkay, 2022). We can see this differentiation through the sub-behavioural districts of two campuses. Yıldız, et.al. (2015) proposes the results of their spatial analysis with respect to the conception of the designer of METU; Behruz Çinici, the architect of METU designed METU in three differentiated zones as, *accommodation*, *social and sports areas*, and *academic units*. Especially the structures of the faculties were designed within fragmental structure having inside courtyards give opportunity to produce small open spaces, squares within the buildings' indoor spaces (Fig. 11).

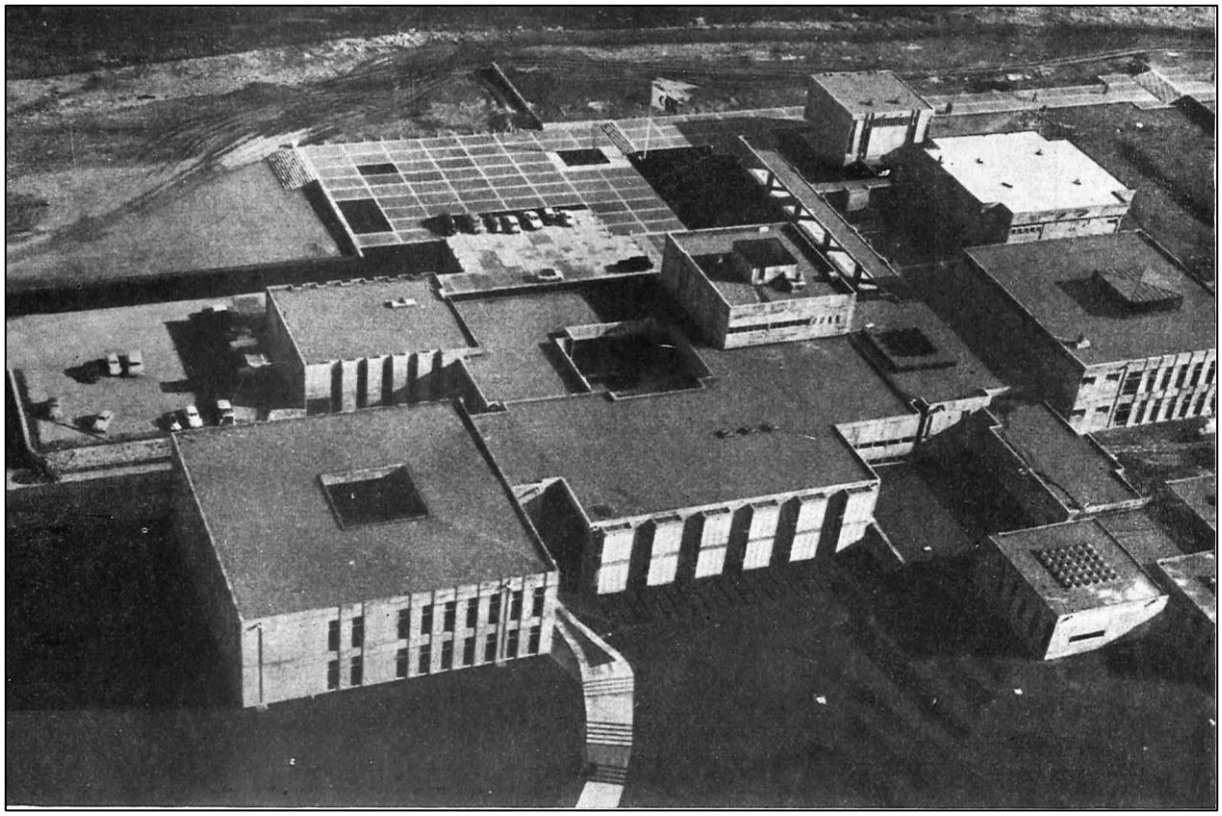


Figure 11. The structure of the department of Architecture, the first building of the campus, METU
Source: *Arkitekt*, 1965, p.108.

Secondary pedestrian paths were attached to the alle in addition to the buildings, which altogether formed a spine for the pedestrian circulation (Yıldız, et.al., 2015). This pattern supported also the mental representations in addition to spatial practice, which indicates the degree of spatial appropriation. During the interview with the lecturer who experienced both campuses, her perceived sub-behavioural districts corresponded to the zones designed by the architect, she mentioned the academic areas between library and MM building in METU, which is the central building of engineering and orients the mental patterning of alle as a landmark and node. She highlighted the difference between METU's green areas and Van YYU's lack of greenery. This colour distinction in relation with the spatial appropriation issue can be observed in her mental map [Fig. 12]. METU has basically three sub-districts, which are spatially separated from each other, one is the faculties and academic-research cluster, the accommodation clusters are located at the two peripheries of the campus and these two regions are connected with the social-cultural and sports cluster having a large slot of green area with a small brook.

Figure 12. One of the mental maps of the interviewees who experienced both campuses [May, 2023]. *Left* is the representation of Van YYU, and *right* is the representation of METU

However, Van YYU has so many different parts which cannot generate a wholistic or relational spatial pattern. The interviewees also indicated the coastal zone as a specific, critical walking district but apart from the academic units. The faculties are not connected with a spatial conception, the alle combines some of the units horizontally (fig. 10) but the spatial structure of the campus is far beyond that axis, moreover this horizontal spine cannot reach or direct to the lake shore, which is highlighted by the students. The empty spaces turn out to be dead and lost spaces in Van YYU. In his research Gülen (2021) investigates the impact of the urban equipment elements in the case of Van YYU, and categorizes the spatial districts of the campus as, firstly, the region of public transport station at the northwest of the campus –which is also at the end of the *alle* and in relation with the dormitories – secondly, the coastline of the campus at the south, thirdly, the main cafeteria and its surroundings, fourthly, the region of the KYK dormitories, fifthly, the surrounding of the faculty of Architecture and Design (also the Faculty of Pharmacy) – the first building of the campus – and also consisting the central building of Rectorship; and lastly, the alle. However, these regions seem to be randomly spread through the campus since a wholistic and comprehensive plan of the campus was lacking since the very beginning of the campus. This can be traced in the mental maps and interpretations/narratives of the interviewees of Van YYU. The students had difficulty to define the spatial hierarchy of the campus and determine the specific spaces where are attached to and appropriated within their daily walking practice. This is a parallel data to the previous studies and maps conducted with the architecture and planning students of YYU since 2016 within courses the writer has given. The alle is usually not appropriated or even recognized by most of the students and the situation is worse with the lecturers and institutional staff who usually relatively less interact with the campus spatial pattern and practices. However, METU interacts with the minds and bodies of both the students and the lecturers or other staff which results in rich and deep spatial appropriation. We argue that the alle has a critical role in this spatial experience and appropriation.

4. Conclusion: Role of Alle at Campus Design and Spatial Appropriation

This paper questioned how the spatial appropriation differentiates via walking practice at *alle* in selected two cases with reference to differentiated design policies of spatial hierarchy at campuses.

The sub-questions of this main research question were:

- How and why the design approaches differentiate in two university campuses in Turkey,
- How the interrelation among *alle* design and spatial appropriation differs in these two cases, and
- What does the differentiated gaps among real and psychographic maps indicate

about the interrelation between design and spatial appropriation.

The comparison was made through three scales, firstly the historical developments of the campuses are located within the history of higher education of Turkish Republic. Secondly, the spatial pattern and sub-behavioural districts were observed and compared with reference to the inner cohesion of the campus spatial pattern. And thirdly, the spatial appropriation was analysed with respect to the narratives and mental maps of the interviewees. This research will be expanded with more interviewees and attentive walks to gather more mental representations, so that these representations will be overlapped to acquire a synthesis of the gap between the physical reality and collective psychological reality.

Comparing the establishment processes of the universities, although two cases are both constructed as campus universities isolated from the city, the design of the campuses corresponds to different urbanization and higher education processes. Van Yüzüncü Yıl University as an idea goes back to the first period, the urbanization of state (1923-50), however it is realized after 1980s, the urbanization of capital era, and the corruption of higher education has started so far. METU, was designed and realized in the same period, 1960s, the urbanization of working-class era and the development period of higher education. So, the policy behind the design were so differentiated. Metu is a planned-designed campus whereas YYU is an unplanned campus, and the place of the alle in their design stories indicate this situation. The morphology of the campuses also supports the same argument. METU is a more holistic, however YYU is more fragmented, which can be followed via mental maps and narratives, and *dérive*s as well. The forest is the main unit for the image of the METU, and the lake is the main unit for the image of YYU. METU uses the symbol of *tree* both symbolically in the emblem of the university [also with a statue at the entrance of the university] and physically as a spatial tool within the spatial hierarchy of the campus; however, Van YYU can neither abstract nor instrumentalise the *lake* as a spatial tool and target.

As a result, the quality of campus design seems to retreat with reference to the shift in campus design policy and higher education policy (prioritising quantity rather than quality). This shift results in the decline of the place attachment and fertileness of walking as an urban spatial practice, which may lead to spatial appropriation and development of more democrat canals of spatial transformation. This research indicates that the degree of spatial appropriation and quality of walking practice in Van YYU is lower than the case in METU. This is partly resulted from the campus design which shapes both the spatial hierarchy within walking districts and the perceptions of the users which can be followed in the mental representations and narratives indicating the spatial experience. We need to hear and touch more the soul of the city space, especially in university campuses which are so fruitful and autonomous walking districts of the city. And should be models for

more democratic planning practices.

References

Ankara'da Ortadoğu Teknik Üniversitesi. *Arkitekt,* 1965, v.3, pp. 108-115.

Birinci, N., Erdoğan, S., & Birol, G. (2020). Bir kamusal temas alanı olarak kampüs açık alanları: İzmir Demokrasi Üniversitesi kampüs tasarımı. *Journal of Social and Humanities Sciences Research*, *7*(50), 232-240.

Coverley, M. (2011). *Psikocoğrafya: Londra Yazıları.* Kalkedon Yay. [Coverley, M. (2006), *Psychogeography*. Harpenden, UK: Pocket Essentials]

Gülen, M. (2021). Donatı Elemanlarının Kentsel Alanlara Etkisi: Van Yüzüncü Yıl Üniversitesi Kampüsü Örneği. *Yüzüncü Yıl Üniversitesi Fen Bilimleri Enstitüsü Dergisi*, *26*(1), 34-44.

İlkay, Y. (2007). *The political struggle on and at public space: The case of Kızılay Square*. Unpublished Masters' Thesis*,* Middle East Technical University, Institutte of Social Sciences, Department of Urban Policy Planning and Local Governments, Ankara.

İlkay, Y. (2020). Kendileme odağında kentte yürümenin mekânsal topolojisi: Van örneğinde alt yürüme bölgeleri. Sketch Journal of. City and Regional Planning, 02(02), 21-39. https://doi.org/10.5505/sjcrp.2021.43153

İlkay, Y. (2022). Evaluation of psychogeography in planning as a new spatial methodology via 'walking body'. *Geographies, Planning & Tourism Studios, 2*(2):107-118. https://doi.org/10.5505/gpts.2022.29392.

Kelly, F. (2020). 'Hurry up please, it's time!'A psychogeography of a decommissioned university campus. *Teaching in Higher Education*, *25*(6), 722-735.

Kömürlü, E. (2019). 1960'lara kadar Türkiye'de ilk üniversitelerin kuruluşları. *Üniversite Araştırmaları Dergisi*, *2*(1), 50-57. https://doi.org/10.26701/uad.473016

Larkham, P. (2000). Institutions and urban form: the example of universities. *Urban Morphology*, 4 (2), 63-77.

Lefebvre, H. (1991). *Production of Space*, Blackwell.

Özyıldıran, G. (2022). Geçmişten Günümüze Van Yüzüncü Yıl Üniversitesi Yerleşkesi ve Yapılarının Mimari Gelişimi. *Yüzüncü Yıl Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, (58), 190-217. https://doi.org/10.53568/yyusbed.1175773

Sargın, S. (2007). Türkiye'de üniversitelerin gelişim süreci ve bölgesel dağılımı. *Süleyman Demirel Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, (5), 133-150.

Sarı, J. (2013). *Kenti deneyimleme aracı olarak psikocoğrafya.* Unpublished Master's Thesis, İstanbul Technical University, Graduate School of Science and Applied Sciences,

Department of Architecture.
Şengül, H. T. (2003). On the trajectory of urbanization in Turkey: an attempt of periodisation. *International Development Planning Review*. 25, 3, 153-168.
Turner, P. (1984). *Campus: An American planning tradition*. Cambridge MA: MIT Press.
Yaylalı, B., & Çil, E. (2021). Issues in the planning and design of university campuses in Turkey. *A/Z ITU Journal of the Faculty of Architecture*.
Yıldız, B. Y., Çil, E., & Can, I. (2015). Kampüs Morfolojisi: Bir Yaşam Alanı Olarak Üniversite Yerleşkelerinin Analizi. *Türkiye Kentsel Morfoloji Ağı*, 368-386.
https://www.metu.edu.tr/

METHOD FOR REFINED FUNCTION ZONING PREDICTION OF TOURIST TOWN URBAN DESIGN BASED ON BIG DATA AND CONDITIONAL GAN (1053)

Minghao Xu[1*], Yiheng Feng[2], Jian Wen[2], Yifan Cui[2], Li Li[2]

[1] University of California, Berkeley, College of Environmental Design, Berkeley, CA, USA; [*]minghao_xu@berkeley.edu

[2] Southeast University, School of Architecture, Nanjing, China

Abstract. Looking at the urban design of a tourist town, it is necessary to refine further the function zoning given by the urban plan. However, in the traditional urban design process, this step requires the designers to manually research for similar cases studies to analyze the spatial distribution relationships between businesses and geographical elements such as road networks, water bodies, and topography, which is not only time-consuming and laborious but also lacks reliability and accuracy. Therefore, this paper aims to propose a method that uses big data and conditional Generation Adversarial Network(cGAN) to obtain a POI-guided refined function zoning efficiently and accurately based on multiple proven precedents. Taking Nanjing's Tangquan Hot Spring Town as an example, this paper shows the process of acquiring and processing the dataset, building and training the model, and finally applying it to the target site and generating a preliminary urban design massing based on Rhinoceros and Grasshopper.

Keywords: Urban Design, Big Data, Conditional GAN, Function Zoning, Tourist Town Design.

1. Introduction

The decision-making process for the functional zoning of urban land has been complicated as it involves a large number of participants and contains multiple competing non-linear and non-additive objectives. This process requires rational resolution of the spatial dependence between plot functions and reference to the correlation between each type of function and the site basic conditions (Haque and Asami, 2014). In addition to employing functional zoning in master urban planning as a general guide, detailed plot-level function zoning and development intensity indicators are frequently required as references for detailed urban design in urban planning and design. The determination of a plot's refined function, zoning, and development intensity in the traditional urban design process typically rely on the urban designer's personal experience and the reference of a large batch of similar cases, which tests individual design ability and requires a lot of time and human resources.

For tourist towns, a refined function zoning of the plot plays a crucial role in the development of the town. A reasonable allocation of different types of buildings and corresponding development intensity in a short timeframe can help the town to function and develop well in the first place. On the contrary, we can see that delayed and unsupported zoning often affects the operation of the town at the beginning of its opening and reduces the probability of its subsequent success.

The above problems prompted the search for a newer solution. Modern information technology's continuous development and improvement have enabled new analyses that were previously unattainable due to a lack of data aggregation. Big Data and Artificial Intelligence enable a more comprehensive and rational approach to urban planning and design. Using big data and artificial intelligence can help designers improve the efficiency and accuracy of this process.

On the one hand, Big Data offers a fresh perspective on the planning and development of cities. The availability of such data suggests that it can be useful in making informed decisions to optimize resource use. On the other hand, using artificial intelligence models can provide scientific analysis for target site design based on available big data, which can help refine site design.

To provide reliable data support, this research introduces POI (Point of Interest) data as an important data basis for the functional zoning of the site where information on various functional facilities in urban space is distributed. This distribution implies the connection between urban functional zoning and the basic conditions of the site (Ye *et al.*, 2011).

For this research, the types of functional zoning required for tourist towns are relatively simple and clear, and the distribution relationship between each functional zoning and the local road network, natural environment, and other environmental conditions will largely affect the operation and use experience of the town. This research is based on the urban design of a tourist town, and this type of plot with clear development goals and relatively simple functional zoning is suitable as a preliminary experimental case for this research.

The objective of this research is to propose a method of applying big data and machine learning to try to master the POI distribution of a large number of cases similar to the target tourist town, to obtain a predicted POI distribution of the target town, and then guide the functional zoning refinement and subsequent urban design of the town.

2. Related Works

The development of computer science is providing an ever-growing assistance in the field of urban planning and design research. (e.g., Liang et al.(Liang *et al.*, 2018), 2018; Stevens, Dragicevic, and Roth-ley, 2007) (Stevens, Dragicevic and Rothley, 2007). Traditional planning methods usually use rule-based evolutionary mechanisms to make the corresponding decisions, such as cellular automaton models (CA) or multiagent-based models (MA). The drawback of these methods is that their corresponding rules and generation logic lack data support and rely heavily

on human experience and subjective judgment. The completeness of their constraints largely determines the completeness of the computer-generated results.

Artificial intelligence tools aim to provide a reference tool for urban planners and designers. Machine learning uses artificial intelligence to enable systems to learn and adapt themselves without being explicitly programmed through prior experience (Baduge *et al.*, 2022).

In 2014, Ian Goodfellow proposed the structure of generative adversarial networks (Goodfellow *et al.*, 2020). That is, two multilayer perceptrons, a generator, and a discriminator are used to generate data and classify it as true or false based on the training data.

In November 2014, Mehdi Mirza and Simon Osindero proposed conditional GAN (CGAN) to place labels on the training data of generators and discriminators in the GAN structure (Goodfellow *et al.*, 2020). cGAN-based Pix2Pix model was proposed by Isola et al. in 2018 (Isola *et al.*, 2016), which is capable of learning from images to form an image to another image mapping relationship.

cGAN has already been applied to the field of site planning. For example, using reinforcement learning for urban texture studies (Peipei Jin,2022 (Jing, 2021)), for complete site planning design (CDRF 2020: Proceedings of the 2020 DigitalFUTURES pp 103-11 (Tian, 2021)), or for the forced-row design of settlements (Xinyu Cong, 2021 (SUN Cheng, 2021)). These studies demonstrate the feasibility of automatic site planning and design using methods such as cGAN with certain datasets.

POI information, roads, human activities and other information can provide rich quantitative data and decision support for urban development planning, commercial site selection, infrastructure layout, and other fields. By investigating the POI configuration of an area, urban planners can assess its function, vitality, and development (Cai et al., 2019 (Cai *et al.*, 2019); Gao, Janowicz, & Couclelis, 2017 (Gao, Janowicz and Couclelis, 2017); Lyu, Bertolini, & Pfeffer 2016 (Lyu, Bertolini and Pfeffer, 2016); Yue et al., 2017 (Yue *et al.*, 2017)). POI can be geographic information data and an important data link between data and urban planning.

When performing the above tasks or studies on urban areas, such as identifying urban functions, measuring vitality, and assessing development, it has become common to count the proportion or number of various types of POIs separately. For example, Liu and Long (2016) studied the main POI types that accounted for a large proportion of the POI within each region to determine the function of the region (Liu and Long, 2016); Yue et al. (2017) calculated the Hill number of an area from POI data to help people better understand the relationship between mixed use and community vitality(Yue *et al.*, 2017). Wu, Ye, Ren, and Du (2018) analyzed spatial-temporal effects of POI-based configurations on vibrancy and offered policy suggestions to improve resource utilization and design neighborhood rationally(Wu *et al.*, 2018).

The above work shows that it is feasible to use cGAN and big data for the prediction of sites. In this paper, we will build on the previous research by combining the advantages of big data and cGAN in their respective fields to enhance the data-based interpretation of image results while using big data for sample support.

3. Methodology

The synthesis workflow for this research uses a typical framework of data science processes and can be divided into three steps: data acquisition and processing, machine learning, and application in urban design (see Figure 1).

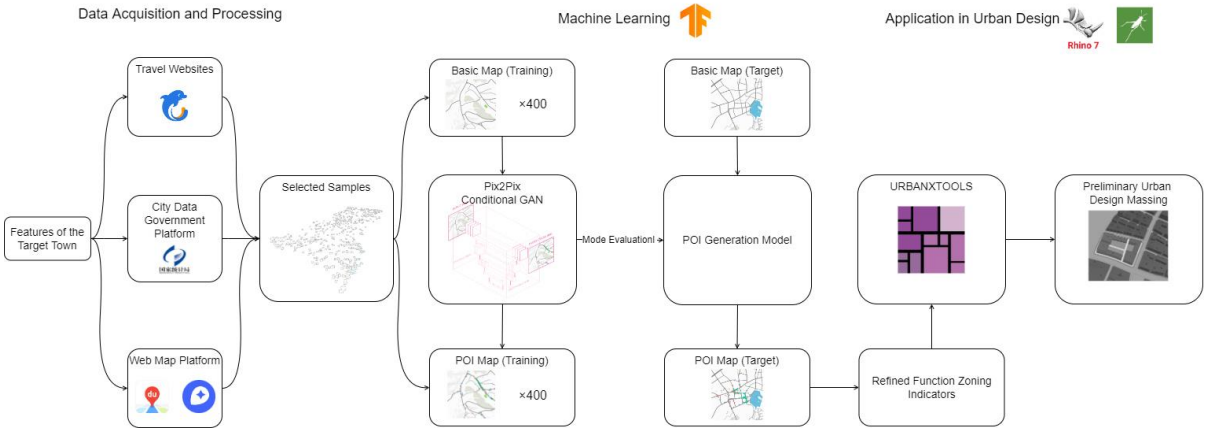


Figure 13. Research workflow

3.1. Data Acquisition and Processing

The data used in this research are all sourced from open-source platforms, including travel websites, city data government platforms, and web map platforms. Firstly, to get samples for subsequent machine learning, the preliminary samples are retrieved from the travel website by the characteristic keywords of the target town. Then, they are selected by their similarity to the target town in terms of urban development index and their ratings on travel websites. For each selected sample, a 1 km square map PNG image of the town center containing basic natural environment information and road net (Basic Map), and a map PNG image with additional POI marking points (POI Map) are created through web map platforms (Mapbox). Finally, paired Basic Map and POI Map are used as input for the subsequent machine learning.

3.2. Machine Learning

The machine learning model in this research uses the Pix2Pix pipeline to construct a translation from Basic Map to POI Map.

The Pix2Pix model consists of two parts: a generator, and a discriminator. The condition is concatenated with Gaussian noise as the input to the generator and again with the output of the generator as the input to the discriminator (‘Pix2Pix Tutorial with Tensorflow’, no date).

Additionally, the model's objective function is the sum of the GAN loss, the binary cross entropy, and the l1 criterion between the generated image and the ground truth (see Figure 2).

In this research, the input image of the Basic Map is represented as a 256-pixel by 256-pixel image; the ground truth image is the same image appended with POI information distinguished by different colors. For the tourist towns we focus on in this research, we selected three POI: hotel, shop, and food. Similar approaches can be used for other POI types as well.

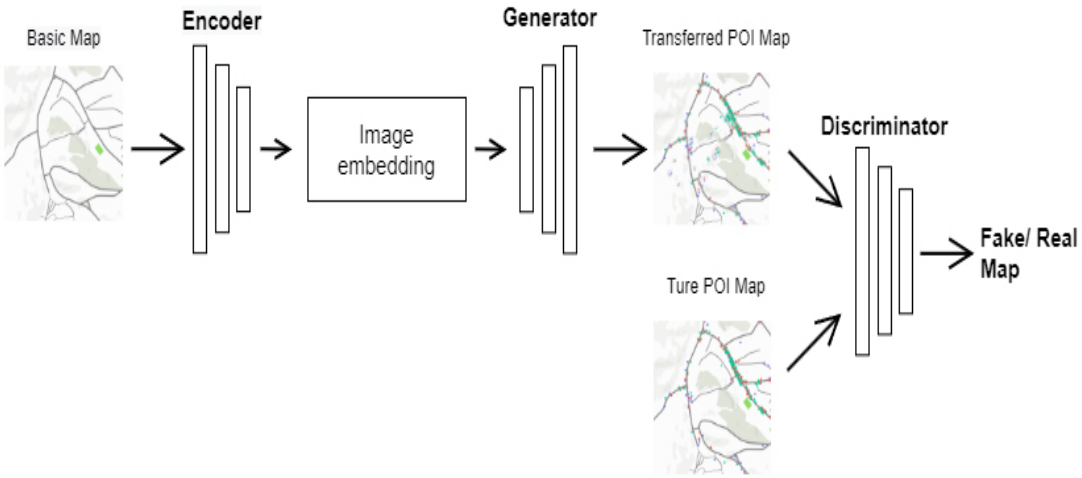


Figure 14. Pix2Pix architecture

3.3. Application in Urban Design

After the training of the model, the Basic Map of the target town center is input into the model to get the corresponding POI Map, and then transformed into a refined function zoning guide. In the generated POI Map, the plots to be refined and visualized are selected based on the initial zoning given by urban planning, and the number of POI in each selected plot is counted using OpenCV. The results of the count are translated into inputs (FAR, building density, mix ratio) for the UrabanXTools [13] plugin to generate POI-based urban design massing in the Rhinoceros window. This result serves as a guide to the refined function zoning of the target.

4. Case Study: Tangquan Hot spring Town in Nanjing

[13] UrbanXTools, developed by CAUPDxUrbanXLab of Tongji University, can rapidly generate rudimentary spatial models for urban design projects. The spatial model will be complied with superior plans and regulations('UrbanXTools', 2021).

The proposed workflow was applied to the urban design of Tangquan hot spring town around Nanjing, Jiangsu Province, China (hereinafter referred to as Tangquan). The research was assisted and guided by designers who carried out the actual urban design work in Tangquan.

4.1. Dataset

Sample Acquisition. The data were obtained from open-source platforms, including travel websites (Trip.com), city data government platforms (National Bureau of Statistics of China), and web map platforms (Baidu Map and Mapbox). To obtain Basic Map and POI Map image pairs of similar, high-quality samples that can be used as a machine learning database, we conducted a search based on the characteristics keywords of Tangquan, a selection based on the economic data of the surrounding cities and the town's rating, and a map image interception of the selected samples. For targeting Tangquan, we selected a total of 10 keywords to search on Trip.com, and a total of 3,464 preliminary samples were obtained. Subsequently, 400 samples were selected by comparing the similarity of the average urban development index of surrounding towns (in the 200 km radius) to the target town and their ratings on Trip.com (whether they were higher than 4 stars). These selected samples were used to generate image pairs of the Basic Map and POI Map to be used as the training set for machine learning.

Data Processing. To use the Pix2Pix model to learn the POI distribution characteristics of the selected samples for the refined function zoning prediction required a central Basic Map of each selected sample and a POI Map image made on this basis. We used the address to coordinate conversion function provided by Baidu Map to obtain each sample's initial central coordinates, retrieved the three types of POI within a 5 km square, and then used the geometric center of all three types of POI to create a modified center. Following that, a Basic Map image of 1 km2 of each sample was obtained in Mapbox using the coordinates of the modified center. The Basic Map contained map information related to refined function zoning prediction, including roads, water, greening, and terrain, which were represented by different colors, respectively. The POI Map was based on the Basic Map and was marked in three colors with three types of POIs: hotels, stores, and food. Finally, for input to the Pix2Pixmachine learning mode, both Basic Map and POI Map images were processed into 256 * 256 pixel PNG format (see Figure 3).

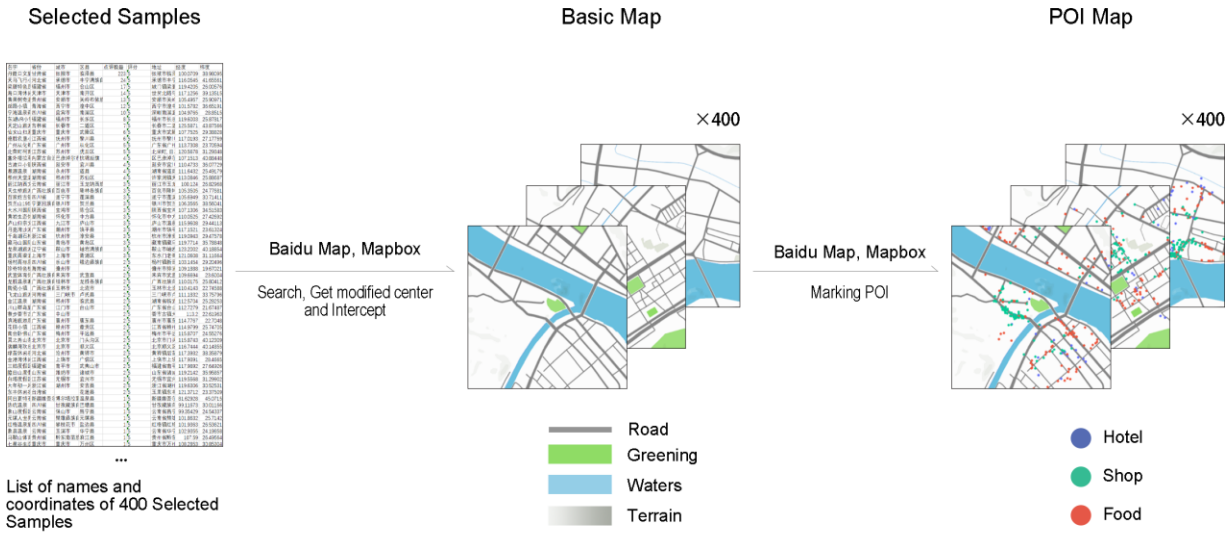


Figure 15. Data processing

4.2. Model Building and Training

To prepare a dataset for Pix2Pix training, we prepared a dataset composed of training images (Basic Map) and predicted images (POI Map) laid side-by-side as image pairs.

The model was trained in TensorFlow 2.1.0 environment with NVIDIA GeForce RTX 3070 GPU acceleration. The training data consists of 400 pairs of Basic Map and POI Map (see Figure 4).

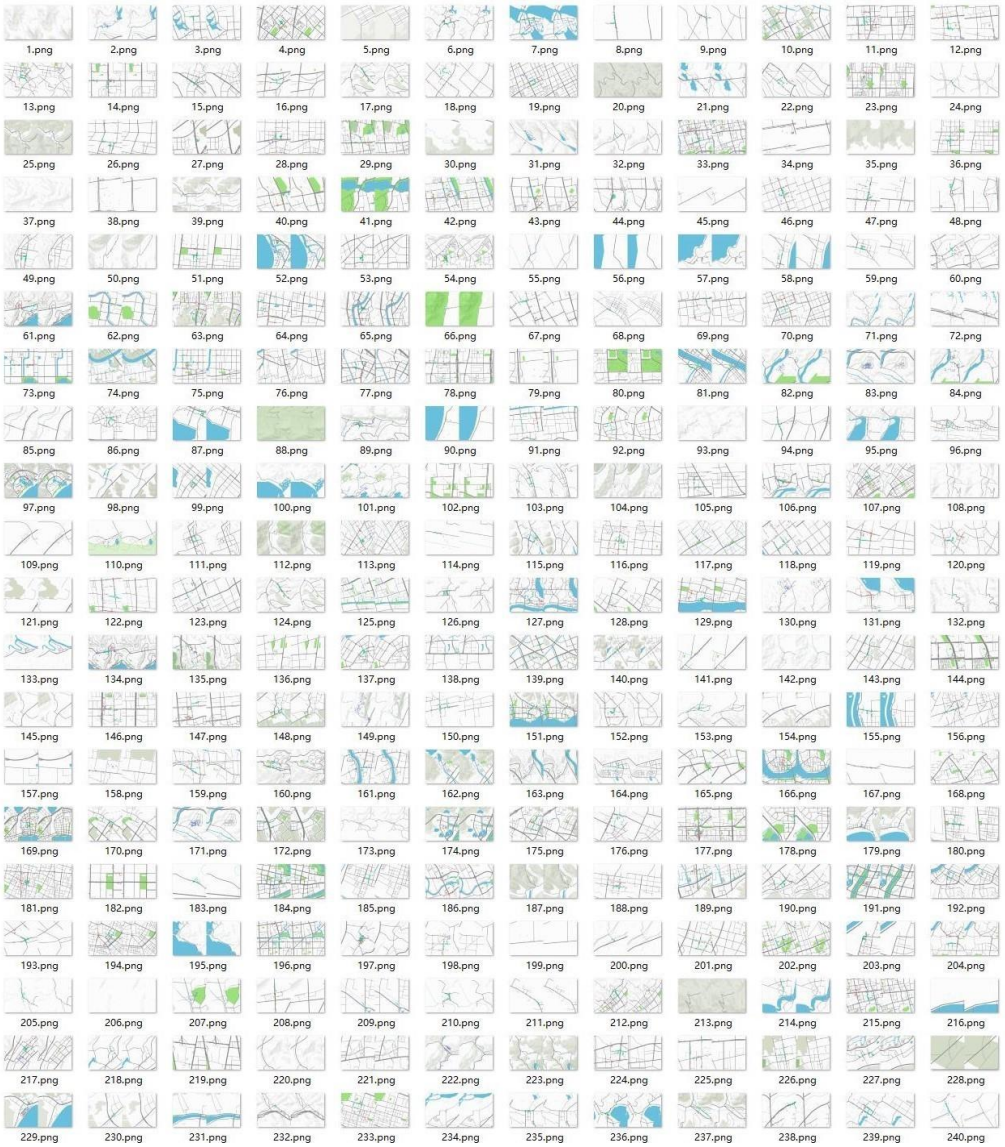


Figure 16. Training data batch example

4.3. Model Result and Evaluation

The initial result of the model was to realize the generation of images with POI distribution information from the tourist town map images containing only basic information such as roads, waters, greening, and terrain to guide the refined function zoning prediction. As the training proceeds, the model gradually identified the connection between the POI distribution and the elements in the Basic Map.

Several samples were used as test data to test the model in generating POI Map from Basic Map. It is worth noting that the final model predictions did not exactly match the ground truth images

but converged to the results learned for all databases combined, indicating that the model's overfitting is controlled (see Figure 5).

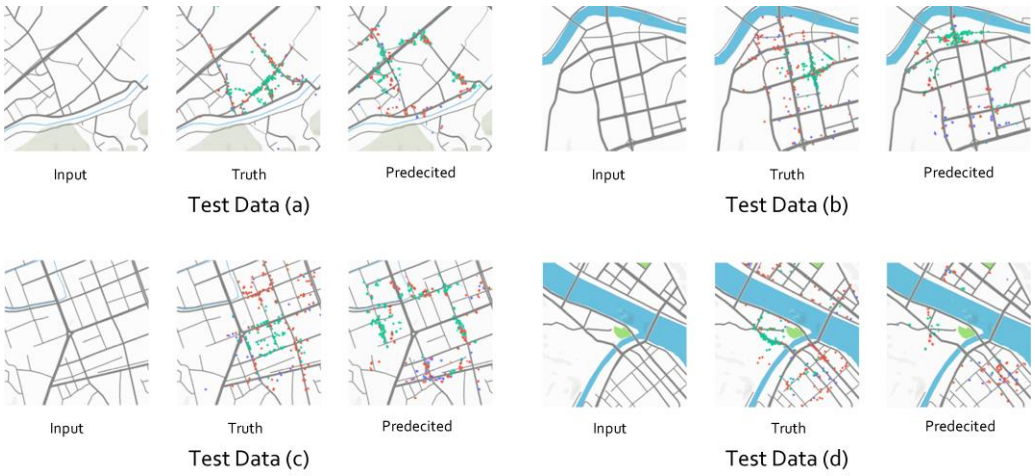


Figure 17. Model generation test example

As Tangquan was still in the undeveloped stage, the map platform did not have access to its planned road net. Therefore, after acquiring the map containing the natural environment information, the road net given by urban planning was attached in the same style as the training data to form the Tangquan Basic Map. We input the Basic Map of Tangquan into the trained Pix2Pix model and got the POI Map prediction of it (see Figure 6).

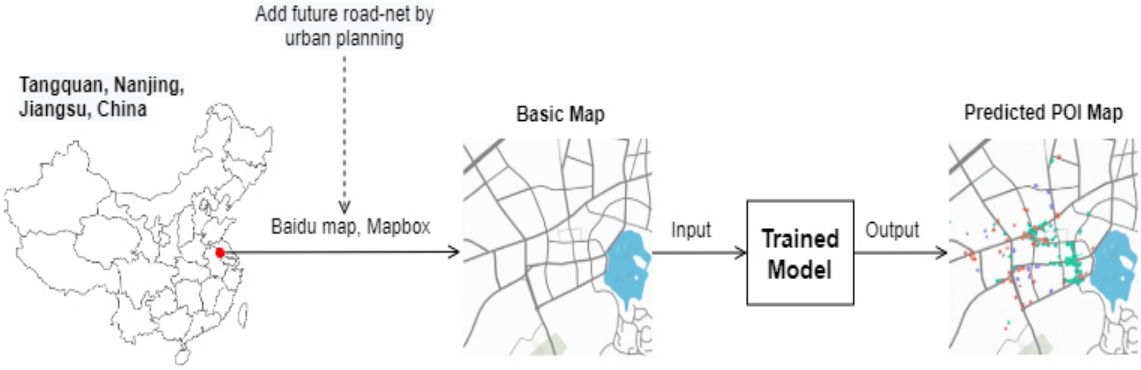


Figure 18. Training data batch example

4.4. Urban Design Application

To translate POI Map prediction into metrics useful for refined function zoning and to visualize them for designers, the types of POIs and the pixel number of each type of POI on each plot were counted, which determines the input values for the automatic massing generation program including building massing type, number, and volume ratio. This generated an urban design massing that can be easily referenced by designers.

Transformation of Images to Plot Indicators. The existing function zoning at the urban planning level of Tangquan could serve as the basis and prerequisite for refining the function zoning at the urban design level using the predicted POI Map. Based on the planned road network and the initial functional zoning, mixed commercial and residential land, commercial service facility land, and mixed commercial and office land (commercial-related) were selected as the plots for refining the functional zoning using the predicted POI Map. Then, the plots were numbered and the number of each type of POI[14] contained in the predicted POI Map was calculated for each plot using OpenCV (see Figure 7). The predicted numbers of three types of POI in each plot were plotted separately (see Figure 8). The number of the three POI in each plot and their ratio could indicate the development intensity of a specific building function (hotel, stores and food) and the mix ratio between them, as a reference for zoning refinement.

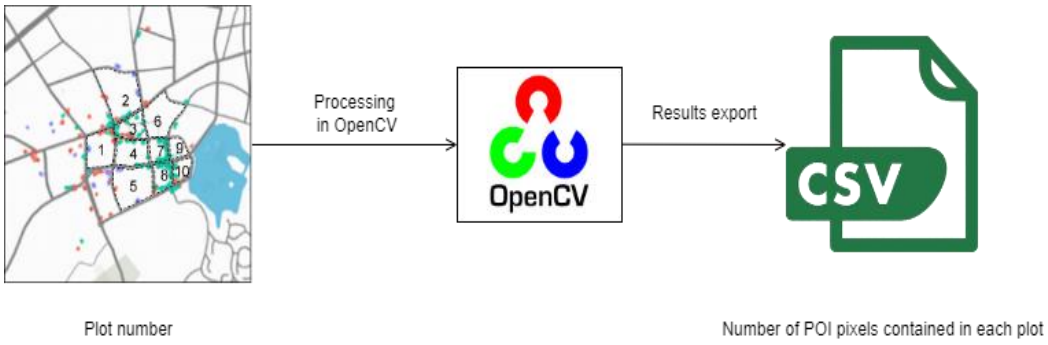


Figure 19. Processing predicted POI Map with OpenCV

[14] The number of POI is estimated by the number of pixels per type of POI.

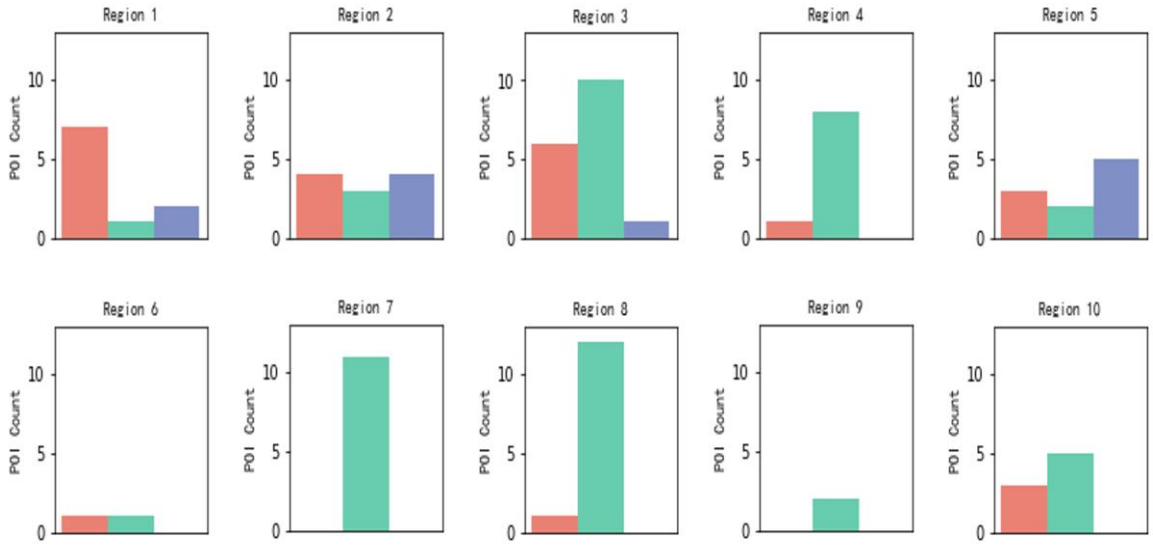


Figure 20. Predicted number of three types of POI in each plot

Visualization of POI-based massing in Rhinoceros and Grasshopper. UrbanXTools in Grasshopper was used to visualize the predictions into 3D volumes that designers can identify easily, and POI-based urban design massing was generated in Rhinoceros by controlling their FAR, building density and function mix ratio (see Figure 9). It is worth noting that the generated massing was based on the statistical results of POI number and common urban design criteria, and its goal is to provide designers a reference for the refined function zoning and corresponding development intensity, rather than to generate the final urban design massing results.

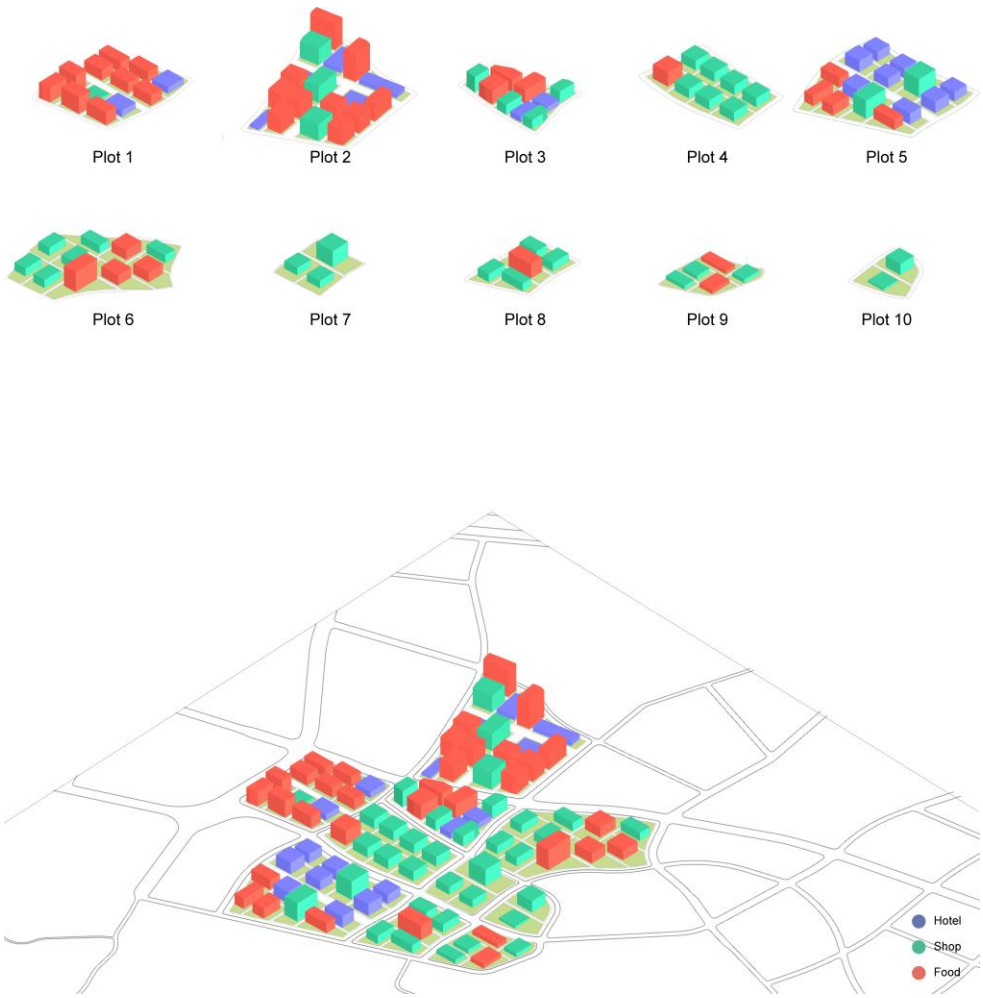


Figure 9. Visualization of POI-based massing

5. Conclusion

This research proposed a method to predict the POI distribution of a target tourist town based on big data and cGAN and to guide refined function zoning based on the predicted POI Map of the target town. In addition to presenting the method of predicting POI Map, this research also explored how to interpret the predicted results and translate them into urban design indicators to visualize urban design massing for reference.

5.1. Discussion and Contribution

This research illustrated a new methodological approach using Pix2Pix to predict graphical plot indicators and guide urban design function zoning refinement accordingly, which is made possible by the development of big data and machine learning. This approach is based on a large number of existing cases with their common features mastered in machine learning. This indicates that

the prediction results generated by this method have a high reference value for designers. Furthermore, this method can significantly reduce the time and labor costs of function zoning refinement in the urban design process, which allows designers to address a greater number of design objects and iterate quickly in a shorter period.

The application of this method opens possibility of big data and machine learning assisted urban design. Predicting the distribution of possible POI guides the refinement of function zoning of targets in a bottom-up approach. Moreover, this method provides data support for urban design and streamlines the urban design process, which allows designers to devote more energy to urban design refinement.

5.2. Challenges and Future Study

Three factors should be taken into account in future research: a larger sample size with more extended models, network structure optimization, and a more thorough interpretation and translation of prediction results.

This research focused on tourist towns and applied the methodology to a specific design target. The advantage of this approach is that it focuses on a specific type and requires only a relatively small number of samples based on the characteristics of the target. The drawback is the inability of usage for more general targets. In other words, the model trained by cGAN corresponds to the target and cannot be directly applied to other types of targets. The model needs to be retrained using the same method for new targets of different types. Therefore, one possible evolution is to target more general targets and use larger sample sizes for training. Also, mapping relations related to the target type can be added to improve the specificity while ensuring the overall generality of the model. This evolution may avoid repetitive training of the model.

Another possible evolution is the optimization of network structure. For example, using DCGAN to improve the stability of GAN training and the quality of the generated results (Radford, Metz and Chintala, 2016), or using WGAN to improve GAN in terms of the loss function to solve the instability of training to some extent (Arjovsky, Chintala and Bottou, 2017).

Improvements could also be made to the interpretation of the predicted results. The number of POI contained in each plot can be counted in a more precise way, for example, by identifying POI centers based on color and then counting them. Also, a more systematic and supported approach can be used in translating statistical POI data into urban design indicators, such as by correlating with local urban design guidelines.

References

Arjovsky, M., Chintala, S. and Bottou, L. (2017) 'Wasserstein GAN'. arXiv. Available at: http://arxiv.org/abs/1701.07875 (Accessed: 14 September 2022).

Baduge, S.K. *et al.* (2022) 'Artificial intelligence and smart vision for building and construction 4.0: Machine and deep learning methods and applications', *Automation in Construction*, 141, p. 104440. Available at: https://doi.org/10.1016/j.autcon.2022.104440.

Cai, L. *et al.* (2019) 'Sensing multiple semantics of urban space from crowdsourcing positioning data', *Cities*, 93, pp. 31–42. Available at: https://doi.org/10.1016/j.cities.2019.04.011.

Gao, S., Janowicz, K. and Couclelis, H. (2017) 'Extracting urban functional regions from points of interest and human activities on location-based social networks: GAO et al.', *Transactions in GIS*, 21(3), pp. 446–467. Available at: https://doi.org/10.1111/tgis.12289.

Goodfellow, I. *et al.* (2020) 'Generative adversarial networks', *Communications of the ACM*, 63(11), pp. 139–144. Available at: https://doi.org/10.1145/3422622.

Haque, A. and Asami, Y. (2014) 'Optimizing urban land use allocation for planners and real estate developers', *Computers, Environment and Urban Systems*, 46, pp. 57–69. Available at: https://doi.org/10.1016/j.compenvurbsys.2014.04.004.

Isola, P. *et al.* (2016) 'Image-to-Image Translation with Conditional Adversarial Networks'. Available at: https://doi.org/10.48550/ARXIV.1611.07004.

Jing, P. (2021) *Research on Application of Style Transfer And Conditional Generative Adversarial Networks In Urban Fabric Generation*.

Liang, X. *et al.* (2018) 'Delineating multi-scenario urban growth boundaries with a CA-based FLUS model and morphological method', *Landscape and Urban Planning*, 177, pp. 47–63. Available at: https://doi.org/10.1016/j.landurbplan.2018.04.016.

Liu, X. and Long, Y. (2016) 'Automated identification and characterization of parcels with OpenStreetMap and points of interest', *Environment and Planning B: Planning and Design*, 43(2), pp. 341–360. Available at: https://doi.org/10.1177/0265813515604767.

Lyu, G., Bertolini, L. and Pfeffer, K. (2016) 'Developing a TOD typology for Beijing metro station areas', *Journal of Transport Geography*, 55, pp. 40–50. Available at: https://doi.org/10.1016/j.jtrangeo.2016.07.002.

'Pix2Pix Tutorial with Tensorflow' (no date) *Pix2Pix Tutorial with Tensorflow.* Available at: https://www.tensorflow.org/tutorials/generative/pix2pix (Accessed: 21 September 2022).

Radford, A., Metz, L. and Chintala, S. (2016) 'Unsupervised Representation Learning with Deep Convolutional Generative Adversarial Networks'. arXiv. Available at: http://arxiv.org/abs/1511.06434 (Accessed: 14 September 2022).

Stevens, D., Dragicevic, S. and Rothley, K. (2007) 'iCity: A GIS–CA modelling tool for urban planning and decision making', *Environmental Modelling & Software*, 22(6), pp. 761–773. Available at: https://doi.org/10.1016/j.envsoft.2006.02.004.

SUN Cheng, C.X., HAN Yunsong, (2021) 'Generative design method of forced layout in residential area based on CGAN', *Harbin Gongye Daxue Xuebao/Journal of Harbin Institute of Technology*, 53(2). Available at: http://hebgydxxb.periodicales.com/index.php/JHIT/article/view/147 (Accessed: 10 September 2022).

Tian, R. (2021) 'Suggestive Site Planning with Conditional GAN and Urban GIS Data', in P.F. Yuan et al. (eds) *Proceedings of the 2020 DigitalFUTURES*. Singapore: Springer Singapore, pp. 103–113. Available at: https://doi.org/10.1007/978-981-33-4400-6_10.

'UrbanXTools' (2021). Available at: https://github.com/CAUPDxUrbanXLab/UrbanXTools (Accessed: 21 June 2022).

Wu, C. *et al.* (2018) 'Check-in behaviour and spatio-temporal vibrancy: An exploratory analysis in Shenzhen, China', *Cities*, 77, pp. 104–116. Available at: https://doi.org/10.1016/j.cities.2018.01.017.

Ye, M. *et al.* (2011) 'Exploiting geographical influence for collaborative point-of-interest recommendation', in *Proceedings of the 34th international ACM SIGIR conference on Research and development in Information - SIGIR '11*. *the 34th international ACM SIGIR conference*, Beijing, China: ACM Press, p. 325. Available at: https://doi.org/10.1145/2009916.2009962.

Yue, Y. *et al.* (2017) 'Measurements of POI-based mixed use and their relationships with neighbourhood vibrancy', *International Journal of Geographical Information Science*, 31(4), pp. 658–675. Available at: https://doi.org/10.1080/13658816.2016.1220561.

BEYOND VISUALISATION OF BIG DATA: TOWARDS DYNAMIC DATA-DRIVEN CITY PLANNING IN SINGAPORE (1068)

Zdravko Trivic[1*], Aditya Sinha[1], Kai Ma[2], Kim Huat Goh[2]

[1] Department of Architecture, College of Design and Engineering, National University of Singapore, Singapore, [*]akizt@nus.edu.sg

[2] Division of Information Technology & Operations Management, Nanyang Business School, Nanyang Technological University, Singapore

Abstract. Cities are complex systems shaped by simultaneous dynamic processes. While an increased number of studies focus on analysing urban big data, the attempts predominantly propose means for data visualisation, and fall short in data interpretation and guidance. In response, this paper aims to systematically understand dynamic urban big data, trends and anomalies in city functioning. We outline a comprehensive framework and "DataCube-CityScan" platform that harness on dynamic economic, societal, environmental, health and attitudinal data available in Singapore (e.g., people movement, public transport use, shopping behaviour). We use GIS alongside multiple outlier detection algorithms to analyse and identify specific trends and anomalies in real-time and alert city officials to respond and make informed and timely decisions, monitor changes, plan actions and strategies, and maximise their resources.

Keywords: dynamic urban data; big data visualisation; city pulse; city planning; Singapore.

1. Introduction

Cities are complex systems shaped by numerous simultaneous dynamic processes, which either work in harmony and keep the system healthy and thriving or converge into conflicts and cause anomalies and disruptions. The ways cities have developed historically and how these processes have manifested were considerably dependent on technological advancements, which arguably became more rapid in recent decades. According to Smith and Lobo (2019), contemporary cities can be described as both the devices of innovation and growth, and the containers of intensive social relations, the so-called *'energized crowding'*. Such concentrations of structure, infrastructures, information, people and processes that are constantly changing require more robust, dynamic and resilient urban management mechanism to support city planning and growth.

With the advancement of information and communication technology (ICT) in cities, enormous amount of urban data is generated by the minute, concerning various aspects of everyday city's functioning. By using this dynamic real-time data alongside the conventional static and semi-static data, planners and city officials can bridge the gap between different temporal scales of urban activities (Batty and Kandt, 2021), which can allow for deep understanding of complex city

processes and urban structures. This in turn helps to create timely and more refined policies, guidelines and actions to manage these processes.

Unsurprisingly, the questions of *'When, Where and How'* to use such vast, high frequency dynamic urban data reflect critical challenges. While there have been numerous studies that focused on a single domain or type of dataset to analyse, visualize variables, and solve a particular set of problems or hypothesis, very few studies have focused on using multiple datasets of different characteristics of the city simultaneously (Puiu et al., 2016). Moreover, recent studies tended to propose smart new means for big urban data visualisation, while also falling short in data interpretation and planning guidance.

In response, this paper outlines part of a larger study done in Singapore to systematically approach the vast expanse of urban big data and develop an alert system for the city officials and agencies to understand the underlying anomalies in the everyday city functioning. Singapore being one of the smartest cities in the world provides a range of open data at various scales and velocities (Lee et al., 2016). This paper presents a multi-perspective "Data Cube" framework to collect, aggregate and visualize dynamic economic, societal, environmental, health and attitudinal data at various granularities (city, regions, planning areas and planning subzones) in Singapore. It also presents a "DataCube-CityScan" platform, which harnesses on GIS, AI, data mining and outlier detection algorithms to identify specific trends and anomalies/outliers in real-time and alert city officials to respond, monitor changes, plan their actions and maximise their resources timely.

2. Literature Review

Development of digital technology has allowed cities to become much more intelligent, integrated and smarter in managing their resources. This has been possible by employing urban analytics to understand the unique set of challenges and opportunities in a city. Miranda (2017) finds analogies between everyday functions in a city with pulse in a human body. He argues that activities in a city are unpredictable in magnitude and location, and they vary with time, similar to a human pulse. These activities can generate from any part of the city at any time of the day which in turn defines the nature of that location at a particular time. In line with this, many researchers have tried to capture and measure the pulse of a city and to understand the dynamics of the city through big data analysis (Puiu et al., 2016; Vaccari et al., 2010; Froehlich, Neumann and Oliver, 2009; Kuemper et al., 2015, Liu and Biljecki, 2022). Most of the cities today provide access to city data, which allows research institutes to analyse them and provide innovative solutions to urban problems. Governments across the world have also shown interest in using big data to increase the innovation capacities of their urban centres in recent decades. UK government has set up pilot cities with Office of Data Analytics (ODA) for tacking everyday challenges (Eaton and Camilla, 2018). Main functions of ODA include taking data driven initiatives and creating reusable code of ethics and data standards (Templatizing) to be used across UK. Qualitative research done for cities, such as London and Barcelona, has shown that while these cities have big ambitions regarding the

development in applied data-informed technologies, they differ in readiness of infrastructure and competence to process and analyse data to provide meaningful insights (Bibri and Krogstie, 2020).

While big data opens endless avenues for experimentation, one of the common issues it faces is the lack of direction (Batty, 2013). It is argued that as the amount of data increases, the number of correlations increases as well. Thus, without a theory such correlation can be considered a diversion. In his book, Bibri (2020) tried to combine the analytical capacities involving big data and context-aware technologies to provide directed solutions for the urban form.

2.1. Using Big Data in Smart Cities

Through the years, smart cities have been associated with different nomenclatures, such as intelligent cities, information cities, and virtual cities, amongst others (Batty, 2013). Urban analytics has become synonymous with smart city to provide solutions to urban problems by drawing on theoretical perspectives and identifying causal relationships. It offers a set of methods that can be applied to digital infrastructure to ensure good data processing and inform the decision makers of accurate insights into and about the urban systems (Kandt and Batty, 2021). Urban analytics can help us answer numerous questions, such as 'What has happened?', 'Why the thing has happened?', 'What will happen?', and 'What should we do?' (Barbero et al., 2016). Recent research has also tried to apply the scientific base of urban analytics to define and measure urban pulse by creating novel framework that can allow the city officials and citizens alike to take part in the decision-making process (Puiu et al., 2016).

Some of the studies have focused on providing solutions to common issues associated with using big data, such as data acquisition, semantic interoperability and real-time analysis, to name a few. For instance, one such research developed data annotation and aggregation, event detection, data federation, context filtering and decision support modules to support decision making process by working on some of the technical issues associated with handling of big data (Puiu et al., 2016). Another research employed data collected from sensors to map and measure movement and aggregation points for special city events that attracted people from all around the world, such as the 2009 presidential Inauguration (Vaccari et al., 2010). Similar study had tried to define the rhythm of the city by capturing spatio-temporal variations of city 'activities' (Miranda et al., 2017), while another analysed usage of bicycle stations in Barcelona to gain insights into the dynamics of the city (Froehlich et al., 2009). Such research approaches represent only an example of the endless capacity that big data holds. Being able to provide the necessary direction to the use of big data is a feat of human ingenuity and has the capacity to optimize a wide spectrum of city's functions.

2.2. Visualisation of Smart City Datasets

Visualisation has a great impact on how we perceive and interpret data, often allowing us to see

things that we might ignore if not properly presented. Interpretation and understanding of data are often dependent on effective visualisation. With big data in picture, it becomes even more critical to convey relevant messages across the board. It is important to have clear understanding of what needs to be visualised at the start of every project (Midway, 2020). In the past few decades several business intelligence platforms such as Tableau, Power BI, Qlik sense, Looker and ArcGIS dashboard among others have emerged. These platforms provide a range of tools to visualize spatial or non-spatial big data with capacity to do real time analysis as well. Apart from cities directly using these platforms, many cities have designed their own dynamic dashboards such as Dublin, London, Hawaii and New York to name a few. Topics such as economy, safety, health, diversity, education and planning modules amongst other points of interests are presented in these dashboards. These city dashboards provide interfaces that are able to deliver complex information to multiple user types in a more intuitive manner (Young and Kitchin, 2020). Using intuitive dashboards to convey technical city data using simple visuals proves to be a powerful instrument to gaining insights on city dynamics.

3. SCoRe Methodology

3.1. Conceptual Framework and Data Cube

Based on a comprehensive review of the literature, we developed SCoRe (Societal Comprehensive Reflective Estimate) Methodology to systematically and holistically capture and measure the dynamics of the city, its pulse. In reference to Singaporean context, we put emphasis on five key perspectives, namely: Economic, Health, Environmental, Societal and Attitudinal.

The data is collected along the lines of these five perspectives at various granularities, temporal variations and formats. Some of the data that have been collected are highly dynamic in nature, such as movement and behavior related indicators while other are static or semi-dynamic with quarterly or annual updates such as economic, health, household and spending habits related data. The datasets vary in granularity as well with some captured at national level which provides macro-view of the urban makeup to subzone level which can be used to analyse micro-situations. A number of datasets have been captured in spatial formats, such as point of interest, movement and administrative boundaries while others are aggregated in form of tables which are sorted at national, planning area or subzone levels. A representation of how the three dimensions interact with each other is given as a data cube in the Figure 1 below.

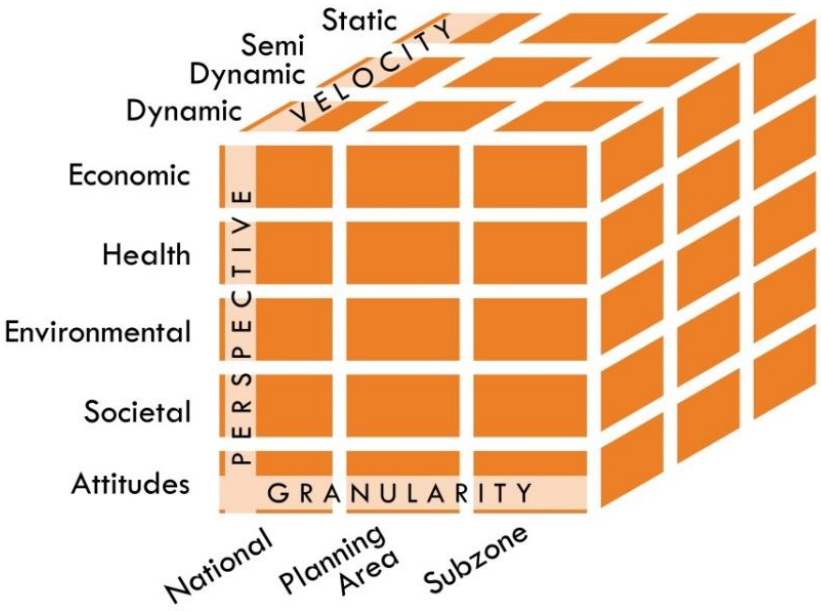


Figure 1. Data Cube

The data cube provides the basis for analysing dynamic data and distilling the anomalies in the datasets. The process consists of three steps, as shown in Figure 2. Firstly, the data that we gathered from various government sources and collaborators is cleaned and standardised as per spatial and analytical standards. Indicators such as building footprint, entropy, green cover, etc. have also been calculated at this stage for analysis. Secondly, the data is fed into the system for outlier analysis. At this stage the stakeholder has the option to select multiple fields and datasets for outlier analysis other than the pre-defined sets of combinations that are based on extensive literature review. As there can be many outliers, the top 1-5 percent of the results are then further analysed. Finally, the outliers that have been detected will be visualized along with the supporting data to understand the issues in depth.

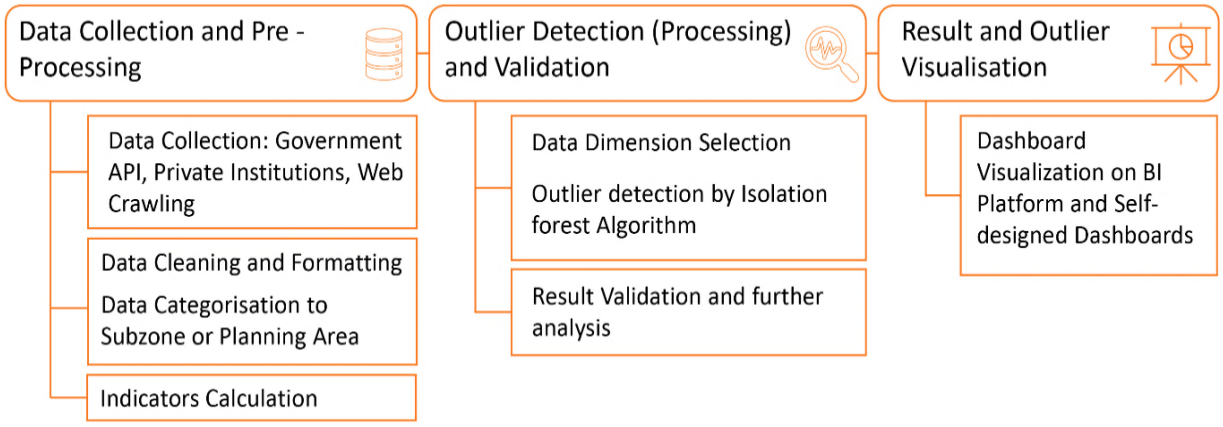


Figure 2. Summary of Outlier detection process and Visualisation

For extracting the outliers, we are using Isolation Forest algorithm due to its merits over other outlier detection systems. First, it has the ability to handle unsupervised datasets. Second, there is no need to establish criteria for defining the datasets. Third, it can handle multiple variables at the same time and with high dimensionality and finally, it can work with few samples as well as extremely large datasets and requires less computational power than some of its other counterparts. However, in order to provide additional flexibility, there will be a provision to use other algorithms as well if needed for validation purposes.

3.2. Data Collection

Data collection is one of the most important parts of this project as it is employed to provide a comprehensive view of the pulse of the city. Datasets are collected from various sources, including government institutions and private organizations, such as healthcare providers and a major credit card network provider. Some of the datasets are gathered as static files while most of the dynamic data has been aggregated by using APIs and by web crawling. All datasets collected have been fully anonymized before use to ensure residents' privacy, which is deemed critical in this study. To ensure data privacy, which is critical in this study, all private data collected is fully anonymized, i.e., do not contain any variables that will lead to the individual's identity. More precisely, the healthcare data gathered has been fully anonymised in accordance with the 'Health Insurance Portability and Accountability Act of 1996' (HIPAA). The payment transaction data is geo-aggregated and indexed to ensure that no identifiable data can be traced. Other private data from third parties are also handled with similar protocols, and ethics approval is obtained when necessary. Additionally, for city planning purposes, individual-level data is not required; hence, the data captured is aggregated at a subzone level, making anonymization plausible. Figure 3 shows different sources we have gathered the data from.

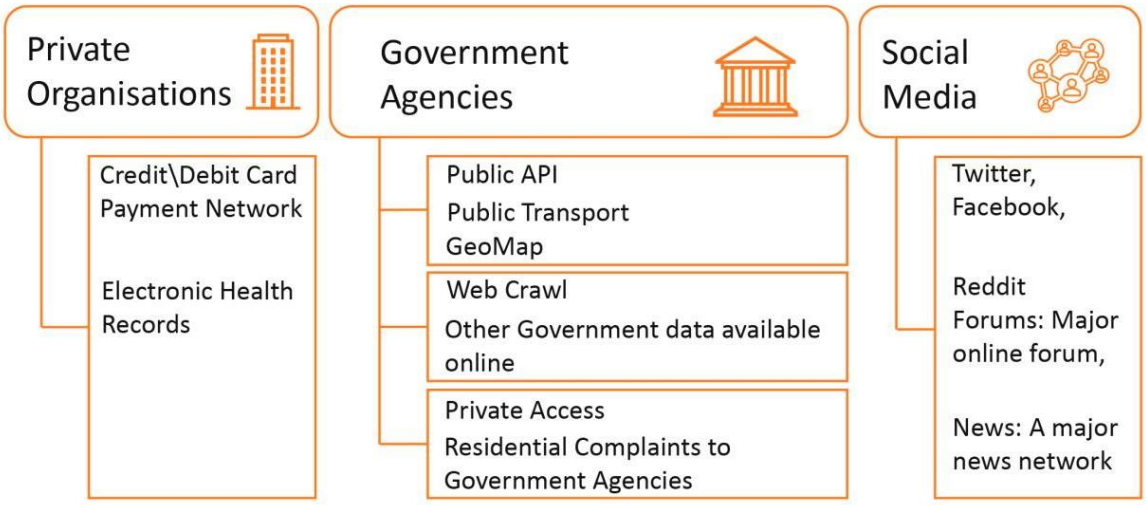


Figure 3. Sources of Data Collection

A list of data that has been collected at different granularity and velocity so far is presented in Table 1. Apart from the raw datasets collected, indices, such as Network Density, Road Coverage, Green Cover, Entropy Index, Dissimilarity Index (Bordoloi et al., 2013), Herfindahl–Hirschman Index (HHI) (Zagorskas, 2016), Land Use Distribution, Built Density, etc., were calculated to gain more holistic insights of the urban data and the urban landscapes.

Table 1. List of Datasets collected

Data Collected	**Granularity**	**Source**	**Velocity**
Environmental Perspective			
Carpark availability	Subzone	Government	Real time
PSI Index	Subzone	Government	Daily
Administrative Boundary - Singapore Boundary	National	Government	Not applicable
Administrative Boundary - Planning Area	Planning Area	Government	Not applicable
Administrative Boundary - Subzone	Subzone	Government	Not applicable
Land Use Data	Subzone	Government	Not applicable
Building Footprint Data	Subzone	Open Street Map	Not applicable
Point Of Interest Data	Subzone	Government	Not applicable

Passenger volume by bus stop	Subzone	Government	Monthly
Passenger volume by train stations	Subzone	Government	Monthly
Taxi availability	Subzone	Government	Real time
Mode of Transports to School Data	Planning Area	Government	Annually
Mode of Transport to Work Data	Planning Area	Government	Annually
Health Perspective			
Infectious diseases	Planning Area	E-Medical Record	Quarterly
Chronic	Planning Area	E-Medical Record	Quarterly
Mental Well-being	Planning Area	E-Medical Record	Quarterly
Injuries	Planning Area	E-Medical Record	Quarterly
Substance abuse	Planning Area	E-Medical Record	Quarterly
Other cause of concerns	Planning Area	E-Medical Record	Quarterly
Economic Perspective			
Residential property transacted values (Affluence)	Subzone	Payment Provider Network (PPN)	Daily
Retailer: Txn Amount	Subzone	PPN	Monthly
Retailer: Txn Count	Subzone	PPN	Monthly
Retailer: Avg Ticket Size	Subzone	PPN	Monthly
Number of distinct cards used	Subzone	PPN	Monthly
Avg ticket size per card use	Subzone	PPN	Monthly
Avg frequency of use per card	Subzone	PPN	Monthly
Avg amount spent per card	Subzone	PPN	Monthly
Economic Status Data	Subzone	PPN	Annually
Work Income for Household (Monthly)	Subzone	PPN	Annually
Income from Work Data	Subzone	PPN	Annually
Industry of Population Data	Subzone	PPN	Annually
Societal Perspective			
Dwelling Type Household Data	Subzone	Government	Annually
Dwelling Type Population Data	Subzone	Government	Annually
Household Size Data	Subzone	Government	Annually
Household Structure Data	Subzone	Government	Annually

Education Status Data	Subzone	Government	Annually
Ethnic Distribution Data	Subzone	Government	Annually
Language Literacy Data	Subzone	Government	Annually
Marital Status Data	Subzone	Government	Annually
Occupation Data	Subzone	Government	Annually
Age Data	Subzone	Government	Annually
Religion Data	Subzone	Government	Annually
Spoken Language Data	Subzone	Government	Annually
Tenancy Data	Subzone	Government	Annually
Formal Complaints from residents	Subzone	Government	Quarterly
Attitudinal Perspective			
Social media comments from Twitter (Geotag to the country)	Planning Area	Twitter	Real time
Social media comments from Facebook (Public Institution accounts)	Planning Area	Facebook	Real time
All news articles from the major news network	Planning Area	Major News Network	Real time
All news articles from the community news network	Planning Area	Community news network	Real time
Relevant threads from Reddit forums	Planning Area	Reddit	Real time
All threads from a major online discussion board	Planning Area	Major Online Forum	Real time

3.3. Using SCoRe Methodology and Data Cube

There are two key applications of SCoRe methodologies.

3.3.1. Exploratory Research – Detecting and Interpreting Outliers

The primary use of the methodology and the resulting data cube is to understand the city dynamics. One of the ways to achieve this is to use the data cube as an alerting system. Being able to highlight outliers or anomalies in the datasets can help us to identify points of distress in the city's pulse. By assuming outliers as *'self-emerging'* and can surface from any section of the dataset we can use outlier detection algorithm to flag out the outliers (Goh et.al., 2022). With the outlier detection mechanism in place, we have tried to solve the problem by allowing users to focus on what data is relevant in the current situation and dive deep into it.

One example of the outlier that was detected by examining the health datasets was hospitalization of unusually high percentage of residents due to asthma cases in two subzones. The number of asthma cases in these two subzones was much higher than the national incident rate of asthma cases. Our further analysis revealed that these two areas also had a relatively higher proportion of rental housing units which are typically occupied by lower-income families. Nevertheless, any potential relationships between the public housing typology and health outcomes are highly unclear and speculative, and require further study.

Despite possible limitations with approximation and speculation, such initial observations may alert city officials of specific issues and provide a path that can be followed to address the problems timely and more quickly. One thing to note is that the aim of this study is not to argue for any causal relationships that may be formed during the analysis but to be used as an alerting tool and comparing various characteristics of the city data.

3.3.2. Directed Research – Comparative Analysis and Forecasting

The data cube can be used for comparison of properties of different subzones. This can be in the form of a directed question that stakeholders might be interested in or can be used to forecast the trends in data. While the purpose of using data cube is to find anomalies in datasets, the outliers that are detected can help to form the questions that need to be asked in a focused manner.

Comparison has been one of the important tools that planners and city officials use to examine proposed guidelines (Kandt and Batty, 2021). In Singapore, much of the data is available at high granularity and up to date, which enables the user to compare multiple subzones at the same time. To achieve this, the platform is equipped to visualize all relevant datasets to aid comparison of cross-domain data (Zhang et al., 2022). To make the process more intuitive and flexible, at this stage the user will be able to select the type of data to be showcased and the time period that needs to be visualized. By providing the ability to select the data, users can be connected to the process itself and will be better equipped to look at the facts from different angles.

Figure 4 provides an example of the comparative analysis of two specific attributes, namely: ‘rail (MRT) tap-in volume’ and ‘economic spending per active credit/debit card’ at two different time periods. The months selected, namely July 2021 and July 2022, represent the periods of complete lockdown and subsequent opening of the city state once Covid-19 cases went down. In respect to movement data, one can observe that the movement in the southern part of the country has increased with easing of Covid-19 restrictions, which is an indication that people had started returning to the offices for work in the downtown region of the city (in the central south). On the other hand, credit card spendings were distributed more evenly across the island than in 2022.

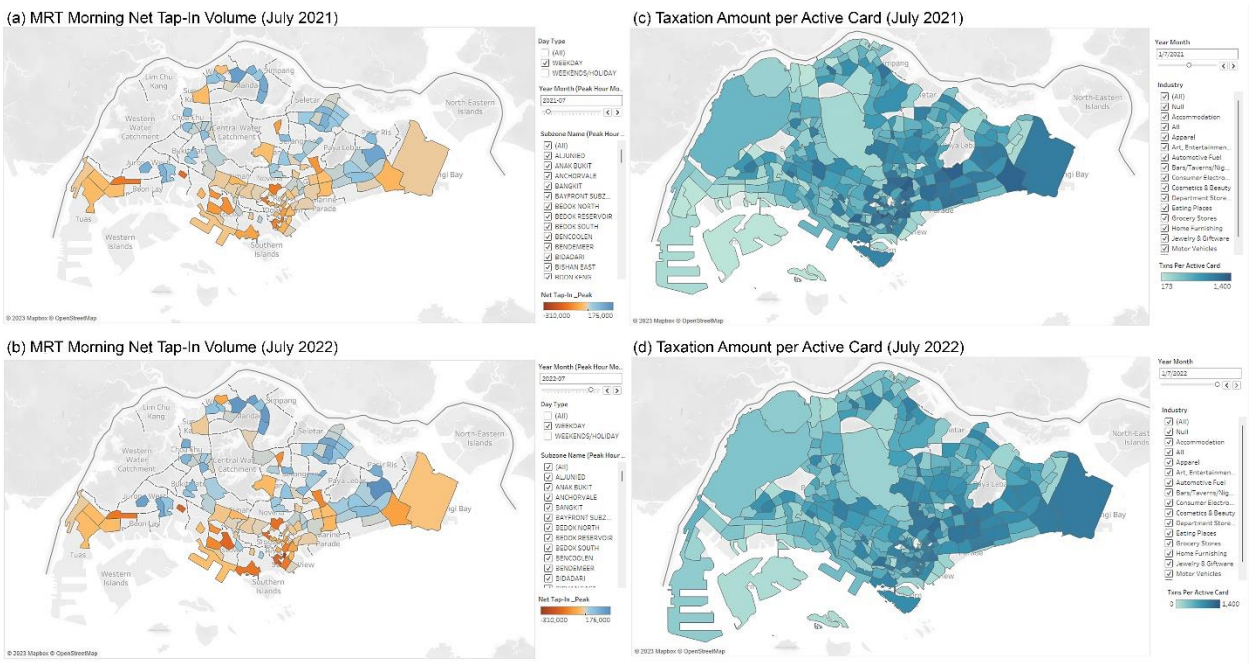


Figure 4. Movement - Economic Spending comparison: Metro rail tap-in volume compared with active card taxation at subzone level from July 2021 (when remote work was mandatory) until July 2022 (when situations were back to normal); (a) and (b) represent the MRT Net Tap-In volumes in July 2021 and July 2022 respectively; (c) and (d) represent taxation amount per active card in July 2021 and July 2022 respectively

Similarly, the user can zoom into one of the planning areas or subzones to get more details. In Figure 5, 'Chinatown' subzone is highlighted in the 'Outram' planning area to compare the Tap-In volumes (left) and active taxations (right) at different timeframes.

For performing this type of dashboarding, we used the existing BI platforms due to three main reasons. Firstly, the project needs to be handed over to the government agencies, and the used of the platform that is already in use by them would allow for a smooth knowledge transfer. Secondly, available BI platforms do not require complicated programming skills, which enables a larger group of users to use the platform easily, including editing or replacing datasets without much hassle. Lastly, the support for large number of formats and live data means that the platform can be automated to show live data analysis when required.

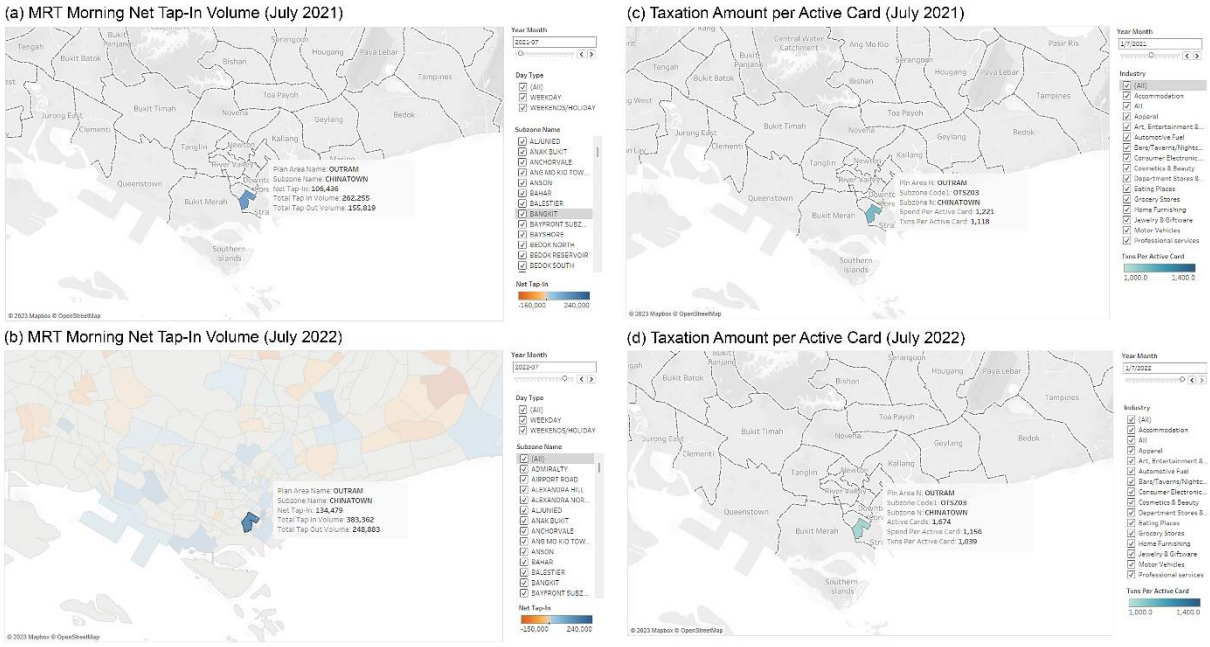


Figure 5. Movement -Economic Spending comparison - Zooming into one of the subzones in Outram Park planning area provides comparison of attributes from July, 2021 (when remote work mandatory) to July, 2022 (when situations were back to normal); (a) and (b) represent the MRT Net Tap-In volumes in July 2021 and July 2022 respectively; (c) and (d) represent taxation amount per active card in July 2021 and July 2022 respectively

4. Discussion and Future Work

In this paper, we have demonstrated the conceptual capacities of the alerting system that is being developed based on dynamic urban data understanding and analysis and the city pulse and anomalies detection. While the development of the platform for outlier detection is still in progress, the preliminary results are encouraging, indicating shorter time for issue detection, feedback and response to the community.

The response to the developments by the government agencies has been encouraging and the suggestions that were proposed by various stakeholders provided us the clarity for developing an intelligent dashboard that is intuitive and able to support real-time calculations and data visualisations. Some of the features that were appreciated by the stakeholders included: the capability to do comparative analysis (among subzones of similar characteristics), enabling the end user to select initial data and perform desired calculations in real-time (which is technologically challenging), and the ability to zoom in on particular planning areas for further analysis.

One of the requirements for being able to use the findings of urban analytics in general is adoption

of data analytics techniques across the official landscape. This allows the user to be receptive towards the results of analysis. Singapore being one of the smartest cities in the world has most of its government offices well equipped with capacities of using big data in policy framework. The methodology presented here can have significant implications for city planning. The current research can have implications specifically in policy planning (understanding the current situation as an alerting system), Policy adoption and design (evidence-based design), Policy implementation and application (monitoring of policy) and future policy evaluation (Barbero et al., 2016).

Some limitations of the methodology should be acknowledged. Firstly, the quality of data available is not perfect. Data are from various sources and in different formats, which requires cleaning and pre-processing before use. As the amount of data increases so do the imperfections. More imperfections lead to increased processing time and ultimately delays in analysis. Secondly, the project depends on the availability of data at the micro-scale. Most of the data available is present at the national or regional scale, but only few datasets are present at planning area or subzone levels. This limits the granularity at which different datasets can be used for the analysis. Finally, the data are not always complete or representative. For instance, the credit card transaction and spending data that we have collected only represent part of the spectrum of the total spending by the citizens. In everyday life, much of the transactions are done using other means, such as cash and mobile payment platforms, or other credit card providers.

5. Conclusion

With this project we have tried to provide a stage for discussing the use of relevant datasets from the enormous pool of Big Data available. This will help to understand the vast expanse of city's digital footprint and by using outliers for factoring out the data, we will be able to focus on issues that needed immediate attention. Such alerting systems help to reduce the response time to issues faced by the city. By involving stakeholders in the process of development we were able to get several valuable responses that will allow us to mold the final platform towards the specific needs of the city planners and officials while retaining the original skeleton and framework intact.

Singapore is one of the smartest cities in the world and has its advantage in data readiness. On the other side of the spectrum are the cities whose digital infrastructure is not as capable. For such cities, where the availability and quality of data is in question, outlier analysis using isolation forest algorithm can still be a viable option due to its advantage of working even with small number of data points.

Acknowledgments. The content discussed in this paper is part of the research project funded under the Cities of Tomorrow R&D program (Award No: COT-CityScan-2020-1) by the National Research Foundation and Ministry of National Development of Singapore. Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do

not reflect the views of National Research Foundation, Singapore and Ministry of National Development, Singapore.

References

Ahlfeldt, Gabriel M. and Elisabetta Pietrostefani (2019) The economic effects of density: A synthesis. *Journal of Urban Economics, 111*, pp. 93-107. DOI: https://doi.org/10.1016/j.jue.2019.04.006.

Barbero, Martina, Jo Coutuer, Régy Jackers, Karim Moueddene, Els Renders, Wim Stevens, Yves Toninato, Sebastiaan van der Peijl and Dimitry Versteele (2016) *Big data analytics for policy making.* Brussels: European Commission. Available from: https://joinup.ec.europa.eu/sites/default/files/document/2016-07/dg_digit_study_big_data_analytics_for_policy_making.pdf Accessed [09/05/2023]

Batty, Michael (2013) Big data, smart cities and city planning. *Dialogues in Human Geography, 3* (3), pp. 274-279. DOI: https://doi.org/10.1177/2043820613513390.

Bibri, Simon E. and John Krogstie (2020) The emerging data–driven Smart City and its innovative applied solutions for sustainability: The cases of London and Barcelona. *Energy Informatics, 3* (1), 5. DOI: https://doi.org/10.1186/s42162-020-00108-6.

Bordoloi, Rupjyoti, Amit Mote, Partha P. Sarkar and C. Mallikarjuna (2013) Quantification of land use diversity in the context of mixed land use. *Procedia - Social and Behavioral Sciences, 104*, pp. 563-572. DOI: https://doi.org/10.1016/j.sbspro.2013.11.150.

Cao, Xinhui, Mei Wang and Xin Liu (2020) Application of big data visualization in urban planning. *IOP Conference Series: Earth and Environmental Science, 440* (4), 042066. DOI: https://doi.org/10.1088/1755-1315/440/4/042066.

Eaton, Michelle and Camilla Bertoncin (2018) *State of Offices of Data Analytics (ODA) in the UK*, London: Nesta. Available from: https://media.nesta.org.uk/documents/State_of_Offices_of_Data_Analytics_ODA_in_the_UK_WEB_v5.pdf Accessed [09/05/2023]

Froehlich, Jon, Joachim Neumann and Nuria Oliver (2009) Sensing and predicting the pulse of the city through shared bicycling. *In IJCAI'09: Proceedings of the 21st International Joint Conference on Artificial Intelligence*, pp.1420-1426. Available from: https://www.ijcai.org/Proceedings/09/Papers/238.pdf Accessed [09/05/2023]

Goh, Kim Huat, Wai Fong Boh and Premchand Dommaraju (2022) A social science approach using big data for city planning. *In ICIS 2022 Proceedings*, 4, 1555. Available from: https://aisel.aisnet.org/icis2022/it_policy/it_policy/4 Accessed [09/05/2023]

Kandt, Jens and Michael Batty (2021) Smart cities, big data and urban policy: Towards urban analytics for the long run. *Cities, 109*, 102992. DOI: https://doi.org/10.1016/j.cities.2020.102992.

Liu, Pengyuan and Filip Biljecki (2022*)* A review of spatially-explicit GeoAI applications in Urban Geography*, International Journal of Applied Earth Observation and Geoinformation*, 112,

102936. DOI: https://doi.org/10.1016/j.jag.2022.102936.

Miranda, Fabio, Harish Doraiswamy, Marcos Lage, Kai Zhao, Bruno Gonçalves, Luc Wilson, Mondrian Hsieh and Claudio T. Silva (2017) Urban pulse: Capturing the rhythm of cities, *IEEE Transactions on Visualization and Computer Graphics*, 23(1), pp. 791–800. DOI: https://doi.org/10.1109/TVCG.2016.2598585.

Puiu, Dan, Payam Barnaghi, Ralf Tonjes, Daniel Kumper, Muhammad Intizar Ali, Alessandra Mileo, Josiane Xavier Parreira, Marten Fischer, Sefki Kolozali, Nazli Farajidavar, Feng Gao, Thorben Iggena, Thu-Le Pham, Cosmin-Septimiu Nechifor, Daniel Puschmann and Joao Fernandes (2016) CityPulse: Large scale data analytics framework for smart cities, *IEEE Access*, 4, pp. 1086–1108. DOI: https://doi.org/10.1109/ACCESS.2016.2541999.

Smith, Micheal E. and Jose Lobo (2019) Cities through the ages: One thing or many?, *Frontiers in Digital Humanities*, 6, pp. 12. DOI: https://doi.org/10.3389/fdigh.2019.00012.

Vaccari, Andrea, Mauro Martino, Francisca Rojas and Carlo Ratti (2010) Pulse of the city: Visualizing urban dynamics of special events. *In GraphiCon'2010, Proceedings of the 20th International Conference on Computer Graphics and Vision*, September 20–24, 2010, St.Petersburg, Russia. Available from: http://hdl.handle.net/1721.1/79406 Accessed [09/05/2023]

Young, Gareth W. and Rob Kitchin (2020) Creating design guidelines for building city dashboards from a user's perspectives, *International Journal of Human-Computer Studies*, 140, 102429. DOI: https://doi.org/10.1016/j.ijhcs.2020.102429.

Zagorskas, Jurgis (2016) GIS-based modelling and estimation of land use mix in urban environment, *International Journal of Environmental Science*, 1, pp. 284-293. Available from: https://www.iaras.org/iaras/filedownloads/ijes/2016/008-0044.pdf Accessed [09/05/2023]

Zhang, Dan, L.G. Pee, Shan L. Pan and Lili Cui (2022) Big data analytics, resource orchestration, and digital sustainability: A case study of smart city development, *Government Information Quarterly*, 39(1), 101626. DOI: https://doi.org/10.1016/j.giq.2021.101626.

TOWARDS COMMUNITY-HEALTH PLANNING: COMPLIANCE AND THE SOCIAL SPACE OF CITIES UNDER COVID-19 REGULATIONS (1069)

Emil Israel[1*], Tal Feder[1]

[1] The Faculty of Architecture and Town Planning, Technion-Israel, Institute of Technology, Technion City, Haifa, Israel; [*]emil.israel@technion.ac.il

Abstract. Cities' environments are key to healthier communities. The Covid-19 pandemic challenged this relationship, when the issue of communities' compliance with government restrictions to mitigate the spread of the pandemic became apparent. Despite the growing literature on the relationship between communities' characteristics and Covid-19 throughout the pandemic, little attention has been paid to the drivers of compliance at the city and community levels. Our paper addresses this lack through the Bourdieusian concept of communities' capital resources. Using Israel as a test case, we explore how the economic, social and cultural capital of urban communities affected compliance with Covid-19 related restrictions. The analysis reveals how the spatial dispersion of the components of these capitals explains the likelihood of communities' level of compliance. It shows how the accumulation of various forms of capital increased compliance with health regulations. The study highlights the explanatory power of local resources in collective spatial behavior patterns.

Keywords: Compliance; Public health; Covid-19; Spatial capital; Social space; Habitus.

1. Introduction

The global Covid-19 pandemic prompted governments worldwide to impose restrictions on civilians including lockdowns (Deb et al., 2022). These restrictions prompted various reactions, ranging from compliance to backlashes and defiance (Bargain & Aminjonov, 2020; Nivette et al., 2021). Compliance, in the context of health behavior, is defined as "the extent to which a person's behavior coincides with medical or health advice" (Winnick et al., 2005, p. 718). The mitigation of Covid-19 depended on people's compliance with preventive measures. Given that people's behavior is embedded in and influenced by their social context, researchers have investigated the social factors that impact compliance (Clark et al., 2020) and the factors associated with compliance with Covid-19 regulations at the individual level (e.g., Painter & Qiu, 2020;). However, despite the numerous studies about the association between communities' characteristics and Covid-19 (e.g., Barak et al., 2021), less attention has been paid to the determinants of compliance at the city and community levels.

Thus, our goal is to expand our understanding of the relationship between various community characteristics and the level of compliance with Covid-19 regulations. We do so using the concept of communities' capital resources rooted in the theories of the French sociologist Pierre Bourdieu who conceptualized three forms of capital: economic, cultural, and social (Bourdieu, 2018). The Bourdieusian approach is used in studying the Covid-19 crisis, and the effect of social class on various domains of life during the pandemic (e.g., Bawidamann et al., 2021).

We explore Bourdieu's three forms of capital at the local level and their associations with compliance with Covid-19 state regulations in Israel. We use factor analysis to distinguish between several dimensions within each form of capital and to construct indices of the level of capital of various Israeli cities (Frenkel & Ashkenazi, 2008). We then run a series of regression analyses to estimate the influence of the three forms of communal-municipal level capital on the level of compliance with state-imposed Covid-19 regulations.

2. Theoretical background

2.1. Cities, health and compliance

Most of the world's population today--more than 4.3 billion people--lives in cities (Ritchie & Roser, 2018). Living in a city has major implications for the lives of its residents, including their health and well-being. In general, living in cities has been associated with poorer health in comparison to non-urban areas and has been called the "urban health penalty" (Freudenberg et al., 2005; Zhu et al., 2021). However, urban residency also has positive outcomes such as lower infant mortality rates and higher height-for-age ratios (Vlahov et al., 2005).

The Covid-19 pandemic highlighted the importance of behavioral factors in explaining health outcomes. Traditional health behavior theories have focused on the motivations for the behavior, on the action strategies deployed, or on both (Armitage & Conner, 2000). However, these theories have not paid enough attention to the role of compliance with health regulations. The Covid-19 pandemic imposed a set of global health regulations that brought the issue of compliance with these containment measures to the everyday level in an unprecedented way (Van Rooij et al., 2020). Following the pandemic's outbreak, many governments imposed behavior and travel restrictions, including lockdowns, shelter-in-place orders, mask-wearing mandates, prohibitions on social gatherings, a ban on outdoor activities, and mandatory vaccinations (Deb et al., 2022; Barak et al. 2021).

2.2. Compliance and Covid-19 – Measurement and determinants

The research on compliance during Covid-19 has produced equivocal results as to the individual and contextual factors that influence it. The first challenge is measuring compliance. Researchers have used two methods: traditional surveys and big data approaches. The former ask respondents directly about their health behavior during the pandemic including their level of adherence with specific restrictions (Plohl & Musil, 2021; Wang et al., 2021). In contrast, alternative methods that use big data focus on drops in mobility because many of the restrictions such as lockdowns, shelter-at-home orders, and social distancing resulted in less physical mobility (e.g., Sheikh et al. 2020; Painter & Qiu, 2020).

Variations in the methodologies and the factors investigated affect the ability to integrate these findings. While some factors appear to be important, the impact of others is more ambiguous. An important factor that is unequivocally associated positively with compliance with Covid-19 restrictions is risk perceptions and fear of the pandemic (Clark et al., 2020; Harper et al., 2021; Plohl & Musil, 2021). Trust is also positively linked to compliance, especially trust in government (Nivette et al., 2021; Wang et al., 2021), and trust in science (Plohl & Musil,

2021). Social responsibility and social conformity are positively linked to compliance according to some studies (Nivette et al., 2021; Wang et al., 2021), but Harper et al. (2021) found ingroup loyalty to be uncorrelated with compliance.

The evidence regarding the link between level of education and compliance with Covid-19 restrictions is also equivocal (Wang et al. 2021; Musil, 2021; Nivette et al 2021). Wright et al. (2020) demonstrated that those with more income and more economic security were more likely to comply, while Van rooij et al. (2020) found that compliance was linked to lack of fear of the authorities, and the behavior of the social surrounding.

Given the equivocal results, we speculated that community-level contextual variables might provide more insights into compliance patterns.

2.3. Bourdieusian foundations, compliance with health regulations, and implications for municipalities

Similar to Ugwudike (2017) and Bawidamann et al. (2021), we use Bourdieu's notions of habitus, field, and capital to develop a spatial municipal perspective on the constraints imposed by Covid-19. In particular, we focus on Bourdieu's three forms of capital: economic, cultural, and social (Bourdieu, 2018). In theory, these various forms of capital determine a social space. Thus, social stratification involves various structural fields, (e.g., health, community) in which people use their capital (Bourdieu, 2018; Israel & Frenkel, 2018). The level of capital affects their proclivities and dispositions, meaning their habitus (Sayer, 2011), which is the result of the internalization of their capital (Hillier, 2005). From the perspective of field theory, habitus helps or hinders a person's agency in structuring what will be seen as reasonable and what will be seen as unreasonable to do (Bourdieu, 1977).

Recently, Bourdieu's theory was also used to explain Covid-19 related behavior, although in topics unrelated to our study (e.g., Akkermans et al., 2020; Graham, 2020). The concept of a healthy lifestyle is based on the interaction between a social structure (membership in a social group) and human agency (enactments of health behaviors and their connections to individual identities: Cockerham, 2005).

Not only do health lifestyles consist of individual behaviors and the habitus that frequently drives them (Bourdieu, 1986), but they also involve group-based components, such as identities and norms that either support or inhibit health (Cockerham, 2005; Krueger et al., 2009). Social belonging, networks, and a sense of pride in the community promote health and wellbeing (Smith & Anderson, 2018).

Bourdieu (2000) paid attention to how the materiality of place affects its social aspects. Given that social space is located in actual places, it is a subtle reflection of the place's social structure (Fogle, 2011; Israel & Frenkel, 2018). Indeed, Hillier and Rooksby (2005) claimed that the habitus is "a sense of a place," or an "internalization of social practices in its origin, … reaching out to place, a being or becoming in place" as Casey (2001, p. 687) said. A place's habitus is a communal spirit defined by its ethnicity, class divisions, gender, and so forth, and encompasses the residents' shared dispositions and social practices (Easthope, 2004; Pain, 2008; Simpson, 2016).

The analysis of communities' forms of capital is evolving, though relatively scarce. For example, Blokland and Savage's (2016) volume presents multiple contributions exploring the links between urban residency and social networks. However, the study and measurement of cultural capital at the city level are less frequent. Savage et al. (2018) explored cultural capital in London and Brussels, while Frenkel and Porat (2017) created a model for local strategic planning based on the concept of spatial capital. They assessed "the accumulated assets and capabilities of a region" and measured various regional capabilities including types of economic, human and cultural, and social capital (Frenkel & Porat, 2017). Similarly, Israel and Frenkel (2018; 2015) measured the three forms of capital in Israeli cities, and their effect on people's chances in life are related to social justice and the spatial equality of opportunity.

3. The study's framework

3.1. Research goals and hypotheses

In this research, we study the impact of cities' economic, cultural, and social capital on the level of compliance with state-imposed Covid-19 restrictions. Put differently, the community's habitus (Israel, 2021) evokes mechanisms of social control that impact people's reactions to the restrictions and social beliefs about the pandemic. Accordingly, we hypothesize that communities with more economic, social, and cultural capital will be more likely to comply with the state's Covid-19 regulations.

3.1.1 Economic capital

Wealthier communities that possess more economic capital will be more concerned about the disruption of markets and economic activity caused by the pandemic. Therefore, they will be more likely to comply with official regulations whose goal is to return to normal economic activity as soon as possible. In contexts other than pandemics, those of lower socioeconomic status are more likely to be less compliant with medical advice (Ligthart et al., 2017; Philbin et al., 2001). Similarly, Wright et al. (2020) showed that individuals living in low-income areas in the US are less likely to obey shelter-at-home protocols.

3.1.2 Social Capital

Communities rich in social capital and with more social cohesion will demonstrate higher levels of mutual responsibility and altruistic behavior. Individuals who belong to strong communities and are integrated into their social structures will be more likely to engage in conformist behavior and socially responsible activities. Therefore, we expect social capital to have a positive effect on compliance with governmental restrictions during the pandemic. Israel, for example, has many communities with large proportions of immigrants. Studies have shown that migration status has almost no independent effect on obeying the law and that the level of criminal behavior among immigrants is mediated by economic status (Aoki & Todo, 2009; Bianchi et al., 2012). However, negative attitudes towards immigrants are linked to less social solidarity (Bay & Pedersen, 2006). Therefore, since compliance with pandemic mitigation measures can be regarded as a form of social solidarity (Barry, 2022), we can expect that

immigration level will have an overall negative effect on compliance with Covid-19 regulations, both in immigrant and non-immigrant populations. Recent evidence concerning compliance with Covid-19 restrictions supports this hypothesis. Van rooij et al. (2020) found that people tend to obey restrictions more when people they know do so too. Bargain and Aminjonov (2020) reported that residents of regions with more trust in the political system were more likely to reduce their mobility during the pandemic.

3.1.3 Cultural capital

Communities rich in cultural capital are more educated and, therefore, will be more likely to accept scientific authority and follow its guidance with regard to the pandemic. Previous studies have shown that a higher educational level is correlated with trust in the scientific method and in scientific institutions (Achterberg et al., 2017). Educational level is also positively correlated with general trust in government (Foster & Frieden, 2017). However, other studies found equivocal results regarding the link between educational level and trust in government (Van Elsas, 2015). Compliance with health restrictions might also be a form of virtue signaling or conspicuous compliance (Kolstoe, 2020).

3.2. The Israeli case study

To explore these hypotheses, we used Israel as a test case. Israel is a society divided in many ways, the leading one being the division between Jews and Arabs (Horowitz & Lissak, 1989). Today, Israel's Jewish society is multi-ethnic and composed mostly of Jews originating in North African, Europe, and the Middle Eastern (Smooha, 2004).

The Arab-Palestinian population constitutes about 21% of the population. Most Arabs and most Jews live in Arab-only or Jewish-only cities. There is a small number of mixed cities (e.g., Tel Aviv-Jaffa, Jerusalem, Haifa, Acre) that have both Arab and Jewish residents (Falah, 1996).

During the 1967 "Six-Day War", Israel conquered areas in the West Bank and East Jerusalem that are often referred to as the "occupied territories." Since the 1970s, Jewish communities have been created in the occupied territories. Their residents are Israeli citizens, that benefit from real estate opportunities to improve their standard of living (Gonen, 1995).

Another division that pertains specifically to the Jewish population is that between the Haredi (ultra-Orthodox) population and the rest of the Jewish population. Haredi society seeks autonomy in many aspects of life. It tends to distrust the state and obeys its religious leader in case of any conflict between the two (Halbertal, 2016).

The first lockdown in Israel in response to Covid-19 occurred on March 17, 2020 with additional restrictions, such as mask-wearing mandates, imposed in the following weeks. During the following waves of the pandemic, the level of compliance with the restrictions varied based on time, social group, and location (Barak et al., 2021). Research found that Arab residents had less trust in the government's restrictions and reported less compliance with physical distancing regulations (Shibli et al., 2022). Arabs were also more likely than Jews to refuse to be vaccinated (Green et al., 2021). However, other studies indicated that Arabs reported higher levels of intentions to comply than Jews (Goren et al., 2021; Mevorach et al.,

2021). The ultra-Orthodox communities had some of the highest levels of Covid-19 morbidity rates (Shomron & David, 2022).

3.3. Data sources and method of analysis

3.3.1 Municipalities and capital forms and construction of capital indices

To explore places' social spaces, we compiled data from 140 cities in Israel. The city was the research unit for the empirical examination. We use this concept of place to express a communal spirit, or the residents' shared dispositions and social practices, which are the result of their shared resources (Easthope, 2004; Pain, 2008; Simpson, 2016).

We used various official data sources to measure the levels of economic, social, and cultural capital for the cities. We then ran factor analyses to identify various dimensions of these forms of capital and constructed an index for each of them. The databases included data from the local authorities, reports from various Israeli government ministries, and the national police.

Following Frenkel and Ashkenazi (2008), we ran an exploratory factor analysis (EFA) for each group of variables belonging to a specific form of capital. We determined the number of factors relevant for each form of capital. The dominant variables in each factor allowed us to classify and label the "identity" of each factor in relation to the theoretical definitions of the three Bourdieusian forms of capital.

We used the loadings produced by the analyses to compute factor scores for each observation (i.e., city or municipality). In addition, we normalized each factor by z-score transformations and fixed the lowest value to 0 (subtracting the minimal value from each score). The resulting scores were used as indicators measuring the levels of the different dimensions of the forms of capital. We also computed a combined index for each form of capital following Frenkel and Ashkenazi (2008) and Israel and Frenkel (2015). We constructed a combined measure by computing a weighted mean of the original factor scores.

3.3.2 Compliance

We measured compliance using three different proxy variables:

1) Police fines – the number of Covid-19 related police fines per capita during the third wave as reported in the registry of the Israeli police. During the lockdowns, the Israeli police were deployed to enforce the regulations and gave fines to those who disobeyed them (Perry & Jonathan-Zamir, 2020; Yogev, 2021).
2) Vaccination rate – Number of residents per capita vaccinated in two doses (on the date of the approval of the third dose) as reported in the Ministry of Health's data repository. Israel was the country with the fastest rollout of Covid-19 vaccinations (Rosen et al, 2021a). The Israeli government strongly recommended vaccinations, restrictions were put on unvaccinated individuals, and a vaccination mandate was considered but ultimately not implemented. However, a considerable number of Israeli citizens were hesitant or reluctant to get vaccinated (Rosen et al., 2021b; Shacham et al., 2021).

3) Morbidity - Highest daily number of new confirmed Covid-19 cases per capita during the third wave as reported in the Ministry of Health's data repository. Since morbidity is linked to public Covid-19 regulations, among other factors, we used it as another indicator of compliance (Talic et al., 2021).

We also ran a factor analysis of these three variables to construct a combined compliance index.

Finally, we developed multiple linear regression (OLS) models to examine the impact of different forms of capital on the community's compliance. The major factors that emerged from the factor analysis scores of each form of capital served as explanatory variables, indicating their contribution to the weighted index of the local compliance measure, our dependent variable.

4. Results

4.1. The social space - Measuring forms of capital

This section presents the results of the exploratory factor analysis we ran to identify the dimensions of the forms of economic, cultural, and social capital and construct the index variables. Conceptually, these factors underlie the social space of the cities in the study. We named each factor in accordance with the most influential variables that comprise it (highlighted in the table).

4.1.1 Economic capital

The first factor, "Wealth," explained 35% of the total variance (Table 1). As Table 1 indicates, this factor represents economic status characterizing local inhabitants. It consists of variables that measure material wealth in terms of both earnings and housing. The second economic capital factor, "Economic Security," explained 19% of the total variance. It represents economic stability and low levels of economic risk, separable from the economic status. "Economic Security" is dependent on the state's welfare policy rather than on personal wealth.

Table 1. Factor analysis of economic capital: major factors and factor loadings

	Factors	
	1 - Wealth	2 – Economic Security
% of employees who earn more than 3 times the average wage	**0.967**	-0.246
% of self-employed who earn more than 3 times the average wage	**0.875**	-0.203
Household water consumption per capita (m^3)	**0.616**	-0.060
% of supplementary income allowances recipients	**-0.514**	-0.114
% of welfare nursing allowances recipients	0.035	**0.756**
% of unemployment benefits recipients	-0.009	**0.633**

Municipal expenditure on welfare per capita (ILS)	-0.275	**0.509**
% of variance explained by the factor	35%	19%

Major factors were defined by eigenvalues >1.
Dominant measures were defined as those with an absolute value of the component coefficient greater than 0.45.
In order to facilitate labeling the factors, the dominant items are marked in bold.

4.1.2 Cultural capital

The first factor, "School Achievement," explained 27% of the variance (Table 2). It refers to educational achievement, achievement in leading professions, forerunners of attainments in tangent (academic) and non-tangent fields (employment, residence). It also represents a location's academic student elite, reflected in acceptance to elite universities rather than public colleges with less strict admission criteria. Israelis regard the latter as less selective (Ayalon & Mcdossi, 2019). School achievement has a symbolic value that provides people with benefits in various areas of life, certainly if they are compared to the rest of the population in the community, which has an academic education, or a college (not a university) degree (Shwed & Shavit, 2006). The second component, "Professional Academic Attainment," explained 23% of the overall variance. It is made up of institutional credentials that can be converted into benefits and better labor market prospects (Bourdieu, 2018; Toft, 2018).

Table 2. Factor analysis of cultural capital: major factors and factor loadings

	Factors		
	1 – School Achievement	2 – Professional-Academic Attainment	3 – Urban Cultural Fostering
Average city score in English (8th grade)	**0.825**	0.318	0.331
Average city score in mathematics (8th grade)	**0.817**	0.250	0.195
Average city score in science (8th grade)	**0.782**	0.129	0.011
% of B.A. (or equivalent) students who study at a university (and not in a public college)	**0.619**	0.435	-0.026
% of B.A. (or equivalent) students who study at one of Israel's elite academic institutions	**0.597**	0.202	0.003
% of baccalaureate recipients that are eligible to enter a university	**0.501**	0.323	0.229
% of workers in academic occupations	0.345	**0.882**	0.144
% of residents with M.A. (or equivalent) or higher degree	0.305	**0.803**	0.343
% of residents with B.A. (or equivalent) degree	0.385	**0.752**	0.350
% of workers in managerial occupations	0.329	**0.675**	0.411
Municipality's additional expenditure on	0.141	0.139	**0.818**

education (ILS)			
Municipal expenditure on culture per capita (ILS)	0.111	0.177	**0.577**
Municipal expenditure on celebration per capita (ILS)	-0.015	0.125	**0.471**
% of variance explained by the factor	27%	23%	14%

Major factors were defined by eigenvalues >1.
Dominant measures were defined as those with an absolute value of the component coefficient greater than 0.45.
In order to facilitate labeling the factors, the dominant items are marked in bold.

The third component, "Urban Cultural Fostering," which explained 14% of the overall variance, represents the desire and ability of local authorities to make investments that promote culture (Israel, 2021). These inputs are aimed at nurturing and enhancing elements of cultural capital (e.g., institutional, knowledge, and tastes).

4.1.3 Social capital

The first factor, "Social Integration," explained 36% of the variance. It combines expenditures to promote social bonding and those allocated to integrate people into the community (see Table 3). The willingness to make such expenditures indicates the desire to take care of the community and be involved in it. The component demonstrates how the ethnic composition impacts social bonds and communal sentiment (Forrest & Kearns, 2001, p. 2131).

Table 3. Factor analysis of social capital: major factors and factor loadings[15]

	Factors	
	1 - Social Integration	2 - Mutual Responsibility
Gini index of employee's wages	-0.088	**-0.847**
Voting percentage in 2018 municipal elections	-0.587	**0.603**
Mean score of municipality's school efforts to encourage social and civil involvement	-0.180	**0.579**
% of post-1990 immigrants in population	**0.966**	-0.249
Municipal expenditure on immigrant absorption per capita (ILS)	**0.695**	0.041
% of variance explained by the factor	36%	30%

Major factors were defined by eigenvalues >1.
Dominant measures were defined as those with an absolute value of the component coefficient greater than 0.45.
In order to facilitate labeling the factors, the dominant items are marked in bold.

[15] We reversed the values of the social capital factors so that positive values represent higher levels of capital in congruence with the two other capital indices.

It suggests that communities with numerous immigrants have less social cohesion (Putnam, 2007), which may weaken the bonds with the community and involvement in its affairs. In such communities, it is even more important for the city to invest in bringing its people together. We reversed the scores for this variable when conducting the analysis so that higher values indicated more social capital.

The second social factor, "Mutual Responsibility," explained 30% of the variance. This factor combines variables that indicate the political leadership's desire to bridge economic inequalities and the educational motivation to do so. The negative sign of the first variable points to the negative role of inequality in producing and accumulating social capital. From the perspective of the local government, for instance, the need for social involvement becomes less urgent as inequality rises, and it is possible that other urgencies need to be treated too.

4.1.4 Compliance

We analyzed the three compliance indicators separately, but we also constructed a combined compliance variable using the same factor analysis procedure described above. As expected, the compliance factor analysis yielded a single compliance factor (see Table 4). The vaccination rate played the most significant role in constructing this factor, but police fines and morbidity contributed to it as well.

Table 4. Factor analysis of the combined compliance indicator

	Compliance
Police fines	-0.308
Covid-19 morbidity	-0.224
Vaccination rate	0.997

Major factors were defined by eigenvalues >1.
In order to facilitate labeling the factors, the dominant items are marked in bold.

4.2. Analysis of OLS regressions

We ran a series of OLS regressions to test the association between compliance and the three types of community-level forms of capital. The independent variables included in these models are the three forms of community-level capital – economic, cultural, and social. We estimated models with the three forms of capital measured by the single combined index and by the individual factors as described above. We also estimated additional models controlling for special characteristics of the cities (Equation 1) – Arab cities with a majority Arab population, cities with a majority Haredi (ultra-Orthodox) population, and Jewish communities in the occupied territories (The West Bank).

The results (Table 5) confirm the research hypothesis regarding the relationship between the characteristics of the communities' social space (i.e., the local habitus) and compliance. Model 1a in Table 5 shows the association between compliance, measured by the combined compliance index described above. The results indicate that all three forms of capital have a positive influence on compliance. Residents of cities with higher levels of economic, social,

and cultural capital complied more with Covid-19 restrictions, with each form of capital having its own independent effect. Model 1b includes controls for special population groups. Controlling for all other variables in the model, Haredi cities showed less compliance. Municipalities on the West Bank complied more than non-Haredi Israeli Jewish cities. The coefficient of the Arab cities was not statistically significant.

We also estimated separate models for each component of the compliance index separately. We found similar results for the vaccination rate model (Model 2a) with economic, cultural, and social capital having a positive effect on this rate. There was an additional positive association between vaccinations and municipalities on the West Bank, and a negative association with Haredi populations (Model 2b).

Model 3a revealed a negative effect of economic capital on morbidity, without significant effects of social and cultural capital. However, when we introduced the special populations' control variables, economic capital became insignificant and social capital had a positive effect on morbidity. Additionally, both Haredi communities and municipalities on the West Bank had higher morbidity rates. Finally, police fines indicated the negative impact of cultural capital, meaning that residents of cities with higher levels of cultural capital received fewer fines (Models 4a and 4b).

Table 5. OLS Regression results of the determinants of community compliance - combined indices

	Combined index		Vaccination		Morbidity		Police fines	
	Model 1a	Model 1b	Model 2a	Model 2b	Model 3a	Model 3b	Model 4a	Model 4b
Economic capital	0.866***	0.878***	0.108***	0.109***	-0.449*	-0.047	-0.002	-0.002
	(0.15)	(0.16)	(0.02)	(0.02)	(0.22)	(0.25)	(0.00)	(0.00)
Social capital	0.573***	0.814***	0.072***	0.101***	0.308	0.479*	0.018***	0
	(0.12)	(0.15)	(0.01)	(0.02)	(0.18)	(0.23)	(0.00)	(0.00)
Cultural capital	0.539***	0.412**	0.067***	0.051**	-0.098	-0.209	-0.016***	-0.012**
	(0.13)	(0.13)	(0.02)	(0.02)	(0.20)	(0.19)	(0.00)	(0.00)
Arab		-0.43		-0.053		0.148		0.034***
		(0.25)		(0.03)		(0.37)		(0.01)
Haredi		-1.201***		-0.149***		2.068***		-0.007
		(0.31)		(0.04)		(0.47)		(0.01)
Settlement		0.659**		0.082**		0.671		-0.01
		(0.24)		(0.03)		(0.37)		(0.01)
Constant	-0.092	-0.163	0.321***	0.312***	2.255***	1.289*	0.031**	0.044***
	(0.37)	(0.38)	(0.05)	(0.05)	(0.56)	(0.57)	(0.01)	(0.01)
N	140	140	140	140	140	140	140	140
R^2	0.475	0.56	0.474	0.559	0.234	0.358	0.502	0.619

Note: Standard errors in parentheses. * p<0.05, ** p<0.01, *** p<0.001

Social capital had a positive effect on the number of fines, but this effect disappeared when we introduced the controls for special populations (Model 4b). The residents of Arab cities received more fines than residents of other cities. Although in the other models Haredi cities had a stronger negative effect on compliance compared to Arab cities, in the police fines model Haredi cities had no effect. However, the fines did have a negative effect on compliance in the Arab cities. Over-policing and the racial profiling of ethnic minorities are a common phenomenon, especially in "deeply divided societies" like Israel (Hasisi & Weitzer, 2007; Perry, 2006). This interesting result might suggest that there was over-policing of Arab citizens during the pandemic or leniency toward the defiance of regulations in the Haredi population (Ben-Porat et al., 2012).[2]

Table 6 shows the results of the OLS regressions of the different Covid-19 compliance indicators on the various dimensions of local economic, cultural, and social capital. The results again indicate that all three types of capital have an influence on compliance with Covid-19 restrictions.

Both dimensions of economic capital, Wealth (EC_1) and Economic Security (EC_2), are positively associated with compliance. Cities with wealthy residents and better support for social welfare complied more with the regulations (Model 1c). Looking at each compliance measure separately indicates that these dimensions of economic capital are also associated with higher vaccination rates (Model 2c). However, Wealth (EC_1) is associated with lower Covid-19 morbidity rates, whereas Economic Security (EC_2) is associated with higher rates of Covid-19 morbidity (Model 3c). These effects remain intact, and in some cases become even stronger, after adding the controls for special populations (Models 1d, 2d, 3d). Economic capital is not significantly associated with Covid-19 related police fines.

Both dimensions of social capital have a positive effect on compliance. Social Integration (SOC_1) and Mutual Responsibility (SOC_2) are positively associated with the combined compliance index (Model 1c), and vaccination rates (Model 2c). These results hold even after introducing the controls for the special populations (Models 1d, 2d). However, Social Integration is also positively associated with morbidity, both with and without the special populations' control variables (Models 3c, 3d). In addition, Mutual Responsibility is positively linked with morbidity in Model 3d, which includes these controls. Thus, communities with higher levels of social capital have more deaths from Covid-19. A partial explanation for these findings is that high levels of social capital are linked to frequent social interactions that occur face-to-face. Frequent physical interactions can increase the spread of infection during a pandemic, explaining the positive effect of social capital on morbidity among Haredi communities. Both aspects of social capital also have a positive effect on police fines. However, this effect diminishes and becomes statistically insignificant when controlling for special populations. Mutual Responsibility has a positive association with police fines but this effect vanishes when introducing the controls for the special populations (Models 4c, 4d).

[2] It should be noted that there are also claims of under-policing in the Arab population in Israel when it comes to crime inside Arab cities (Ben-Porat et al., 2012).

Table 6. OLS Regression results of the determinants of community compliance - separate indices

	Combined index		Vaccination		Morbidity		Police fines	
	Model 1c	Model 1d	Model 2c	Model 2d	Model 3c	Model 3d	Model 4c	Model 4d
EC_1	0.573***	0.631***	0.071***	0.078***	-1.063***	-0.792***	0.005	0.001
wealth	(0.15)	(0.16)	(0.02)	(0.02)	(0.22)	(0.23)	(0.00)	(0.00)
EC_2	0.252*	0.244*	0.031*	0.030*	0.404**	0.478***	0	-0.001
Economic security	(0.10)	(0.10)	(0.01)	(0.01)	(0.15)	(0.14)	(0.00)	(0.00)
SOC_1	0.314***	0.389***	0.039***	0.048***	0.565***	0.635***	0.005	-0.001
Social integration	(0.09)	(0.10)	(0.01)	(0.01)	(0.13)	(0.14)	(0.00)	(0.00)
SOC_2	0.545***	0.508***	0.068***	0.063***	0.144	0.392*	0.011**	0.005
Mutual responsibility	(0.13)	(0.14)	(0.02)	(0.02)	(0.19)	(0.19)	(0.00)	(0.00)
CUL_1	0.401**	0.217	0.050**	0.027	0.606**	0.533**	-0.008	-0.003
School achievement	(0.13)	(0.14)	(0.02)	(0.02)	(0.19)	(0.20)	(0.00)	(0.00)
CUL_2	0.258**	0.190*	0.032**	0.024*	0.22	0.261*	-0.004	-0.004
Professional-academic attainment	(0.08)	(0.08)	(0.01)	(0.01)	(0.12)	(0.11)	(0.00)	(0.00)
CUL_3	0.380**	0.246	0.047**	0.031	0.352	0.27	-0.014***	-0.008*
Urban cultural fostering	(0.12)	(0.13)	(0.02)	(0.02)	(0.18)	(0.18)	(0.00)	(0.00)
Arab		-0.293		-0.036		-0.232		0.026**
		(0.28)		(0.04)		(0.40)		(0.01)
Haredi		-1.084***		-0.135***		-1.981***		-0.008
		(0.32)		(0.04)		(0.45)		(0.01)
Settlement		0.627*		0.078*		0.372		-0.014
		(0.26)		(0.03)		(0.37)		(0.01)
Constant	1.226**	1.985***	0.485***	0.580***	1.137*	1.302	0.103***	0.066***

	(0.40)	(0.53)	(0.05)	(0.07)	(0.57)	(0.75)	(0.01)	(0.02)
N	140	140	140	140	140	140	140	140
R^2	0.508	0.571	0.508	0.57	0.343	0.462	0.573	0.639

Note: Standard errors in parentheses. * p<0.05, ** p<0.01, *** p<0.001.

The cultural capital dimensions have a largely positive effect on compliance. All three dimensions have a positive effect on the combined compliance index and the vaccination rates in the basic models (Models 1c, 2c). When introducing the controls for the special populations, only School Achievement (CUL_2) remains statistically significant (Models 1d, 2d). School Achievement is positively associated with morbidity in the model that does not control for the city's population characteristics. When introducing these controls, both School Achievement and Professional Academic Attainment show positive associations with morbidity. Finally, municipal expenditures on culture (CUL_3) are negatively associated with the number of fines (Models 4c, 4d).

When we consider the city's population characteristics, we did not find an additional effect on compliance in Arab municipalities except for a positive effect on the number of police fines. Haredi cities show less overall compliance, lower vaccination rates, and higher morbidity rates but do not receive more fines than non-Arab communities. Israeli municipalities on the West Bank (i.e., settlements) have higher overall compliance and vaccination rates than communities within Israel proper.

5. Discussion and conclusions

Cities are regarded as a sustainable form of settlement (Angelo & Wachsmuth, 2020; Comstock, 2012). Improving their planned and built environments is key to healthier communities (de Leeuw, 2022). The Covid-19 pandemic challenged these ideas (Kotkin, 2020; Krugman, 2021; Rosenthal, 2020), but provided a chance to further enhance cities' resilience with the pandemic's predicted decline (e.g., Triguero-Mas et al., 2022). However, to do so, we must identify the communal factors that prompt people to adhere to regimens that promote their health. Our paper contributes to this effort by concentrating on social stratification in cities that emphasize varying accumulations of Bourdieusian forms of capital (i.e., social space).

Using Israel as a test case, we demonstrate the value of explaining Covid-19-related health behavior at the community level, meaning the extent to which urban communities complied with official regulations regarding preventive health measures as a function of their shared dispositions (i.e., habitus).

Our results establish associations between health behavior and various forms of capital. It broadens the methodology of earlier investigations that were of a similar nature.

Nevertheless, additional case studies in other regions are needed to support the theory we posited. Also, future research that gathers data on forms of capital and compliance indicators relative to different health concerns at the level of people and their families may mitigate the disadvantages associated with urban-level data.

References

Achterberg, P., De Koster, W., & Van der Waal, J. (2017). A science confidence gap: Education, trust in scientific methods, and trust in scientific institutions in the United States, 2014. *Public Understanding of Science*, *26*(6), 704–720.

Akkermans, J., Richardson, J., & Kraimer, M. L. (2020). The Covid-19 crisis as a career shock: Implications for careers and vocational behavior. In *Journal of Vocational Behavior* (Vol. 119, p. 103434). Elsevier.

Angelo, H., and Wachsmuth, D. (2020). Why does everyone think cities can save the planet? *Urban Studies*, ;57(11), 2201-2221.

Aoki, Y., & Todo, Y. (2009). Are immigrants more likely to commit crimes? Evidence from France. *Applied Economics Letters*, *16*(15), 1537–1541.

Armitage, C. J., & Conner, M. (2000). Social cognition models and health behaviour: A structured review. *Psychology and Health*, *15*(2), 173–189.

Ayalon, H., and Mcdossi, O. (2019). Economic achievements of nonacademic parents and patterns of enrollment in higher education of their children: the case of Israel. *Higher Education, 77*, 135–153.

Barak, N., Sommer, U., & Mualam, N. (2021). Urban attributes and the spread of COVID-19: The effects of density, compliance and socio-political factors in Israel. *Science of the Total Environment*, *793*, 148626.

Bargain, O., & Aminjonov, U. (2020). Trust and compliance to public health policies in times of COVID-19. *Journal of Public Economics*, *192*, 104316.

Barry, L. (2022). Epidemic and Insurance: Two Forms of Solidarity. *Theory, Culture & Society*, 02632764221087932.

Bawidamann, L., Peter, L., and Walthert, R. (2021). Restricted religion. Compliance, vicariousness, and authority during the Corona pandemic in Switzerland. *European Societies*, 23. DOI: 10.1080/14616696.2020.1833068

Bay, A.-H., & Pedersen, A. W. (2006). The limits of social solidarity: Basic income, immigration and the legitimacy of the universal welfare state. *Acta Sociologica*, *49*(4), 419–436.

Ben-Porat, G., Yuval, F., & Mizrahi, S. (2012). The challenge of diversity management: police reform and the Arab minority in Israel. *Policy Sciences*, *45*(3), 243–263.

Bianchi, M., Buonanno, P., & Pinotti, P. (2012). Do immigrants cause crime? *Journal of the European Economic Association*, *10*(6), 1318–1347.

Blokland, T., & Savage, M. (2016). *Networked urbanism: social capital in the city*. Routledge.

Bourdieu, P. (1977). *Outline of a Theory of Practice*.

Bourdieu, P. (1986). *Distinction: A Social Critique of the Judgement of Taste*. Routledge
& Kegan Paul, London.

Bourdieu, P. (2018). The forms of capital. In *The sociology of economic life* (pp. 78–92). Routledge.

Bourdieu, P. (2000). *The Weight of the World: Social Suffering in Contemporary Society*. Palo Alto, CA: Stanford University Press.

Casey, E.S. (2001). Between geography and philosophy: what does it mean to be in the place-world?

Annals of the Association of American Geographers, 91(4), 683-693.
Clark, C., Davila, A., Regis, M., & Kraus, S. (2020). Predictors of COVID-19 voluntary compliance behaviors: An international investigation. *Global Transitions*, *2*, 76–82.
Cockerham, W.C. (2005). Health lifestyle theory and the convergence of agency and structure. *Journal of Health and Social Behavior*, 46, 51–67.
Comstock, M., (2012). Cities: The Drivers of Sustainable Human Development and Prosperity. *Sustainable Cities-World Bank Blogs*.
https://blogs.worldbank.org/sustainablecities/cities-the-drivers-of-sustainable-human-development-and-prosperity
Deb, P., Furceri, D., Ostry, J. D., & Tawk, N. (2022). The economic effects of Covid-19 containment measures. *Open Economies Review*, *33*(1), 1–32.
de Leeuw, E. (2022). Healthy Cities. In: Kokko, S., Baybutt, M. (eds) *Handbook of Settings-Based Health Promotion*. 91-104. Springer, Cham. https://doi.org/10.1007/978-3-030-95856-5_5
Easthope, H. (2004). A place called home. *Housing Theory and Society*, 21, 128-138.
Falah, G. (1996). Living together apart: Residential segregation in mixed Arab-Jewish cities in Israel. *Urban Studies*, *33*(6), 823–857.
Fogle, N. (2011). *The Spatial Logic of Social Struggle: A Bourdieuian Topology*. Lanham, MD: Lexington Books.
Forrest, R. and Kearns, A., 2001, Social cohesion, social capital and the neighborhood. *Urban Studies*, Vol. 38, 2125–2143.
Foster, C., & Frieden, J. (2017). Crisis of trust: Socio-economic determinants of Europeans' confidence in government. *European Union Politics*, *18*(4), 511–535.
Frenkel, A., & Ashkenazi, M. (2008). Measuring urban sprawl: how can we deal with it? *Environment and Planning B: Planning and Design*, *35*(1), 56–79.
Frenkel, A., & Porat, I. (2017). An integrative spatial capital-based model for strategic local planning – An Israeli case. *Planning Practice & Research*, 32(2), 171-196.
Freudenberg, N., Galea, S., & Vlahov, D. (2005). Beyond urban penalty and urban sprawl: back to living conditions as the focus of urban health. *Journal of Community Health*, *30*(1), 1–11.
Friedson, A. I., McNichols, D., Sabia, J. J., & Dave, D. (2021). Shelter-in-place orders and public health: evidence from California during the Covid-19 pandemic. *Journal of Policy Analysis and Management*, *40*(1), 258–283.
Gonen, A. (1995). *Between city and suburb: Urban residential patterns and processes in Israel*. Avebury Aldershot.
Goren, T., Vashdi, D. R., & Beeri, I. (2021). "Apples and Oranges:" Examining Different Social Groups' Compliance With Government Health Instructions During the COVID-19 Pandemic. *International Journal of Health Policy and Management*.
Graham, H. (2020). Hysteresis and the sociological perspective in a time of crisis. *Acta Sociologica*, *63*(4), 450–452.
Green, M. S., Abdullah, R., Vered, S., & Nitzan, D. (2021). A study of ethnic, gender and educational differences in attitudes toward COVID-19 vaccines in Israel–implications for vaccination

implementation policies. *Israel Journal of Health Policy Research*, *10*(1), 1–12.
Halbertal, D. (2016). 7. Religion and State, One and the Same. *Handbook of Israel: Major Debates*, 122.
Harper, C. A., Satchell, L. P., Fido, D., & Latzman, R. D. (2021). Functional fear predicts public health compliance in the COVID-19 pandemic. *International Journal of Mental Health and Addiction*, *19*(5), 1875–1888.
Hasisi, B., & Weitzer, R. (2007). Police relations with Arabs and Jews in Israel. *The British Journal of Criminology*, *47*(5), 728–745.
Hillier, J. (2005). Mind the gap. In: Hillier, J., Rooksby, E., (Eds.) *Habitus: A Sense of Place* (pp. 161-188). England and Burlington VT: Aldershot and Ashgate Hants.
Hillier, J., & Rooksby, E., (Eds.) (2005). *Habitus: A Sense of Place*. England and Burlington VT: Aldershot and Ashgate Hants.
Horowitz, D., & Lissak, M. (1989). *Trouble in utopia: The overburdened polity of Israel*. Suny Press.
Israel, E. (2021). Place habitus in the city and suburbs: The politics of middle-class education and the perspective of elite decisionmakers. Cities, 114.
Israel, E., & Frenkel, A. (2015). The distribution of capital forms between cities and suburbs and their impact on social justice in space. *Urban Geography*, *36*(4), 578–607.
Israel, E., & Frenkel, A. (2018). Social justice and spatial inequality: Toward a conceptual framework. *Progress in Human Geography*, *42*(5), 647–665.
Kolstoe, S. (2020). *Coronavirus: Wearing a cloth face mask is less about science and more about solidarity*. The Conversation. https://theconversation.com/coronavirus-wearing-a-cloth%0A-face-mask-is-less-about-science-and-more-about-solidarity-138461.
Kotkin, J., (2020). Angelenos love their suburban sprawl. The Coronavirus proves them
right. Los Angeles Times.
Krampf, A., (2018). *The Israeli Path to Neoliberalism: the State, Continuity and Change.* Routledge, Milton Park, Abingdon, Oxon & New York, NY.
Krueger, P.M., Bhaloo, T., Rosenau, P.V. (2009). Health lifestyles in the United States and Canada: are we really so different? *Social Science Quarterly*, 90, 1380–1402.
Krugman, P., (2021). Opinion|The Pandemic and the Future City. N. Y. Times.
Ligthart, K. A. M., Buitendijk, L., Koes, B. W., & van Middelkoop, M. (2017). The association between ethnicity, socioeconomic status and compliance to pediatric weight-management interventions–a systematic review. *Obesity Research & Clinical Practice*, *11*(5), 1–51.
Mevorach, T., Cohen, J., & Apter, A. (2021). Keep calm and stay safe: the relationship between anxiety and other psychological factors, media exposure and compliance with COVID-19 regulations. *International Journal of Environmental Research and Public Health*, *18*(6), 2852.
Nivette, A., Ribeaud, D., Murray, A., Steinhoff, A., Bechtiger, L., Hepp, U., Shanahan, L., & Eisner, M. (2021). Non-compliance with COVID-19-related public health measures among young adults in Switzerland: Insights from a longitudinal cohort study. *Social Science & Medicine*, *268*, 113370.
Pain, K. (2008). Spaces of practice in advanced business services: rethinking London -Frankfurt relations. *Environment and Planning D*, 26, 264-279.

Painter, M., & Qiu, T. (2020). Political beliefs affect compliance with covid-19 social distancing orders. *Covid Economics*, *4*, 103–123.

Perry, B. (2006). Nobody trusts them! Under-and over-policing Native American communities. *Critical Criminology*, *14*(4), 411–444.

Perry, G., & Jonathan-Zamir, T. (2020). Expectations, effectiveness, trust, and cooperation: public attitudes towards the Israel Police during the COVID-19 pandemic. *Policing: A Journal of Policy and Practice*, *14*(4), 1073–1091.

Philbin, E. F., Dec, G. W., Jenkins, P. L., & DiSalvo, T. G. (2001). Socioeconomic status as an independent risk factor for hospital readmission for heart failure. *The American Journal of Cardiology*, *87*(12), 1367–1371.

Plohl, N., & Musil, B. (2021). Modeling compliance with COVID-19 prevention guidelines: The critical role of trust in science. *Psychology, Health & Medicine*, *26*(1), 1–12.

Putnam, R.D., 2007, E Pluribus Unum: Diversity and Community in the Twenty-First Century. *Scandinavian Political Studies*, Vol. 30(2), 137-174.

Razin, E. (2004). Needs and impediments for local government reform: lessons from Israel. *Journal of Urban Affairs*, *26*(5), 623–640.

Ritchie, H., & Roser, M. (2018). Urbanization. *Our World in Data*.

Rosen, B., Waitzberg, R., & Israeli, A. (2021a). Israel's rapid rollout of vaccinations for COVID-19. *Israel Journal of Health Policy Research*, *10*(1), 6. https://doi.org/10.1186/s13584-021-00440-6

Rosen, B., Waitzberg, R., Israeli, A., Hartal, M., & Davidovitch, N. (2021b). Addressing vaccine hesitancy and access barriers to achieve persistent progress in Israel's COVID-19 vaccination program. *Israel Journal of Health Policy Research*, *10*(1), 43. https://doi.org/10.1186/s13584-021-00481-x

Rosenthal, B.M., (2020). Density Is New York City's Big 'Enemy' in the Coronavirus Fight. N. Y. Times.

Savage, M., Hanquinet, L., Cunningham, N., & Hjellbrekke, J. (2018). Emerging cultural capital in the city: Profiling London and Brussels. *International Journal of Urban and Regional Research*, *42*(1), 138–149.

Sayer, A. (2011). Habitus, work and contributive justice. *Sociology*, 45(1), 7–21.

Shacham, M., Greenblatt-Kimron, L., Hamama-Raz, Y., Martin, L. R., Peleg, O., Ben-Ezra, M., & Mijiritsky, E. (2021). Increased COVID-19 vaccination hesitancy and health awareness amid COVID-19 vaccinations programs in Israel. *International Journal of Environmental Research and Public Health*, *18*(7), 3804.

Sheikh, A., Sheikh, Z., & Sheikh, A. (2020). Novel approaches to estimate compliance with lockdown measures in the COVID-19 pandemic. *Journal of Global Health*, *10*(1).

Shibli, H., Palkin, D., Aharonson-Daniel, L., Davidovitch, N., & Daoud, N. (2022). Inequalities in Trust Levels and Compliance With Physical Distancing During COVID-19 Outbreaks: Comparing the Arab Minority and Jewish Populations in Israel. *International Journal of Public Health*, *67*, 1604533.

Shomron, B., & David, Y. (2022). Protecting the community: How digital media promotes safer behavior during the Covid-19 pandemic in authoritarian communities—a case study of the ultra-Orthodox community in Israel. *New Media & Society*, 14614448211063620.

Shwed, U., and Shavit, Y. (2006). Occupational and economic attainments of college and university graduates in Israel. *European Sociological Review*, 22(4), 431–442

Simpson, A. (2016). A four-step process to studying the field through the city of London. *Cities*, 51, 96-105.

Smith, E.K. and Anderson, R. (2018). Understanding lay perspectives on socioeconomic health inequalities in Britain: a meta-ethnography. *Sociology of Health & Illness*, 40(1), 146–170.

Smooha, S. (2004). Jewish ethnicity in Israel: symbolic or real? *Jews in Israel: Contemporary Social and Cultural Patterns*, 47–80.

Talic, S., Shah, S., Wild, H., Gasevic, D., Maharaj, A., Ademi, Z., Li, X., Xu, W., Mesa-Eguiagaray, I., & Rostron, J. (2021). Effectiveness of public health measures in reducing the incidence of covid-19, SARS-CoV-2 transmission, and covid-19 mortality: systematic review and meta-analysis. *BMJ*, *375*.

Toft, M. (2018). Upper-class trajectories: capital-specific pathways to power. *Socio-Economic Review*, 16(2), 341–364.

Triguero-Mas, M., Anguelovski, I., and Cole. HVS (2022). Healthy cities after COVID-19 pandemic: the just ecofeminist healthy cities approach. Journal of Epidemiology & Community Health, 76, 354-359.

Ueki, H., Furusawa, Y., Iwatsuki-Horimoto, K., Imai, M., Kabata, H., Nishimura, H., & Kawaoka, Y. (2020). Effectiveness of face masks in preventing airborne transmission of SARS-CoV-2. *MSphere*, *5*(5), e00637-20.

Ugwudike P. (2017). Understanding compliance dynamics in community justice settings: The relevance of Bourdieu's habitus, field, and capital. *International Criminal Justice Review*, 27(1), 40-59.

Van Elsas, E. (2015). Political trust as a rational attitude: A comparison of the nature of political trust across different levels of education. *Political Studies*, *63*(5), 1158–1178.

Van Rooij, B., de Bruijn, A. L., Reinders Folmer, C., Kooistra, E. B., Kuiper, M. E., Brownlee, M., Olthuis, E., & Fine, A. (2020). Compliance with COVID-19 mitigation measures in the United States. *Amsterdam Law School Research Paper*, *2020–21*.

Vlahov, D., Galea, S., & Freudenberg, N. (2005). The urban health "advantage." *Journal of Urban Health*, *82*(1), 1–4.

Wang, D., Marmo-Roman, S., Krase, K., & Phanord, L. (2021). Compliance with preventative measures during the COVID-19 pandemic in the USA and Canada: Results from an online survey. *Social Work in Health Care*, *60*(3), 240–255.

Winnick, S., Lucas, D. O., Hartman, A. L., & Toll, D. (2005). How do you improve compliance? *Pediatrics*, *115*(6), e718–e724.

Wright, A. L., Sonin, K., Driscoll, J., & Wilson, J. (2020). Poverty and economic dislocation reduce compliance with COVID-19 shelter-in-place protocols. *Journal of Economic Behavior & Organization*, *180*, 544–554.

Yogev, D. (2021). Social capital transformation and social control: What can we learn from the changing style in communication between religious communities and the police during COVID-19. *Policing and Society*, 1–22.

Zhu, D., Ye, X., Li, W., Ding, R., & He, P. (2021). Urban health advantage or urban health penalty? Urban-rural disparities in age trajectories of physiological health among Chinese middle-aged and older women and men. *Health & Place*, *69*, 102559.

HOW TO SUPPORT AFFORDABILITY AND SUSTAINABILITY OF HOUSING? SET OF TOOLS APPLICABLE VIA STRATEGIC PLANS OF CITIES (1087)

Lucia Dobrucká

Czech Technical University, Masaryk Institute of Advanced Studies, Prague, Czech Republic; ldobrucka@gmail.com

Abstract. This article presents the results of project "Affordable and Sustainable Housing in Strategic Settlement Planning". The project researched how municipal strategic planning might be connected to housing policies and brought the set of 30 tools and actions supporting affordability and sustainability of housing at local level. When applied individually, none of the presented tools and actions solves the situation – they always need to be well combined, fit the conditions of individual cities, and create synergies. Even though the project focused on the Czech Republic, the developed list of tools and actions might be inspiring for other countries too.

Keywords: cities; affordable housing; strategic plans; tools supporting sustainability.

1. Introduction

Today, more people live in cities than in the countryside (approx. 75% in Europe), and housing remains the primary function of cities (approx. 75% of building permits in the Czech Republic). This situation increases the pressure on the conditions of living in cities. Housing is related to the social structure of inhabitants, lifestyle, culture, urban structure, public space, services, economic activities, health, mobility, and many other aspects of living. How people reside influences their quality of life, wellbeing, and health. Lack of suitable housing might cause problems such as homelessness, poverty, social conflicts, and other crises. Unfortunately, the last decade brought the rapid growth of demand on the real estate market accompanied with the decreasing number of free flats/houses and growing prices. As more and more people fail to find adequate places to live, the urge to redirect public policies on how to support the affordability of housing is increasing. Well-prepared housing policies became means to strengthen the competitiveness of individual cities as well as the social, cultural, and economic sustainability of societies.

This article presents the set of 30 tools and actions that might help to support affordability and sustainability of housing on the level of Czech cities and which can be implemented via strategic plans. Strategic plans as documents were chosen because they call for the integrated views of various actors, sectors, and levels and allow to build multi-level partnerships between city administration and civil society. In comparison to urban plans, strategic plans possess higher rate of flexibility, easier vocabularies, and less formal processes of cooperation; therefore, they are more opened to integrate diverse actors' perspectives and offer suitable platform for creating

housing policies. In the text below, readers can find the table of 30 tools and actions and the brief guidelines on how to work with the list. The article is based on the results conducted during the project "Affordable and Sustainable Housing in Strategic Settlement Planning" supported by the Technology Agency of the Czech Republic (project no. TL01000143). The methodology of project included especially international literature review and the best practice examples across European cities.

2. Housing, markets and policies

Housing can be considered the basic human need and right as well as economic investment. Housing market reflects the wide scale of factors, such as the prices of houses/flats, maintenance costs, the availability of financial resources, the legal processes of building permits, country and individual locality, the legal system of owners' as well as tenants' rights, demography, cultural values, the rate of foreign investors, subjective preferences and expectations, social status and lifestyle, emotional attachments, and many others (e.g. Sunega, Mikeszová, Lux, 2009; Suhaida, et.al, 2011; Sunega, Lux, 2013; Ram, Needham, 2016; Deschermeier, Haas, Voigtländer, 2019; Hudeček, et.al, 2019; Duca, 2020; Pill, at.al, 2021; Mueller, Tighe, 2022; etc.). It is obvious that there are many factors significantly influencing the rising demand for housing, which makes housing unaffordable especially in locations with the high concentration of various forms of prosperity. Accordingly, the large variety of factors determines the variety of housing policies that are used by different countries and cities (e.g. Mulliner, Smallbone, Maliene, 2013; Žufan, 2016; Kraftová, Šmidová, 2017; Balmer, Gerber, 2018; Clegg, Farstad, 2019; Granath Hansson, 2019; Ryan-Collins, 2019; Wakely, 2019; Debrunner, Hartmann, 2020; Dobrucká et.al, 2020; Tsenkova, 2021; and others).

A brief history of housing policies in the Czech Republic was described by Kohout, Štěpánek, et.al. (2019, 2020b). After 1918, the young republic of Czechoslovakia managed the acute shortage of housing by the complex of legislation, fiscal actions, and organisational changes. Even though it failed to establish the equal distribution of support across the whole country, it well succeeded to coordinate and integrate the activities of state, municipalities, private sector, academic sector, and research institutions. During the Second World War, the German occupation ended some of the Czech independent policies, including the housing policy coordinated by the Ministry of Public Work (ministry coordinating economic life). Even though the era generally strengthened the principles of centralised planning (war economy), building sector was divided and spread across diverse resorts, departments, and institutions. Unfortunately, the situation never repaired to the previous complex unit and remained fragmented until today. After the war, there was the shortage of housing in big cities and industrial centres, while most border localities offered the surplus of free houses and flats. This might be one of reasons why communism era abandoned the approach of laws, financial aids, and coordination and turned to the central planning, state interventions, and citizens reallocation. Free housing market broke down, and the massive construction of

housing estates (block of flats) was supposed to provide the high standard of living for most citizens (especially in cities). The most common providers of new housing stock became cooperatives (flats) and individual people (houses).

Consequently, contemporary housing in the Czech Republic struggles not only from the points described in the first paragraph, but also from aspects that are specific for post-communist countries (see Kohout, Tichý, 2018; Kohout, Štěpánek, et.al., 2019; MMR, 2019; ČSÚ, 2021; Kohout, Molnárová, Dobrucká, 2021; Chudý, Molnárová, 2022; and others). First fundamental factor influencing todays situation is the privatisation of housing stock after 1990. On one hand, state owned too many facilities without appropriate resources to manage, maintain, and finance them, and privatisation helped to increase the effectivity of entire system. On the other hand, the scale of privatised stock was too large, and the prices for sold flats were too low. As a result, cities lost the significant amount of property as well as control over their own demographic and social development. Another consequence of privatisation is the phenomenon of "poor owners". Inhabitants (especially seniors in large cities) often live in houses and flats which exceed their regular income; therefore, properties cannot be effectively managed and maintained. Another factor is that the large percentage of Czech citizens live in housing estates, especially people with middle income. Housing estates represent from one quarter to one third of all housing stock in the Czech Republic and more than one half of flats. However, the contemporary condition of most housing estates is getting critical due to the aspects such as buildings at the edge of their life-span, monofunctional use, weak adaptability, the lack of social infrastructure, citizens' low identification with the locality, the absence of community life, and similar. Altogether, the Czech Republic faces the challenges of building the new modern housing stock as well as of renovating the huge amount of old but used flats. Unfortunately, the situation is further complicated due to the fragmented structure of owners. The fact that individual owners' rights are far superior to common interests makes the renovations and maintenance of buildings as well as public spaces extremely difficult.

If we look at housing as a system coordinated by public administration, such system should set up conditions, under which the economic and social environment allows citizens to have the economic freedom to obtain housing appropriate to their lifestyle and resources. Public sector is obliged to create, coordinate and manage such system; it means to determine the most important goals of such system, integrate the interests and roles of its actors, set rules governing the system, and define the administrative tools available to individual cities. As already mentioned, different countries and cities chose different housing policies to deal with the contemporary problems. In Europe, most of those policies follow the Geneva UN Charter on Sustainable Housing (2015). It states that housing policies today should reflect the balanced principles of environmental adaptability, economic activity, social inclusion and cultural adequacy. In the Czech Republic, the strategic goals of housing policy are defined as affordability, stability, and quality (Czech Republic Housing Policy to 2020, Czech Republic Housing Policy 2021+). Nevertheless, the details of how to apply the given goals, and how to implement the state housing policy, are not agreed yet.

3. List of tools and actions supporting affordability and sustainability of housing

The Table 1 shows the list of 30 tools and actions which might help to support affordability and sustainability of housing on the level of Czech cities. The list is based on the project "Affordable and Sustainable Housing in Strategic Settlement Planning" (see Kohout et.al, 2020a, 2020b), which focused mainly on reviewing international literature and collecting the best practice examples across European cities.

Table 1. List of tools and actions supporting affordability and sustainability of housing in Czech cities

n	tools and actions	character	connection to chapters / process of strategic planning	availability	sustainability				management	connections to other tools/actions
					enviro	econ	socio	cult		
1	**Audit of the housing stock**	administrative	analyses						x	2, 3, 5, 10, 13, 15, 16, 19, 28
2	**Demographic study**	administrative, planning	analyses				x		x	1,3, 5, 8, 15, 29
3	**Social study**	social	analyses				x		x	1, 2, 6, 7, 11
4	**Superior position of local housing policy in the strategic plan**	political, planning	priorities supported	x					x	7, 8, 12, 16, 21, 28
5	**Active housing policy**	political, administrative	priorities supported	x					x	1, 2, 3, 4, 16, 21, 30
6	**Implementation of social and demographic diversity policy (social mix)**	social, regulatory	priorities supported	x		x	x			4, 5, 8, 11, 15, 24
7	**Goodwill strategy / Strategy of good address**	communicative	priorities supported				x	x	x	4, 9, 11, 17, 18, 20, 24, 25
8	**Social housing**	economic, planning	priorities supported	x			x			1, 2, 3, 15, 30
9	**Revitalization of public spaces and extension of blue-green infrastructure**	environmental, planning	priorities supported		x			x		7, 19, 20
10	**Energy management of apartment buildings**	environmental	priorities supported		x	x				1, 16, 19, 21, 25
11	**Support for community activities**	social	priorities supported				x	x		2, 3, 7
12	**Regulation of business activities which do not support desired development**	political, administrative	prevented activities				x	x		6, 13, 17, 18, 19, 28
13	**Short-term use of municipal property**	economic, administrative	implementation	x		x			x	11, 14, 15
14	**Management of rents from the housing stock**	economic, administrative	implementation	x		x	x		x	1, 2, 3, 5, 8, 13
15	**Shared housing**	political, administrative	implementation	x		x	x			2, 5, 8, 11, 25
16	**Housing Development Fund**	economic	implementation	x		x			x	1, 4, 12, 14, 21, 26, 27
17	**Subsidies supporting the use of houses**	economic	implementation	x		x		x	x	1, 7, 10, 16, 18, 27
18	**Subsidies supporting the desired upgrades of used houses**	economic, administrative	implementation			x		x	x	1, 7, 10, 16, 17, 27
19	**Support of individual environmental measures in the municipality**	environmental, economic	implementation		x				x	7, 9, 10
20	**Architectural competitions (suppliers based on qualitative criteria)**	administrative	implementation					x	x	7, 16, 21
21	**Development company established by local government (public developer)**	political, administrative	implementation						x	4, 8, 9, 16, 20, 24, 30
22	**Private-Public-Partnership (PPP) projects**	economic	implementation			x			x	4, 5, 23, 24, 30
23	**Support of new legal forms of housing associations**	political, legislative	implementation	x					x	5, 15, 17
24	**Urban/Zoning plan with regulatory elements**	planning	follow-up documents	x	x			x	x	4, 8, 9, 21, 30
25	**Modification of building regulations**	administrative	follow-up documents					x	x	11, 15
26	**Taxation of foreign (or multiple) real estate investments**	political	follow-up documents	x		x	x			4, 7, 21, 28
27	**Restrictive taxation of unused empty apartment buildings**	political	follow-up documents	x		x		x		1, 7, 12, 16
28	**Regulation of tourism running on shared economy platforms**	economic, political	follow-up documents	x		x	x			1, 7, 25, 26, 29
29	**Increased protection of tenants' rights**	legislative	follow-up documents	x			x			2, 3, 5, 12, 23, 28
30	**Valorising the value of municipal land**	political, administrative	other impact			x				4, 5, 8, 16, 21, 23, 24

Source: updated table of Kohout et.al., 2020b, p.19).

The listed tools and actions are divided into six categories:

- political, legislative, and administrative (e.g. 21. establishing a public developer) reflect public interests, locally shared values, and political representatives' ideological roots. They might require political courage and will, which makes them difficult to implement yet very effective.
- social (e.g. 2. demographic study) reflect the need for social justice, cohesion, and sustainability. They help to clarify the shared frame of values and prevent deeper problems in the future.
- economic (e.g. 17. financial support to reconstruct old buildings) provide a set of supportive as well as restrictive financial tools, which are separated from municipal budgets.
- rooted in infrastructure and environment (e.g. 10. management of energies) reflect space as item increasing the quality of life and decreasing living costs and inequalities.
- dealing with planning system and processes (e.g. 4. strengthening the position of housing policies in strategic plans) are usually rooted in laws and methodologies, call for expertise, and connect housing policies to specific conditions of cities at hand. They are often regulative, connected to administrative and bureaucratic procedures.
- and based on reputation, marketing, and branding (e.g. 7. goodwill strategies) bring in soft aspects, such as political representatives, inhabitants, genius loci, perceived image, atc.

The proposed tools and actions are connected to strategic plans and/or the process of strategic planning, since they focus on the phases of

- analyses (e.g. 3. social study), which should consist of trends, data in mutual interactions, and potentials and limits of locality;
- setting priorities (e.g. 9. public space and green-blue infrastructure) and ensuring prevention (e.g. 12. regulation of potentially harmful activities) in the form of priorities, general rules and/or quantified indicators;
- implementation (e.g. 22. PPP projects) dealing with finances, organisation, rules etc.;
- other connected documents (e.g. 29. supporting tenants' rights) and other impacts (e.g. 30. valorising the value of municipal lands).

Special attention is paid to the diverse aspects of implementation, such as mandatory documents (e.g. 24. urban plans), financial aspects (e.g. 16. housing development fund), organisation (e.g. 21. public developer), cooperation (e.g. 22. PPP projects), and public support (e.g. 9. public space or 7. goodwill strategy). Successful implementation in heavily dependent on the quality of local managers, their abilities to cooperate and create synergies as well as to set up effective processes. Therefore, some tools and actions focus on managerial aspects, such as using architectural competitions (20.), establishing public developer (21.) or supporting new legal forms of housing associations (23.).

As for the way of how the proposed tools and actions work, the list consists of methodological tools (e.g. 1. audit of housing estate), regulative tools (e.g. 24. urban plans and their regulations), restrictive tools (e.g. 26. progressive taxes of more than one housing estate), as well as proactive tools (e.g. 16. creating funds for housing development). In terms of their impact, the listed tools

and actions influence all aspects of sustainability – environment (e.g. 19. support of environmental measures), economy (e.g. 10. energy management), and socio-cultural aspects (e.g. 17-18. support of desired design, upgrades and use of buildings). Affordability can be increased through the better management of existing housing stock (e.g. 13. short-term use of city property) as well as by developing the new one (e.g. 8. social housing).

Moreover, the list offers short-term perspective (e.g. 14. managing rents from the existing public real estate), mid-term perspective (e.g. 8. investments in social housing), long-term perspective (e.g. 6. strategy of diversity and social mix), and perspective requiring changes in national legislation first (e.g. 25. modifications in building regulations). Some of the listed tools and actions are fully manageable by individual cities today (e.g. 1-4. analyses or superior position of housing in strategic plans), whereas others require the change of political alignment (e.g. 6. implementing social mix or 12. regulation of business activities which do not support desired development) or even the revisions of state legislation (e.g. 23. new legal forms of housing associations or 25. modification of building regulations). Nevertheless, the majority of the proposed list is already in use abroad and could be implemented in the Czech cities within the relatively short period of time.

The last column of table n.1 presents interactions among individual tools and actions which help to create synergies and/or should be considered as a unit. For instance, active housing policy (5.) primarily reflects the attitude of city, its representatives and inhabitants towards active interventions on housing market. Externally, it manifests via new investments, privatisation vs. purchases, the existence (or absence) of building rules and regulations, the tolerance of speculative businesses, and similar aspects. Internally, it is rooted in shared local values, political maturity, the quality of local governance, etc. Therefore, it is necessary to perceive and manage active housing policy in the context of possessed data (1-3. analyses), the clear declaration of interests and rules (4. superior position in strategic plan, 24. urban plan with regulations, 25. building regulations), specific actions (V8. social housing, 13. use of municipal property), and conditions for actions (16. housing development fund, 17-19. subsidies, 29. tenants' rights). Altogether, active housing policy (5.) provides the base for complex interactions between various tools and actions supporting the affordability and sustainability of housing. It also shows that synergies come from well-considered combinations.

4. Choices of tools and actions reflect specific needs of cities

It is obvious that the proposed list is wide and covers the different perspectives of housing. Nevertheless, none of the listed tools and activities brings results on its own, neither is there an ideal combination suitable for all cities. Some of the listed tools and actions might be considered universal across European cities, such as understanding the situation via analyses (1-3.), superior position of housing in strategic plans (4.) or extending blue-green infrastructure in public space

(9.). Yet, the majority of tools, actions, and their combinations should be considered in the context of particular cities and circumstances.

The first criterion about which tools and actions to choose is the size of cities and the level of their independence. Big cities with full governance competencies possess more opportunities than small cities belonging to others' jurisdictions. At the same time, however, it is more difficult to balance various interests, set up housing policies, and coordinate their implementation in big cities. Hence, the role of conceptual and regulative tools (e.g. 24. regulative urban plans or 25. modification of building regulations) is more fundamental in big cities. Also, big cities can combine the tools and actions for individual zones and settlements separately. For instance, historic centrums might benefit from regulating shared platforms (e.g. AirBnB, 28.), whereas distanced neighbourhoods and suburbs might benefit from supporting such platforms. The combination of restricting and supporting various districts via the same tool benefits the city as a whole by redistributing tourists, sustaining housing in centrums and supporting economy in localities which would otherwise be omitted.

Second aspect is the localisation of particular city and its development situation. Rising cities need different housing policy than shrinking cities; a city located close to a capital has different dynamics from a city located in a structurally deprived region. Cities facing rapid development and strong investment pressures need clear rules and regulations (e.g. 12. regulation of business activities, 24. Regulative urban plans or 25. Modification of building regulations). The suburbs of capitals serving mainly for "sleeping" might benefit from stronger local community and services (11. supporting community activities). The widest impact and synergies of direct subsidies (17-18.) could be seen in cities pwhich face shrinking and degradation. Managing rents (14.) is useful especially in cities which lack housing stock or where prices rise too rapidly compared to the rise of salaries. Cities with empty buildings might increase taxes in case when investors benefit from owning buildings rather than renting them, but should carefully ponder doing so if abandoned buildings result from people leaving the region.

5. Conclusion

Due to the increasing problems with the affordability and sustainability of housing in many European cities, housing policies are becoming one of the key municipal agendas. In the Czech Republic, however, the agreed housing policy lacks details of how to implement the stated strategic goals. This article introduced the list of 30 tools and actions which might support affordability and sustainability of housing via strategic plans of cities. They cover the wide scale of aspects, such as:

- laws, administration, communication, politics, economy, social factors, etc.
- the different chapters of strategic plans /phases of planning;

- the factors of implementing and managing the development of housing stock, e.g. finances, organisation, cooperation, legal forms, etc.
- impact on all three pillars of sustainability;
- immediate applicability by individual cities as well as the long-term perspective of structural changes.

Strategic plans were considered the suitable platform for creating housing policies because they are well established documents and, at the same time, less formal, more opened and flexible, and easier to be understood by various actors than urban plans. Even though the introduced list of tools and actions was developed according to the needs of the Czech Republic, it might be inspiring for other countries too.

References

Balmer, Ivo, Gerber Jean D. (2018) Why are housing cooperatives successful? Insights from Swiss affordable housing policy. *Housing Studies*, 33(3), p. 361-385.

Chudý, Ondřej, Molnárová, Jitka (2022) Katalog zásahů do panelových domů a nezastavěného prostoru na sídlištích. In: *Člověk, stavba a územní plánování 16*. Article in press.

Clegg, Liam, Farstad, Fay M. (2019) The local political economy of the regulatory state: Governing affordable housing in England. *Regulation and Governance*, 15(1), p. 168-184.

Czech Republic Housing Policy to 2020 (revised) Ministry of Regional Development CZ, June 2016. Available: https://www.mmr.cz/getmedia/da7228a5-5eb8-4d62-a015-0c6765d6cd1e/KB-R_VIII-2016__ENG__fin.pdf.aspx?ext=.pdf

Czech Republic Housing Policy 2021+ (revised) Ministry of Regional Development CZ, March, 2021. Available: https://www.mmr.cz/getmedia/30528174-7e61-421e-a058-5f39aa4f09c9/KB-2021-_komplet-web(C)_max.pdf.aspx?ext=.pdf

Český statistický úrad (2021) Sčítání lidu, domů a bytů. [online, May 2023]. Available: https://www.czso.cz/csu/czso/scitani-lidu-domu-a-bytu

Deschermeier, Philipp, Haas, Heide, Voigtländer, Michael (2019) Impact of housing market transformation in Germany on affordable housing: the case of North Rhine-Westphalia. *Journal of Housing and the Built Environment*, 34(2), p. 385-404.

Debrunner, Gabriela, Hartmann, Thomas (2020) Strategic use of land policy instruments for affordable housing – Coping with social challenges under scare land conditions in Swiss cities. *Land Use Policy*, 99, n. 104993.

Dobrucká, Lucia, Kohout, Michal, Štěpánek, Petr, Tichý, David (2020) Spektrum nástrojov strategického plánovania pre zabezpečenie dostupného bývania v českých sídlach. In: *Člověk, stavba a územní plánování 13*. ČVUT v Praze, Fakulta stavební, p. 186–201.

Duca, John V. (2020). Making sense of increased synchronization in global house prices. *Journal of European Real Estate Research*, 13(1), p. 5-16.

Geneva UN Charter on Sustainable Housing. Geneva, 2015.

Granath Hansson, Anna (2019) City strategies for affordable housing: the approaches of Berlin, Hamburg, Stockholm, and Gothenburg. *International Journal of Housing Policy*, 19(1), p. 95-119.

Hudeček, Tomáš, Hlaváček, Pavel, Hainc, Jaromír, Červinka, M. (2019) Statistics and Governance. Current Issues of Affordable Housing: The Case of Prague. *IOP Conference Series: Earth and Environmental Science*, 290(1).

Kohout, Michal, Tichý, David (2018) Housing in the Czech Republic – from management to coordination. In: SIDOROVÁ, M., LAMMELOVÁ, Z.: *Restless Cities: Lessons from Central Europe*. Praha: Heinrich-Böll-Stiftung.

Kohout, Michal, Štěpánek, Petr, Tichý, David, Dobrucká, Lucia, Špirková, Daniela, Peňázová, Veronika (2019): *Dostupné a udržitelné bydlení ve strategických plánech sídel. Výzkumná správa*. Praha: České vysoké učení technické.

Kohout, Michal, Molnárová, Jitka, Dobrucká, Lucia (eds) (2021) *Revitalizace městských obytných celků sídlištního typu s důrazem na řešení jejich prostorového uspořádání a organizaci veřejného prostranství. Metodika řešení komplexních projektů regenerace obytných celků sídlištního typu.* Praha: České vysoké učení technické, Centrum kvality bydlení.

Kohout, Michal, Štěpánek, Petr, Dobrucká, Lucia, Tichý, David, Špirková, Daniela, Peňázová, Veronika (2020a) *Dostupné a udržitelné bydlení ve strategických plánech sidel – výběr klíčových zjištění a souvislostí*. Praha: ČVUT. Available: https://www.fa.cvut.cz/fakulta/ustavy/15118-ustav-nauky-o-budovach/bydleni-vyzkum-publikace/dostupne-a-udrzitelne-bydleni-ve-strategickych-planech-sidel---vyber-klicovych-zjisteni-a-souvislosti.pdf

Kohout, Michal, Štěpánek, Petr, Dobrucká, Lucia, Tichý, David, Špirková, Daniela, Peňázová, Veronika (2020b) *Affordable and sustainable housing in strategic settlement planning*. Prague: CTU. Available: https://www.fa.cvut.cz/fakulta/ustavy/15118-ustav-nauky-o-budovach/konference_ah2019/affordablle-sustainable-housing-in-strategical-plans_2020_ctu-prague.pdf

Kraftová, Ivana, Šmidová, Jitka (2017) Diferenciační faktory bydlení a jejich změny v regionech české republiky. *Scientific Papers of the University of Pardubice, Series D: Faculty of Economics and Administration*, 24(39), p. 98-106.

Ministerstvo pro místní rozvoj ČR (2019) Vybrané údaje o bydlení 2018 (červen 2019). [online, June 2021]. Available: https://www.mmr.cz/cs/ministerstvo/bytova-politika/ statistiky-analyzy/statistiky-z-oblasti-bytove-politiky/ vybrane-udaje-o-bydlen/zde-bude-text

Mueller, Elizabeth J., Tighe, J. Rosie (2022) *The affordable housing reader*. Taylor and Francis, ISBN 978-100059482-9

MULLINER, Emma, SMALLBONE, Kieran, MALIENE, Vida (2013) An assessment of sustainable housing affordability using a multiple criteria decision making method. *Omega (United Kingdom)*, 41(2), p. 270-279.

Pill, M., Gurran, N., Gilbert, C., Phibbs, P. (2021) Strategic planning, „city deals“ and affordable housing. *AHURI Final Report*, n. 331, p. 1-64.

RAM, Padmini, NEEDHAM, Barrie (2016) Why is Public Policy for Affordable Housing in India

Changing So Slowly: Explaining Institutional Inertia. *Environment and Urbanization ASIA*, 7(2), p. 177-195.

RYAN-COLLINS, Josh (2019) Breaking the housing-finance cycle: Macroeconomic policy reforms for more affordable homes. *Environment and Planning A*, 53(3), p. 480-502.

SUHAIDA, M.S., TAWIL, M.M., HAMZAH, N. CHE-ANI, A.I., BARSI, H., YUZAINEE, M.Y. (2011) Housing affordability: A conceptual overview for house price index. *Procedia Engineering*, 20, p. 346-353.

SUNEGA, Petr, LUX, Martin (2013) Systémová rizika trhu bydlení v ČR. *E a M: Ekonomie a Management*, 16(4), p. 55-70.

SUNEGA, Petr, MIKESZOVÁ, Martina, LUX, Martin (2009) Příčiny regionálních nerovností ve finanční dostupnosti bydlení v ČR. *E a M: Ekonomie a Management*, 12(2), p. 55-75.

Tsenkova, Sasha (2021) *Cities and affordable housing: Planning, design and policy nexus*. Taylor and Francis, ISBN 978-100043383-8

WAKELY, Patrick (2019) Partnership: a strategic paradigm for the production & management of affordable housing & sustainable urban development. *International Journal of Sustainable Development*, 12(1), p. 119-125.

ŽUFAN, Pavel (2016) Development of costs of living in the south moravian region of the Czech Republic, and affordable housing. *Lecture Notes of the Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering LNICST*, 166, p. 598-604.

MULTI-FACTORS EVALUATION OF THE IMPACT OF THE STREET-LEVEL ON SEXUAL CRIME OCCURRENCES USING COMPUTER VISION AND BIG DATA: A CASE STUDY OF MANHATTAN (1120)

Yuxuan Cai[1], Hongqian Li[2], Shuyao Dai[3*]

[1] University of California, Berkeley, United States
[2] Tongji University, China
[3] University of Sydney, Australia; shuyao.dai.18@ucl.ac.uk

Abstract. Manhattan, a central US hub for economics and entertainment, consistently battles high crime rates. Despite existing research examining correlations between overall crime, spatial and sociodemographic factors, or urban architecture's influence on specific crimes, there's a dearth of empirical studies integrating street-level urban features and sociodemographic contexts in sexual crime analysis. This study employs computer vision, machine learning, and big data to investigate associations between Manhattan's urban environment and street-level sex crimes. Two initial Ordinary Least Squares (OLS) models examine the distribution of these crimes from macro-urban and micro-environmental perspectives. A Geographically Weighted Regression (GWR) model further explores local sex crime correlations with different spatial-scale variables. The results suggest a model incorporating multi-dimensional microenvironmental characteristics more effectively explains the incidence of sexual crimes.

Keywords: Sexual Violence, Semantic Segmentation, Space Syntax, Least Square Regression (OLS), Geographic Weighted Regression (GWR).

1. Introduction

In various public domains, incidents of sexual harassment and various forms of sexual assault against women and girls is prevalent globally. The city of New York presents a formidable challenge in guaranteeing the safety and security of people in public spaces (Syeda et al., 2020). Building on the theory that variations in environmental features can influence specific types of criminal activity (Taylor and Gottfredson, 1986), numerous studies have drawn connections between the physical urban environment and crime. Elements such as car parks, commercial buildings, street lights, and vegetation coverage (Ye et al., 2018) have been examined, revealing that the characteristics of crime hotspots significantly explain criminal behavior (Law and Chan, 2012).From a traditional sociological perspective, factors indicative of social inequality like demography, foreclosure, poverty, unemployment, educational level, and racial heterogeneity have also been instrumental in investigating the impact on crime (Arnio and Baumer, 2012; Raphael

and Winter-Ebmer, 2001). Since the 1960s, Geographic Information Systems (GIS) have been utilized in numerous crime-related studies. However, recent developments in AI, such as neural networks, machine learning, and random forests, have allowed for a more nuanced understanding of environmental and economic features how to affect crime. Combining these technologies with GIS enables a more detailed discussion of how varying physical environmental features can influence crime (McClendon and Meghanathan, 2015; Alves et al., 2018; Shah et al., 2021).

Inspired by previous studies and based on the hypothesis correlating socioeconomic and physical environmental features at the street scale in Manhattan with sexual crimes, this study adopts a multifactorial analytical framework. Firstly, the results of computer vision (CV) and spatial syntax analyses are used as variables to objectively evaluate the microscopic architectural environment of Manhattan. Secondly, socioeconomic and land use factors are considered to explore the macro environment. Lastly, two OLS models and a GWR model are employed to explore the correlation of these variables with incidents of sexual crime globally and at different local spatial scales, while investigating their spatio-temporal distribution.

2. Literature Review

Previous literature believes that the spatial characteristics of urban environments may directly impact criminal activity(Quick et al., 2018). As such, there is a need to understand their relationship in order to shape safe streets and gender-inclusive communities (Miranda et al., 2020). The recent developments in emerging technologies such as computer vision, machine learning, and big data make it possible to quantify the impact of street-level built environments on crime. Multi-scale analysis of street images and urban street information can effectively quantify the impact of the built environment on crime occurrence (Jing et al., 2021; Khorshidi et al., 2021; Su et al., 2022). However, previous research has concentrated mostly on the specific spatial location or economic features of total crime (He et al., 2022). Or concentrate on the impact of urban physical characteristics on specific crimes (Summers and Johnson, 2017), but little empirical research exists on the street-level social and environmental features and urban spatiotemporal scale associated with sexual crime (Lee et al., 2023).

2.1. Macroscopic - Urban Socioeconomic Factors with Crime

Quantifying socioeconomic features through census data is a fundamental approach to exploring the correlation between relevant variables and crime rates. Numerous studies have reported the impact of macro-scale urban, demographic, socio-economic, and land use factors on crime rates (Socia, 2016; Wang et al., 2019). Open data platforms for

various cities and platforms like OpenStreetMap provide data about urban infrastructure distribution and various urban features, enabling the exploration of linear and spatial relationships between features of different regions and the occurrence of crimes (Lee and Lee, 2020).

2.2. Micro-Urban Street Assessment and CPTED Theory

Street feature assessments have traditionally been conducted through designing and distributing surveys to obtain subjective community evaluations. However, these subjective evaluations based on surveys are somewhat limited in their interpretation of human perceptions. Alternatives, such as exploring street emotional features through social media data (Tang et al., 2022), suffer from low accuracy due to data precision and inherent biases in social media data.

In recent years, environmental feature frameworks, developed from criminological theories like Crime Prevention Through Environmental Design (CPTED), have emphasized the impact of spatial factors on criminal behavior and victims. This allows visual and infrastructure elements of public spaces to be better utilized for quantifying the relationship between street features and criminal incidents (He et al., 2022). With the diversification and convenience of open data platforms like Google Street View, remote sensing images and machine learning technologies are used to define street features and assess environmental street characteristics through computer vision (CV) .

Advanced convolutional neural network technologies like Pyramid Scene Parsing Network (PSP-Net) and Mask R-CNN allow for more precise separation and evaluation of environmental features in street view images. In terms of objective street environment evaluation, spatial syntax serves as a concept and analytical method for understanding the morphological logic of urban grids from urban design and architectural perspectives (Hillier, 2007). Combined with urban morphology and socioeconomic factors, it enables a more comprehensive measurement of urban space (Alabi, 2021).

Spatial syntax also provides an integrated framework for describing the shape and structure of environments, allowing for the quantitative formulation and testing of theories about environmental behavior and emotional responses (Franz and Wiener, 2008). The combination of these technologies enables a more comprehensive assessment of the street environment and facilitates the exploration of correlations between urban environments and crime rates.

3. Method and Data

We propose a method that combines different analysis techniques (corresponding to

different city scale levels) and successfully unifies them at the street level. This allows the results of different analyses to be compared and studied at the same level. Further correlation studies on these different analytical data allow us to reveal the potential relationship that may exist between criminal activities and urban space from a data science perspective. Based on these results, we further propose strategies and suggestions on how to intervene and propose safer urban space design.

This study primarily utilized multiple open databases, including US Census, POI data, 21,073 Google Street View images, 100,252 total crime reports, and 14,305 sex crime reports. Through techniques such as spatial syntax (Hillier, 2007), Geographic Information Systems (GIS), and the Pyramid Scene Parsing Network (PSPNet) (Zhao et al., 2017), These techniques allow us to study and process data, mainly from multiple dimensions, in both the physical and the social environments. Specifically, guided by the theory of crime prevention through environmental design (CPTED; Jeffery, 1971), this study considers 38 physical and 10 social environmental variables.

In the physical environmental assessment is focusing on using the PSPNet model based on the ADE20K dataset to extract streetscape pixels, performing physical feature classification based on visual index values and pixel percentages, quantifying the results on a street scale using a GIS system, on the side to evaluating street-scale environmental connectivity, integration, mean depth using the spatial syntax.

Part of the social environmental assessment focuses on using the extraction of land use and POI data, as well as American Community Survey (ACS) data, to quantify Manhattan's social environmental characteristics at the street level using GIS, and analyzing the spatial and temporal distribution of crime using NYPD crime report data to build a spatial-temporal cube and analyze distribution patterns of crime at the street level. Finally, based on the aforementioned. This study two Ordinary Least Squares (OLS) models are introduced for the analysis, exploring the distribution patterns of street-level sex crimes from both macro urban features and micro-environmental characteristics perspectives. This provides recommendations for safer city planning and crime intervention. Ultimately, by selecting variables, a Geographically Weighted Regression (GWR) model is constructed to locally explore the correlation between sex crimes and variables at different spatial scales. The fit results of each model are compared to determine the optimal explanatory model. Help to suggesting recommendations for spatial matching of urban resources and policies.

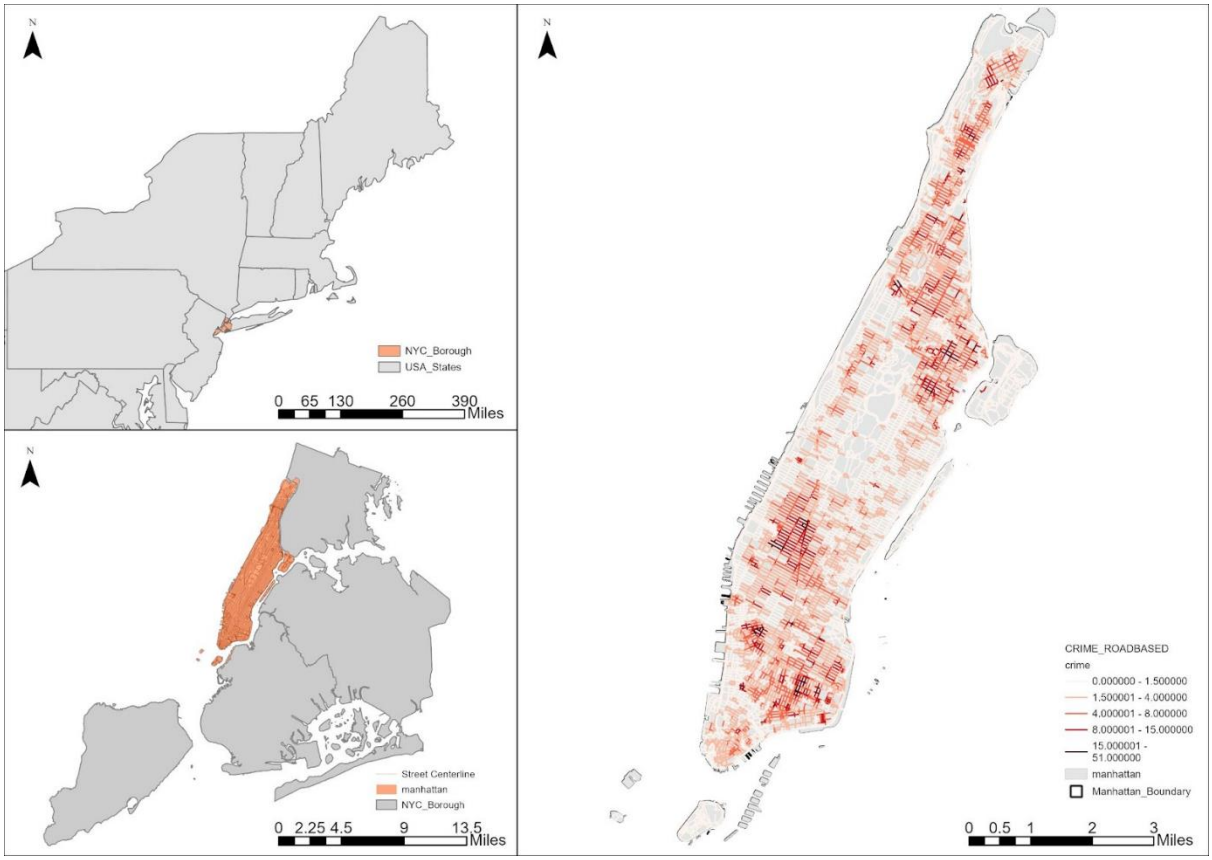


Figure 1. Study area: Manhattan & sexual crime reports

3.1. Study Area

Manhattan, the core urban part of New York City, has a population of approximately 1.6 million people. The city encompasses a variety of land uses, including residential, commercial, and industrial. With its high population density and advanced economic and cultural development, it also has a high crime rate. This study aims to identify correlations between crime occurrence rates and urban features within a multi-factorial framework, centering on specific target locations. The case study area will primarily focus on the urban street level. The data for the entire area comprises polylines of 13,149 street units (Figure 1).

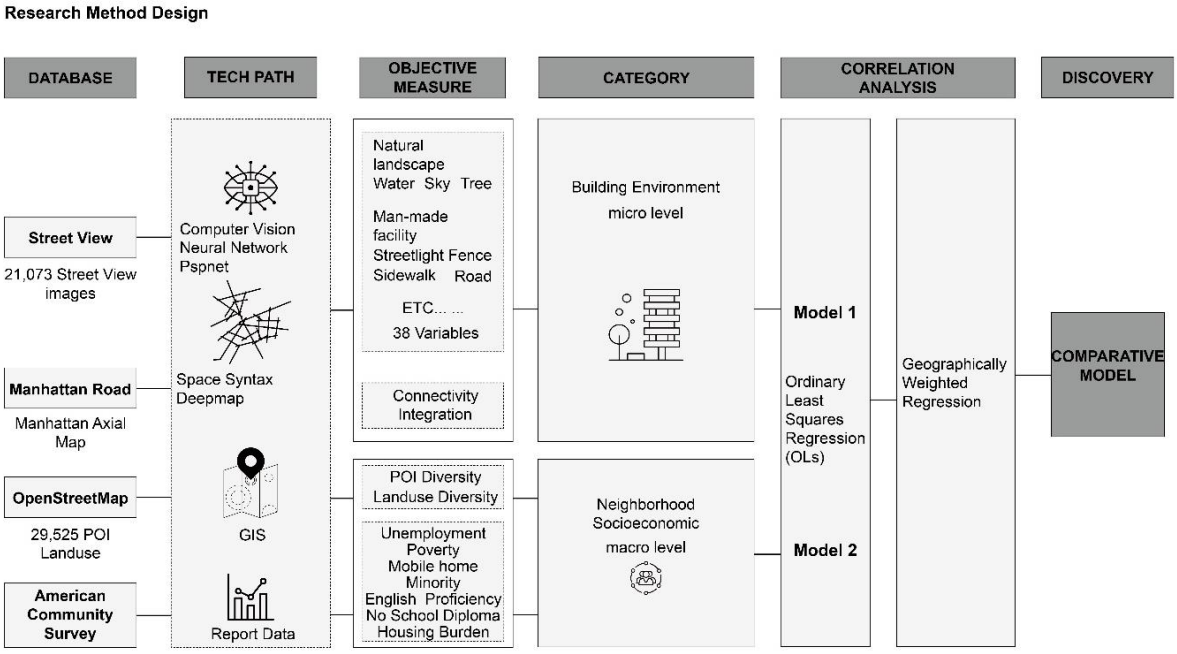


Figure 2. Research Method Design

3.2. Study Design

The research framework for our investigation is delineated in four steps, as illustrated in (Figure 2). This study is designed to address the pivotal issue, exploring the key factors in assessing criminal activities at both the micro level - architectural physical environment, and the macro level - neighborhood socioeconomic characteristics.

In terms of evaluating the architectural physical environment, we first employ SVI, and CV, for objective assessments. The focus lies on extracting streetscape pixels using the PSPNet model based on the ADE20K dataset. The physical features are classified based on visual index values and pixel percentages, segmenting the image content into 38 variables. Furthermore, by employing spatial syntax, two variables related to street-scale environmental connectivity and integration are incorporated into this system for evaluation. Subsequently, on the macro level of Neighborhood Socioeconomic characteristics, the assessment is conducted by selecting seven principal factors related to social vulnerability, encompassing socioeconomic and educational elements, as well as the diversity of points of interest (POIs) as the main variables. Thirdly, these factors are quantified at the street level through the application of The Geographic Information System (GIS). Lastly, using the aforementioned data, this study establishes an Ordinary Least Squares (OLS) regression model, a space-time cube hotspot distribution, as well as a Multiscale Geographically Weighted Regression (GWR) model. These are used to

elucidate the relationship between criminal activities in Manhattan and urban characteristics, as well as their spatiotemporal distribution features.

3.3. Dependent Variable

As we delve into the relationship between the environmental backdrop of Manhattan and sexual crimes, a comprehensive dataset was necessitated. Thus, we sifted through the NYPD Complaint Data, procured from the NYC open data platform, isolating 14,305 reports of sexual crimes from a total of 100,252 reports, which were then collated to serve as the dependent variable.

The NYC open data platform is a public resource released by New York City agencies and other partners, that includes NYPD Complaint Data, regularly updated by the NYPD. Detailed within the annual historical crime data reports for Manhattan, from January to December 2022, each crime record is inclusive of the precise date of occurrence, the coordinates of the incident (longitude and latitude details), offense classification code, and level of offense. This invaluable resource proved instrumental in facilitating our study and its objectives.

3.4. Independent Variables

To foster a more nuanced understanding of the dynamics behind sexual crimes in Manhattan, our study proposes a bifocal perspective, dissecting the independent variables into two conceptual frameworks: Microscopic and Macroscopic.

In the Microscopic context, we studied:

1) Street Image Objective Features Measure: With the help of computer vision technology, we segmented and analyzed visual elements within the environment, with the proportional representation of different elements serving as variables.
2) Space Syntax: DeepMap software was used to analyze the structural layout of Manhattan's streets, with selected outcomes used as explanatory variables.

Switching to the Macroscopic lens, our study incorporated:

1) Point of Interest (POI) Diversity & 2) Land-use Diversity: The Shannon Index formula was employed to evaluate the diversity of land use and POI attributes within the buffer zone of the streets.
2) Socioeconomic Characteristics: Drawing from the CDC's Social Vulnerability Index (SVI) 2020 project, itself reliant on the American Community Survey (ACS) five-year estimates from 2016 to 2020, we selected seven facets of socioeconomic characteristics as integral parts of our inquiry.

By employing this dual framework, our study aims to draw a more comprehensive picture of the interplay between environmental factors and the incidence of sexual crimes in Manhattan.

3.4.1. Microscopic - Google Street Image Sampling and Objective Features Measure

Google Street View (GSV) data was crawled from the Google Maps Developer platform (https://developers.google.com/maps). In this study, sample points were generated within the urban range of Manhattan, with each sample point yielding a GSV image. Each image measures 800x400 pixels, with a vertical angle of 0◦ (pitch = 0, fov ='90'). Street View Images (SVI) for each sampling point can be downloaded by providing unique coordinates via the Google Street View (GSV) API and visualized in GIS. Ultimately, 21,073 street-view images of Manhattan were collected. To better segment the proportion of pixels for characteristic visual elements in the images, such as buildings, trees, sidewalks, and other typical elements, the Pyramid Scene Parsing Network (PSPNet) was used. This method automates the collection of this information for visualization, allowing for the classification and distinction of different visual elements in the image, and calculating the percentage of each feature in the total image pixels. This data serves as variables to measure the relationship between spatial features and sexual crimes (Figure 3).

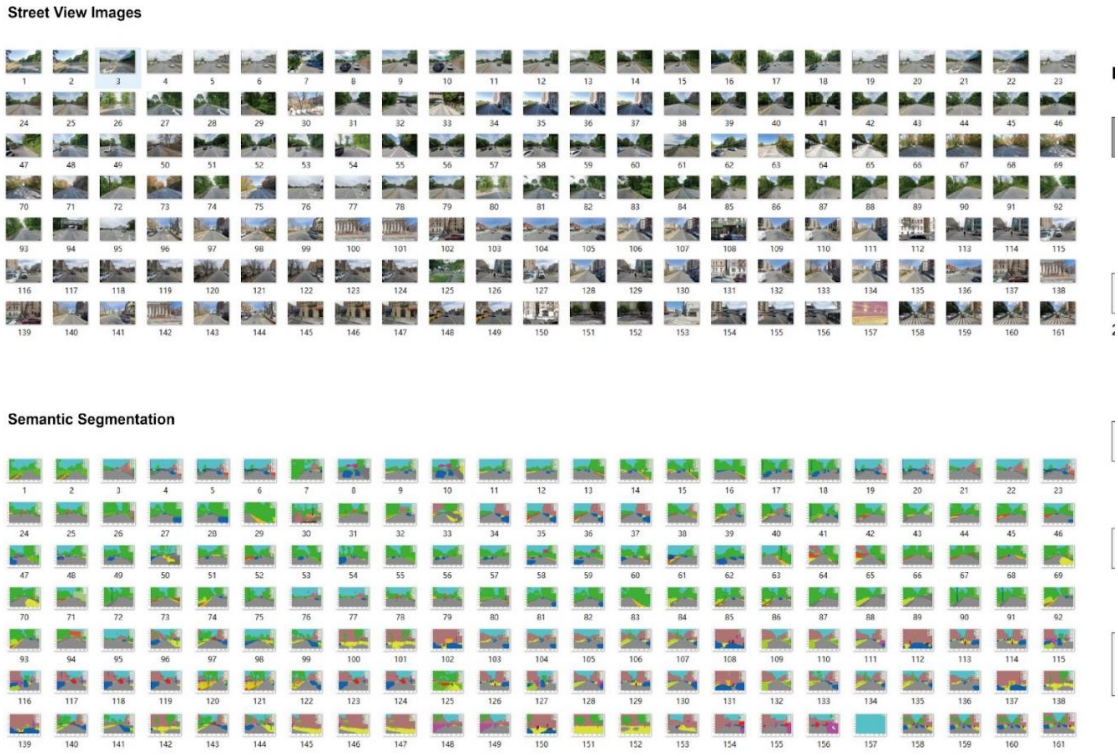


Figure 3. SVI Semantic Segmentation

3.4.2. Microscopic - Space Syntax Features Measure

Space syntax can strictly represent and analyze the urban spatial structure. An analysis of Manhattan streets was conducted using space syntax analysis software, with 'integration' serving as the most effective standard for measuring site accessibility in the results of space syntax analysis, and 'connectivity' is an important indicator for measuring site street connectivity (Talavera-Garcia, 2012). Therefore, 'integration' and 'connectivity' were chosen as two variables for measuring street scale (Figure 4).

3.4.3. Macroscopic - Point of Interest(POI) Diversity

POI attributes are extremely useful for crime prediction, allowing for accurate differentiation between high-risk and low-risk areas (Cichosz, 2020). POI diversity also serves as an important indicator of urban vitality (Tu et al., 2020). Therefore, 29,525 POI data points within the urban range of Manhattan were obtained through the OpenStreetMap platform (https://www.openstreetmap.org/), and the results were classified and mapped at the street level. In the formula, SWD represents the diversity index, 'pi' denotes the proportion of the number of points of interest (POI) of type 'i' within the grid, relative to the total number of POIs of all types. 'm' refers to the total number of unique POI types within the grid.

$$SWD(POI) = -\sum_{i=1}^{m} pi \times ln\, p\, i$$

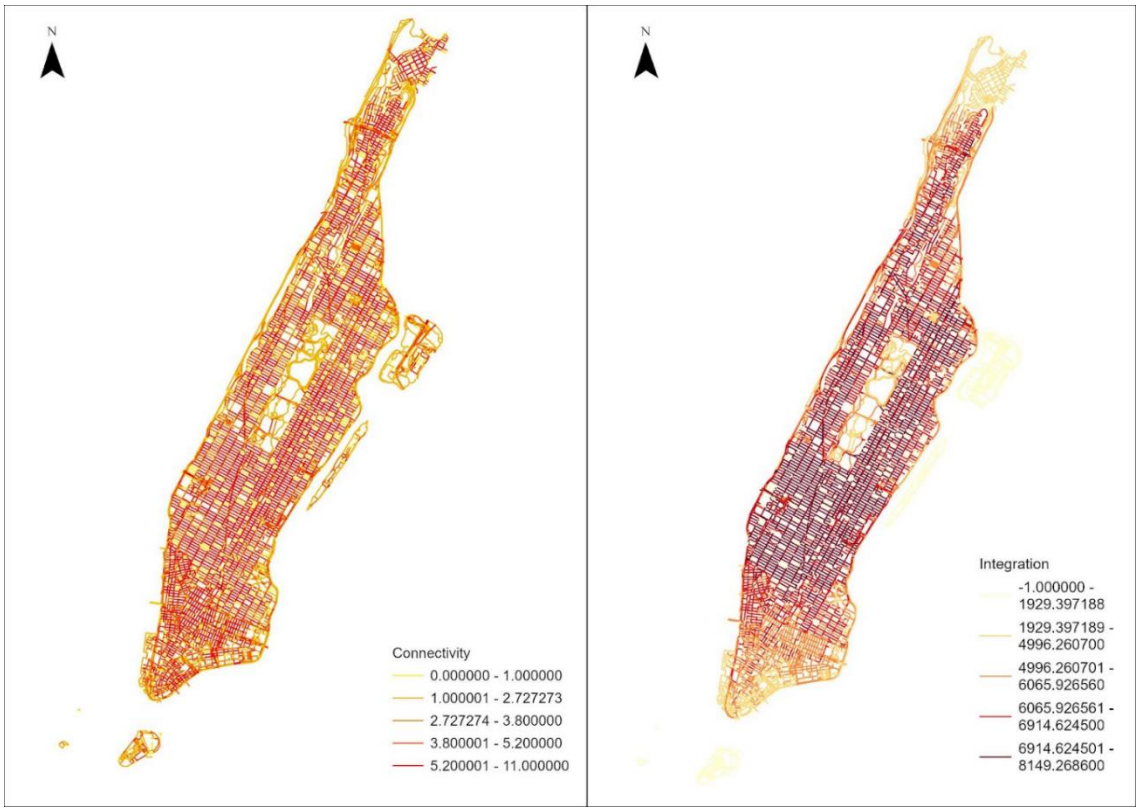


Figure 4. Space syntax distribution

3.3.4. Macroscopic -Socioeconomic Characteristics of Manhattan

Seven variables related to economy, education, and housing were obtained from the Social Vulnerability Index (SVI) database released by the CDC in 2020, serving as the main socioeconomic variables. The SVI encompasses diverse data on social, economic, and residential environments and can effectively predict community crime risk (Polcari et al., 2022).

3.3.5. Macroscopic -Landuse Diversity

In this study, land use data was collected from the MapPLUTO project, a public repository maintained by the New York City Department of City Planning. Our methodology involved constructing a buffer zone extending 100 meters from all roadways in the city, encompassing the variety of land use types within this buffer zone. These types were subsequently quantified as percentages of the total land use within the defined area. To assess diversity in land use, we utilized the Shannon diversity index (SDI), a quantitative measure widely used in environmental and ecological studies to capture the species

diversity in a community. Here, 'species' is metaphorically used to refer to different types of land use within our buffer zone.

In the formula for SDI, denoted by SWD, 'pi' represents the proportion of the area occupied by the ith land use type within the grid, and 'm' refers to the total number of distinct land use types. Specifically, SDI is calculated as:

$$\mathrm{SWD(LANDUSE)} = -\sum_{i=1}^{m} \mathrm{pi} \times \ln \mathrm{p\,i}$$

where 'i' ranges from 1 to 'm', and 'pi' represents the proportion of each land use type 'i'. The SDI achieves its maximum value when all land use types cover an equal proportion of the area within the buffer zone. This indicates maximum diversity, or equality in the distribution of different land use types. Conversely, the SDI value becomes zero when only one land use type is present within the area, representing a lack of diversity in land use.

This quantitative analysis of land use in New York City provides a crucial framework for understanding urban dynamics in major cities, with potential implications for urban planning and policy.

Table 1. Primary Variables

Variables	**Data Source**	**Data Description and Extraction**	**Reference**
Macroscopic Sociodemographic Factors			
Poverty	2016-2020 ACS	Persons below 150% poverty estimate	Centers for Disease Control and Prevention/ Agency for Toxic Substances and Disease Registry/
Unemployed		Civilian (age 16+) unemployed estimate	
Housing Cost Burden		Housing cost-burdened occupied housing units with annual income less than $75,000 (30%+ of income spent on housing costs) estimate,	

No High School Diploma		Persons (age 25+) with no high school diploma estimate	Geospatial Research, Analysis, and Services Program. CDC/ATSDR Social Vulnerability Index 2020 Database NYC.
English Proficiency		Persons (age 5+) who speak English "less than well" estimate	
minority		People of color	
mobile home		Mobile homes estimate	
POI diversity	Open Street Map- 29,525 POI	Number of Poi species	openstreetmap.org
Landuse Diversity	Open Street Map	Number of *Landuse* species	openstreetmap.org
Microscopic- Built Environment			
sky, tree, road, grass, person, earth, mountain, car, fence, water, street light, wall, building, plant, signboard, sidewalk, chair, awning, railing, skyscraper, bridge, bicycle, van, ceiling, column, windowpane, ashcan, sculpture, minibike, pier,	21,073 Google Street Image	PSP Net semantic segmentation framework was used in Python.	

fountain, bulletin board, lamp, booth, lake, sofa, desk, glass.			
Connectivity, Integration	NYC Open Data- NYC Street Centerline	Space Syntax	URL:https://data.cityofnewyork.us/d/exjm-f27b?category=City-Government&view_name=NYC-Street-Centerline-CSCL-

4.1. Descriptive Statistics of the Segmentation

We computed the view indices for thirty-nine physical attributes using training images with the aid of a PSPNet pre-trained semantic segmentation algorithm, based on a standard formula. According to the Crime Prevention Through Environmental Design (CPTED) theory, there is a significant correlation between physical environmental factors and urban crime, as shown in Table 2.

Table 2. Descriptive Statistics of the Segmentation

	sky	**tree**	**road**	**grass**	**person**	**earth**	**mountain**	**car**
mean	0.147958	0.141806	0.213156	0.021477	0.005228	0.018091	0.002029	0.074557
std	0.142800	0.103547	0.060962	0.044363	0.008684	0.031900	0.012527	0.045819
min	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
max	0.997859	0.647649	0.422518	0.440359	0.164002	0.350594	0.233836	0.259734
	water	**fence**	**streetligh**	**wall**	**building**	**plant**	**signboard**	**sidewalk**
mean	0.007074	0.027355	0.001329	0.042803	0.292240	0.016421	0.004970	0.053154
std	0.032149	0.039137	0.001888	0.067739	0.148743	0.025722	0.005993	0.038776
min	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
max	0.442109	0.371488	0.023824	0.838697	0.741828	0.319149	0.136176	0.329730
	chair	**awning**	**railing**	**skyscraper**	**bridge**	**bicycle**	**van**	**ceiling**
mean	0.000439	0.003554	0.011594	0.004227	0.014483	0.002877	0.015880	0.034981
std	0.002633	0.007390	0.018556	0.013693	0.034754	0.008893	0.028185	0.075380

min	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
max	0.047887	0.109641	0.275492	0.151884	0.343323	0.124076	0.357352	0.444954
	column	**windowpane**	**ashcan**	**sculpture**	**minibike**	**pier**	**fountain**	**bulletin b**
mean	0.003199	0.002470	0.001642	0.000310	0.001437	0.000513	0.000499	0.000218
std	0.011466	0.019797	0.003775	0.002535	0.003959	0.003488	0.003759	0.004687
min	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
max	0.173672	0.702074	0.058778	0.039414	0.047719	0.142441	0.061766	0.273859
	lamp	**booth**	**lake**	**sofa**	**desk**	**glass**		
mean	0.000007	0.000010	0.000139	0.000007	0.000038	0.000013		
std	0.000095	0.000271	0.003387	0.000215	0.000991	0.000326		
min	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000		
max	0.002248	0.011605	0.082871	0.008246	0.029301	0.010043		

4.2. Spatial and Temporal Distribution

Utilizing GIS PRO, the study uses the "CMPLNT_FR_DT" field (exact date of the reported event or the starting date of occurrence, if exists) in the sexual crime database as the time range for statistical analysis, aligning with the end time as the Time Step Alignment. The

data was aggregated in square grids of 200 meters on each side at hourly intervals (Time Step Interval).

According to the distribution results, most regions did not exhibit significant trends. However, certain areas such as Downtown Manhattan, Midtown Manhattan, and parts of the Upper West Side showed an increasing trend, with crime rates escalating towards the evening. Contrarily, some areas like parts of the Upper East Side displayed an opposite pattern. Sexual crimes appeared to have some 'sporadic hot spots' in areas like Downtown Manhattan, Midtown Manhattan, and Harlem (Figure 5).

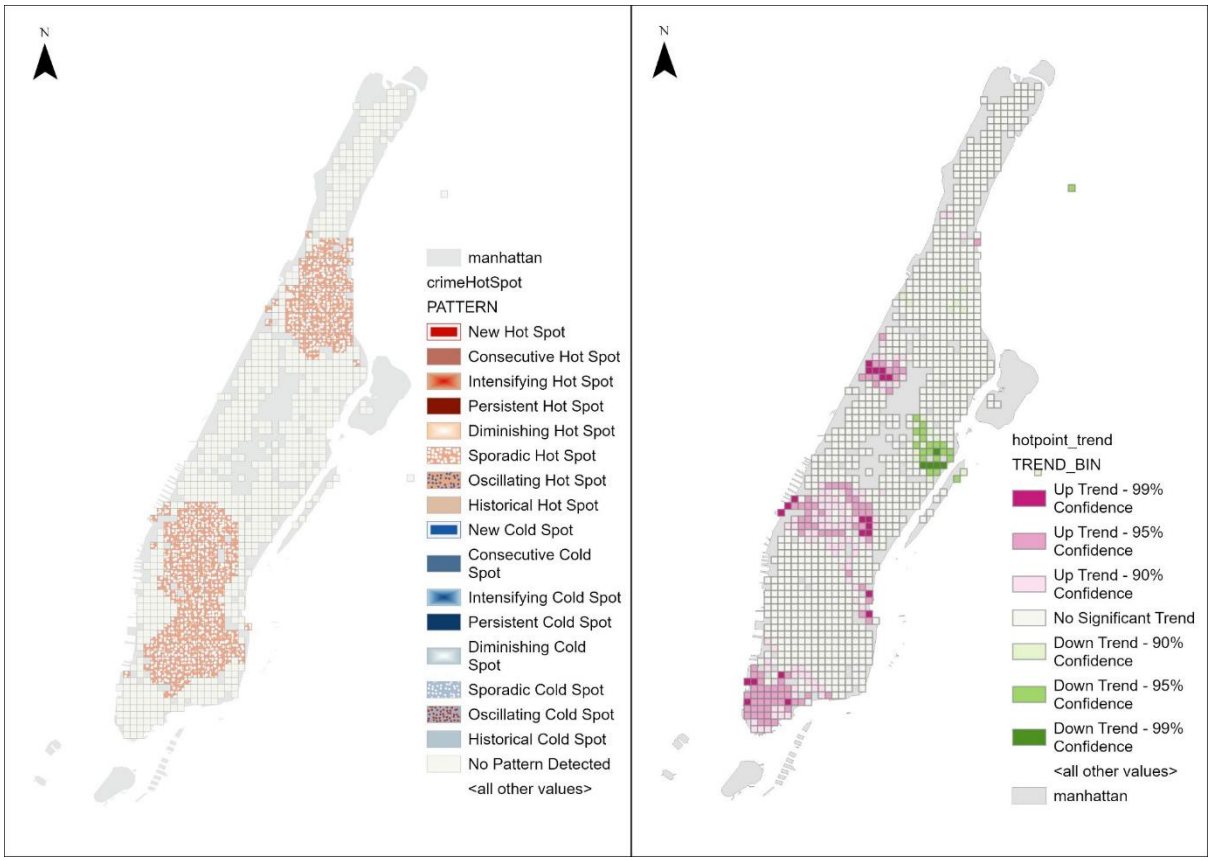


Figure 5. Temporal-spatial hotspot trends

4.3. Correlation Analysis of Independent Variables

To ascertain the presence of any relationships between criminal behavior and other scale variables, an analysis is conducted through the parsons correlation analysis.

4.3.1 Correlation Analysis of Physical Environment Variables *and Sexual Crime Rate*

Based on Parsons correlation analysis, it is evident that the crime rate is significantly negatively correlated ($p<0.01$) with indicators such as sky, tree, grass, earth, mountain, water, fence, streetlight, wall, plant, railing, skyscraper, bridge, ceiling, column, ashcan, and pier. It is also negatively correlated ($p<0.05$) with road and sculpture indicators. This implies that as the presence of sky, tree, grass, earth, mountain, water, fence, streetlight, wall, plant, railing, skyscraper, bridge, ceiling, column, ashcan, pier, road, and sculpture increases, the incidence of crime decreases. The increase in elements associated with the natural environment, such as sky, tree, grass, earth, mountain, and water, leads to a lower crime rate. Similarly, as monitoring elements like fence, streetlight, and wall increase, the occurrence of crime decreases, aligning with the majority of research findings.The crime rate shows a significant positive correlation ($p<0.01$) with indicators such as person, car, building, awning, bicycle, van, minibike, fountain, lake, connectivity, integration, land use diversity, and poi diversity. This suggests that as the presence of person, car, building, awning, bicycle, van, minibike, fountain, lake, connectivity, integration, land use diversity, and poi diversity increases, the crime rate tends to be higher. Some of these correlations align with the conclusions drawn in most previous studies. However, certain results deviate from the findings of previous research. For instance, indicators representing surveillance measures such as person, car, bicycle, van, and minibike contradict the notion proposed by the natural surveillance theory that higher human presence leads to lower crime rates. Furthermore, while it would be expected that an increase in certain natural environmental indicators such as fountain and lake would result in a lower crime rate, this study found that a higher presence of these indicators is associated with a higher incidence of crime. This suggests that sexual crimes primarily concentrate in areas with high population density, complex land use, and high accessibility, where the presence of others does not necessarily prevent sexual offenses. The probability of crime occurrence is comparatively higher in environments such as fountains and lakes.

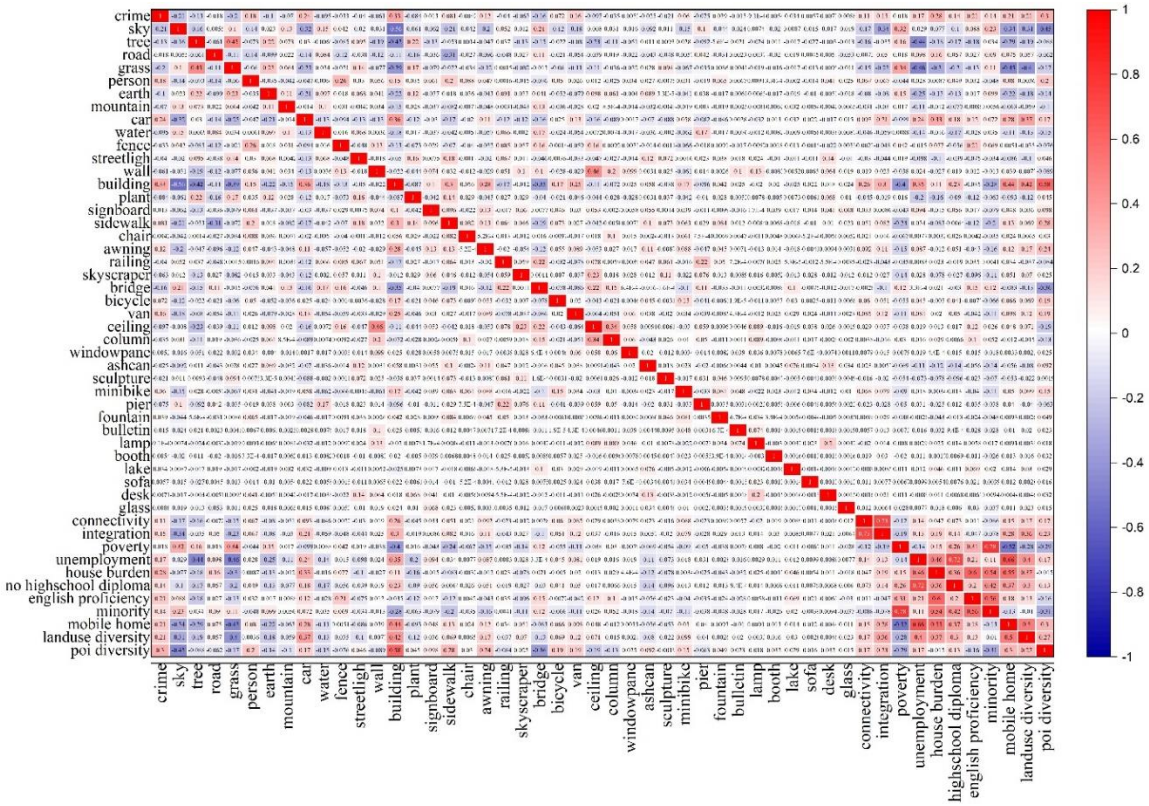


Figure 6. Correlations

4.3.2 Correlation Analysis of Socioeconomic Variable Indicators and Sexual Crime Rate

The crime rate exhibits a significant positive correlation with indicators such as unemployment, house burden, no high school diploma, English proficiency, minority, and mobile home ($p<0.01$). It is also positively correlated with poverty. This indicates that as unemployment, house burden, no high school diploma, English proficiency, minority, mobile home, and poverty increase, the crime rate tends to be higher, aligning with the conclusions of most research papers (Figure 6).

4.4. Regression Results

Two Ordinary Least Squares (OLS) models are instrumental in interpreting the global correlation between macro and micro variables and sexual crime. It provides a broad perspective on the relationship by utilizing data from the entire study area, offering a comprehensive understanding of the interplay between various independent variables and sexual crime on a large scale. However, while the OLS model provides valuable insights at the global level, it may not adequately capture the nuances of local spatial variations

and their impact on crime rates. The GWR model complements the global perspective provided by the OLS model by examining the correlation at a local level. It does this by focusing on spatial units within Manhattan, analyzing the local spatial variations and the influence they have on the correlation with sexual crime. This allows for an exploration of how relationships between variables may change in different locations within the same city. These offer a more holistic perspective, allowing us to discuss the correlation between sexual crimes and various variables from both a global and local viewpoint. This combination results in a nuanced and comprehensive understanding of the intricate relationships at play, which can inform more effective strategies for addressing and preventing sexual crimes in different areas.

4.4.1 OLS Regression Result of Physical Built Environment Indicators and Sexual Crime Rate

Through the construction and analysis of an Ordinary Least Squares (OLS) regression model, the following outcomes were obtained (Table 3): Variance Inflation Factor (VIF) values for indicators were less than 7.5, the model's R-squared value was 0.28, and the Akaike's Information Criterion (AIC) was 65525.93. Among the physical built environment indicators, trees, population count, cars, buildings, awnings, railings, trucks, posts, fountains, light fixtures, lakes, integration, and POI diversity demonstrated significant positive correlations with the sexual crime rate. These findings align with the majority of existing literature. However, a divergence was observed regarding the correlation of people and mixed land use, where urbanists commonly perceive mixed land use and density as beneficial for increasing "eyes on the street" and facilitating natural surveillance of the community (Grant, 2002; Jacobs, 1961). This study found that POI diversity and population indicators were positively correlated with crime, suggesting that the surveillance effect of street users might have been overstated (Kitchen & Schneider, 2007).

On the other hand, sky, grass, ground, water, fences, vegetation, chairs, bridges, ceilings, window glass, trash cans, docks, display stands, desks, and glass showed significant negative correlations with crime rates. Most of these outcomes are in line with existing theories. For example, the study found that the window glass index was negatively correlated with the crime rate, suggesting that the presence of windows might deter potential criminals due to the risk of being observed. This perspective is supported by the Crime Prevention Through Environmental Design (CPTED) theory, which proposes that windows provide opportunities for natural surveillance. Likewise, the negative correlation between the fence index and the crime rate supports the CPTED conclusion that fences promote territoriality (Cozens et al., 2005). Natural landscape elements such as grass, sky, ground, and vegetation showed negative correlations with crime rates, potentially due to the calming effects of green spaces reducing anger and impulsive criminal behavior in potential offenders (Kuo & Sullivan, 2001; Markevych et al., 2017).

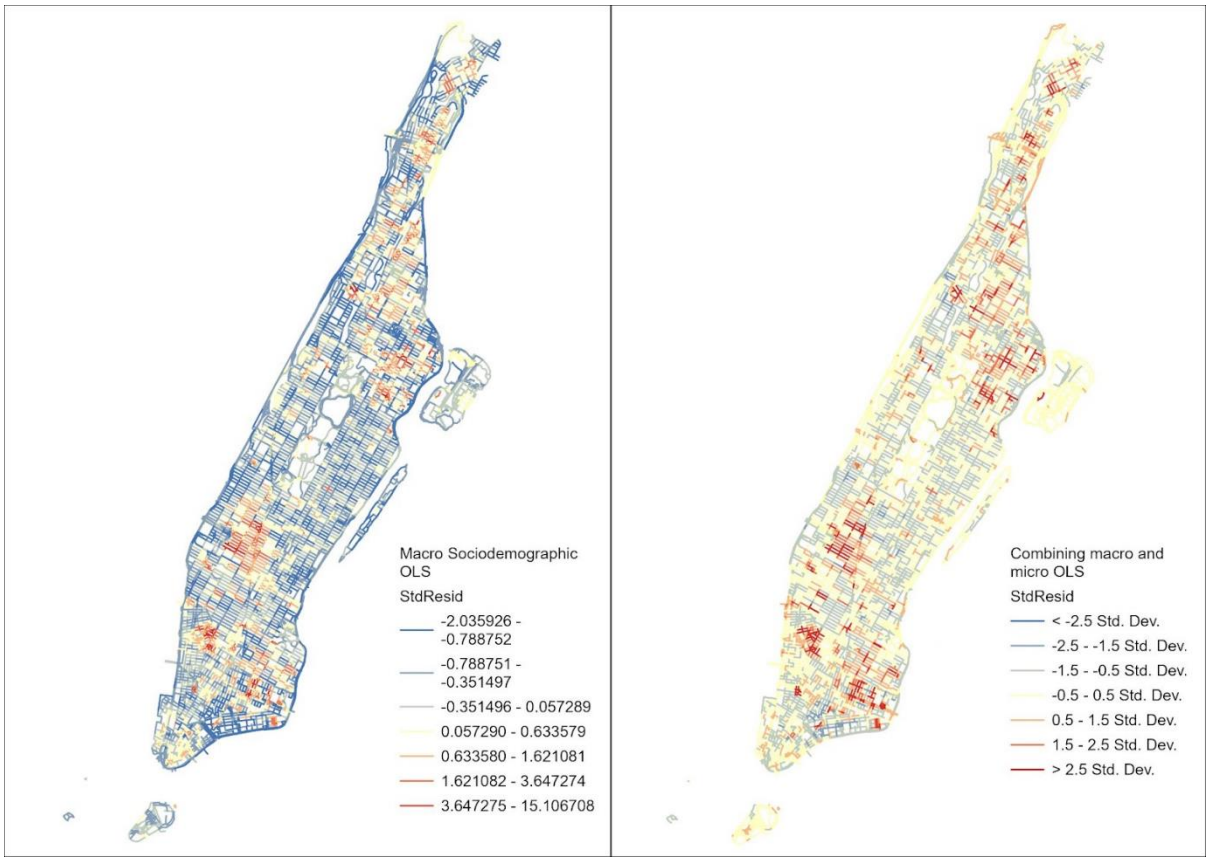


Figure 7. OLS StdResid

4.4.2 OLS Regression Result of Socioeconomic Factors Indicators and Sexual Crime Rate

In socio-economic factors, poverty, unemployment, housing burden, English proficiency, and minority populations demonstrated a significant positive correlation with the crime rate. Among the socio-economic indicators, a high school diploma showed a significant negative correlation with the crime rate, with a regression coefficient of -0.003. This aligns with previous literature endorsing the idea that social instability and structural defects could precipitate criminal activity (Hipp, 2007; Merton, 1938).

Table 3. Combining Macro and Micro Variables OLS

Variable	Coefficient [a]	Standard Deviation	T-statistic	Probability [b]	Robust_SE	Robust_T	Robust_Pr [b]	VIF [c]
intercept	-2.651756	0.321006	-8.260768	0.000000*	0.276944	-9.575073	0.000000*	--------
SKY	-0.764395	0.31616	-2.417752	0.015616*	0.269252	-2.838961	0.004538*	3.146977
TREE	0.794407	0.44803	1.77311	0.076239	0.391417	2.029568	0.042410*	3.322918
ROAD	-0.380168	0.538673	-0.70575	0.48035	0.436894	-0.87016	0.384214	1.66495
GRASS	-5.59241	0.77856	-7.183021	0.000000*	0.536225	-10.429227	0.000000*	1.841808
PERSON	53.911491	3.241885	16.629674	0.000000*	12.942742	4.165384	0.000037*	1.223669
EARTH	-1.587011	0.889425	-1.784311	0.074401	0.720655	-2.202179	0.027654*	1.242874
MOUNTAIN	0.515269	2.126655	0.242291	0.808561	1.316906	0.391272	0.695618	1.095715
CAR	3.318511	0.799273	4.151912	0.000039*	0.738374	4.494348	0.000009*	2.070646
WATER	-2.851314	0.856781	-3.327937	0.000894*	0.541949	-5.261222	0.000000*	1.171425

FENCE	-5.971515	0.746009	-8.004619	0.000000*	1.043064	-5.724976	0.000000*	1.316076
STREETLIGH	1.391336	14.32092	0.097154	0.922588	13.03323	0.106753	0.91497	1.128374
WALL	-0.643753	0.444765	-1.447401	0.147824	0.415351	-1.549901	0.121205	1.401424
BUILDING	4.444403	0.386985	11.48469	0.000000*	0.362907	12.24668	0.000000*	5.115516
PLANT	-5.641156	1.077079	-5.23746	0.000000*	1.065421	-5.294764	0.000000*	1.185053
SIGNBOARD	-9.276641	4.418061	-2.099709	0.035760*	5.16918	-1.794606	0.072744	1.082366
SIDEWALK	-0.18069	0.845521	-0.213703	0.830779	0.854076	-0.211562	0.832449	1.659595
CHAIR	-26.721652	9.927091	-2.691791	0.007114*	8.512782	-3.139003	0.001714*	1.054951
AWNING	14.129977	3.719611	3.798778	0.000157*	4.33014	3.263169	0.001121*	1.166626
RAILING	6.648851	1.495067	4.447191	0.000012*	1.3054	5.093344	0.000001*	1.188267
SKYSCRAPER	-1.921334	2.003828	-0.958832	0.337647	1.533459	-1.252941	0.210255	1.162421

BRIDGE	-3.325639	0.910838	-3.651184	0.000276*	0.645964	-5.148337	0.000001*	1.547105
BICYCLE	0.173516	2.965109	0.058519	0.95332	2.839892	0.061099	0.951265	1.073493
VAN	9.477358	0.949195	9.984625	0.000000*	1.308899	7.240709	0.000000*	1.105024
CEILING	-1.207572	0.447653	-2.697563	0.006992*	0.347941	-3.470621	0.000537*	1.758013
COLUMN	4.467661	2.445834	1.826642	0.067779	1.489489	2.99946	0.002721*	1.214216
WINDOWPANE	-2.9697	1.301632	-2.281521	0.022517*	0.728679	-4.075459	0.000053*	1.025148
ASHCAN	-33.1705	7.163687	-4.630367	0.000005*	5.343961	-6.2071	0.000000*	1.128836
SCULPTURE	12.627669	10.368085	1.217937	0.223273	6.580338	1.919	0.055002	1.066253
MINIBIKE	-0.962461	6.729257	-0.143026	0.886258	7.199626	-0.133682	0.893642	1.095992
PIER	-18.108469	7.807524	-2.319361	0.020374*	4.068016	-4.451425	0.000011*	1.145227
FOUNTAIN	24.142161	6.886839	3.505555	0.000473*	11.719357	2.060024	0.039404*	1.034422
LAMP	25.040477	278.390805	0.089947	0.928313	191.368957	0.130849	0.895882	1.074156

BOOTH	-191.259368	94.328423	-2.02759	0.042612*	45.755077	-4.180069	0.000035*	1.007448
LAKE	20.366474	7.678675	2.652342	0.007999*	6.864852	2.966776	0.003025*	1.044417
SOFA	-61.392527	118.730752	-0.517074	0.605125	52.635641	-1.166368	0.243486	1.008577
DESK	-52.139247	26.873655	-1.940162	0.052376	14.947503	-3.488158	0.000504*	1.095096
GLASS	-59.918615	78.588649	-0.762433	0.445804	22.27023	-2.690525	0.007141*	1.014534
CONNECTIVI	-0.001431	0.02152	-0.066515	0.946952	0.020886	-0.068534	0.945345	2.646905
INTEGRATIO	0.000034	0.000018	1.904941	0.056807	0.000017	1.975222	0.048257*	3.151839
POVERTY	0.007534	0.002633	2.860943	0.004236*	0.002501	3.012429	0.002608*	6.588402
UNEMPLOYME	0.000662	0.00024	2.762894	0.005738*	0.000155	4.260338	0.000025*	5.975327
HOUSE_BURD	0.011806	0.003503	3.370224	0.000770*	0.003381	3.492036	0.000497*	4.562402
NO_HIGH_SC	-0.003156	0.000287	-10.993428	0.000000*	0.000228	-13.840033	0.000000*	4.928765
ENGLISH	0.035307	0.003828	9.223058	0.000000*	0.004455	7.925624	0.000000*	2.252184

MINORITY	0.025275	0.002232	11.324862	0.000000*	0.002078	12.164131	0.000000*	6.641822
MOBILE_HOM	0.000153	0.000202	0.757425	0.448798	0.000132	1.163984	0.24445	5.445775
LANDUSE_Diversity	0.005251	0.068942	0.076166	0.939271	0.068156	0.077044	0.938572	1.800504
POI_Diversity	0.6707	0.037388	17.938823	0.000000*	0.037463	17.902851	0.000000*	2.001219

4.4.3. Geographically Weighted Regression (GWR)

In the occurrence recognized as spatial non-stationarity, a Geographically Weighted Regression (GWR) model is employed to elucidate spatial disparities that global Ordinary Least Squares (OLS) models inadequately explain (Iyanda et al., 2022). The preliminary global dataset consisted of 49 variables. In an effort to prevent multicollinearity complications, variables displaying high Variance Inflation Factors (VIF) and prominent mutual correlations were omitted following correlation and OLS ordering procedures. This step led to the removal of 33 variables, leaving 19 within the macro and micro to operate the GWR model (Table 4).

With regard to the distribution of local R^2, areas in Manhattan where the GWR model demonstrated superior explanatory power include the southwestern region of Downtown Manhattan, Midtown Manhattan, the northern part of Upper East Side, and Harlem. Conversely, the model's explanatory capacity appeared to be weaker in central Downtown Manhattan and the Upper West Side (Figure 8).

Figure 8. GWR Local R^2 Distribution in Manhattan

As per the Geographically Weighted Regression (GWR) results, the regression fit between each variable and sexual crime indicated that primary variables with a higher R^2 included building, Point of Interest (POI) diversity, house cost, and car. Moreover, the distribution of these coefficients broadly corresponds with the overall model R^2 results. These variables provide a more comprehensive explanation for the occurrence of sexual crimes (Figure 9). In the downtown Manhattan area, Points of Interest (POIs), rent proportion, and the number of vehicles show a strong explanatory power. Apart from a region in the west where POIs are highly correlated, the distribution is highly consistent within other ranges. Buildings, however, exhibit weaker explanatory power in this area. Downtown Manhattan is the commercial, cultural, and governmental center of New York City, with a dense distribution of POIs, high rent, and a large number of vehicles required for transportation. These factors make it more likely to correlate with crime. The weaker correlation with buildings may be due to the substantial proportion of parks and green spaces in the central area. Another region with high explanatory power is the eastern part of Harlem, specifically East Harlem. This area has long been plagued by problems such as poverty, crime, and poor housing conditions, making it one of the higher-risk communities. POIs, buildings, and cars show a high explanatory power, and their distribution is roughly

the same. The factor of rent proportion, however, primarily exhibits strong explanatory power in the northern part.

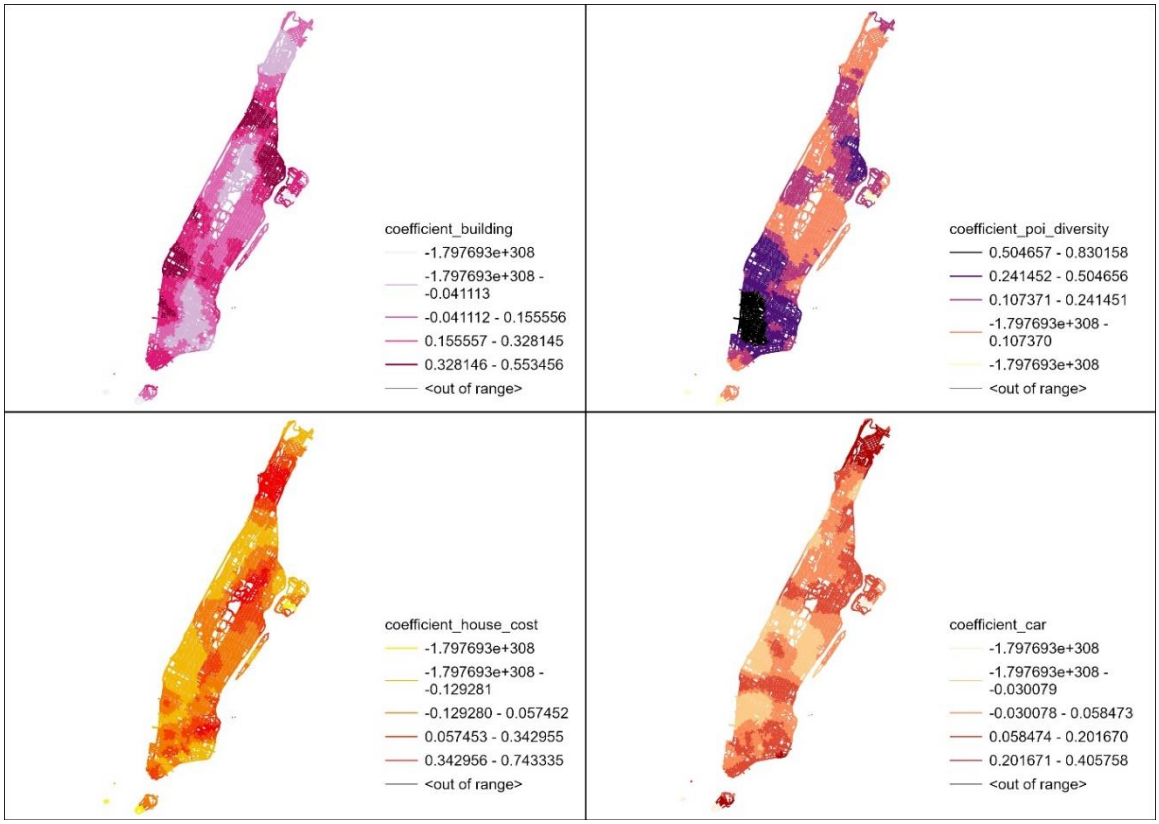


Figure 9. GWR Coefficient Distribution in Manhattan

Table 4. GWR result and variables

Variables	**Parameter**
Residual Squares	1336.949931
Effective Number	186.374001
Sigma	0.570509
AICc	7483.170824
R2	0.543554

R2Adjusted	0.522955
Dependent Variables	
sexual crime	
Independent Variables	
Physical Environment Variables	**Socioeconomic Variable**
Building, person, car, van	Housing Cost Burden
Fence, grass, plant, tree	Poi diversity
Fountain, ashcan, water	Minority
Awning, ceiling, railing	No High School Diploma
	English Proficiency

5. Discussion and Conclusion

The results show that, compared to the model that only considers socioeconomic factors, the OLS model that integrates a variety of microscopic environmental indicators has a decrease of 1066.731728 in the AICc and an increase of 0.079369 in the Adjusted R-Squared value compared to the previous model. The research findings indicate that the latter model, which integrates microscopic environmental variables, offers superior predictive power and explanation for urban sexual crimes, thereby emphasizing the crucial role these variables play in such investigations. Lastly, based on the Geographically Weighted Regression (GWR) model, the occurrence of sexual crimes is explained across different spatial scales. The model exhibits an Adjusted R-Squared of 0.522955 and an Akaike's Information Criterion (AICc) of 7483.170824, demonstrating superior statistical efficiency and explanatory power. This provides valuable insights for policy interventions and resource allocation on a spatial scale. Furthermore, the Geographically Weighted Regression (GWR) model was used to explain the occurrence of sexual crimes across different spatial scales, showcasing an impressive statistical efficiency and explanatory capacity, which offers important implications for spatially focused policy interventions and resource allocation.

Nevertheless, Given the complexity of urban dynamical systems, wherein concurrent dynamic influences occur across temporal and spatial scales between systems, gauging the effects of different factors on sexual crime at the scale of street layouts pose a considerable challenge. Due to data limitations, we could not delve deeper into the correlation between daily temporal variations and macro and microscopic urban characteristics. Also, according to research conducted (Hoffman et al.,2022), there is a significant correlation between reported cases of sexual crimes, income levels, and racial heterogeneity. However, it's important to note that inherent biases may exist within the data itself. We recommend that future research explicates this correlation, considering factors across various spatial scales and basic temporal distributions.

The multifactorial analytical approach employed in this study may offer valuable insights for future criminal analysis research. Additionally, combining analytical methods like spatial syntax and computer vision could supplement and provide powerful tools for urban informatics researchers exploring and addressing urban crime issues. Two comparative multifactorial OLS analytic frameworks are established, investigating the efficacy of an OLS model solely encompassing socioeconomic factors versus one incorporating several dimensions of microscopic environmental indicators in explaining and predicting the incidence of sexual crimes in Manhattan. And a GWR model to explain the crime in the local scale, and finally explore the spatial and temporal distribution. The methods discussed in this study demonstrate significant potential and are expected to offer more comprehensive and accurate insights into understanding and predicting urban sexual crime behavior.

References

Andresen, M.A., 2006a. A spatial analysis of crime in Vancouver, British Columbia: a synthesis of social disorganization and routine activity theory. Canadian Geographies / Les géographies canadiennes 50, 487–502. https://doi.org/10.1111/j.1541-0064.2006.00159.x

Andresen, M.A., 2006b. Crime Measures and the Spatial Analysis of Criminal Activity. The British Journal of Criminology 46, 258–285. https://doi.org/10.1093/bjc/azi054

Ceccato, V., Paz, Y., 2017. Crime in São Paulo's metro system: sexual crimes against women. Crime Prev Community Saf 19, 211–226. https://doi.org/10.1057/s41300-017-0027-2

Costanza, S.E., Bankston, W.B., Shihadeh, E., 2001. Alcohol Availability and Violent Crime Rates: A Spatial Analysis. Journal of Crime and Justice 24, 71–83. https://doi.org/10.1080/0735648X.2001.9721617

Cozens, P., 2013. Crime prevention through environmental design. In Environmental criminology and crime analysis (pp. 175-199). Willan.

Curtis-Ham, S., Walton, D., 2017. Mapping crime harm and priority locations in New Zealand:

A comparison of spatial analysis methods. Applied Geography 86, 245–254. https://doi.org/10.1016/j.apgeog.2017.06.008

Cichosz, P., 2020. Urban Crime Risk Prediction Using Point of Interest Data. ISPRS International Journal of Geo-Information 9, 459. https://doi.org/10.3390/ijgi9070459

Dubey, A., Naik, N., Parikh, D., Raskar, R., Hidalgo, C.A., 2016. Deep Learning the City: Quantifying Urban Perception at a Global Scale, in: Leibe, B., Matas, J., Sebe, N., Welling, M. (Eds.), Computer Vision – ECCV 2016, 计算机科学系列讲义. Springer International Publishing, Cham, pp. 196–212. https://doi.org/10.1007/978-3-319-46448-0_12

Fotheringham, A.S., Yang, W., Kang, W., 2017. Multiscale Geographically Weighted Regression (MGWR). Annals of the American Association of Geographers 107, 1247–1265. https://doi.org/10.1080/24694452.2017.1352480

Grant, J., 2002. Mixed use in theory and practice: Canadian experience with implementing a planning principle. Journal of the American planning association, 68(1), pp.71-84.

He, Z., Wang, Z., Xie, Z., Wu, L., Chen, Z., 2022a. Multiscale analysis of the influence of street built environment on crime occurrence using street-view images. Computers, Environment and Urban Systems 97, 101865. https://doi.org/10.1016/j.compenvurbsys.2022.101865

Hipp, J.R., 2007. Income inequality, race, and place: Does the distribution of race and class within neighborhoods affect crime rates?. Criminology, 45(3), pp.665-697.

Merton, R.K., 1938. Social structure and anomie. American sociological review, 3(5), pp.672-682.

Hipp, J.R., Kim, Y.-A., Wo, J.C., 2021. Micro-Scale, Meso-Scale, Macro-Scale, and Temporal Scale: Comparing the Relative Importance for Robbery Risk in New York City. Justice Quarterly 38, 767–791. https://doi.org/10.1080/07418825.2020.1730423

Hillier, B., 2007. Space is the machine: a configurational theory of architecture, Space Syntax: London, UK. (2007). Space Syntax, London, UK.

Iyanda, A.E., Adeleke, R., Boakye, K.A., Adeusi, T.J., Lu, Y., 2022. Underage tobacco sales violations and neighborhood crime arrest in Philadephia: a multiscale GIS-based analysis. GeoJournal 87, 4455–4474. https://doi.org/10.1007/s10708-021-10507-1

Jeffery, C.R., 1971. Crime Prevention Through Environmental Design. American Behavioral Scientist 14, 598–598. https://doi.org/10.1177/000276427101400409

Jacobs, J., 2016. The death and life of great American cities. Vintage.

Kitchen, T. and Schneider, R.H., 2007. Crime prevention and the built environment. Routledge.

Kim, H.J., Choi, Y., 2016. A Study on the Influence of the Space Syntax and the Urban Characteristics on the Incidence of Crime Using Negative Binomial Regression. KSCE Journal of Civil and Environmental Engineering Research 36, 333–340. https://doi.org/10.12652/Ksce.2016.36.2.0333

Kounadi, O., Ristea, A., Araujo, A., Leitner, M., 2020. A systematic review on spatial crime forecasting. Crime Science 9, 7. https://doi.org/10.1186/s40163-020-00116-7

Lee, D.W., Lee, D.S., 2020. Analysis of Influential Factors of Violent Crimes and Building a

Spatial Cluster in South Korea. Appl. Spatial Analysis 13, 759–776. https://doi.org/10.1007/s12061-019-09327-1

Lee, S., Park, S., Kim, J., & Lee, J. (2023). Street environments and crime around low-income and minority schools: Adopting an environmental audit tool to assess crime prevention through environmental design (CPTED). Landscape and Urban Planning, 232, 104676. https://doi.org/10.1016/j.landurbplan.2022.104676

McIlhatton, D., McGreal, W., Taltavul de la Paz, P., Adair, A., 2016. Impact of crime on spatial analysis of house prices: evidence from a UK city. International Journal of Housing Markets and Analysis 9, 627–647. https://doi.org/10.1108/IJHMA-10-2015-0065

Markevych, I., Schoierer, J., Hartig, T., Chudnovsky, A., Hystad, P., Dzhambov, A.M., De Vries, S., Triguero-Mas, M., Brauer, M., Nieuwenhuijsen, M.J. and Lupp, G., 2017. Exploring pathways linking greenspace to health: Theoretical and methodological guidance. Environmental research, 158, pp.301-317.

Miranda, J. V., & van Nes, A. (2020). Sexual violence in the city: Space, gender, and the occurrence of sexual violence in Rotterdam. Sustainability, 12(18), 7609. https://doi.org/10.3390/su12187609

NYC Open Data. (n.d.). https://opendata.cityofnewyork.us/

OpenStreetMap. (n.d.). https://www.openstreetmap.org/about

Polcari, A.M., Slidell, M.B., Nordgren, R., Hoefer, L.E., Zakrison, T.L., Benjamin, A.J., 2022. Social Vulnerability Index Predicts Violent Crime in Chicago. Journal of the American College of Surgeons 235, S296. https://doi.org/10.1097/01.XCS.0000895336.61680.d6

Quick, M., Li, G., Brunton-Smith, I., 2018. Crime-general and crime-specific spatial patterns: A multivariate spatial analysis of four crime types at the small-area scale. Journal of Criminal Justice 58, 22–32. https://doi.org/10.1016/j.jcrimjus.2018.06.003

Sohn, D.-W., 2016. Residential crimes and neighbourhood built environment: Assessing the effectiveness of crime prevention through environmental design (CPTED). Cities 52, 86–93. https://doi.org/10.1016/j.cities.2015.11.023

Socia, K.M., 2016. Examining the Concentration of Registered Sex Offenders in Upstate New York Census Tracts. Crime & Delinquency 62, 748–776. https://doi.org/10.1177/0011128714526563

Su, N., Li, W., Qiu, W., 2022. Measuring The Associations Between Eye-Level Urban Design Quality and On-Street Crime Density Around Subway Entrances in Manhattan. https://doi.org/10.13140/RG.2.2.32289.28002

Summers, L., Johnson, S.D., 2017. Does the Configuration of the Street Network Influence Where Outdoor Serious Violence Takes Place? Using Space Syntax to Test Crime Pattern Theory. J Quant Criminol 33, 397–420. https://doi.org/10.1007/s10940-016-9306-9

Syeda, H. (2020). Public sexual harassment mayhem on public transport in megacities-Karachi and London: A comparative review. Aggression and Violent Behavior, 52, 101420. https://doi.org/10.1016/j.avb.2020.101420

Talavera-Garcia, R., 2012. IMPROVING PEDESTRIAN ACCESSIBILITY TO PUBLIC SPACE

THROUGH SPACE SYNTAX ANALYSIS.
Tu, W., Zhu, T., Xia, J., Zhou, Y., Lai, Y., Jiang, J., Li, Q., 2020. Portraying the spatial dynamics of urban vibrancy using multisource urban big data. Computers, Environment and Urban Systems 80, 101428. https://doi.org/10.1016/j.compenvurbsys.2019.101428
Zhanjun, H. E., Li, J., Wang, X., Ma, H., & Chen, J. (2022). Multiscale analysis of the influence of street built environment on crime occurrence using street-view images. Computers, Environment and Urban Systems, 97, 101865. https://doi.org/10.1016/j.compenvurbsys.2022.101865
Zhao, H., Shi, J., Qi, X., Wang, X., Jia, J., 2017. Pyramid Scene Parsing Network.
https://doi.org/10.48550/arXiv.1612.01105
Zhou, B., Zhao, H., Puig, X., Xiao, T., Fidler, S., Barriuso, A. and Torralba, A., 2019. Semantic understanding of scenes through the ade20k dataset. International Journal of Computer Vision, 127,302-321. https://doi.org/10.1007/s11263-018-1140-0

RESEARCH ON THE REGIONAL SPATIAL STRUCTURE AND CHARACTERISTICS FROM THE SPACE OF FLOWS PERSPECTIVE BASED ON BIG DATA: TAKE GUIZHOU PROVINCE IN CHINA AS AN EXAMPLE (1154)

Xuchen Zhang[1*], Lin Tian[2]

[1] Tongji University, China; [*]304741416@qq.com

[2] College of Architecture and Urban Planning, China

Abstract. From the perspective of Space of Flows, taking Take Guizhou Province in China as an example, this paper explores the regional city network from population flow connection (physical connection) and economic flow connection (non-physical connection) by mainly using mobile signaling migration data and enterprise big data. The following conclusions can be drawn: 1) The overall pattern of the city network in Guizhou Province presents a multi-level Core-Periphery structure. 2)Top two cities in Guizhou Province have formed a strong economic link, but the actual population flow needs to be strengthened. 3)The network hinterland of Guiyang covers the whole province, but the network hinterland of Zunyi is mainly concentrated in its city and has not had a radiation effect on other areas of the whole province.

Keywords: Space of Flows, City Network, Guizhou Province, Population Flow, Economic Flow.

1. Introduction

In the 1990s, Manuel Castells(1996) proposed the theory of Space of Flows, believing that various types of flows have built our society and created a global city network system. Cities cannot exist independently in the network, and are increasingly interfered with by flow factors. He argues that "space of flows" rather than "space of places" has created the global urban system, and emphasizes the value of cities as nodes in shaping the entire network system after "de-spatialization", and that information-based cities are a symbol of future livability.This theory has changed the research perspective of regional city research, and it has gradually shifted from the static space inside the city to the dynamic connection outside the city. Based on the types of the composition of flow space elements, existing studies can be broadly classified into four categories: studies of enterprise networks based on the composition of enterprise investment or service relationships, studies of networks focusing on individual travel behavior, studies of networks based on infrastructures such as logistics or transportation, and network measurement based on the perspective of social activities such as information flow.

The remainder of this paper is organizedas follows.Thenext sectionintroduces the study area, data, and research methods. The third section critically evaluates the spatial structure and connections of Guizhou province through network analysis and spatial analysis via ArcGIS, and Navicat, using mobile signaling migration data and enterprise big data, after which we conclude the main findings, and provide a viewpoint for planners and policymakers concerning the overall spatial layout of Guizhou province.

2. Research method

2.1. The study area

Guizhou province, which is powerful support for China's western development strategy, is selected as the primary research object. It is locatedinthe southwest of China and consists of five municipalities: Guiyang, Zunyi, Tongren, Bijie, Liupanshui, and three Autonomous Prefectures, Q ian'nan,Qiandongnanand Qianxi'nan.It covers an area of 176167 km2 with a total population of about 38.5 million. The real GDP in 2021 is 1958.64 billion, accounting for 2% of China's.

Figure 1.The location of Guizhou province

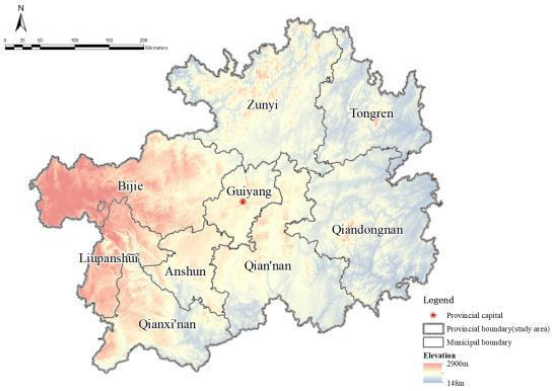


Figure 2.The layout of Guizhou province

2.2. Data

From the perspective of Space of Flows, this paper exploresthe regional city network from population flow connection (physical connection) and economic flow connection (non-physical connection) by mainlyusing mobile signaling migration data and enterprise big data. The former data can well reflect the temporal and spatial law of crowd flow behavior, representing the links and dependence of society, business, and travel between cities.

Thedatawas obtained from China Unicom in December 2019[1].Enterprises are the direct actors of economic links between cities(Taylor &Derudder, 2004). Theanalysis method based onenterprise big data is themainstream method representingeconomic links between cities(Derudder, 2004). Enterprise data was obtained from the database of Chinese industrial and commercial enterprises in December 2018.

2.3. Network analysis andmeasures of centrality

2.3.1 Citynetworkapproach based on"Headquarters-branch" corporatelink

Referringtothe "headquarters-branch" approach (Cheng Yao,Zhang Yishuai &Zhao Min,,2016; Zhang Yishuai&Zhao Min, 2018), we define Sij as the association of m enterprises *p* with headquarters in city i and branchesin city j, Sji as the association of n enterprises *q* with headquarters in city j and branches in city i, Tij as the association of all enterprises with headquarters in city i and branches in city j, Tji as the association of all enterprises with headquarters in city j and branches in city i, and Vij or Vji as the total value of association between two cities (called "network association degree"), theformula is:

$$Tij = \sum_{1}^{m} Sij = \sum_{p=1}^{m} kp$$

$$Tji = \sum_{1}^{n} Sji = \sum_{q=1}^{n} kq$$

$$Vij/Vji = Tij + Tji$$

Tij and Tji are directional, and the total inward correlation ("Inbounddegree") Ii and the total outward correlation ("Outbounddegree") Oi of a city node represent the ability of city i to take in external factors and control regional production factors in that city network, respectively. ") Oi represent city i's ability to take in external factors and control regional productionfactors in that city network,respectively, while the city i's aggregate total correlation ("Degree centrality") Ci expresses its "network position", the formula is:

$$Ii = \sum_{j=1}^{r} Tji$$

$$Oi = \sum_{j=1}^{r} Tij$$

[1] Considering the exclusion of the impact of the new crown epidemic on population movement, data were collected for the month before the new crown epidemic, i.e., December 2019.

2.3.2 City network approach basedon intercity travel

With the popularity of mobile communication in urban and rural areas, by virtue of its wide coverage, high holding rate and good dynamics, mobile phone signaling data provides new data support for regional and urban research. Cell phone signaling data is alarge sample with wide coverageand a high user holding rate, which can better reflect the spatial and temporal patterns of human behavior; cell phone signaling data is anonymous data with good security, without any personal attributeinformation and no personal privacy; cell phone signaling data is involuntary data, users passively provide information and cannot interfere with the survey results; cell phone signaling data has dynamic real-time and continuity, which can accurately reflect the results in It can accurately reflect the spatial location of cell phone users at different points of time in a continuous time period, which provides the possibility to quantitatively describe the flow trajectory of people in the region(Yao Kai &Niu Xinyi,2016). The dynamic mobility demand of the crowd comes from business connections, tourism connections, etc., which can objectively reflect the direct economic and social connection demand and dependency of the city from the side, thus providing a new perspective for the cognition of urban networksand spatial structure.

Measuring the intensityof pedestrian travel is similar to the calculation method of the enterprise-associatedurban network approach, i.e., the urban network linkage model aggregates and statistically analyzes the cell phone user flowtrajectory data across counties within the metropolitan area to obtain the linkage direction and linkage intensity between towns in the study area, characterizes the urban network linkage system, and then quantitatively evaluates the urban network linkage. POi is the amount of travel from city i tothe outside world. PIii the travel volume from other cities to cityi, and the sum of the two is the total population travel volume of city i. Theformula is:

$$PO_i = \sum_{j-1}^{r} T_{ij}$$

$$PI_i = \sum_{j-1|}^{r} T_{ji}$$

3. Analyses and results

3.1. Economic flow connection features

Based on the previous research method and the "headquarters-branch" data ofenterprises, the data are organized and calculated by using SQL statements to obtain the spatial structure of cities in Guizhou province. From the figure, it is obvious that Guiyang city has the highest centrality and shows the dominant role in the economic connection of enterprises in the province, followed by Zunyi, Bijie, Xinyi and Liupanshui.

At the district and county level, the top 20 districts and counties are shown in the table below. The first tier is Yunyan District (3596) and Nanming District (2103), with centrality greater than 2000; the second tier is Xinyi City, Guanshan Lake District, Honghuagang District and Huichuan District, withcentrality greater than 1000; the third tier is Zhongshan District, Huaxi District, Qixingguan District and Xixiu District, with centrality greater than 850. it can be found that the ranking 8 of the top 10 districts and counties are located in the two metropolitan areas, and the centrality of Yunyan District and Nanming District is far ahead of the rest of the districts and counties, and the out-degree is obviously greater than the in-degree, indicatingthat a large number of corporate headquarters in Guizhou Province are set up in these two districts. In addition, the center degrees of Xinyi City in Qianxinan Prefecture and Zhongshan District in Liupanshui City are 1232 and 921 respectively, and the out-degree is similar to the in-degree, which indicates that these two districts have a good level of economic development and have gathered a certain number of enterprises, and have similar ability to accept radiation and drive the surrounding area.

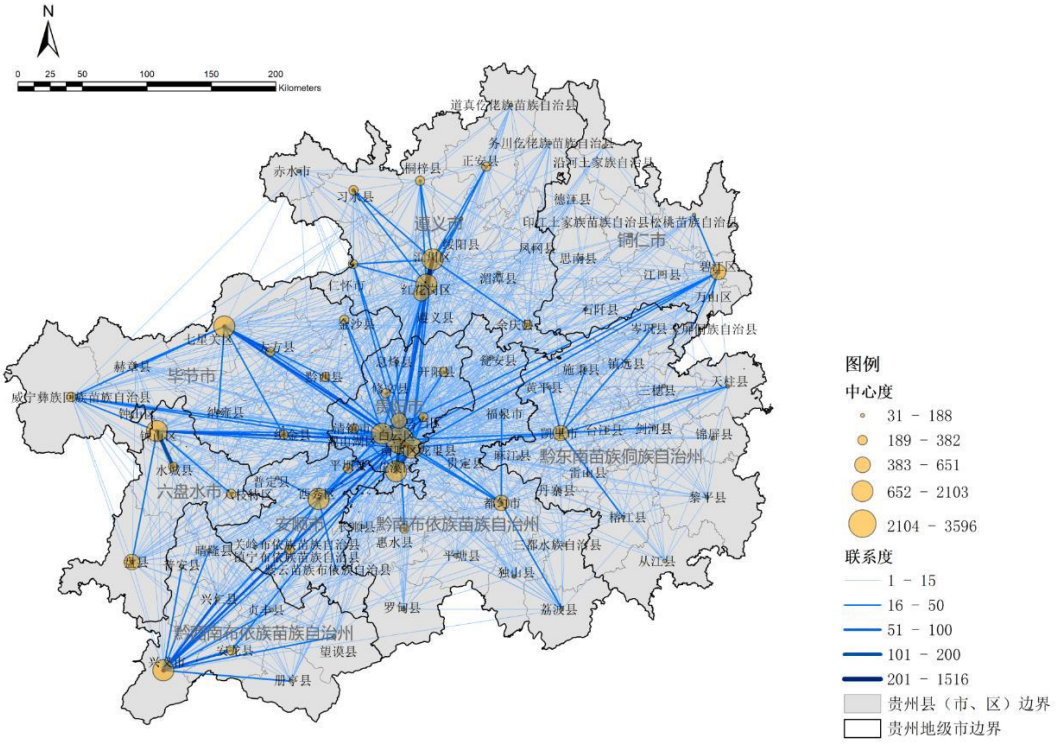


Figure 1. Spatial structure of cities at county level in Guizhou province (based on business linkages)

Table 1. City network centrality at district and county level in Guizhou province (based on enterprise linkages)

Number	County	City	Inbound degree	Outbound degree	Degree centrality
1	Yunyan	Guiyang	2398	1198	3596
2	Nanming	Guiyang	1339	764	2103
3	Xingyi	Qianxi'nan	639	593	1232
4	Guanshanhu	Guiyang	774	435	1209
5	Honghuagang	Zunyi	592	540	1132
6	Huichuan	Zunyi	576	479	1055
7	Zhongshan	Liupanshui	491	430	921
8	Huaxi	Guiyang	490	413	903
9	Qixingguan	Bijie	441	452	893
10	Xixiu	Anshun	468	420	888
11	Kaili	Qiandongnan	381	270	651
12	Pan county	Liupanshui	259	324	583
13	Duyun	Qian'nan	305	247	552
14	Zunyicounty	Zunyicity	228	299	527
15	Bijiang	Tongren	273	225	498
16	Baiyun	Guiyang	261	220	481
17	Xishui	Zunyi	156	226	382
18	Wudang	Guiyang	211	165	376
19	Zhijin	Bijie	147	209	356
20	Qingzhen	Guiyang	145	207	352

A separate analysis of the corporate ties in Guiyang City, from the branch ties headquartered inGuiyang City, reveals that the closest ties with Guiyang City are Qixingguan District in Bijie City, followed by Huichuan District and Honghuagang District in ZunyiCity, as well as Xixiu District in Anshun, Xinyi City in Qianxinan Prefecture, Qingzhen City in Guiyang City, Zhongshan District in Liupanshui, Kaili City in Qiandongnan Prefecture, Bijiang District in Tongren City, Qiannan Duyun City, most of which are the

seats of prefecture (city) governments inGuizhou Province. In addition, it can be foundfrom the headquarter organization links in Guiyang's municipal district that the core area of Gui'an New Area (Qingzhen City), Anshun City and Zunyi City's municipal district have certain headquarter-branch relationship for Guiyang, which also receives radiation and factor flow from the rest of the cities with more developed economy or higher degree of specialization. In the future planning, while pushing forward thefive-year action of "strong provincial capital", we should also pay attention to the differentiated and specialized development of the rest of the central cities in the prefecture, so that they can radiate and drive each other to form a modern economic development pattern with complementary advantages.

A separate analysis of the corporate tiesin Zunyi City, from the branch ties headquartered in Zunyi City jurisdiction can be found that the closest ties with Guiyang City jurisdiction is Xishui County of Zunyi City, followed by Tongzi County, Suiyang County, Renhuai City, Zheng'an County, Yuqing County, etc. The top 11 are all within the city limits of Zunyi, indicating that the radiation range of Zunyi City jurisdiction is basically restricted to the city.In addition, the stronger ties include Jinsha County, Qixingguan District, Bijie City and Yunyan District, Guiyang City. It can be found from the contact of the headquarter institutions branching out in Guiyang Municipal District that Zunyi City is widelyradiated by Guiyang Municipal District and has acloser contact with Guiyang Municipal District.

3.2. Population flow connection features

3.2.1 Based on all-purpose travel data

Based on the previous research method with the all-purpose travel data of Unicom cell phone signaling in December 2019, the data are organized and calculated using SQL statements and visualized and drawn based on GIS platform to obtain the spatial structure of cities in Guizhou province. From the figure, it is also obvious that Guiyang city district has the highest centrality, followed by Zunyi city, Anshun city, Bijie city Kaili city, Liupanshui city, and Xinyi city. Implemented to the district and county level, the top three ranked Yunyan District, Nanming District, Guanshan Lake District, are located in Guiyang City, followed by Zhongshan District, Qixingguan District, Huaxi District, Honghuagang District, Xixiu District, Huichuan District, Xinyi City, travel to the higher degree of the region is also the location of the local state (city) government. From the point of view of the degree of contact, Huichuan District travel to Honghuagang District has the highest volume of 400634, Honghuagang District travel to Huichuan District (393379) ranked second, followed by Nanming District -Yunyan District (300212), Yunyan District -Nanming District (299949), Yunyan District -Guanshan Lake District (180105) , Guanshan Lake District -Yunyan District (174452), Shuicheng District -Zhongshan District (161390), Zhongshan District-Shuicheng District 160178, Honghuagang District-Baoxu District

(153551), Baoxu District-Honghuagang District (151856), indicating that Zunyi City, Guiyang City and Liupanshui City are more closely linked in terms of pedestrian flow, and the amount of population travel within the district is higher.

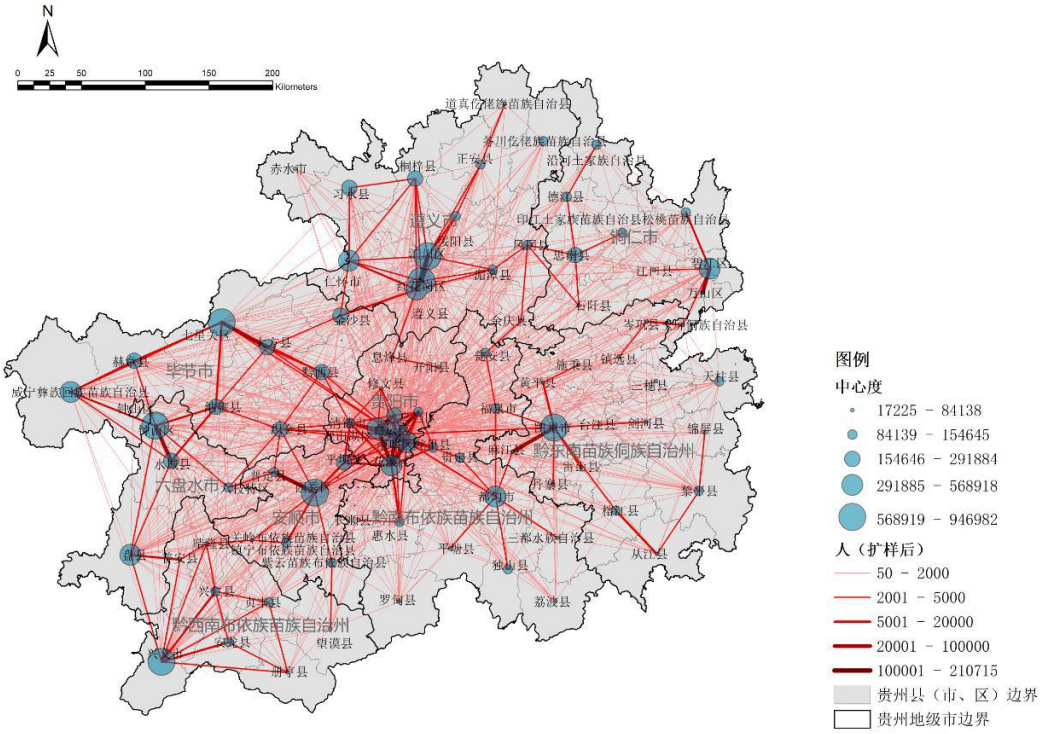
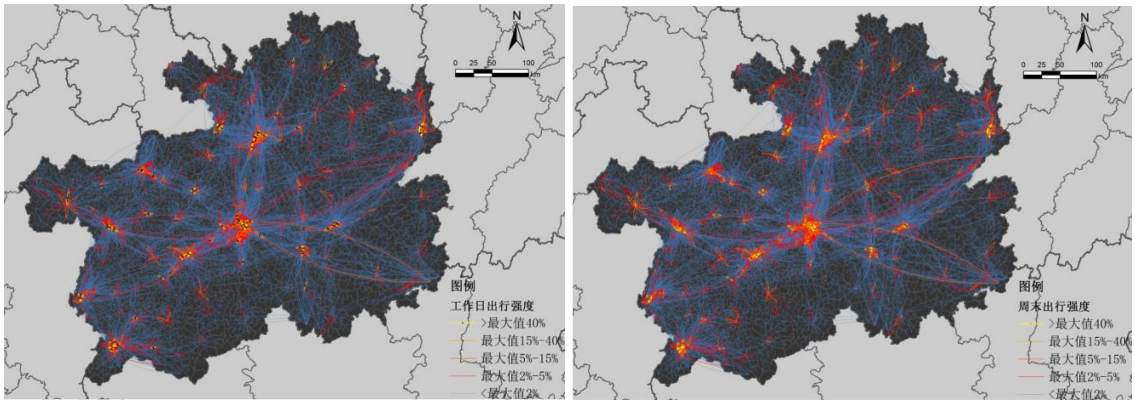


Figure 3-3. Urban spatial structure at the district and county level in Guizhou province (based on all-purpose travel links).

The cell phone signaling travel data are extracted and travel intensity is calculated accordingto two time periods: weekdays and weekends, and it can be found that weekday travel is mainly concentrated within the city area or within the central city area of the city (county),and the travel volume is the largest in Guiyang and Zunyi city districts;the cross-city travel volume increases significantly on weekends, such as Guiyang city district and Anshun, Zunyi city district and Tongzi county, etc.



Guizhou All Purpose Travel Contact Network (weekdays)

Guizhou All Purpose Travel Contact Network (Weekend)

Figure 3-4. Analysis of the all pu rpose travel linkage network in your province

A separate analysis of the travel links of people in Guiyang city shows that the top two district s (cities) in terms of linkage are Qingzhen city and Longli co unty, no matter from Guiyang municipal district or to Guiyang city. This indicates that the daily travel links between Qingzhen City and Guiyang Municipal District are already relatively close a nd have a strong demand for connection. Therefore, the city of Qingzhen can be continuously promoted to be abol ished and incorporated into the Guiyang municipal district, expanding the spatial scope of the Guiyang municipal district, optimizing the scope of affairs and approval rights of the Qingzhen area, and promoting further economic development of Guiyang. At the same time, Longli County, as the bridgehead of Qiannan State connecting Guiyang, actively cooperates with Guiyang City in industry, infrastruc ture and public services (especially Huaxi District), providin g strong supporting guarantee for the development of Guiyang.

Longli Express Logistics Park has become the largest express logistics distribution center in the southwest. Now the development of Huaxi Longli co location should be actively promoted.

Second ly, the districts and counties with strong ties t o Guiyang city district are Xiuwen County, Kaiyang County, Xifeng County, Huishui County, Guiding County, Pingba District, Xixiu District, Honghu agang District, Tongzi County, Qianxi County, Yuping C ounty and so on. Among them, Xiuwen County, Kaiyang Count y, Xifeng County, Guiyang City, the county within the scope of the city, should continue to promote the northern three counties of Guiyang to abo lish the county, expanding the spatial scope of Guiyan g City. In addition to Longli County, Huishui County and Guiding County are strategic areas in Qiannan State linked to Guiyang, and should be actively integrated into the development of Guiyang,

togethe r with Longli and Changshun, to create a modern storag e and logistics undertaking area around Guiyang, and a co nsumer goods preservation area around Guiyang city, to enhance factor concentration and carrying capacity, and improve economic strength and industrial competitiveness. Pingba District and Xixiu Dist rict are important areas of Gui'an New Area, which means that the integrated development of Guiyang Gui'an has begun to bear fruit. In the future, the cooperation and exchange between Guiyang and Gui'anin industry, ecology and infrastructure should be continuously promoted to form provincial growth poles and drive the economic development of Guiyang-Gui'an-Anshun metropolitan area as well as the province. Honghuagang District, Tongzi County, Qianxi County and Yuping County are located in Zunyi City, Bijie City and Tongren City, respectively, and should continue to strengthen the interconnection between Guiyang City and regional central cities on the existing basis, as well as cooperation in various aspects such as economic industries, to achieve a win-win situation and promote the high-quality development of Guizhou.

3.2.2 Based on occupational and residential travel data

Similarly, using SQL statements with the GIS platform, the data of occupational and residential trips were analyzed. It can be found that the overall and all-purpose travel analysis presents relatively similar results, with Guiyang city district having the highest centrality, followed by, Zunyi city district, then Duyun, Xinyi, Zhongshan district (Liupanshui), and Qixingguan district (Bijie city). However, it should be noted that the workplace travel is mostly concentrated in the municipal district or within the county, long-distance cross-city travel is relatively small. For example, in Guiyang City, work and residence travel is concentrated in Nanming District, Yunyan District, Huaxi District, Wudang District, Baiyun District, Guanshan Lake District, followed by a certain intensity of work and residence contact with Qingzhen City, Longli County. For example, in Zunyi City, work and residence trips are mainly concentrated in Huanghuagang District, Huichuan District and Buzhou District within the city's jurisdiction.

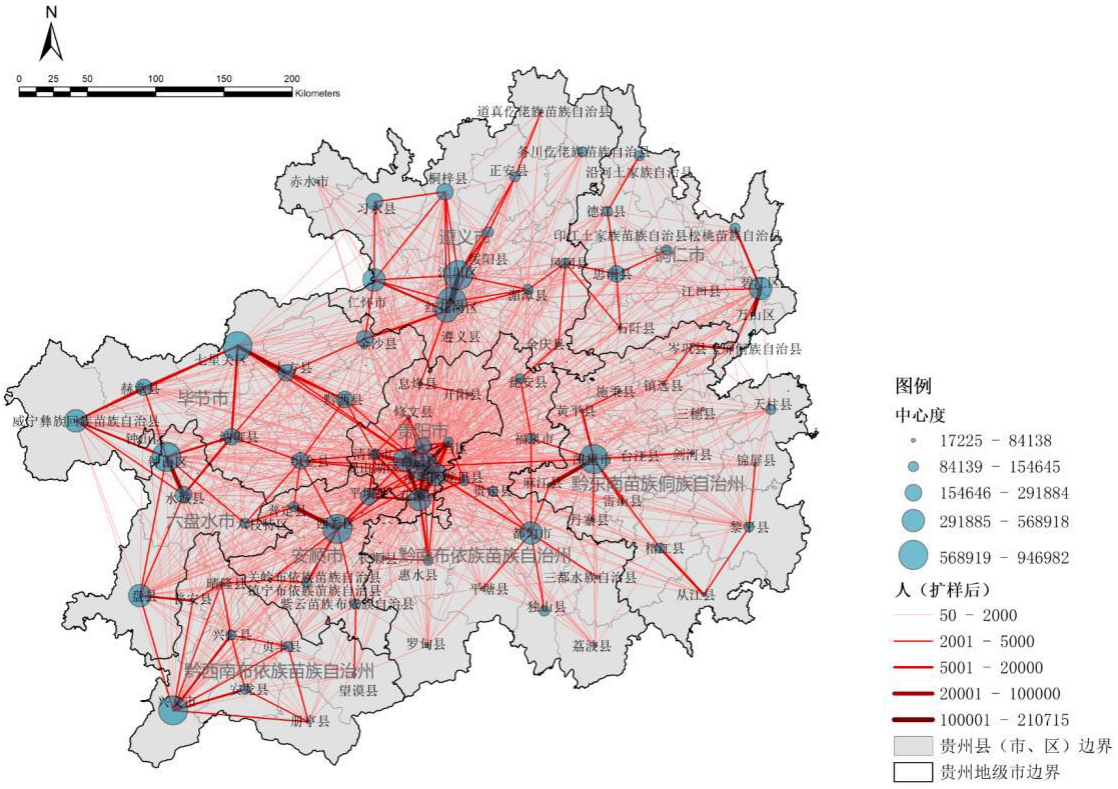


Figure 3-5. Urban spatial structure at the district and county level in Guizhou province (based on occupational and resident ial travel links)

4. Conclusion and policy suggestion

The following conclusions can be drawn from this study: 1) The o verall pattern of the city network in Guizhou Province pre sents a multi level Core Periphery structure. Within the province, Guiyang, the provincial capital, is the core and other regions are the peripheries, showing the dominant role in the economic links of enterprises in the province; Within the area, a networ k structure with regional central cities as the core and surrounding cities and towns as the peripheries is mainly formed. At the same time, from the perspective of population flow, it can be found that Guizhou Province presents the characteristics of init ial networking. 2)Compared with the higher enterprise network link degree betwee n Guiyang and Zunyi, the link degree of population flow is lower, which shows that Guiyang and Zunyi, as the top two c ities in Guizhou Province, have formed a strong economic l ink, but the actual population flow needs to be strengthened. 3)The network hint erland of Guiyang covers the whole province, but the network hinterland of Zunyi is mainly concentrated in its city and has not had a radiation effect on other areas of the who le province. At the same time, while receiving the radiation of Guiyang, other

r egional central cities also play a leading role in the surrounding small and medium sized cities and towns.

Based on the characteristics of Guizhou's mountainous area, the city is in line with the trend of urban development and population concentration in Guizhou Province, and responds to the national policy guidance to promote the cluster with the circle, strengthen the center and drive the periphery. Combining the above analysis of the spatial structure of cities and towns, th e spatial scope of the Guiyang Gui'an Anshun metropolitan area and Zunyi metropolitan area, and the spatial scope of Qianzhong urban cluster, and d rawing on the networked "galaxy" development pattern of "corridors + nodes" in the metropolitan areas of the Unit ed States, we propose the construction of the Qianzhong urban cluster as the main body, with the main city of Guizhou as the main city. The mai n body of the city cluster is Qianzhong, with Guiyang Gui'an as the leader, Guiyang Gui'an Anshun and Zunyi as th e core growth poles, Biji e, Liupanshui, Tongren, Kaili, Duyun and Xinyi as the focus, several county node cities as the important support, and small towns as the basis of the "one core group, two circles and six centers". The spatial pattern of Guizhou's mountainous town system is based on a core group, two circles, six centers, multiple branches and multiple points.

With the continuous promotion of regional coordination strategy, th e cooperation between cities has been strengthened. As the main platform platform, megapolitan clusters and m etropolitan areas composed of multiple cities and towns gradually replace individual cities to participate in global c ompetition, and their internal will in evitably form a close and reasonable city network. Then, how identifying the city network and relate d characteristics has become the key point. This study will help to identify and understand the characteristics of cit y networks from Space of Flows and the irimportance to regional coordinated development, aiming at providing a reference for relevant simi lar research and decision making.

References

Castells, M. (1996). The spa ce of flows. The rise of the network society 1 , 376482.

Taylor, P., & Derudder, B. (2004). World City Network: A Global Urban Analysis. International Social Science Journal . 31(4):641 642.

Derudder, B. (2007). The mismatch between concepts and evidence in the study of a global urban network. Cit ies in globalization. Practices, policies, and theories. London, 261 275.

Rozenblat, C., & Pumain, D. (2007). Firm linkages, innovation, a nd the evolution of urban systems. Cities in Globalization: Pract ices, policies, theories , 130 156.

YAO Kai, NIU Xinyi .(2015) Practical Analysis of Mobile Phone Signaling Data in Urban System Planning: A Case Study of Nanchang Metropolis. Shanghai Urban Planning

Review. 91 97.
Cheng Yao,Zhang Yishuai,Zhao Min. Exploring the spatial organization characteristics and planning orientation of Yangtze River Delta city clust er_Anempirical study based on enterprise linkages_Cheng Yao[J]. Journal of Urban Planning, 2016, No. 230(4): 30 3 7.
Zhang Yishuai,Zhao Min. Research on Northeast China and its Urban Network Linkages with Beijing Tianjin Hebei Region Based on Business Linka ges[J]. Urban Planning,2018,42(11):41 53.

ZONING CHANGES IN RECENT ITALIAN URBAN PLANS FOR SUSTAINABLE REGENERATIONS: THE CASES OF MILAN AND BOLOGNA (1067)

Chiara Barattucci

Polytechnic University of Milan and University Iuav of Venice, Venice, Italy; chiara.barattucci@polimi.it ; chiara.barattucci@iuav.it

Abstract. The spatial planning of the twentieth century shows different consequences of rigid uses of zoning as technical tool that determined too homogeneous urban areas. However, in the last twenty years the renovation of that zoning has been increasingly present in the Italian urban planning. The main question is: how has zoning changed in recent decades? Starting from this query, the paper proposes some reflections studying specific sources: Italian urban Plans, in particular the recent Plans of Bologna and Milan. Here it is argued that the indispensable overcoming of traditional zoning in recent urban Plans, although it has introduced important innovations on the necessary flexibility of the instruments themselves, at the same time has weakened the rules on the physical and social dimension of urban transformations.

Keywords: Italian urban planning; regulatory plans; zoning innovations; urban fabric.

1. The multiple dimensions of zoning to regulate urban growth

The term zoning (*zonizzazione*) in Italian urban planning defines the technical tool that has guided the urban and territorial transformations through the perimeter of different zones for each of which different rules regulate the building activities: respect the intended uses, the densities and volumes, the heights of the buildings, the covered area, etc. This zoning is an instrument of regulatory plans that has multiple dimensions and properties and that can have diversified urban and territorial implications and consequences (Mancuso 1978; Mazza 1995; Barattucci 2005, 2013). As known, when it is conforming, it affects the *ius aedificandi* and can also be unequal, but despite its close relationship with rent, it is not only a technical instrument for controlling the use, value and market of land (Micelli, 2011; Camagni, Micelli, Moroni, 2014; Chiodelli and Moroni, 2016). In fact, zoning can affect not only the land value, but also the morphological design of the city, the localization and the compatibility of activities, the uses of public spaces, the distribution of different social

groups and the spatial justice, the temporality of use in several specialized areas and their accessibility through collective mobility. The same zoning can therefore be economic, morphological, functional and social at the same time: it is a tool which, depending on how it is used, with respect to the different goals to be achieved, can guide in various directions the transformation of the urban territories (Barattucci, 2005, 2013, 2021).

The Plans of the Twentieth century urban expansion have shown different consequences of rigid uses of zoning that have determined, first of all, zones too homogeneous under the physical, social and functional aspect, contributing to the spatial and socio-economic separation of the inhabitants, without functional and social mixes (Piccinato, 1974, Mancuso, 1978, Mazza, 2013, Barattucci, 2013, 2017, 2022). However, this rigid mono-functional and mono-morphological zoning has been undergoing transformation for many years: the overcoming of its use in rigid ways is now increasingly present in regional urban planning Laws and in the most recent urban Plans.

How has zoning changed in Italian plans in recent decades? Can this renewed tool, learning from past experiences, still be useful for regulating the physical and social dimension of urban transformations?

Zoning over the last century until today, has changed a lot. In Italy, its first utilization in the expansion Plans during the end of the Nineteenth century, its intense experimentation in the regulatory Plans of the 1920s, its fine-tuning in the Rome Plan of 1931 determined its introduction to art.7 in the fundamental national urban planning Law no.1150/1942, particularly attentive to the morphological dimension of urban growth (Barattucci, 2013). According to this Law the municipal regulatory Plan had to be implemented through detailed plans that had the task of defining urban forms and building types, following the Italian urbanism tradition that has its roots in architecture (Calabi, 2000).

After the Second World War and the season of emergency reconstruction Plans, in the Fifties and Sixties, during the Italian economic boom and urban growth, the few approved Plans did not allow for sufficient control of land speculations, led by private builders on coasts, hills and farmlands. Only after a series of environmental disasters, in the second half of the 1960s, the zoning changed with the main goal of regulating the speculative actions and to prohibit construction in the absence of approved municipal Plans. The Law no. 765/1967 and its implementing Decree no.1444 of 1968 introduce a zoning connected to the urban *Standards* to define the minimum quantities of public spaces and services complementary to the residence and production zones (Gaeta, Rivolin, Mazza 2013).

The zoning thus becomes the most important tool of a Plan that divides the entire municipal territory into nine ZTO - Homogeneous Territorial Zones: each of them is characterized by specific intended uses and abstract numeric indices and parameters to guide urban growth. Besides, the Plans of the second half of the 20th century were often over dimensioned for the future population growth, especially through the extension of

the building zones C and the weak attention on the zones E of the agricultural land. The latter was in fact considered as a large reservoir for urban expansion and welcomed the rapid growth of the suburbs and of the low-density diffuse urbanizations (Campos, Oliva 1993, Salzano 2003; Barattucci 2004). The regulation of urban growth was made by breaking down the territory into specialized and homogeneous zones according to functional, physical and social points of view (Secchi 2013). Only from the Eighties and Nineties of the Twentieth century the experiments for new forms of Plan make their way, also with respect to a different zoning.

2. The progressive transformation of zoning in the regulatory Plans

During the Italian 1980s, the speculative sector was joined by punctual projects as new opportunities for building promotion by industrial and financial groups. Through continuous variants, indispensable for the realization of punctual projects in limited urban sectors, the municipal Plan loses some of its authority (Indovina, 1992). During the 1990s, to implement punctual projects, public-private contractual and negotiated urban planning was developed introducing complex programmes to intervene rapidly in degraded or abandoned areas, but mostly these instruments acted in derogation to the Plan. At the same time, the regional urban planning laws that differentiate the forms of the Plan multiplied, while environmental awareness, linked to sustainability, strengthened.

In this context at the end of the century, renewed relationships between Plans and Projects are experienced, between the normative and prescriptive dimension and the implementing and operational one, also with the aim of overcoming zoning (Palermo, 1992). However, it is important to remember that the importance to elaborate Plans in a different way than a rigid zoning and according to different Plan forms, was already underlined by urban planners since the 1960s, such as Giancarlo De Carlo in his Plan of Urbino (De Carlo, 1964, 1973).

During the 1980s, the reflections of urban planner Giuseppe Campos Venuti on the third generation of planning (Campos Venuti, 1987) have been crucial in changing direction, also thanks to his Plans for Pavia and Bologna. In particular, the latter represents a real turning point in the Italian panorama to use the zoning not to guide urban growth on agricultural land. In fact the Plan of Bologna does not envisage expansion zones, but chooses to identify interstitial areas in the existing urban fabric as transformation areas that can also accommodate morphological, functional and social mix. For these areas, great attention is also given to public spaces and services to be established also considering the results of the participation of the inhabitants. With the approval of the Plan in 1986, the morphological control for the interstitial transformation areas was entrusted to a coordination tool, the DUC - Concerted Urban Design, which contains indications and rules for the physical transformations of the urban fabric (Campos Venuti,

1993).

In the last twenty years of the 20th century, other urban planning tools were experimented, not only through a greater and more minute fragmentation and articulation of homogeneous zones, but also through Plans based on structures and systems. The planner Bernardo Secchi goes in this direction, in particular with his PRG of Prato of 1996. The Plan is structured on different thematic systems, considered as layers that are articulated and cross in different and innovative ways: «The idea of an organization of the city by systems, intensively explored by some plans in recent years, arises precisely from the criticism of zoning as traditionally considered» (Secchi, 1996).

The experiments of new forms of Piano, especially those of Giuseppe Campos Venuti in Bologna and of Bernardo Secchi in Prato, were crucial for the elaboration of the regulatory plan of Rome (AA.VV., 2001). Approved in 2008, it is divided into three structural components: the environmental, mobility and settlement systems. It is not based on the future sizing of the population, but assumes demographic stability, chooses the reduction of urban expansion and the internal redevelopment of the city, pursuing a polycentric model and enhancing new centralities in the diffuse urbanisation, paying great attention to functional mix. Important innovations are also introduced for the *Standards* on public services: the equalization and compensatory assignment aim to guarantee the availability of areas for public spaces and services without resorting to expropriation. Instead of the traditional zoning with its homogeneous zones, this Plan is articulated in morphological/programmatic categories, distinguishing the actions in existing Fabrics *Tessuti*) with their morphological features, and the possible transformations in different Ambits (*Ambiti*): in the historic city, in the consolidated city or in the city to be restructured. For the design definition of the physical dimension of the forecasts, the Plan introduces for the first time in Italy, inspired by France, the *Urban Project* as a procedure which allows, also by comparing alternative spatial configurations, the verification of the urban, environmental, economic and social sustainability of the proposed modifications in the different Fabrics and Ambits (Barattucci, 2004).

In Italy this Plan was important in overcoming the old zoning and it has become a reference for many subsequent plans, including those elaborated at the beginning of the XXIth century (Bianchetti, 2011, Gabellini, 2018). Today the municipality of Rome is working on the preparation of a new Regulatory Plan, while the municipalities of Milan and Bologna have already drawn them up, placing the European culture of sustainability, the reduction of soil consumption, the urban and territorial regeneration, in line with the sustainable development goals set by the European Urban Agenda and by the United Nations.

3. The sustainable transformation of zoning in the recent Plans of Bologna

The PSC - Municipal Structural Plan of Bologna was approved in 2008: its sustainability goals confirm the Bolognese urban culture of redevelopment, restructuring and reuse of the existing urban fabric in compliance with the regional law no. 20/2000 which requires the distinction between urban, rural and urbanizable territories. It is a Plan based on different restructuring figures relating to the recognition of 7 cities for the transformations that are specified by 3 Systems, 34 Situations and 189 Ambits (*Ambiti*). These *Ambits* replace in the Plan the homogeneous zones and constitute the minimum units for regulating modifications in the urban territory to be structured, in the structured one and in the rural spaces. The RUE - Urban Building Code, has a legal joust and contains general rules to be respected in the various Ambits. In this Plan the expression *homogeneous zone* is no longer used and the possibility of functional mixes, according to different compatibilities, is evident from the Rue: this obviously does not mean that all the specialized zones must become mixed.

Regarding the most recent Plan of Bologna, approved in 2021 in compliance with regional law no. 24/2017 and called PUG - General Urban Plan, it defines the structural invariants and the strategic choices of urban layout and development for the regeneration of the existing urbanisation, for the reduction of soil consumption and for the environmental sustainability. The main goals are the rehabilitation of the building stock, the completion of underused urban sectors and the reconversion of disused buildings and areas through different methods of densification, demolition and replacement. However, this PUG is above all a strategic Plan, structured on the objectives / strategies / actions scheme for whose definition the participation of the inhabitants was also important.

With the intention of strengthening urban and territorial regeneration, the local strategies are declined on the territory in the subdivision into 24 Areals (*areali*) that are not like the homogeneous zones of the old zoning, but recognizable and mixed parts of the city. Each Areal corresponds to a technical sheet that suggests, in a very general way, different actions and explains some problems to be addressed respecting the Table of planning restrictions. The Building Code, on the other hand, is no longer a legal instrument, but a document that guides urban changes in general, regardless of the position of the buildings in the urban fabric. This Building Code also establishes the indispensable arrangements for the coordination of public policies and for negotiation between actors. The main tools for implementing the strategies and actions of the PUG are in fact the Operational Agreements (*Accordi operativi*). The regulatory Plan based on zoning and the attribution of rights to landowners is therefore eliminated. In addition, the importance of alternative spatial configurations to guide physical transformations of the urban fabric is also absent. Despite many innovations, in the PUG of Bologna, in 2020, to allow the allocation of the façade bonus, a table was inserted showing the equivalences between the different new Areals (*areali*) and three old homogeneous zones of the D.I. 1444/1968.

In short, as in many European strategic plans, the rules to be followed for the urban transformations in different Areals, for controlling the modifications of the physical and therefore social dimensions of the urban fabric, are not sufficiently explained. The PUG is a Plan with few formal rules and, even if it is undoubtedly more flexible than those of the past, at the same time it leaves completely the spatial transformations in the hands of many operators according to public-private agreements. Although operational agreements that pay attention to urban and landscape commons are certainly possible, it is necessary to emphasize that these agreements could also favour speculative interests, even if the PUG is officially a plan for the *sustainable regeneration* of existing urban fabrics. It is also important to remember that regeneration actions on the materiality of urban parts, when not sufficiently oriented by the public administration with specific rules that respect social diversities, could cause a profound change and replacement of inhabitants, expelling the most economically disadvantaged population and intensifying spatial injustices on urban territories (Barattucci, 2022).

4. Zoning transformation for urban regeneration in the two last Plans of Milan

The PGT - Territorial Government Plan of the Municipality of Milan, following the Regional Law no.12/2005, was approved in 2012 and is divided into three main documents: DdP - Plan Document, PdS - Services Plan, PdR - Rules Plan. The main objectives are consistent with the European culture of sustainability and tend towards the goal of zero soil consumption by 2050. The idea of the metropolitan city to be pursued is polycentric and reticular, in contrast to the city broken down into social and functional zones - enclaves and the centre-periphery dichotomy. It is a Plan that pushes towards the densification and redevelopment of areas no longer used. Great importance is attached to the functional mix, to subsidized housing, to sustainable mobilities. And the priority attention to environmental and social sustainability is also connected to the participation of citizens, through various listening practices, to define shared choices and to rebalance the provision of public services.

Regarding the overcoming of the old zoning, in the Plan of Rules it takes place in different ways, both in the lack of perimeter of homogeneous zones and in terms of economic value of the soils. The territory is in fact divided into various Ambits (*Ambiti*) which concern the entire municipal territory, and which include those subjects to transformation, but also some for new urbanization on free areas. As regards the land value, the application of building rights in an equalized form is envisaged, thus choosing a principle of basic economic equality of the land. The determination of land uses is also overcome by providing for the indifference of the intended uses which become freely settleable for greater flexibility, even for different compatible activities, but only where there are no explicit prohibitions, such as in areas with environmental protection.

But the most substantial innovations are contained in the latest PGT Milano 2030, approved in 2019 in compliance with Regional Law no. 12/2005 and its recent amendments and additions (Regional Law n. 31/2014 for the reduction of soil consumption and the redevelopment of degraded soil; Regional Law n.18/2019 - incentive and simplification measures for urban and territorial regeneration and for the recovery of the existing building heritage). Still articulated in the three documents DdP, PdR, PdS, the Plan directs the modifications of the municipal territory by promoting urban development in the nodes of the collective mobility network. This is mainly a strategic Plan too, in which the environmental strategy is the strongest one to guide the ecological transformation of different urban areas, while the regulation of the physical dimension of the transformations is also secondary here. The term *regeneration* becomes the protagonist for the transformation of the entire city, but above all for the improvement of the urban quality of the suburbs and for the increase in public and social housing. The goal of reducing the soil consumption is expressed even more strongly than in the previous Plan, both by eliminating the possibility of urbanization in different Ambits and by returning many lands previously destined for urbanization to agricultural land. Once again, the distribution of intended uses and functions is not determined by zoning, but completely free and the determination of land value is entrusted to urban equalization.

The new PGT is therefore not based on functional and morphological zoning, but once again on the identification of precise Ambits (*Ambiti*) in which regeneration is possible thanks to different methods of intervention, between demolitions and densifications. Alongside *large urban functions*, the Ambits refer to a municipal territory that is no longer divided into homogeneous zones, but into 88 districts generally referred to the NIL - *Nuclei di Identità Locale* - local identity centers - with the main goal of strengthening its identity. The only presence of homogeneous zones is found in table Ro2 of urban planning indications, added later, which indicates, just like the PUG of Bologna, the equivalences between the *Ambits* and the ZTOs of the D.I. 1444/68 because in the 2019 budget law for the assignment of the facade bonus it is necessary to identify the homogeneous zones A and B.

In short, even in the last two Plans of Milan the old relationships between population sizing and regulation in homogeneous zones have been transformed, between technical implementation regulations and urban planning standards. These are important changes that attempt to overcome the frequent ineffectiveness, rigidity and non-economic planning of the regulatory plans of the past. However, even in this case, one can legitimately wonder whether this Plan will be capable of guiding the physical and therefore social transformations in the different Ambits, according to which criteria the new volumetric quantities to be built will be established, which settlement rules to guide the spatial configurations will be followed in the regeneration actions, especially with respect to what compatibility between different activities. In fact, each regeneration will

be regulated and designed on a case-by-case basis, in the absence of indications of intended uses or settlement principles and trusting the public administration in the coordination of all public, private and other different actors.

5. Strategic plans for sustainable regeneration of existing urbanizations and zoning

In recent decades, the importance of overcoming the old zoning in new forms of Plan has increased significantly. Obviously, urban planning has also changed with its goals on territorial transformation, today increasingly oriented towards the regeneration of the existing urbanisations and soil saving, it is therefore very far from the urban planning of expansion which developed this tool (Barattucci, 2005, 2013). However, in the framework of European sustainable urban planning of the last thirty years, studying these recent Italian Plans one could legitimately wonder if they hide a dangerous trend towards an urban planning oriented by neoliberalism (Harvey, 2015, 2016, Perulli and Vettoretto, 2022). One might ask whether sustainable urban regeneration of the existing urbanisation can really be implemented only through public-private operational agreements. Whether it is possible to act in a way relevant to specific contexts in the absence of sufficient rules guiding in each urban part the compatibility between activities and possible spatial alternatives considering spatial justice for the different income brackets of all inhabitants.

This apparent victory of the strategic Plans also in Italy is based on the awareness of the impossibility of forecasting, on the uncertainties regarding the future and on the instabilities of the present. However, the observation of the ineffectiveness of a regulatory Plan based on strict zoning, although it has led to an undoubted improvement in the flexibility of the tools and the social and functional mix, must not lead to the drastic elimination of important rules relating to urban morphology which is always physical and social at the same time. Will the operational agreements be democratically effective in the transformation of the inhabited territory in all its parts and physical and socio-economic situations?

A Plan approved by a municipality is always an important reducer of uncertainties for urban and territorial transformations, but the indispensable overcoming of homogeneous areas does not mean having to give up regulating the regeneration of existing urbanization for the good of all. Furthermore, regulatory Plans have always served to direct private initiative, precisely to defend the territory from massive land speculation which in Italy has played a fundamental role since the second half of the 20th century. Will these recent Plans be more effective than those of the past in controlling speculative actions?

It is certainly true that urban planning in contractual and negotiated forms, based on operating agreements, in recent years has guided the regeneration of large urban portions with often positive results, also in the necessary compliance with the requirements of the municipal Plan (Gaeta, 2022). But despite this, the recent municipal Plans here studied

show that a greater balance still needs to be struck between the strategic plan and the punctual design of parts of the city, between public/private operating agreements and the framework rules established by the public administration to protect the commons and spatial justice. For democratic and ecological regenerations guided by these Plans, careful public management is therefore necessary which does not allow itself to be overwhelmed by the chronic scarcity of resources of the public administrations. These latter, in the framework of not only economic, but also environmental and social sustainability, must defend, even through the careful evaluation of possible spatial configurations, those non-negotiable values relating both to the landscape and territorial common goods and to the diversified interests of all the inhabitants.

These recent Plans invite us to reflect further on the undoubted need for the old zoning to be transformed and overcome, but also that this technical tool can still be useful, if used in different ways than in the past, guaranteeing social and functional mixes and regulating possible governance for each part to be transformed (Mazza, 1995, Barattucci, 2005, 2013, Bonfantini, 2022). Although, in fact, there is a certain need for new tools, more suited to the objectives of sustainable regeneration of the existing urban planning, a profoundly renewed zoning - and which can also be called differently - can still regulate land use in different parts and situations according to renewed relationships between Plan and Project. Orienting the regeneration of settlement fabrics also through alternative spatial configurations remains an indispensable operation (Barattucci, 2021, 2022; Infussi 2022). The important thing, however, is that Italian urban planners have now learned from past experiences and therefore know how to use this tool in very renewed ways, with attention and competence, as technicians and intellectuals, but also with a necessary critical look at the political decisions of the public administrations for which they work.

References

Aa.Vv. (2001), *Urbanistica*: 116.

Barattucci, Chiara (2022) Il progetto urbanistico per gli spazi pubblici delle diversità nel contesto occidentale europeo. *Crios*, 23.

Barattucci, Chiara (2021) Strumenti urbanistici per la rigenerazione delle aree produttive come nuove parti di città. *Territorio*, 99.

Barattucci, Chiara (2017) Lezione: Lo zoning nei Piani italiani degli ultimi cinquant'anni, Milano: Politecnico di Milano.

Barattucci, Chiara (2013) Zoning/Mixité. Alle radici dell'urbanistica italiana e francese, 1870-1945. Roma: Officina.

Barattucci, Chiara (2005) Le zoning dans l'urbanisme italien et français du XXe s. *Urbanisme*, 344.

Barattucci, Chiara (2004) Urbanizzazioni disperse. Interpretazioni e azioni in Francia e in

Italia, 1950-2000. Roma: Officina.
Bianchetti, Cristina (2011) Il Novecento è davvero finito. Roma: Donzelli.
Bonfantini, Bertrando (2022) Zoning. *Urbanistica Informazioni*, 301.
Calabi, Donatella (2000) Storia dell'urbanistica europea. Torino: Paravia.
Camagni, Roberto, Ezio Micelli and Stefano Moroni (eds) (2014) Diritti edificatori e governo del territorio: verso una perequazione urbanistica estesa? *Scienze regionali,*13.
Chiodelli Francesco and Stefano Moroni (2016) Zoning-integrative and Zoning-alternative transferable development rights: Compensation, equity, efficiency. *Land Use Policy*, 52.
Campos Venuti, Giuseppe and Federico Oliva (eds) (1993) Cinquant'anni di urbanistica in Italia, 1942-1992. Roma-Bari: Laterza.
Campos Venuti, Giuseppe (1987) La terza generazione dell'urbanistica. Milano: F. Angeli.
De Carlo, Giancarlo (1973) L'architettura degli anni Settanta. Milano: Il Saggiatore.
De Carlo, Giancarlo (1964). Questioni di architettura e urbanistica. Urbino: Argalia.
Gabellini, Patrizia (2018) Le mutazioni dell'urbanistica. Roma: Corocci.
Gaeta, Luca (2022) Urbanistica contrattuale. Criteri, esperienze, precauzioni. Milano: F. Angeli.
Gaeta, Luca, Umberto Janin Rivolin and Luigi Mazza (2013) Governo del territorio e pianificazione spaziale. Novara: De Agostini.
Harvey, David (2016) Il capitalismo contro il diritto alla città. Neoliberalismo, urbanizzazioni, resistenze. Verona: Ombre Corte.
Harvey, David (2015), Cities and Inequalities in a Global and Neoliberal World. London: Routledge.
Indovina, Francesco (1992) La città occasionale. Milano: F. Angeli.
Infussi, Francesco (2022) Per una apologia dell'esplorazione progettuale. In Montedoro, Laura and Michelangelo Russo (eds), Fare urbanistica oggi. Le culture del progetto. Roma: Donzelli.
Mancuso, Franco (1978) *Le vicende dello zoning*. Milano: Il Saggiatore.
Mazza, Luigi (1995) Chi ha paura della zonizzazione? *Urbanistica Informazioni*, 140.
Micelli, Ezio (2011) La gestione dei piani. Perequazione, accordi, incentivi. Venezia: Marsilio.
Palermo, Piercarlo (1992) Interpretazioni dell'analisi urbanistica. Milano: F. Angeli.
Perulli, Paolo and Luciano Vettoretto (2022) Neoplebe, classe creativa, élite. La nuova Italia. Bari-Roma: Laterza.
Piccinato, Giorgio (1974) La costruzione dell'urbanistica. Germania 1971-1914. Roma: Officina.
Salzano, Edoardo (2003) Fondamenti di urbanistica. La storia e la norma. Bari: Laterza.
Secchi, Bernardo (ed) (1996) Laboratorio Prato PRG. Firenze: Alinea.
Secchi, Bernardo (2013) La città dei ricchi e la città dei poveri. Roma-Bari: Laterza.
For the Plans of Rome, Milan and Bologna: websites of the municipal administrations.

STRATEGIC THINKING AS BASIS FOR SUCCESSFUL FUTURE DEVELOPMENT: REPURPOSE POREČ: DEVELOPMENT VISION 2050 (1085)

Lea Petrović Krajnik[1*], Paula Jozić[1], Damir Krajnik[1]

[1]Department of Urban Planning, Spatial Planning and Landscape Architecture, Faculty of Architecture, University of Zagreb, Zagreb, Croatia; [*]lea.petrovic@arhitekt.hr

Abstract. Strategic thinking and development planning of a certain area are of key importance for the course of its development. This paper shows the intention of the establishment of a comprehensive system of strategic planning and development management on the national level in order to ensure its social progress, enhanced and more focused territorial development and the project *Repurpose Poreč: Development vision 2050* that is based on the strategic thinking of spatial development. The aim of this paper is to point out the need for a synergy between strategic planning and spatial planning and the importance of education and the role of spatial planners and urban planners to achieve the highest possible quality of life in cities and regions of the 21st century.

Keywords: development vision, education, Poreč, spatial planners, strategic thinking and planning.

1. Introduction

Strategic thinking and development planning of a certain area are of key importance for the course of its development. The aim of this paper is to point out the need for a synergy between strategic planning and spatial planning and the importance of education and the role of spatial planners and urban planners as it is set out in The Charter of European Planning (ECTP-CEU, 2013), in order to realize the development planning goals and to achieve the highest possible quality of life in cities and regions of the 21st century.

According to the ECTP-CEU (2013), Spatial Planning is cross-disciplinary that involves different professionals and actors in complex processes. It can be said that the planner's role responds to developments in society and planning laws and policies. Depending on the different political and social framework, the planners in different countries are engaged as visionaries, technocrats, managers, advisors, mentors or instructors.

Spatial planning primary focuses on the interests of society as a whole, the settlement or the region as an entity, and the longer-term future. Spatial planners are serving and protecting the general interest and local democracy. Their key role is to be leaders of

change in society towards a more sustainable and secure future.

Spatial planners analyse, draft, implement and monitor development strategies, supporting policies, programmes, and key projects. They are engaged actively in the various phases and scales of the planning process. Besides plan preparation, they are involved in the political process aiming to balance all relevant interests, public and private, where the planner has an important role as a mediator.

Planners must lead the changes that are needed to manage existing and create new cities and regions. The 21st century challenges require planners to be leaders of change, political advisors, designers, urban managers, and scientists. In that way, it would be easier to achieve the Vision, as well as to apply the Charter of European Planning Principles.

Comprehensive planning enables communities to formulate strategic visions for achieving their future goals. Such visions have the potential to be the basis for creating great places and delivering a more sustainable future for communities and to achieve their long-term needs. Spatial Planning operates at all scales, from European, transnational, national, regional to local plans. The integrative approach in spatial planning allows an evaluation of the strengths and challenges of the area, the definition of opportunities and scenarios, and selection of optimal vision and spatial policies for the future development of an area.

Different authors, especially from the field of management (Bonn, 2001; Graetz, 2002; Liedtka, 1998), point out their views on the specificities of strategic thinking and strategic planning. Here we stress Henry Mintzberg (1994) who argues that strategic planning is about analysis (i.e., breaking down a goal into steps, designing how the steps may be implemented, and estimating the anticipated consequences of each step). Whereas from his point of view, strategic thinking is about synthesis, about using intuition and creativity to formulate an integrated perspective, a vision.

The paper will show how students at the Faculty of Architecture in Zagreb on the Master's course in Architecture and Urbanism who choose the Spatial Planning workshop are directed to think strategically about space through comprehensive planning, using the scenario tool in planning future development. For the purposes of this work, the city of Poreč was chosen as one of the exceptional examples of cities in Istria due to its architectural and natural heritage and the long-standing tradition of spatial planning in western Istria.

As part of *Workshop 3: Spatial planning* at the Faculty of Architecture of the University of Zagreb, under the mentorship of prof. Lea Petrović Krajnik, head of the workshop, student Paula Jozić, created a vision for the development of the City of Poreč named *Repurpose Poreč: Development Vision 2050* (Jozić, 2020). Afterwards, she further developed the location and theme to the urban planning project in the Diploma thesis *Urbanistic-architectural Solution for the Revitalization of the Public Space of the Peškera Bay in the*

City of Poreč (Josić, 2021).

2. Strategic Planning and Spatial Development

The establishment of a comprehensive system of strategic planning and development management on the national level and the adoption of legislative and institutional framework for its optimal arrangement are aimed at ensuring its social progress, enhanced and more focused territorial development. The Government of the Republic of Croatia initiated a comprehensive reform of strategic planning and development management in 2017, with the aim of implementing improved public policies and projects at all levels in order to achieve synergistic links between Croatian and European development policies. (Ministry of Regional Development and EU Funds of the Republic of Croatia, 2023)

The Ministry of Regional Development and European Union Funds has the role of coordinating body for the system of strategic planning and management of the development of the Republic of Croatia in order to achieve a link between Croatian and European development policies and to direct the European funds to the development priorities of Croatia.

The strategic framework of strategic planning system and development management of the Republic of Croatia is based on defined principles and includes acts of strategic planning of national significance (National development strategy, multisectoral and sectoral strategies, national plans and associated action plans, Government program and implementation programs of state administration bodies), acts of strategic planning on local and regional level (development plans and implementation programs of self-government units), strategic planning acts related to the EU economic management framework (convergence program and national reform program).

Acts are divided into long-term (National development strategy, multisector and sectoral strategies), medium-term (national plans and development plans of local and regional self-government units) and short-term strategic planning acts (Government program, convergence program, national reform program), implementation programs of state administration bodies and of local and regional self-government units, as well as action plans for the implementation of national plans. Acts of strategic planning are drawn up and implemented in accordance with the principles of accuracy and completeness, efficiency and effectiveness, responsibility and focus on results, sustainability, partnership and transparency (Zakon.hr, 2022). The *National Development Strategy of the Republic of Croatia until 2030* was adopted in 2021 and represents the highest hierarchical act of strategic planning, which serves to shape and implement the development policies of the Republic of Croatia (Official Gazette, 2021).

The spatial planning system, which ensures the conditions for the use, protection and management of space in the Republic of Croatia as a particularly valuable national asset, is the result of long-standing practice and tradition of spatial planning. It is based on the Constitution and the territorial organization of the state determined by a special law, the authority and jurisdiction of the Croatian Parliament, regional units and other public law bodies. The spatial planning system is regulated by the *Physical Planning Act* (Official Gazette 153/13, 65/17, 114/18, 39/19, 98/19) and the basic principles are harmonised with EU regulations.

The key state document for directing spatial development is the *Spatial Development Strategy of the Republic of Croatia*. The strategy is prepared by the Ministry of Physical Planning, Construction and State Assets and adopted by the Croatian Parliament. It is harmonised with European documents on a strategic and supranational level.

In addition to the Ministry of Physical Planning, Construction and State Assets, spatial policy is also managed by the Ministry of Regional Development and EU Funding, the Ministry of Environment and Energy, and the Ministry of Culture and Media, based on the *Physical Planning Act* which regulates spatial planning and sectoral laws on regional development, protection of nature and environment and preservation of cultural assets. Other ministries also have an influence on spatial planning through departmental laws (e.g. *Law on Construction*, *Law on Islands*, *Law on Sustainable Waste Management*, *Law on Settlements*, etc.).

Spatial plans as implementing acts must be in accordance with the Spatial development strategy. They are enacted at the state, regional (county), and local levels (Zakon.hr, 2020).

State-level spatial plans are as follows.

- State spatial development plan
- Spatial plan of an area with special features for areas with natural values (Spatial plan of the Ecological and Fishery Protection Zone, Spatial Plan of the Continental Shelf of the Republic of Croatia, Spatial plan of the national park, and nature park and Spatial plan of areas of special features determined by the State spatial development plan)
- Urban development plans for an area outside of a settlement boundary for economic and/or public purposes of national significance

Spatial plans at the regional level are the County spatial plan and the Urban development plan for an area outside of a settlement boundary for economic and/or public purposes of county importance. Spatial plans at the local level are the Spatial development plans of a city or municipality, the Urban masterplan (General urban plan) and the Urban development plan.

The *Spatial Development Strategy of the Republic of Croatia* was adopted in 2017, as the

key state document to direct spatial development. Based on the established core values of the Croatian space, the spatial development management system and existing spatial processes, the Strategy defines the general goal (vision) of spatial development until 2030 with development starting points and priorities, directions, and a framework for implementation. (Official Gazette, 2017)

The *Law on the System of Strategic Planning and Development Management of the Republic of Croatia* (Official Gazette 123/17, 151/22) stipulates that acts of strategic planning defined by the Law (National development strategy, Sector strategies and multi-sector strategies, National plans), state-level spatial plans, and spatial planning documents must be harmonised. (Zakon.hr, 2022)

Furthermore, strategic planning acts determined by the Law (regional self-government unit development plan, local self-government unit development plan), spatial planning documents and spatial plans adopted at the local and regional level must be harmonised.

In the context of strategic thinking and planning of space as a particularly valuable national asset, there is a need to harmonise strategic planning acts with spatial planning documents, since they are created in 'parallel' systems. The topic is also discussed in professional and scientific circles to enable the best possible synergy between strategic and spatial planning (Ivaničić, 2023). This work aims to show how the education system teaches and directs students to strategic thinking and planning, as well as the possibility of embodying strategic reflection into spatial planning documents.

3. City of Poreč

The city of Poreč is located on the west coast of the Istrian peninsula in the *Poreština* region, which stretches from the Mirna River near Novigrad in the north to Funtana and Vrsar in the south. According to the 2021 population census, in the city of Poreč, there are 53 settlements with 16,607 inhabitants (Croatian Bureau of Statistics, 2022). According to the number of inhabitants, Poreč is, after Pula, the largest Istrian city.

In addition to its favourable geographical position, the city of Poreč is characterized by its extraordinary natural and historical heritage. The first data on the settlement of the Poreč peninsula date from the Bronze Age. In the second century BC Poreč was a fortified Roman military camp from which it gradually developed into a settlement of Roman citizens (*oppidum*). At the end of the Classical era, it got the status of a municipium, and in the early empire, the status of a colony, *Colonia Iulia Parentium*. The regular system of the Roman street network with traces of the forum and capitol has been preserved to this day. A great part of northwest Istria belonged to the city as an *ager*, whose centuriation is still visible today in the area from Mirna River to the Lim channel. In the period from the 4th to the 6th century, the early Christian sacral complex with the Euphrasian basilica was

created, which today represents the most significant cultural monument, included in the UNESCO World Heritage List since 1997. (Milić, 1990)

Although historically known for farming and fishing, during the 20th century, tourism became the main economic activity of Poreč (Jozić, 2021). The *Economic Development Strategy of the City of Poreč 2015-2020* points out that tourism-related activities represent the backbone of the city's development.

3.1. Strategic and Spatial Development Documents of the City of Poreč

The city of Poreč envisions the potential for future sustainable development through an extended tourist season, the balance between service and production activities, and investments in infrastructure and environmental conservation. Along with other sector strategies, in accordance with the new legal framework from 2017, the city started drafting the *Strategic Development Plan for the period from 2021 to 2031*. (City of Poreč – Parenzo, 2021)

In the process of developing the plan, a large number of workshops and focus groups were held, bringing together representatives of different associations, small entrepreneurs, institutions, tourism workers, national minorities and other local stakeholders, as well as representatives of city committees as advisory bodies and representatives of the city administration. The focus groups were thematically organized in six areas: history and key determinants of the City's identity, demography and spatial development, economy, society, environment and infrastructure, and city management. The SWOT analysis and detailed analysis of the current situation of each of the areas mentioned were carried out, the summary of which was integrated into the plan.

During the preparation of this document, compliance with the legislative and strategic framework was taken into account, and emphasis was placed on minimizing the impact on the environment and mitigating the consequences of climate change through compliance with the European Green Plan, as well as on continuing to monitor the digitization trend through the implementation of solutions based on new technologies in all spheres of social and business life.

Public policy priorities for this mid-term period were selected in accordance with the vision of the city's development and the necessity of solving key development needs, in accordance with the possibilities of realization and available financial resources. The process of creating the document was coordinated by *Entrepreneurship Incubator Poreč d.o.o.*, as a local coordinator for the execution and coordination of strategic planning and development management for the city of Poreč. The author of the document is the renowned consulting company *Projekt Jednako Razvoj d.o.o.* from Zagreb. (City of Poreč – Parenzo, 2022a)

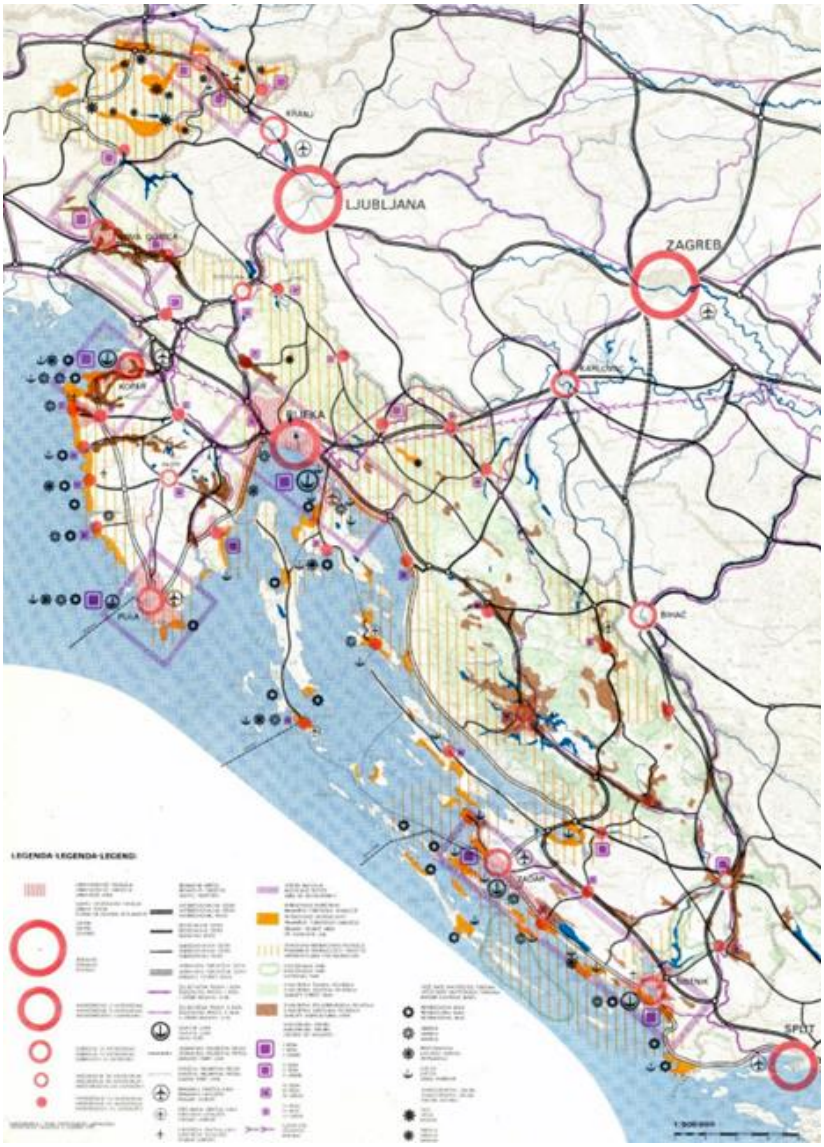


Figure 1. Coordination Regional Plan of the Upper Adriatic

Source: Archiv of the Department of Urban Planning, Spatial Planning and Landscape Architecture, Faculty of Zagreb

The beginning of spatial planning in Istria was prompted by the founding of the *Urban Institute of Croatia* (UIH) in 1947, the *Urban Institute for Rijeka, Istria, and the Northern Primorje* in 1952, and the adoption of the *Law on Urban and Regional Planning* in 1961, which started organized spatial planning activities on the Istrian peninsula. Two plans that should be particularly highlighted as important for the planning of Istria, and thus of Poreč, are the *Regional Spatial Plan of Istria* from 1969 and the *Coordination Regional Plan of the Upper Adriatic* from 1971-1972, which especially appreciated the possibilities of tourism development. (Nefat, 2002)

The legislative framework of the 1970s and 1980s defined the administrative organization of the area, and thus the scope of spatial planning documentation. The spatial plans of Istrian municipalities of the time (Buje, Buzet, Labin, Pazin, Poreč, Pula, and Rovinj) were based on the two mentioned regional plans and the economic development guidelines of the time, which contained a comprehensive planning instrument. This was followed by the preparation of urban masterplans and urban development plans and a series of plans for different locations and uses, which regulated spatial development and protection, with special emphasis on the coastal area.

The Law on the Areas of County, Cities and Municipalities in the Republic of Croatia from 1992 defined a new administrative and spatial division. The new administrative division of space resulted in the need for a new generation of spatial planning documentation. The *County plan of Istria* from 2002 was based on the aforementioned spatial plans of the wider area, as well as on the spatial plans of the former Istrian municipalities. (Hrvatin and Grgurević, 2007)

Spatial development in the past years, as well as the spatial determinants of the future development of the City of Poreč, are defined by the *Spatial Development Plan of the City of Poreč - Parenzo*, the *General Urban Plan of the City of Poreč - Parenzo*, and by approximately fifty Urban development plans and Detailed development plans, which cover most of the area of Poreč and surrounding settlements. The number of spatial plans of lower levels is an indicator of a systematic approach to the development of the city, i.e., a clear vision of the way in which scarce spatial resources should be valorised or preserved.

Amendments to the *Spatial plan* and the *General Urban Plan of the City of Poreč* are both underway. Although the need for changes and additions to the spatial planning documentation in the city of Poreč is not frequent, which indicates good planning, the need for modernizing the plan, rationalizing costs, new projects, implementing new land uses, and providing infrastructure that can be sufficient even during a tourist season when there is an extremely large influx of tourists in the area.

The General urban plan regulates the spatial development of the settlement of Poreč, while the Spatial development plan regulates, in addition to the central settlement, all associated settlements within the administrative boundary of the local self-government

unit.

The Spatial plan determines development of activities and land use, as well as the conditions for sustainable and balanced development. It particularly determines:

- distribution of population including definition of settlement areas, urban renewal of existing built-up areas and rehabilitation of degraded urban and rural areas,
- distribution of activities with guidelines and priorities for achieving the goals of spatial planning,
- agricultural land and forests, water sources and water management systems, mineral raw materials exploitation areas, natural, cultural-historical and landscape values, and endangered areas,
- basic public and communal infrastructure,
- locally significant spatial interventions, and
- conditions for the implementation of a spatial plan (land use, conditions for construction inside and outside of the settlement boundary, general conditions and standards of land equipment and mandatory connection of buildings to communal and other infrastructure, measures for environmental protection, mandatory detailed plans, etc.).

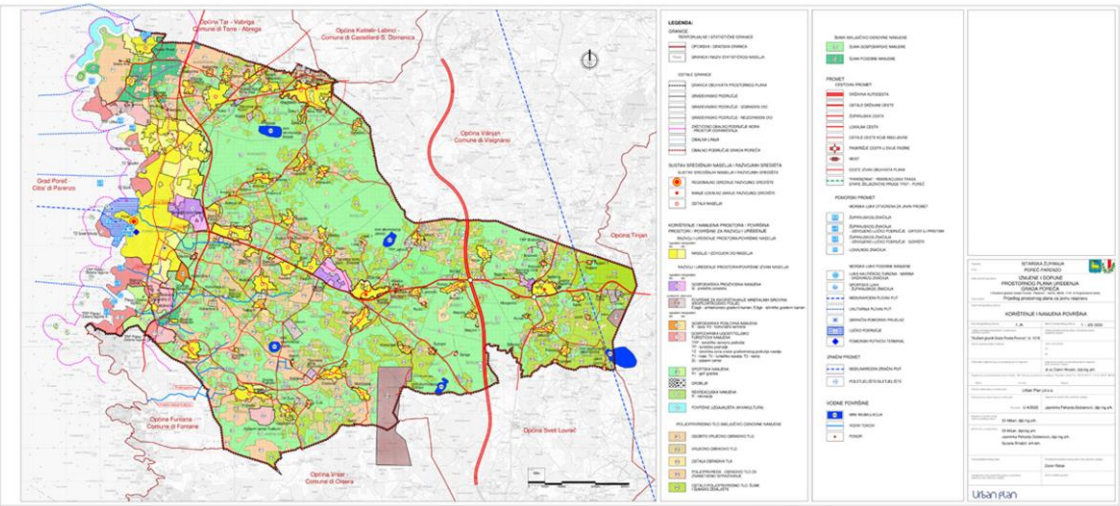


Figure 2. Amendments of the Spatial Development Plan of the City of Poreč - Parenzo
Source: City of Poreč – Parenzo, 2022b.

The General urban plan determines the directions for the development of activities and land use, as well as conditions for the sustainable and balanced development of a town area. According to the goals and objectives established by the valid spatial plan of the city, it determines:

- land use with conditions for spatial arrangement,

- the system of infrastructure corridors and buildings and their connection with the system of the neighbouring and wider area,
- measures to preserve and protect the integral values of the space, as well as natural areas and cultural historical areas and buildings,
- environmental protection and improvement measures,
- Conditions for use, arrangement, and protection of space,
- Plan implementation measures.

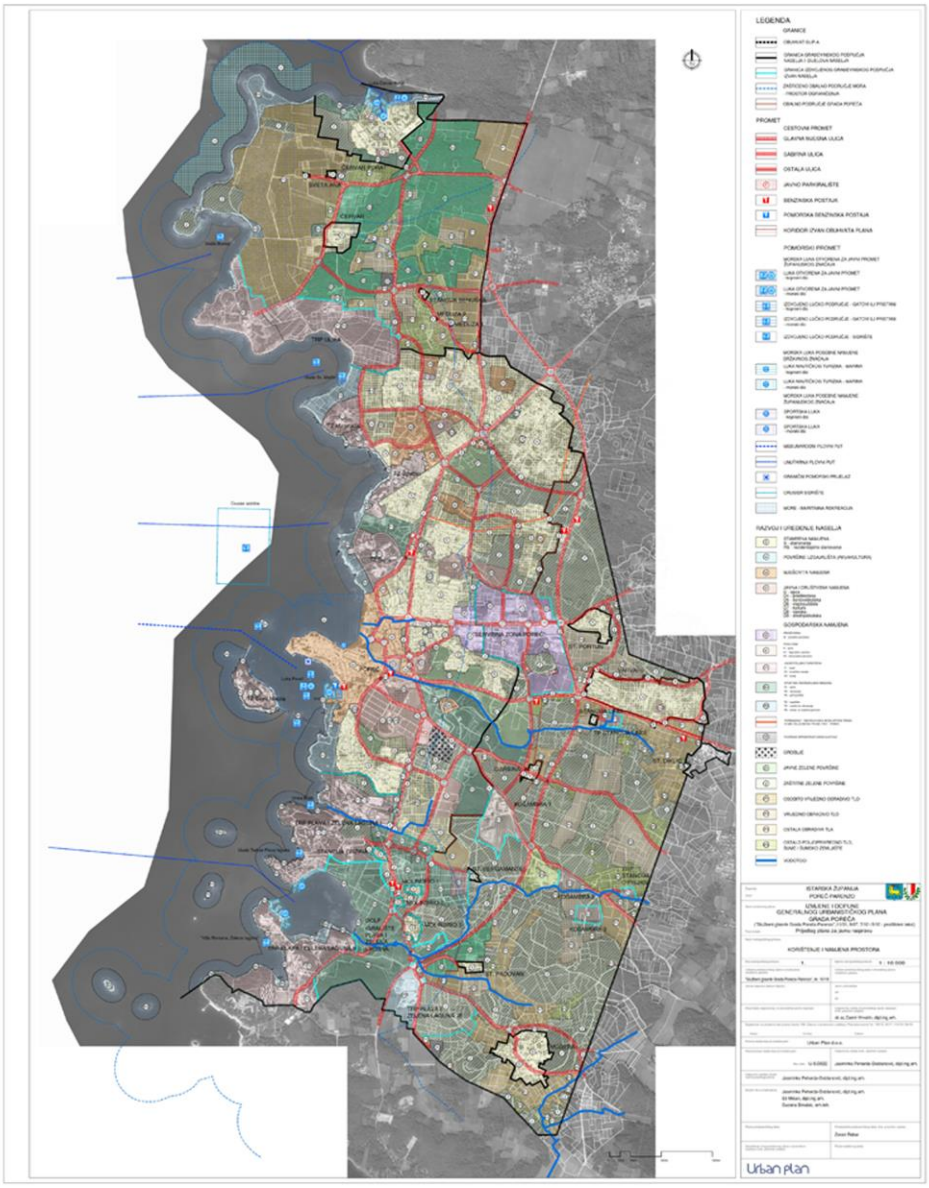


Figure 3. *Amendments of the General Urban Plan of the City of Poreč - Parenzo*
Source: City of Poreč – Parenzo, 2022c.

3.2. Repurpose Poreč: Development Vision 2050

In order to anticipate the future development of the city, the scenario tool as one of the few *par excellence* tools for planning future development was used. Detailed analysis of the current condition of the subject area and the existing spatial planning documentation served as the basis for a SWOT analysis of society, economy, space, and environment, with an aim to define the proposal of different development scenarios for the future 30-year period. In accordance with the set goals and possible scenarios, the development vision based on determined desirable elements was proposed. For the three selected areas in the city of Poreč, detailed development proposals and projects for future development were defined as representative examples of the possible direction of spatial development.

3.2.1 Possible Scenarios for the Development of the City of Poreč

3.2.1.1 Scenario 1 – Tourism

Poreč has been the metropolis of Croatian tourism since the 1970s. A city rich in cultural and historical monuments, an exemplary horticultural arrangement, with various types of tourist accommodation and facilities, especially sports and recreation, is the most frequent target of European tourists in Croatia, especially from Germany, Austria, Italy and, Slovenia. Poreč became famous as a tourist destination in the 1950s with the construction of tourist resorts on the coastline, where active summer vacations were promoted. During the 1970s and 1980s, along the entire Poreč coast, from Lanterna in the north to Blue and Green Lagoon in the south, construction of hotels, tourist resorts, camps, sports, and entertainment centres began. Today, the Poreč-Vrsar Riviera can host more than 100,000 tourists daily. A strong hotel and communal infrastructure, as well as the general tourist orientation of local entrepreneurs, politicians, and the population, for whom this activity is the most important source of income, contributed to Poreč being the first to emerge from the crisis brought to Croatian tourism by the Homeland war. Many renovated hotels, continuous care for the horticultural arrangement of the city and its surroundings, and high ecological standards bring Poreč recognition not only from numerous guests, but also from official tourism institutions. According to the statistical data, in 2016, there were a total of about 28,000 beds in hotel accommodation, private accommodation and campsites in the city area. (City of Poreč - Parenzo, 2023; Jozić, 2020)

The Economic Development Strategy of the City of Poreč 2015-2020 (2015) highlighted the attractiveness of the area (influence of tourism), the multiplier effect of tourism (economic and social impact), the existence of the Institute for Agriculture and Tourism, and the tradition of tourism and related activities as a comparative advantage for the population, entrepreneurship, spatial planning, and infrastructure development, while a mono-economic character with tourism as a fundamental activity was recognised as a

weakness of the economy. The change in the economic structure from mono-economic to multi-economic by combining production and service activities as well as the transition from seasonal to a year-round destination, stand out as development opportunities. A SWOT analysis in the field of tourism was carried out, showing in detail all strengths, weaknesses, opportunities, and threats.

Along with other elements, defining the vision of the economy finds its origin in tourism based on natural and cultural-historical heritage and new tourist attractions. Strategic goal 4 is *Poreč - a globally recognizable tourist destination*.

The scenario of future development foresees the City development based exclusively on tourism, following the direction in which Poreč has developed over the years.

It is assumed that the tourist area will expand considerably by 2050.

The scenario envisages:

- Exploitation of the potential of spatial and natural features of the landscape in the direction of attracting tourists.
- Economic gains and development based on tourism.

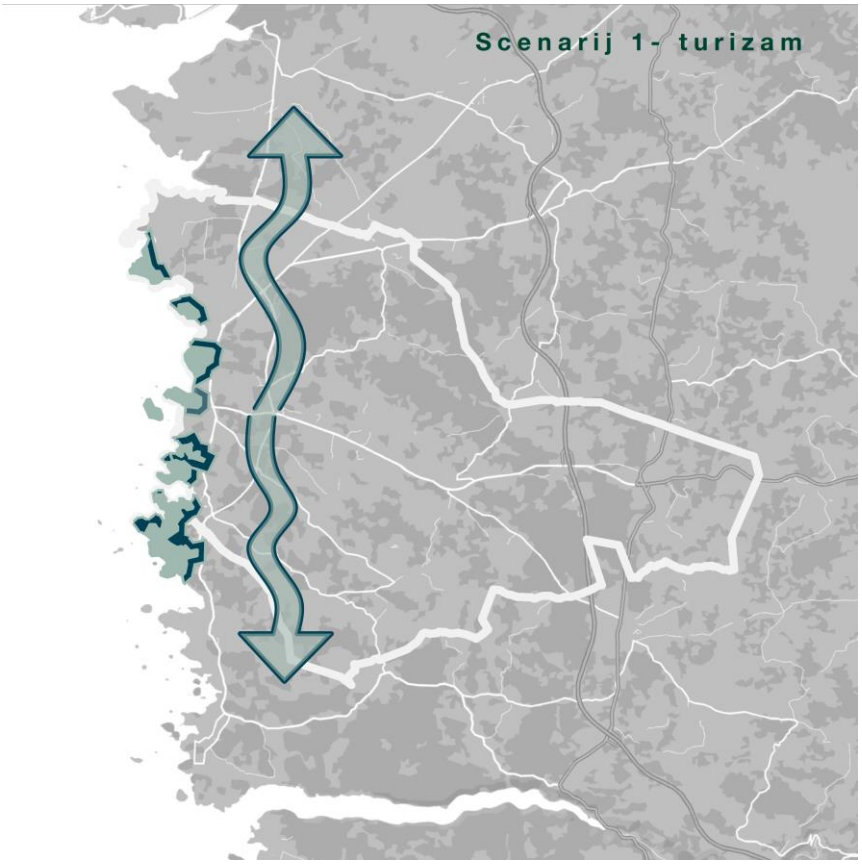


Figure 4. *Scenario1 - Tourism*

Source: Jozić, 2021.

The assumed positive effects of the *Tourism scenario* are: organisation of numerous events in order to attract as many people as possible, economic profit primarily from tourism, creation of new jobs, and additional investments in infrastructure.

The assumed negative effects of the *Tourism scenario* are: reduction and pollution of the natural environment, sea pollution, exploitation of land along the coast, increase in real estate prices, gentrification of the city centre, development of the periphery, endangering the historical heritage, insufficient development of other economic activities, insufficient opening of jobs for highly qualified workforce and immigration of foreign population.

3.2.1.2 Scenario 2 - Agriculture

The City of Poreč covers an area of 139 square kilometres. Throughout the history, until the development of tourism, the inhabitants of Poreč lived almost exclusively from agriculture and fishing. The landscape of the Poreč region is rich in Mediterranean vegetation, with pine forests and green macchia, as well as agricultural areas with high quality red soil suitable for cereals, orchards, olive groves, and vegetables. Agricultural areas have a significant share in the overall area of the city. Today, the area of the Poreč region is known for the production of organic food, olives, grapes, and quality wine varieties such as *Malvazija*, *Borgonja*, *Merlot*, *Pinot* and *Teran*, which forms an important part of the Poreč economy. The Institute for Agriculture and Tourism, a public scientific institute operating within the Ministry of Science, Education and Sports of the Republic of Croatia, is located in the city of Poreč. The main activity of the Institute is the application of scientific research in agriculture and tourism through the implementation of scientific and professional projects in the fields of viticulture, winemaking, olive cultivation and production of olive oil, agro-economics, and tourism. (Jozić, 2020)

The Economic Development Strategy of Poreč 2015-2020 highlights the existence of the Institute for Agriculture and Tourism as a comparative advantage for the development of entrepreneurialism, and as an opportunity for the development of agricultural production, especially olive cultivation and olive oil, as well as viticulture and winemaking.

Along with other elements, defining the vision of economic development is based on agriculture and agriculture-related production, especially viticulture, winemaking, olive growing, and oil production in synergy with tourism. Development of entrepreneurship was set as Strategic Goal 3, and as a priority 3.1. Development of small and medium enterprises. For this priority, the following measures and projects were set: 3.1.10 Development of agriculture and mariculture, 3.1.10.1 Development of ecological and integrated agricultural production, 3.1.10.2. Encouraging the use of modern methods of production and processing of agricultural products, 3.1.10.3. Evaluation of unused

agricultural land owned by the Republic of Croatia, 3.1.10.4. Creation and implementation of the evaluation program of private agricultural land, 3.1.10.5. Branding of indigenous agricultural products, 3.1.10.6. Education of farmers, 3.1.10.7. Encouraging the production of new and profitable agricultural crops for which there are natural prerequisites, 3.1.10.8. Connecting large entrepreneurs, preschool institutions, primary and secondary schools with manufacturers of food products and beverages, and 3.1.10.9. Development of mariculture.

The development of the city area is expected to be in the direction of agriculture until 2050.

The scenario envisages:

- Encouraging the development of agriculture with the aim of increasing and preserving agricultural production through various forms of co-financing,
- increasing employment on private farms,
- preserving rural areas, and
- achieving quality production on a larger scale.

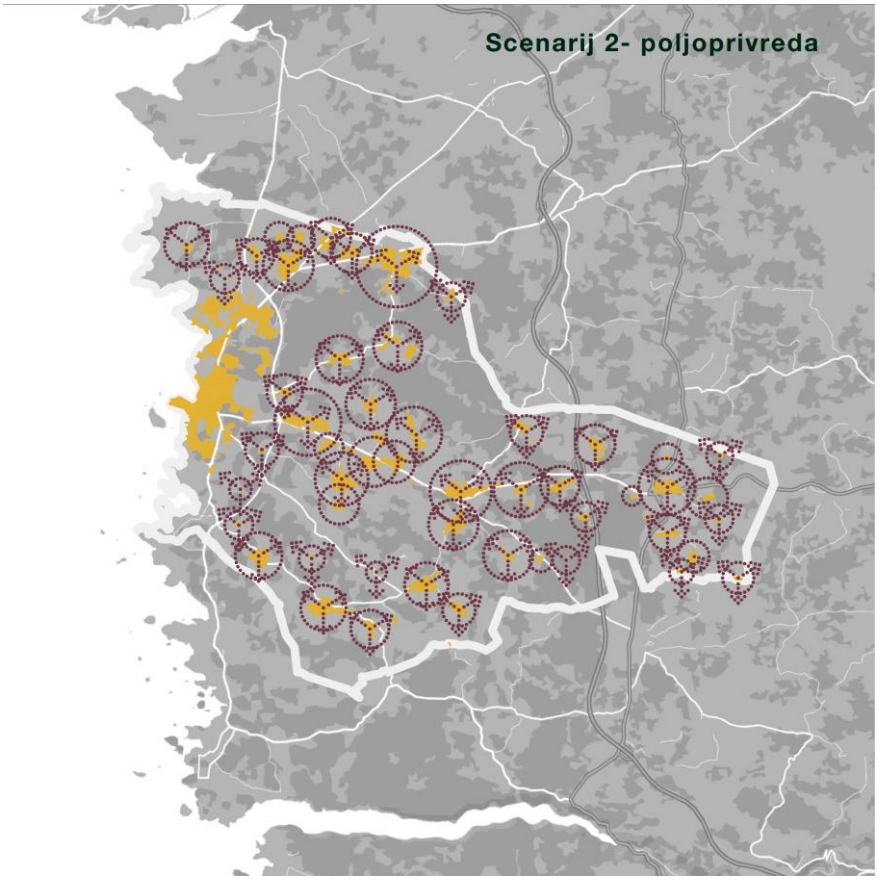


Figure 5. Scenario 2 - Agriculture

Source: Jozić, 2021.

The assumed positive effects of the *Agriculture scenario* are: creation of new jobs, reduction of natural environment pollution, preservation of land from excessive construction, production of healthier food, and thereby creating prerequisites for a healthier life of the population, preservation of coastal area, and economic independence from tourism.

The assumed negative effects of the *Agriculture scenario* are: gentrification of the city centre, insufficient development of other economic activities, insufficient opening of jobs for highly qualified workforce, increase in the built-up area of the periphery, economic decline, reduction of funds for preservation of architectural heritage and infrastructure development.

3.2.1.3 Scenario 3 - Facilities

According to the population census from 2021, Poreč has 53 settlements and a total of 16,607 inhabitants, of which 8,841 live in the central settlement and the remaining 7,766 live in the surrounding settlements. After Pula, Poreč is the largest Istrian city. Most of the inhabitants are Croats, but there are significant national minorities of Italians, Slovenians, Albanians, and Serbs.

The analysis of the current situation indicates a concentration of tourist facilities in the coastal area, while commercial facilities are distributed throughout the city. There is a deficit of public and social facilities, which are located mainly in the city centre and in the northern part of the city area.

In the *Economic Development Strategy of the City of Poreč 2015-2020*, the high degree of entrepreneurial and craft activity of the population, small and dynamic business entities, and the existence of the Institute for Agriculture and Tourism are highlighted as strengths of entrepreneurship development. Weaknesses of entrepreneurship development are unfavourable trends in the number of active trades, the low level of economic added value created by business entities, and the lack of content for young people. Recognised opportunities are: opening of new businesses in trade, entertainment and recreation (larger number of potential jobs), development of new residential zones and public facilities, continuation of public works with the aim of building new and improving existing public and social facilities and communal infrastructure and creating assumptions for further development of economic activities, further arrangement of business zones, facilitation of activities for small entrepreneurs, and improvement of sports infrastructure (bicycle paths, soccer fields, olympic swimming pool).

Along with other elements, defining the economic vision finds its origin in public facilities. Construction of new and development of existing public facilities and communal

infrastructure according to the principles of sustainability and rationality was set as strategic goal 2, with priority 2.1 Construction of new and development of existing public facilities and communal infrastructure respecting the principles of sustainability and rationality. The measures set for this priority were: 2.1.1 Revitalisation of the historic core and the city centre, 2.1.2. Revitalisation of the city waterfront, 2.1.3. Construction of public facilities, 2.1.4. Construction of sports and recreational facilities, 2.1.5. Construction/renovation of other facilities of social importance. Specific projects have also been determined for the implementation of the above-mentioned measures.

Spatial development based on the attraction of the population with new facilities by 2050.

The scenario envisages:

- Attracting and retaining the population by introducing new content that is not based exclusively on tourism, but also on various public and social activities in order to create multiple opportunities for the population.
- Opening of new business branches and cultural attractions in the city area.

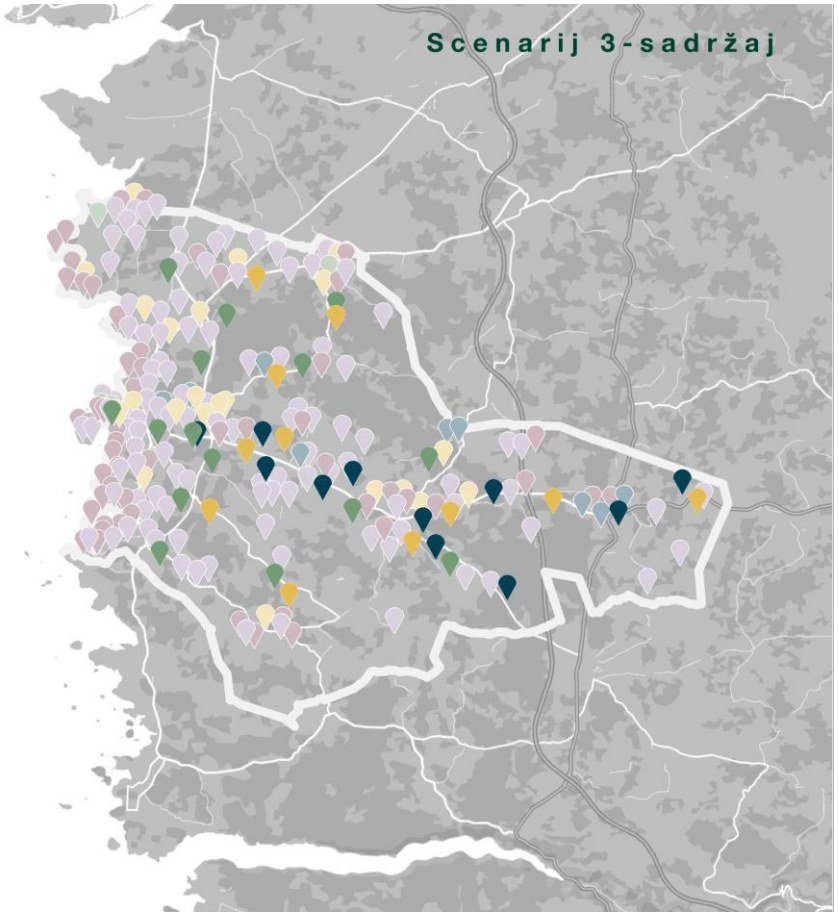


Figure 6. *Scenario 3 - Facilities*
Source: Jozić, 2021.

The assumed positive effects of *Facilities scenario* are: organisation of numerous events in order to attract as many people as possible, a higher quality of life for the existing population, reversing the gentrification process, investments in culture, education, and new business branches in the city area, creating new jobs for the highly educated population, conservation of coastal area, and achieving independence from tourism.

The assumed negative effects of *Facilities scenario* are: an increase in the built-up area of the periphery, a decrease in economic profits, increased immigration, and reduction of funds for preservation of architectural heritage and infrastructure development.

3.2.2 Selected Optimal Scenario – Development Vision for the City of Poreč until 2050

The recognizable image of the city of Poreč is a result of the cultural and historical heritage, agricultural areas and forests, and the characteristic tourist infrastructure. Its characteristics must remain recognizable, and the planned expansion of the built area must preserve the image of the city, the sea coast, and the hinterland recognisable by its forests and agricultural fields. The way the city expands must, therefore, be strictly defined by spatial planning documentation and focused on preservation of the natural and cultural landscape.

To avoid negative effects of spatial development, it is necessary to consider the carrying capacity of the space in relation to the built-up area, economic activities, and the number of people (primarily tourists), and to ensure sustainable development based on the preservation of spatial resources, especially agricultural areas, forests, the coastal area and the sea.

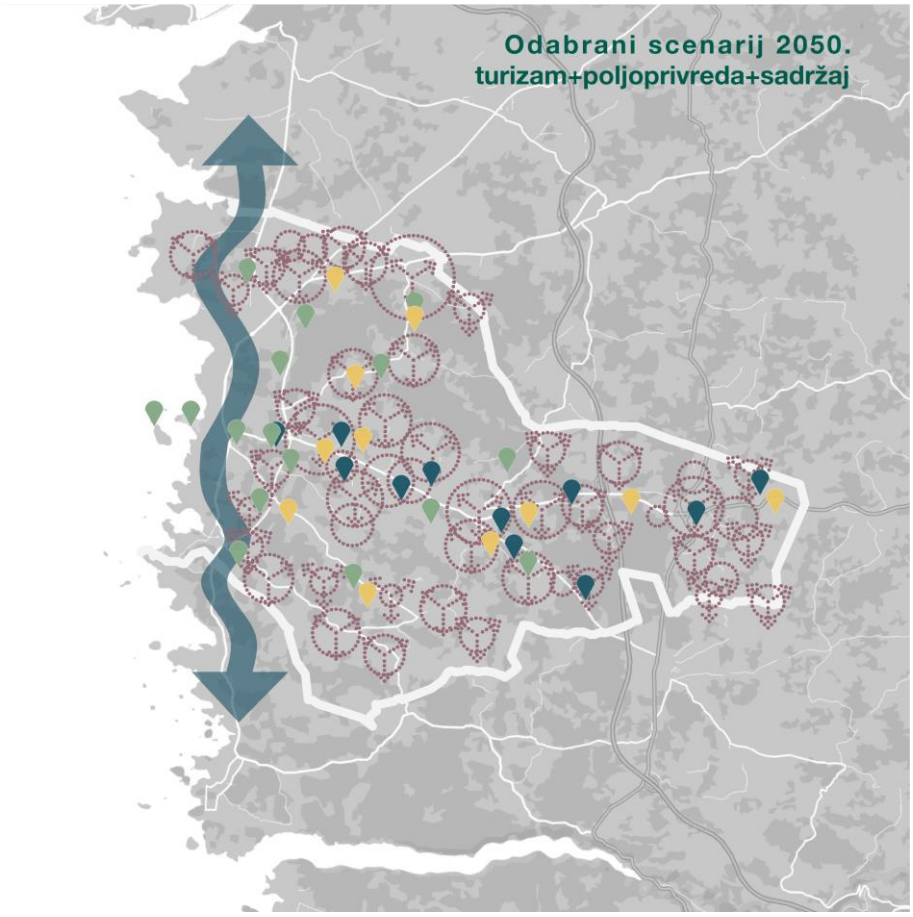


Figure 7. The Development Vision of the City of Poreč

Source: Jozić, 2021

The integration of three possible directions of development of the city of Poreč (tourism, agriculture, and facilities) aims to minimise the negative effects of each individual scenario, and to create new possibilities that could result in positive changes in the area.

The vision ensures attracting and retaining the population with the establishment of new public and social facilities (especially educational) and opening new business branches and cultural attractions in the city. Incentives for investment and agricultural development are planned, which would contribute to quality of life. Different forms of co-financing would enable the increase of agricultural production on family farms and small private estates, which would emphasise the importance of rural areas. By maintaining the quality of existing tourist infrastructure, along with the construction of additional public and cultural facilities, economic development will be ensured, and the development of the area will have a positive effect on its inhabitants.

The assumed positive effects are: organisation of numerous events in order to attract as

many people as possible, a higher quality of life for inhabitants, investments in culture, education, and new business branches, creating new jobs for the highly educated population, preservation of coastal area, achieving independence from tourism, reduction of natural environment pollution, preservation of land from excessive construction, production of healthier food, and thereby creating prerequisites for a healthier life of the population, and investments in infrastructure.

The assumed negative effects are: immigration of foreign population, reduction of funds for preservation of architectural heritage and infrastructure development, gentrification of the city centre, sea pollution, and rise in real estate prices.

The chosen scenario, that is, the development vision, is realised through the synergistic action of three development goals.

Goal 1. *Improvement of quality of life, public and social infrastructure, and human potential*

Public infrastructure and services are important components of the social standard of the community, which significantly affect the increase in educational, health, and cultural standards, and the availability and quality of housing enhance the overall quality of life of all social groups. The goal is achieved through the following priorities: development of education, lifelong learning, and improvement of employment, improvement of public and social infrastructure and services, and improvement of housing standards.

Goal 2. *Development of a competitive and sustainable economy*

This goal contributes to the development of a competitive economy through the development of entrepreneurial infrastructure and services, as well as business zones. The goal is achieved through the following priorities: competitive entrepreneurship and craftsmanship, scientific and technological development and innovation, the development of tourism and culture and sustainable use of natural resources.

Goal 3. *Improvement of the environmental, natural and architectural heritage and space management*

The effort is to improve quality of life and the quality of all spatial components by encouraging the protection and preservation of the environment and natural resources, the improvement of communal infrastructure, sustainable mobility, the rationality of energy use and the concern for climate change, and sustainable development. The goal is achieved through the following priorities: protection and improvement of the quality of the environment and nature, improvement of the infrastructure system, the sustainable mobility, especially the development of public transport, and sustainable spatial development.

The distribution of 16 general development guidelines for the Poreč area is shown in

Figure 8.

The guidelines are: 1)Transport infrastructure; 2) Integrating public transport; 3) Cycling and pedestrian infrastructure; 4) Water supply, drainage and wastewater treatment system; 5) Coastal protection; 6) Waste management; 7) Entrepreneurial support infrastructure system; 8) Development of educational institutions; 9) Development of agriculture and marketing of locally produced products; 10) Cultural heritage and tourism; 11) Green infrastructure and natural heritage; 12) Urban renewal and energy efficiency; 13) Improving youth employment opportunities; 14) Development of health infrastructure and services; 15) Introduction of public facilities; 16) Coordination and networking of spatial development.

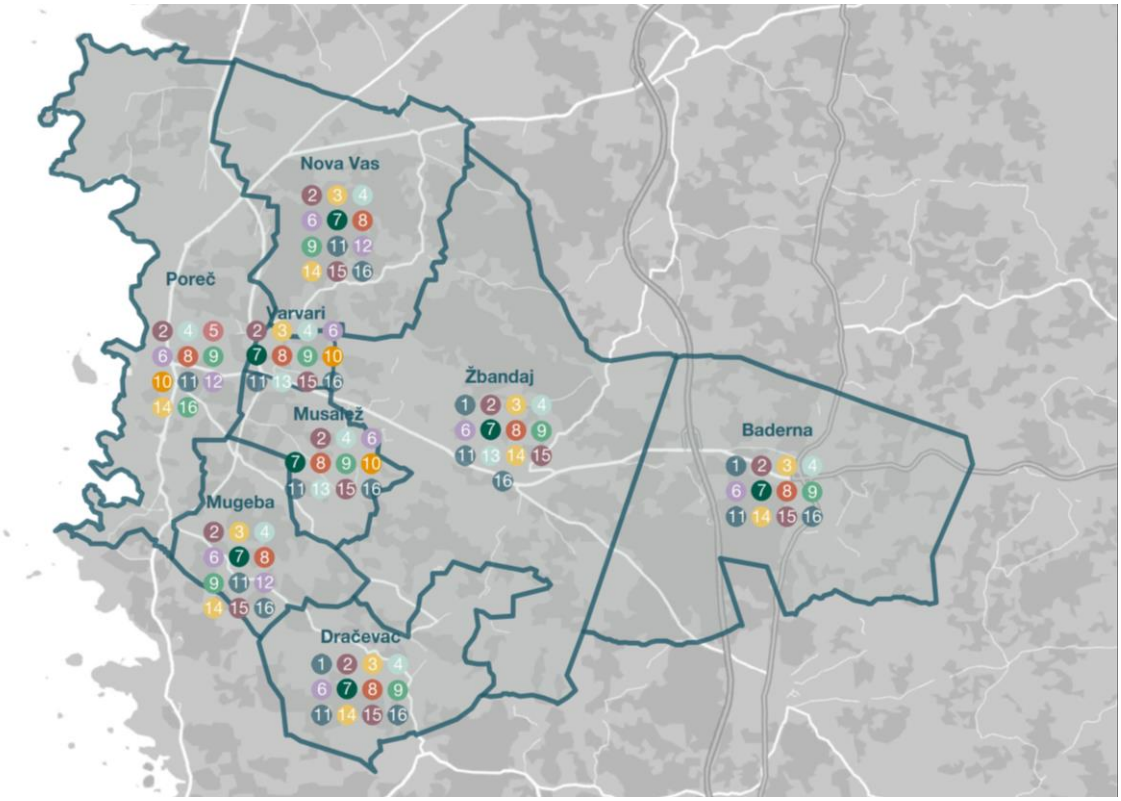


Figure 8. The Development Guidelines

Source: Jozić, 2021.

3.2.3 Three Selected Areas of Development

In order to present the elements of the development vision and development goals, based on the set criteria, areas around three settlements were selected. The first selection criteria was a different location within the administrative area of the city. The second criteria were greater differences in the number of inhabitants, and the third criteria was the specific characteristics of the area, a tourist settlement, a settlement with a business

zone, and a settlement with a distinct natural and cultural landscape.

Červar - Porat is a coastal tourist apartment settlement with 381 inhabitants. Žbandaj is a well-connected settlement located in the hinterland, in the central part of the Poreč administrative area, with 538 inhabitants and a business zone. Čuši is a hinterland settlement located in the southern part of the administrative area of Poreč, with only 27 inhabitants, and a characteristic natural and cultural landscape.

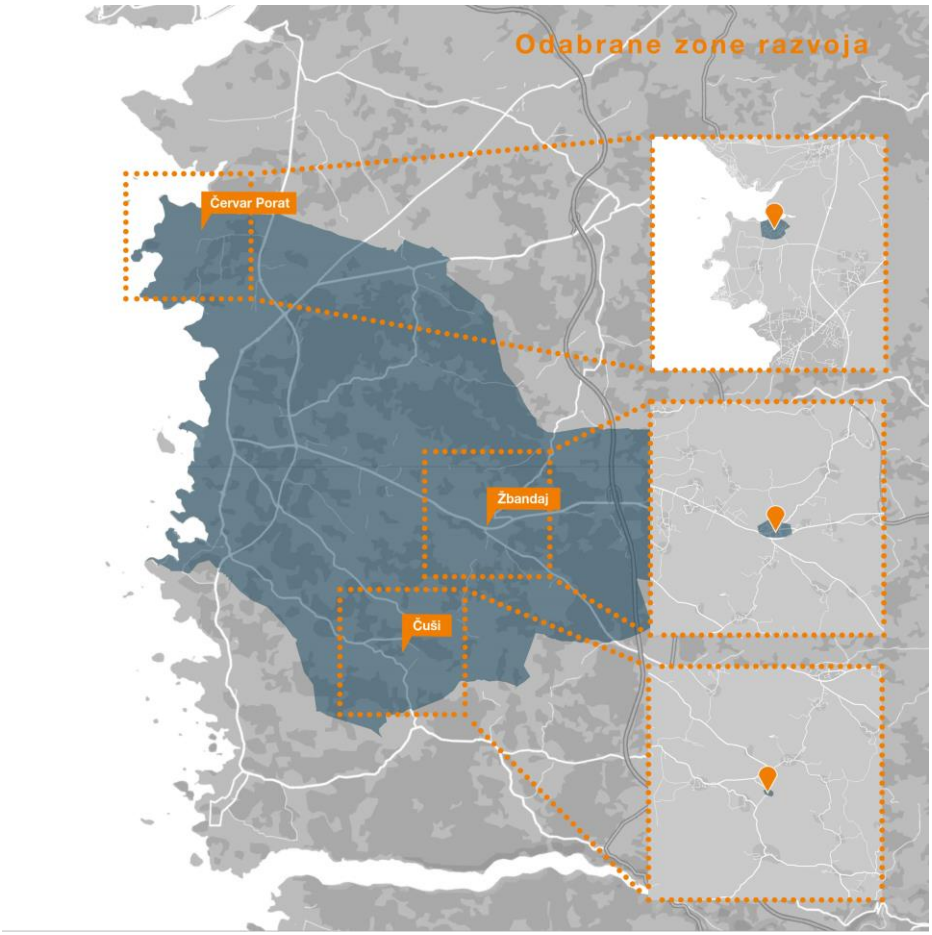


Figure 9. Selected Development Areas in the Area of Poreč

Source: Jozić, 2021.

In the area around the settlement of Červar-Porat, three scenarios are integrated, with an emphasis on the development of a tourist and cultural centre. To encourage development, the implementation of cultural and educational institutions, as well as tourist facilities. The development of circular agriculture is foreseen around the settlement, and the distribution is planned on the various markets located in the settlement. To stimulate other economic activities, the development of various economic and business facilities along the main transport infrastructure is encouraged.

In the area around the settlement of Žbandaj, three scenarios are intended to be integrated, with an emphasis on the development of a business and economic centre. To encourage development, the business infrastructure is proposed, which would especially open up the possibility of employment for young people. The development of circular agriculture is planned around the settlement, and the distribution is planned on the various markets located in the settlement. The construction of accommodation units for business tourism is planned to stimulate the development of the economic and business zone.

In the area around the settlement of Čuši, three scenarios are intended to be integrated, with an emphasis on the development of the centre of agricultural production on small farms with domestic crops. Areas intended for agricultural production are planned around the centre of the settlement, the possibility of developing rural tourism is foreseen, while the construction for the needs of economic and business entities along the main transport infrastructure is planned in order to stimulate divergent economic activity.

Figure 10. Zoom-in: Červar-Porat, Žbandaj and Čusi

Source: Jozić, 2021

4. Discussion

Each country has its own specificities in spatial planning and management systems. In Croatia, spatial planning has a long tradition, which became particularly active after the Second World War. As pointed out, in accordance with the current legislative framework (*Spatial Planning Act* from 2013), the basic state document for directing spatial development is the *Spatial Development Strategy of the Republic of Croatia*, with which all spatial plans on the state, regional, and local level must be harmonised. In 2017, new circumstances emerged when the reform of strategic planning and development management in Croatia began, in accordance with European practices and policies, in order to implement enhanced public policies and projects at the national, regional, and local levels. For the design and implementation of the development policies of the Republic of Croatia, the *National Development Strategy of the Republic of Croatia until*

2030 (2021) plays the most significant role as the highest act of strategic planning. Strategic and spatial planning, although within the scope of various ministries, have a common development goal, with the emphasis of spatial planning on the territory.

Space, as a valuable and limited resource, represents a special value for every country. Therefore, special attention should be paid to its planning and development. Long-term planning and defining the vision for the development of a certain area is of particular interest for society. Therefore, it is necessary to achieve the synergy between strategic planning and spatial planning to achieve appropriate spatial development while preserving all valuable components.

The long tradition of planning in Istria and Poreč shows significant care for the space and long-term consideration of its development. In addition to the *Spatial Plan* and the *General Urban Plan of the City of Poreč*, there are about 50 detailed urban development plans covering the central and surrounding settlements. According to the new legislative framework that determines strategic planning, the City of Poreč has started to draft a *Strategic Development Plan for the period from 2021 to 2031*. Since the amendments to the *Spatial Plan* and the *General Urban Plan of the City of Poreč* are both underway, there is an opportunity to coordinate the elaboration of the city strategic development plan and spatial planning documentation as an instrument that directs the spatial development.

Here, we would like to emphasise the importance of education of architects, urban, and spatial planners, dealing with space on various scales so that they would be able to play different roles highlighted by ECTP-CEU in the *Charter of European Planning*. The Master Course in Architecture and Urbanism at the Faculty of Architecture in Zagreb, that is, the spatial planning workshops, represents a platform for student education about strategic thinking and planning. Strategic thinking, which requires intuition and creativity to formulate an integrated perspective, a vision, enables students to develop creativity and anticipate future spatial development using the scenario tool.

The comparison of three proposed scenarios for the development of the city of Poreč in the context of the *Economic Development Strategy of the City of Poreč 2015-2020* (which was not discussed at the workshop in question) shows an effort to find a balance between the various elements proposed by the sectoral strategy through comprehensive planning.

The aim of the set goals was the arrangement of the development vision with as many positive effects as possible, preserving the natural and cultural potential of the area and using its advantages at the same time. The proposed vision sought to meet the needs of the inhabitants by introducing missing or insufficient public facilities to improve the quality of life and encourage the development of settlements that have specific spatial potential. The connection of different development elements and their spatial distribution contributed to the components of sustainable development of the area.

5. Conclusion

Although the legislative framework in some countries, as in the Republic of Croatia, has a separate system of strategic and spatial planning, it is necessary to achieve their synergy and harmonisation. Since spatial planning is cross-disciplinary, involving different professionals and actors in complex processes, the education of spatial planners, urban planners and architects whose focus is the space and the interest of society, the role for which they prepare during education is of great importance.

Students are taught to work for the benefit of the community, predicting possible development scenarios, and that through the evaluation process they can choose the most appropriate direction and propose a vision for the long-term development of a specific area. Going through different stages and scales in the planning process, they are taught how to balance the various long-term needs of the users, i.e., the community, and how to implement their vision of development through the legislative framework, i.e., spatial planning documentation and policies, programmes, and projects into practise.

In addition to strategic planning based on comprehensive analyses of the causes and consequences of certain activities, education encourages strategic thinking through intuition and creativity, with the aim of formulating an integrated vision of development for cities and regions in order to achieve the development planning goals and the highest possible quality of life in the future.

References

Bonn, Ingrid (2001) Developing Strategic Thinking as a Core Competency. *Management Decision*, 39(1), pp.63-76.

City of Poreč - Parenzo (2015) *Economic Development Strategy of the City of Poreč 2015-2020.* [Online] Available from: http://www.porec.hr/sadrzaj/dokumenti/Strategija%20gospodarskog%20razvoja%20Grada%20Pore%C4%8Da%20-%20Parenzo%202015.%20-%202020.%20godine.pdf Accessed [16/05/2023].

City of Poreč - Parenzo (2021) *Every resident of Poreč will be able to participate in the elaboration of the Poreč Development Plan 2021-2031*. [Online] Available from: http://www.porec.hr/prva.aspx?j=cro&stranica=83315 Accessed [15/05/2023].

City of Poreč - Parenzo (2022a) *After focus groups and workshops, a public consultation is underway for the elaboration of the Development Plan for the City of Poreč-Parenzo for the period from 2021 to 2031*. [Online] Available from: http://www.porec.hr/prva.aspx?stranica=97252&j=CRO&fbclid=IwAR3W8pguwM6siVivcxu6GjmHGz5pLr6DDGlZf0QWFp2UYR8QLy2lBhAtbeA Accessed [15/05/2023].

City of Poreč - Parenzo (2022b) *Amendments of the Spatial Development Plan of the City of Poreč - Parenzo* [Online] Available from: http://www.porec.hr/prva.aspx?stranica=96464 Accessed [16/05/2023].

City of Poreč - Parenzo (2022c) *Amendments of the General Urban Plan of the City of Poreč - Parenzo GUP* [Online] Available from: http://www.porec.hr/prva.aspx?stranica=97235&j=CRO Accessed [16/05/2023].

Croatian Bureau of Statistics (2022) *The final results of the Census 2021 have been published.* [Online] Available from: https://dzs.gov.hr/vijesti/objavljeni-konacni-rezultati-popisa-2021/1270 Accessed [16/05/2023].

ECTP-CEU (2013) *The Charter of European Planning.* [Online] Available from: https://ectp-ceu.eu/2013-the-charter-of-european-planning/ Accessed [16/05/2023].

Graetz, Fiona (2002) Strategic Thinking versus Strategic Planning: Towards Understanding the Complementarities. *Management Decision*, 40(5/6), pp.456-62.

Hrvatin, Damir and Oleg Grgurević (2007) Kontinuitet procesa izrade prostornih planova na području zapadne Istre / Continuity in Developing Physical Plans in West Istria. Prostor, 15(2007), 2(34), pp. 250-259.

Ivančić, Iva (2023) 'Synergy of Strategic and Spatial Planning in the City of Pula', (unpublished Final Work), Zagreb, University of Zagreb.

Jozić, Paula (2020) 'Repurpose Poreč: Development Vision 2050', (unpublished project Workshop 3: Spatial Planning), Zagreb, University of Zagreb.

Jozić, Paula (2021) 'Urban-architectural solution for the revitalisation of the public space of the Peškera bay in the town of Poreč', (unpublished Master thesis), Zagreb, University of Zagreb.

Liedtka, Jeanne (1998) Linking Strategic Thinking with Strategic Planning. *Strategy and* Leadership, 26(4), pp.30-35.

Milić, Bruno (1990) *Razvoj grada kroz stoljeća: Prapovijest – antika / Development of the City through the Centuries: Prehistory - Antiquity*. Zagreb: Školska knjiga.

Ministry of Regional Development and EU Funds of the Republic of Croatia (2023) *System of strategic planning and development management of the Republic of Croatia.* [Online] Available from: https://razvoj.gov.hr/sustav-strateskog-planiranja-i-upravljanja-razvojem-republike-hrvatske-4570/4570 Accessed [16/05/2023].

Mintzberg, Henry (1994) The fall and rise of strategic planning. *Harvard Business Review,* (January-February), pp.107-114.

Nefat, Bruno (2002) *Leksikografski zavod Miroslav Krleža, Istarska enciklopedija - Prostorno planiranje / Spatial Planning*. [Online] Available from: http://istra.lzmk.hr/clanak.aspx?id=2240 Accessed [16/05/2023].

Official Gazette (2017) *Strategija prostornog razvoja Republike Hrvatske / Spatial Development Strategy of the Republic of Croatia* [Online] Available from: https://narodne-novine.nn.hr/clanci/sluzbeni/2017_10_106_2423.html Accessed [16/05/2023].

Official Gazette (2021) *Nacionalna razvojna strategija Republike Hrvatske do 2030. Godine / National Development Strategy of the Republic of Croatia until 2030* [Online] Available from: https://narodne-novine.nn.hr/clanci/sluzbeni/2021_02_13_230.html Accessed [16/05/2023].

Zakon.hr (2020) *Zakon o prostornom uređenju / Physical Planning Act, NN 153/13, 65/17, 114/18, 39/19, 98/19* [Online] Available from: https://www.zakon.hr/z/689/Zakon-o-prostornom-ure%C4%91enju Accessed [16/05/2023].

Zakon.hr (2022) *Zakon o sustavu strateško planiranja i upravljanja razvojem Republike Hrvatske / Law on the System of Strategic Planning and Development Management of the Republic of Croatia, NN 123/17, 151/22* [Online] Available from: https://www.zakon.hr/z/975/Zakon-o-sustavu-strate%C5%A1kog-planiranja-i-upravljanja-razvojem-Republike-Hrvatske Accessed [16/05/2023].

TRACK 04: INTEGRATED PLANNING OVER THE BORDERS

FOUR CITIES, THREE PROVINCES, TWO STATES, ONE REGION: INTEGRATED INNER-CITY DEVELOPMENT CONCEPT IN A REGIONAL CONTEXT (ISEK^4) (1063)

Petra Hirschler[1*], Martin Aufhauser[1], Tom Brandstetter[1], Theresa Janesch[1], Elio Pescatore[1], Florian Pühringer[1], Sibylla Zech[1], Malene Buchenberger[2], Annalisa Mauri[2], Sebastian Sattlegger[2], Markus Tomaselli[2]

[1] TU Wien, Institute of Spatial Planning, Vienna, Austria; [*]petra.hirschler@tuwien.ac.at
[2] TU Wien, Institute of Urban Design and Landscape Architecture, Vienna, Austria

Abstract. Designed as a pilot project for the development of a new planning instrument, ISEK^4 addressed two spatial spheres that – despite obvious necessity – are rarely considered together in the existing planning toolkit: the inner city and the functional region. Integrated urban development concepts for the four inner cities of Bruneck (South Tyrol), Hermagor-Pressegger See (Upper Carinthia), Lienz (East Tyrol), and Spittal an der Drau (Upper Carinthia) were developed in conjunction with a regional symbiosis of the SOUTH ALPINE SPACE region – demonstrating and using synergies between the inner cities as anchor points of public life in the region. ISEK^4 is based on an integrated, interdisciplinary planning approach and was developed together with local steering groups from the cities. Within the project, knowledge and needs were collected, recorded, and located in different workshop formats. The paper will focus on the work process, the lessons learned and the transferability of the project approach, as well as the results.

Keywords: Integrated Planning, Urban Development, Inner Cities, Alpine Cities, Regional Symbiosis.

1. The SOUTH ALPINE SPACE

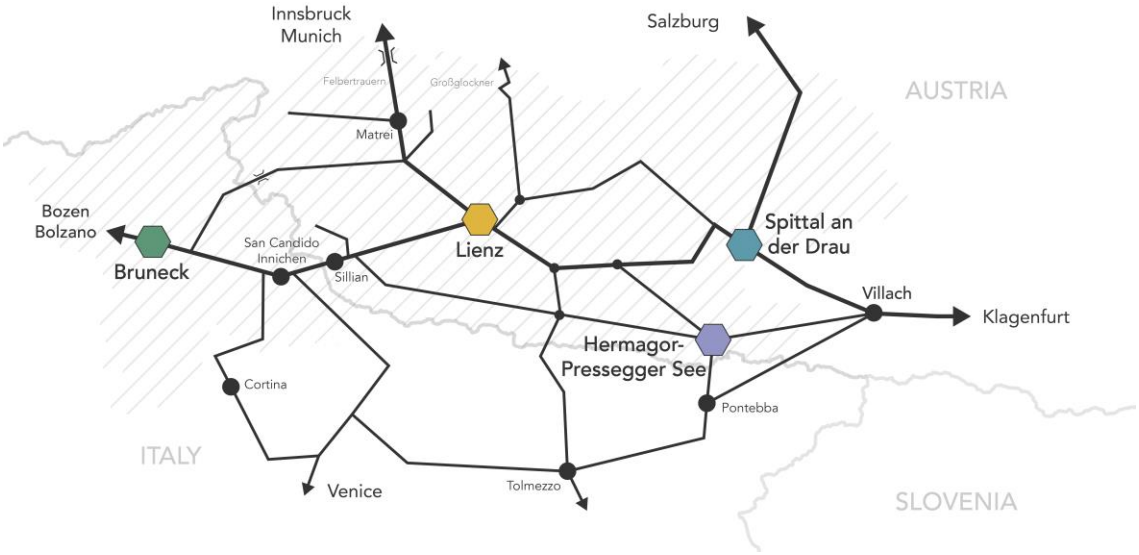


Figure 1. The SOUTH ALPINE SPACE

ISEK[4] was a transnational project aimed to develop a regionally integrated vision, as well as inner city development concepts for four cities in the SOUTH ALPINE SPACE, a highly dynamic and versatile region. As the name suggests, the region is located in Central Europe, right within the Southern Alps *(see figure 1)*. It covers two states, as well as one Italian and two Austrian provinces. The region spans from the north-eastern part of South Tyrol (Italy) to East Tyrol and Upper Carinthia (Austria), displaying both alpine and Mediterranean influences. The four main cities of the SOUTH ALPINE SPACE, Bruneck (Italy), Lienz, Spittal an der Drau and Hermagor-Pressegger See (Austria), share the advantages of being located close to alpine rivers and having direct access to the rail network. The region has had strong connections for centuries – both inwards and outwards towards the surrounding valleys and mountains. There are numerous functional interrelationships with the Italian provinces of Belluno and Friuli-Venezia Giulia, as well as with the urban region of Bolzano and the central area of Carinthia (Klagenfurt, Villach).

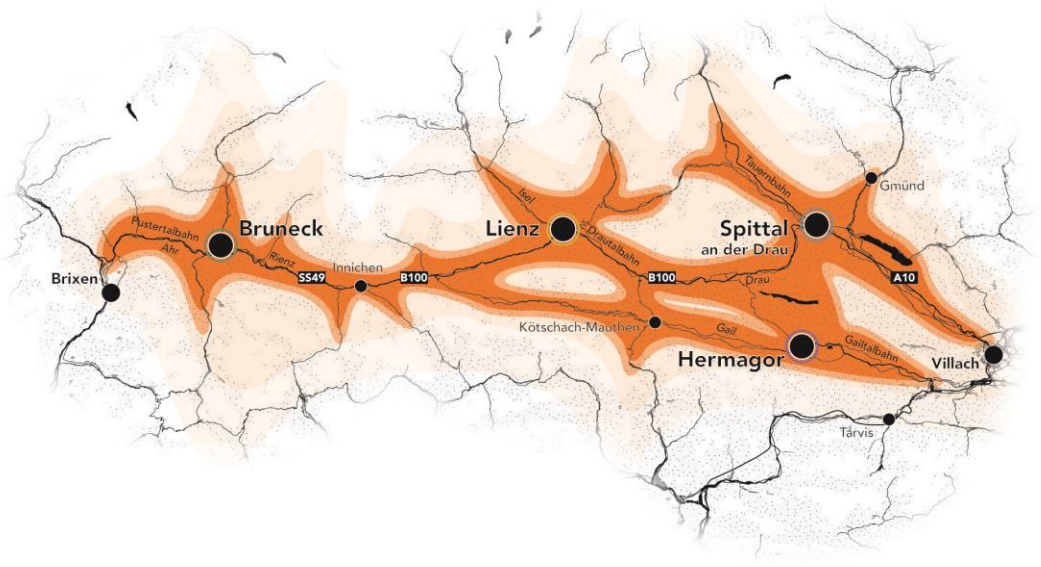


Figure 2. Scheme of the region

The four cities of the SOUTH ALPINE SPACE are connected through valleys that function as important infrastructural axes *(see figure 2)*. At the same time, Alpine mountain ranges form incisive spatial barriers between the cities. Topographically, the South Tyrolean Pustertal, the Drau Valley and the Gitsch Valley connect the four cities.

Through regional railways, the SOUTH ALPINE SPACE is well-connected to the long-distance railway network. There are direct services from Lienz and Spittal an der Drau to Vienna. Further links exist to Salzburg, Innsbruck, Germany, Italy, Switzerland and Zagreb. Thanks to the ÖBB Nightjet, direct overnight connections are available from Spittal-Millstätter See to Zurich and Zagreb. Through the large infrastructure projects for the expansion of TEN corridors (e.g. Brenner Base Tunnel, Semmering Base Tunnel, Koralm Railway), the accessibility of the SOUTH ALPINE SPACE by train will improve even further in the years ahead (cf. Kunzmann, 2015). Beyond that, there are important regional bicycle connections which primarily run along the rivers in the valley areas. Sections of these cycle routes are part of the European EuroVelo network. As of today, the regional bicycle routes are already of enormous importance for summer tourism in the SOUTHERN ALPINE SPACE. The promotion of new international connections (e.g. the long-distance bicycle route from Munich to Venezia) will allow the share of cycle tourism to grow even further (cf. Tscherne, n.d.). An expansion of the tourist bicycle infrastructure will also benefit everyday mobility in the region.

All four cities have been active in city marketing for years. Measures like shared spaces, pedestrian zones, weekly markets and commercial location development produced vibrant inner cities for residents and visitors. Participation and social commitment helped

to establish a resilient cooperation basis among the cities. Know-how transfer and learning outcomes are shared within the region and beyond.

In order to strengthen the region's competitiveness relative to other urban agglomerations (e.g. the Carinthian central area Klagenfurt – Villach), the four core cities of the SOUTH ALPINE SPACE formed a strategic network in 2019 (cf. Regionsmanagement Osttirol, 2021). In a modern-day society, administrative boundaries do not reflect the actual scope of action for a region's population. Thinking along the lines of functionally networked spaces is becoming increasingly important when it comes to regional policies: Major challenges in the fields of climate change, mobility, employment, business, education, housing, commerce, shopping and recreation can only be tackled sustainably by working closely together. Cooperative regional planning has therefore become an essential condition for the formation of resilient regions. The cooperation within the SOUTH ALPINE SPACE cities network has thus far focused on inner-city development as well as on the issues of mobility and infrastructure, climate change, site management, quality of life, civil defence and disaster prevention.

2. The European and National Strategic Framework

The SOUTH ALPINE SPACE cities network is an informal alliance between the four largest cities in the region, Bruneck, Lienz, Spittal an der Drau and Hermagor-Pressegger See. The principles and objectives of the regional cooperation activities were outlined in a charter signed by all mayors in late 2019. Beyond the thematic objectives, the charter also defines the organisational and administrative parameters for the cooperation between the four cities. Through the *Strategic Framework for the Development of the SOUTH ALPINE SPACE* issued in 2021, the region formulated its mission statement and designed a systemic approach to its future work (cf. Regionsmanagement Osttirol, 2021). In this strategic document, the SOUTH ALPINE SPACE positioned itself as an innovative, future-oriented region aiming to become a model region for sustainable cross-border cooperation in and for Europe (cf. ibid, p.4). Under consideration of global mega-trends and their implications for the region, the central topics for the cooperation were defined: Education and knowledge-based economy, regional cycles, inner-city development and care services in the context of demographic change. Further, a governance model was developed to ensure optimal coordination between the different levels of operation and multiple regional actors (cities network, INTERREG, CLLD regions, EGTC). On a formal level, the SOUTH ALPINE SPACE Council (representatives of the EGTCs, the cities and the CLLD regions) is to be established alongside a SOUTH ALPINE SPACE Conference, in which tourism organisations, municipalities, LEADER-LAGs, regional management and associations should participate. The formal bodies are supported by the SOUTH ALPINE SPACE management. On an informal level, projects and events are to be developed in

thematic working groups (cf. ibid, p.21).

By exploring new limits of regional cooperation, the region is contributing to the implementation of the European Union Territorial Agenda 2030 and the New Leipzig Charter, both passed in 2020. The Territorial Agenda 2030 aims to align the individual national spatial development strategies of the EU member states according to common goals and guiding principles. In further continuation of the previous strategies from 2007 and 2011, the Territorial Agenda 2030 takes into account new challenges to spatial development (climate change, energy scarcity, financial and economic crisis). It aims to reduce regional disparities and strengthen social cohesion in Europe. With the objective of a "Green Europe," the agenda calls for the careful and efficient use of natural resources. These ambitions of the Territorial Agenda 2030 are reflected in the strategic positioning of the SOUTH ALPINE SPACE. With the preparation of spatially and thematically integrated inner-city development concepts, the region is also adopting the basic principles of good urban development policy defined in the New Leipzig Charter: Besides an urban development policy aimed at the common good, the Charter calls for an integrated, participation-oriented approach to urban management. Spatial development should be able to operate across administrative boundaries (multi-level approach), but also be location-specific. (cf. European Union, 2020a; European Union, 2020b)

Through the ISEK[4] concept, central objectives of the new Austrian Spatial Development Concept 2030 (ÖREK 2030) are put into practice, for instance the strengthening of polycentric structures, planning in functional living spaces, as well as climate-friendly and sustainable spatial development (cf. ÖROK, 2021). In conjunction with the possible introduction of an urban development support funding (Städtebauförderung) in Austria, a so-called ÖROK partnership was set up by the Austrian Conference on Spatial Planning (ÖROK). The result of this partnership are "Expert Recommendations for Strengthening Local and Urban Cores in Austria" with ten specific proposals. They address, among other aspects, the legal, administrative and instrumental framework conditions – for example, the preparation of integrated urban development concepts (ISEKs) is proposed. The document also includes very specific recommendations for the technical work in the development of such concepts (cf. ÖROK, 2019).

Coordinated spatial development projects in cross-border regions like ISEK[4] provide an important contribution to the long-term development of Europe as well as to the European integration. Beyond that, transnational cooperation promotes the active participation and commitment of citizens, politicians and administrative institutions. For more than 30 years, the EU has been focusing on structural policies for border regions. In 1988, the existing European Structural Funds (ESF, EAGF), ERDF) were integrated into an overarching Cohesion and Structural Policy, which focused on the poorest regions and was linked to a multiannual programming. The first three INTERREG programs (from 1990 to

2006) made distinctions between transnational, cross-border and interregional cooperation. Starting with the fourth edition of the program in early 2007, the ETC (European Territorial Cooperation) program was established with the aim of tapping the potential of cross-border regions (cf. Große Hüttmann and Wehling, 2020). The INTERREG programs are now embedded in the main ETC program and support joint activities within the framework of cross-border cooperation. They still differentiate between cross-border, transnational and interregional cooperation. In the 2014-2020 funding period, around 10.1 billion € (cf. European Academy, n.d.) were provided from the European Regional Development Fund (ERDF). Along with other projects in the framework of the SOUTH ALPINE SPACE cooperation, ISEK[4] was partly funded through the INTERREG Italy-Austria programme.

3. The ISEK[4]-Project

Designed as a pilot project for the development of a new planning instrument, ISEK[4] addressed two spatial spheres that – despite obvious necessity – are rarely considered together in the existing planning toolkit: the inner city and the functional region. Complementing the conventional *ISEK*[1] approach, ISEK[4] includes a so-called regional symbiosis, in which the local initiatives of the four ISEKs are consolidated and a common

[1] ISEKs (Integrated Urban Development Concepts) are a modern form of sectorally and spatially integrated planning. So far, the approach has primarily been used in German-speaking countries. ISEKs are informal planning instruments with a self-binding character, offering prospects for the active shaping of the future in (inner) cities and urban districts. The instrument focuses on the sustainable development of neighbourhoods, taking into account the constantly changing conditions and requirements in cities. In Germany, the urban development support funding (Städtebauförderung) is already linked to the existence of local ISEKs (cf. Heinig, 2022; Bundesministerium für Verkehr, Bau und Stadtentwicklung [BMVBS], 2013). In the ISEK[4] project, the classic ISEK approach was supplemented with a comprehensive regional perspective on the four local concepts.

regional vision of the future is developed.

Fact Box

Clients:

The four cities of Bruneck (South Tyrol), Hermagor-Pressegger See (Upper Carinthia), Lienz (East Tyrol), and Spittal an der Drau (Upper Carinthia).

Duration:

May 2022 – February 2023

Funding:

The ISEK[4] project was financed through multiple funding sources. In addition to an INTERREG funding for the cross-border cooperation between Bruneck (South Tyrol) and Lienz (East Tyrol), the Austrian Federal Ministries for Climate Protection (BMK) and Agriculture (BML) as well as the province of Carinthia supported the project.

3.1 Process Design

The integrated spatial inner city development concept ISEK[4] was developed in a planning process involving (predominantly politically appointed) local steering groups from the four cities, each set up in a gender balanced way. The members of the steering groups actively participated in the workshops during the development process. In addition, selected stakeholders, and on-site experts were invited to certain events. There was a constant exchange between the steering groups and the ISEK[4] project team during the project *(see figure 3)* with the aim of content improvement and quality assurance.

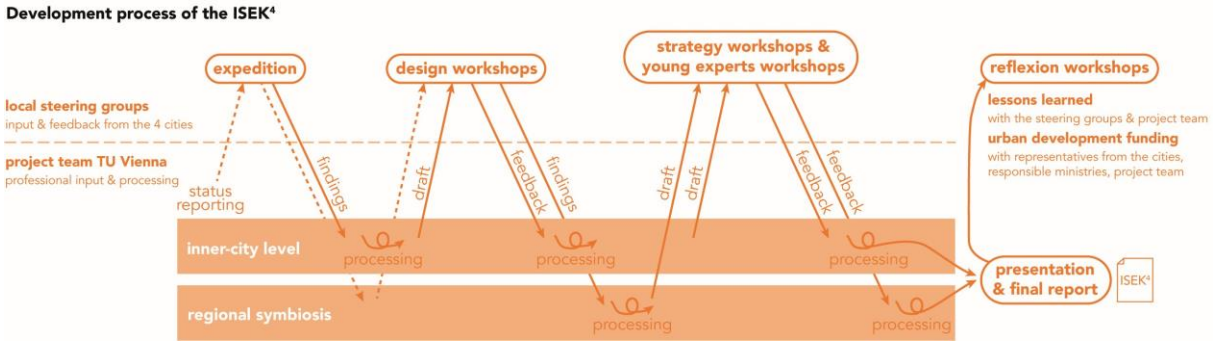


Figure 3. Development process of ISEK[4]

Initially, the focus was put on the identification of key development factors within the inner cities as well as on the spatial and actor-specific analysis, which provided a basis for the integrated urban development concept. This primary and secondary analysis was aimed at identifying so-called *focus areas* as well as opportunities and weaknesses. The spatial and structural analysis took place at the regional, city and district levels, also taking

into account current developments (completed and current projects or plans). An excursion to the identified focus areas revealed new perspectives on the urban structures and city centres.

During the local design workshops, future visions of the four cities were developed together with the steering groups and local experts from the cities. Taking an integrated perspective on the core topics from the analysis helped to define the common objectives and approaches to solving the existing challenges. The focus areas were reflected upon as possible sites for integrated urban development processes, and modified in some cases. The regional scale was constantly under consideration as the participants were asked to reflect the positioning of their individual city within the region. The Visioneering method, which employs different (audio-)visual techniques (e.g. photo collages, infographics or mental maps), was used in this process (cf. Salzmann, 2013).

In the next stage, the future visions were refined during the strategy workshops using the Design Thinking Lab method (cf. Lewrick, Link and Leifer, 2020, pp. 17-27). The objective was to outline collective questions and develop concepts or strategies for action based on these questions. In the subsequent *marketplace of ideas*, suggestions of all participants were collected in an open setting. The Project Canvas method (cf. ibid., p. 309f.) was used to outline rough concepts (time frame, actors, goals, etc.) for the implementation ideas. The project team later condensed and structured the sketches of ideas. These sketches were divided into two categories, *local* and *regional*, in the follow-up to the *marketplace of ideas*.

During the two aforementioned workshops, the cornerstones of the regional symbiosis were also discussed and reflected upon together with the steering groups. This feedback loop allowed for ideas or drafts from the four individual ISEKs to be merged at the regional level. Based on the inputs from the design and strategy workshops, the project team developed a comprehensive regional vision.

Beyond that, young experts were occasionally involved in the preparation of the ISEKs using different participation mechanisms. These individually designed formats drew on youth participation processes that had already been successfully implemented in all four cities. The local youth centres played an important role here, providing the contact to the young experts. The formats included on-site workshops, online surveys and interactive knowledge generation via posters.

In a concluding reflection workshop, lessons learned from the ISEK[4] process were collected. The aim was to identify the dos and don'ts at a local, regional and national level and to reflect on the project's transferability. The reflection workshop took place online with selected members from the steering groups that had been involved in the process. In addition, a workshop discussion on the possible introduction of an urban development support funding (Städtebauförderung) in Austria was held after the submission of the

draft report. It involved the coordinator from each of the four cities , representatives from the responsible ministries and the members of the ISEK[4] project team from TU Wien.

4. The Results

4.1 The Regional Symbiosis

In order to facilitate a holistic approach to the future development of the four inner cities and the SOUTH ALPINE SPACE, a general operational (planning) framework was developed first. The framework contains a set of steering criteria that are intended to provide the foundation for a common future, regardless of the specific spatial situation (city centre, overall city or functional region). In a co-productive approach, these shared planning values were formulated to ensure an inclusive, environmentally conscious, adaptive and thus crisis-resilient development. The operational framework comprises the following six criteria:

- Strengthening of cities and regions of short distances
- Land conservation and reuse of existing facilities
- Making and keeping cities resilient to climate change
- Ensuring equal opportunities for everyone
- Learning from each other and growing together
- Establishing a resilient SOUTH ALPINE SPACE

The framework acts as the common understanding of future developments in the inner cities and the region. It focuses on the sustainable use of land resources, the (re-)distribution and consolidation of essential spatial functions, as well as on the development of a proactive and participatory approach to tackling the climate crisis.

Based on the operational framework, seven spatial guiding principles were developed together with local and regional stakeholders. The guiding principles link the operational framework with the spatial context on the regional and inner-city level. The guiding principles are echoed throughout the ISEK[4], all the way from the city-specific future images and development ideas to the regional vision, as well as in the local and regional idea sketches.

4.1.1 Riverbanks and Free Spaces – Perceptible and Nature-Oriented

A common characteristic of the four cities in the SOUTH ALPINE SPACE is their location along rivers, which can facilitate the development of high urban qualities. In the light of the advancing climate crisis, river areas are gaining significance as recreational sites and natural air-conditioning systems in the urban fabric. By removing visibility barriers, improving accessibility (while at the same time taking natural hazards into account), and integrating high-quality pedestrian and bicycle connections, possibilities for new uses are

generated. These newly usable riverbanks are a part of a dense network of (green) free spaces which cover the cities and connect them to their immediate surroundings.

4.1.2 Mobility Transition – Lived and Liveable

Priorities in the choice of transportation mode in cities will shift considerably towards walking and cycling in the foreseeable future. Given their sizes, the cities in the SOUTH ALPINE SPACE are predestined to become cities of short distances: Virtually all important destinations can be reached within 15 minutes by walking, cycling or via complementary services (city bus, shuttle, sharing vehicles, etc.). A dense regional public transport network as well as attractive interregional bike paths between the cities can provide an appealing alternative to cars. The shift in mobility helps to reduce traffic-related CO_2 emissions and will free up more space in the cities for alternative uses.

4.1.3 Railway Station Districts – Integrated and Activating

Train stations function as important drivers of sustainable mobility. In their capacity as mobility hubs, they connect (supra-)regional with local transportation networks. At the same time, they bring together a wide range of uses: Local amenities, gastronomy, meeting places, logistics, sharing services, etc. This spatial concentration of different uses reduces the distances travelled in day-to-day life and at the same time offers the potential to activate and revitalise the surrounding urban spaces. A spatial and functional integration of these station quarters into the urban fabric creates a link between transnational mobility axes and inner cities.

4.1.4 Tourism – the City Centre as an attraction

In the future, the touristic potential of the SOUTH ALPINE SPACE should be linked more closely to the inner cities' activities. In this context, attention should be given to providing convenient connections to tourist destinations via public transport, as well as to integrating touristic bicycle routes into the inner-city mobility networks. This also helps to increase the visibility of the city centres along these routes. Establishing a joint brand identity focused on sustainable and healthy tourism can contribute to an increase in the number of overnight stays and to a strengthening of the cooperative culture in the SOUTH ALPINE SPACE.

4.1.5 Building and Planning Culture – Reuse and Renew

A state-of-the-art building culture requires the careful consideration of existing structures. In times of the climate crisis, it is vital not to waste the grey energy contained within existing buildings. The housing stock often offers qualities that simply need to be restored or retrofitted to adjust to future needs. (Re)developing the existing building structures to a high standard is only possible if a comprehensive planning culture is established in the region. An actively practised planning culture provides the opportunity to tailor region-specific solutions to contemporary global challenges.

4.1.6 Planning for all Generations – Attractive and Inclusive

A comprehensive planning approach for the SOUTH ALPINE SPACE should strive to create attractive living conditions for people of all ages and from all walks of life. This includes the provision of affordable and high-quality housing for young families, students and elderly people, as well as the improvement of childcare services. The region benefits from a diverse spectrum of leisure facilities in the cities. Providing barrier-free public spaces will make the cities more accessible and experienceable for people with disabilities.

4.1.7 Regional Resources – Use and Expand

In light of the complex challenges prevalent right now (climate crisis, energy crisis and tight municipal budgets), a reorientation towards regional strengths and local resources has become essential. The diverse palette of regional products in the SOUTH ALPINE SPACE can increase the quality and security of grocery supply. Expanding renewable energy makes an important contribution to the efforts against the climate crisis. Tackling challenges jointly as a region and focusing on key issues is more efficient on strained municipal budgets.

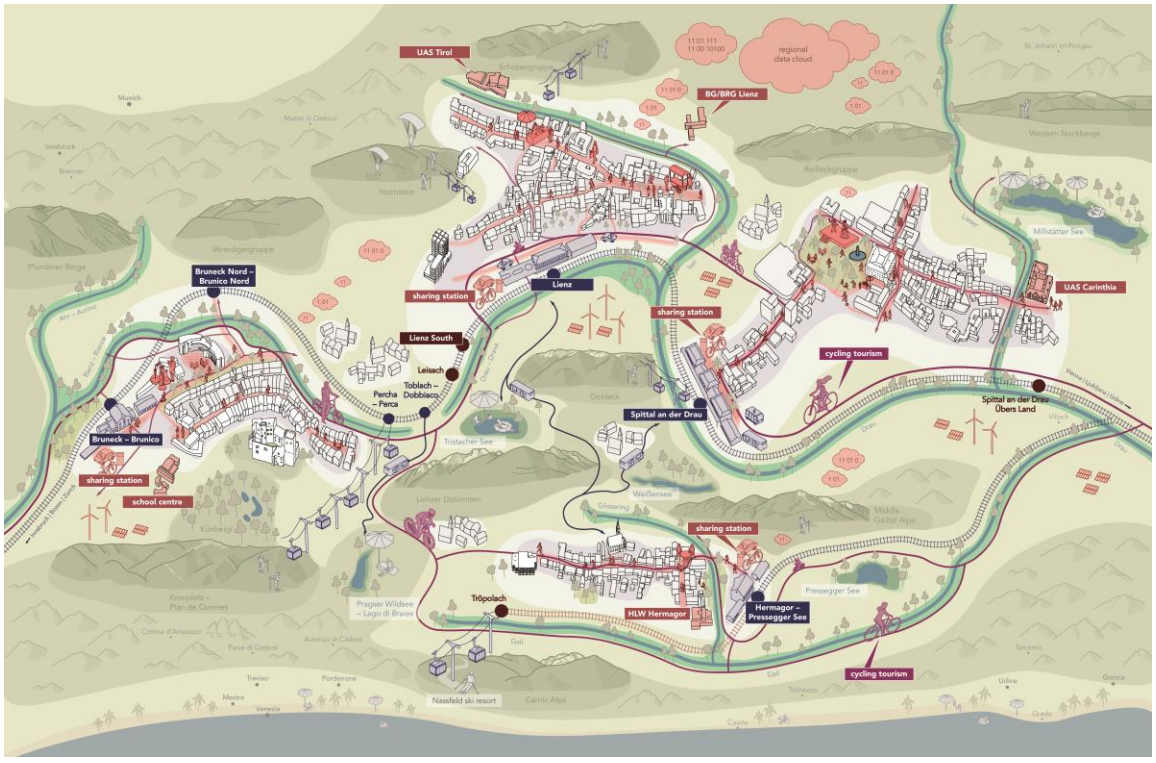


Figure 4. Regional symbiosis

In the so-called *regional symbiosis (see figure 4)*, the individual strengths of the four cities

were brought together and combined into a common vision. This vision was visualised as a picture in which the inner cities have merged into a strong region. The SOUTH ALPINE SPACE as an interconnected region is diverse, connected and future-oriented, but also traditional and mindful of its local resources. The four inner cities form important anchor points and provide impulses for the development of the entire area. The visualisation neglects the topography and brings the four cities closer together. At the same time, it highlights the potentials and strengths of each individual city and the region.

The need for regional collaboration in the SOUTH ALPINE SPACE is reflected in the structure and conception of the ISEK[4]: Local activities should be understood in the context of regional framework conditions, potentials and goals. To bundle the region-specific targets, the seven spatial guiding principles described above were developed. Apart from the close links between the guiding principles and the local interventions, the regional integration of local projects into a regional symbiosis was the main reason for the decision to combine all ISEKs within one document.

4.2 The Inner City Visions

The four local focus points of the ISEK[4] each include a status report, an overview of current developments and concepts, a vision for the future as well as local intervention plans. They do not deal with the entire city centres, but concentrate on particular spatial focus areas (short to medium-term development) and perspective areas (long-term strategic development). The spatial extent of the "inner cities" was not defined specifically, allowing for the consideration of additional inner-city relations and for more flexibility in development processes.

5. Lessons Learned and Next Steps (Evaluation)

Previous ISEK approaches exclusively focused on single cities or physically connected urban structures. The innovation of the project – especially in contrast to previous ISEKs – is the simultaneous consideration of multiple cities in a regional context.

The regional symbiosis provides a major added value for the future development of the four cities and the region, helping to join activities of inner city development. These common activities are the basis for further exchange and an even more intensive cooperation between the four cities. The regional vision (for which a cartographically abstract representation was deliberately chosen) enables the cities to move closer together. The graphical vision has become a symbol of cooperation between the cities according to the local actors. An exchange between the four steering groups would have been beneficial to the project, but unfortunately could not be realised. A cross-city discourse would have been of great importance, especially for the development and

refinement of the regional vision.

Surrounding municipalities in the vicinity of the four cities were hardly involved in the project. With the goal of an integrative planning approach in mind, it is recommended to include the perspective and needs of the surrounding communities in future projects. The question of how the ISEK[4] affects the surrounding municipalities remains unanswered, yet professionally exciting. The implication of a more spatially comprehensive view of the region might be tested in another (pilot) project.

Regional cooperation could serve as an incentive for new funding mechanisms. Care should be taken not to construct random cooperations ("pseudo cooperations"). Cities that have already done a lot in terms of inner city development should continue to be confirmed and motivated in their actions – through funding measures in favour of holistic inner city development in the sense of the ISEK[4]. An exclusive focus of the funding instruments on the (historic) inner city is counter-productive for these cities.

The steering groups in the four cities took on a dual function in the project organisation: They acted both as an information source and as a development partner. The composition varied from city to city, ranging from an exclusively political group to a mixed groups of politicians and persons from civil society. The number of members in the steering group also varied greatly. The participatory approach is the right way to bundle synergies and to work out development perspectives for the cities and the region that are as broadly supported as possible. A recommendation on the optimal composition and number of participants cannot be derived from the experience of the ISEK[4]. It is much more important to take local conditions and cooperation cultures into account. In any case, it is recommended to involve the political representatives from the beginning and to coordinate the composition of the steering group at the beginning of the process in cooperation with the city and the region.

In general, the aim should be to have as diverse a group as possible in terms of gender, age, social class, affiliation, etc. The aim should be to include all the people living in the city. The aim is to give all groups living in the city a voice in the process.

The ISEK[4] does not represent an implementation strategy and does not contain any detailed elaborated or implementable projects. The intensive involvement of the cities in the process through the steering groups was completed at the end of the project. Through the public joint presentation and the book, the project has been completed, and the implementation has been handed over to the cities. The task of the cities will be to use or create organisational structures at city and regional level – also to adjust funding schemes. The elaboration of a strategy for implementation or realisation would be useful.

Despite evident regional similarities, differences in planning culture and urban development structures proved challenging in the process. These differences manifested

not only in the composition of the steering groups but also in the mindset the participation workshops were met with in the four cities. While in some cities it appeared commonplace to actively involve thematic civil interest groups in the visioning and idea generation process, other cities tended to have a more political focus to the workshops. As a result, the focus and the level of detail of the local ISEKs also vary to a certain degree.

6. Transferability

The combination of the ISEK as a local tool with the regional scope of action is an innovation in the Austrian planning landscape an in the SOUTH ALPINE SPACE. Working across several provincial and national borders posed a special challenge for the project team.

The existence of (proven) cooperations in a region is beneficial for the elaboration of a regionally integrated ISEK. In the case of the SOUTH ALPINE SPACE, the existing charter from 2019 formed an appropriate foundation for common action. In addition to such institutional links, however, functional and thematic interdependencies are essential for enabling lasting and longer-term cooperation.

The larger the region gets the more differences in planning systems and cooperation culture might occur. Reflecting on the legal framework, experience in cooperation and transnational projects helps to secure a sound project process, provided the project design is flexible enough to react on the specific circumstances.

The size and characteristics of a particular region are by no means the decisive factors. Rather, it is important for cities to shift their focus to challenges that might be easier to tackle together – especially in the face of tight municipal budgets and urgent (global) crises. Bringing different perspectives and points of view into discussions on the future development of a region also promotes a climate of learning from one another. The added value of different perspectives became particularly evident in the cross-border work in the ISEK[4] project.

Finally, the project funds have to be secured. The more actors and funding bodies are involved, the more criteria and requirements need to be fulfilled. This poses a huge challenge to the implementation. Dedicated new funding programs or more flexibility in existing ones would stimulate regions to work on common concepts and booster the European dimension of integrated regional planning.

Acknowledgements. The ISEK[4] project was financed through multiple funding sources. In addition to an INTERREG funding for the cross-border cooperation between Bruneck (South Tyrol) and Lienz (East Tyrol), the Austrian Federal Ministries for Climate Protection

(BMK) and Agriculture (BML) as well as the province of Carinthia supported the project financially.

References

Bundesministerium für Verkehr, Bau und Stadtentwicklung [BMVBS] (2013) *Integrierte städtebauliche Entwicklungskonzepte in der Städtebauförderung. Eine Arbeitshilfe für Kommunen.* Berlin: BMVBS, Referat SW 21.

European Academy (n.d.) 'European Territorial Cooperation (ETC)'. Available from https://www.europeanacademy.com/interreg-european-territorial-co-operation (Accessed 10/05/2023).

European Union (2020a) *The new Leipzig charter. The transformative power of cities for the common good.* Adopted at the Informal Ministerial Meeting on Urban and Territorial Development on 30 November 2020. Available from https://futurium.ec.europa.eu/en/urban-agenda/library/new-leipzig-charter-and-implementing-document (Accessed 10/05/2023).

European Union (2020b) *Territorial Agenda 2030: A Future for All Places.* Adopted at the Informal Ministerial Meeting on Spatial Planning, Territorial Development and/or Territorial Cohesion on 01 December 2020. Available from https://territorialagenda.eu/wp-content/uploads/TA2030_jun2021_en.pdf (Accessed 11/05/2023).

Große Hüttmann, M. and Wehling, H.-G. (2020) *Das Europalexikon*. 3rd edn. Bonn: J.H.W. Dietz Nachf. GmbH.

Heinig, S. (2022) *Integrierte Stadtentwicklungsplanung. Konzepte – Methoden – Beispiele.* Urban Studies series, Bielefeld: transcript.

Kunzmann, K. R. (2015) 'Afterword. TENs and Visions for Cohesion of the European Space' in: Fabbro, S. (ed.) *Mega Transport Infrastructure Planning*. Cham: Springer, pp. 251-264.

Lewrick, M; Link, P.; Leifer, L. (2020) *The Design Thinking Toolbox: A Guide to Mastering the Most Popular and Valuable Innovation Methods.* Design Thinking series, Hoboken, NJ: John Wiley & Sons.

Österreichische Raumordnungskonferenz [ÖROK] (2019) *Fachempfehlungen zur Stärkung der Orts- und Stadtkerne in Österreich.* Wien: Geschäftsstelle der ÖROK.

Österreichische Raumordnungskonferenz [ÖROK] (2021) *ÖREK 2030. Österreichisches Raumentwicklungskonzept. Raum für Wandel.* Wien: Geschäftsstelle der ÖROK.

Regionsmanagement Osttirol (2021) *Strategischer Rahmen zur Entwicklung des SÜD ALPEN RAUMS.* Available from https://www.suedalpenraum.eu/wp-content/uploads/2021/07/rmo_strategiepapier_su%CC%88dalpenraum_DIN_A4_de-komprimiert.pdf (Accessed 10/05/2023).

Salzmann, G. (2013) ‘Visioneering – Planning tools with the phenomenological approach’ in: Zavodnik Lamovšek, A.; Kušar, S.; Dillinger, A. (eds.) *International Student Workshop Tracking the Ljubljana Urban Region 2012/2023*. Ljubljana: University of Ljubljana, Faculty of Civil and Geodetic Engineering, pp. 57-59.

Tscherne, C. (n.d.) *München – Venezia. Radgenuss und Alpenüberquerung bis zur Adria.* Available from https://www.muenchen-venezia.info (Accessed 11/05/2023).

INTEGRATED PLANNING OVER THE BOUNDARIES WITHIN CHINA (1096)

Meng Meng [1,2]*, Marcin Dabrowski[3]

[1] Department of Urban Planning, Faculty of Architecture, South China University of Technology, Guangzhou, China
[2] State Key Laboratory of Subtropical Building Science, China; mmeng@scut.edu.cn
[3] Department of Urbanism, Faculty of Architecture and the Built Environment, Delft University of Technology, Delft, The Netherlands

Abstract. Integrated planning and design over administrative and political boundaries are becoming a hot topic in China, especially in the case of the Greater Bay Area on the account of Hong Kong and Macao two special regions. Focusing on the emergence and drivers of transboundary development, this paper discusses how China promoted this process in the context of multi-level governance. The paper unveils the transitions from the recent infrastructure projects to strategic policies for closer regional cooperation at the mega-regional and local levels. This transition is more linked with broader concerns like unbalanced development, economic resilience, convenient connectivity, etc. Hengqin, a typical case described in this paper, gives an example of the emergence of soft space since the Opening Up Policy issued in the late 1970s. For this special case, extra problems needed to be considered in the urban designs associated with the cooperation with Macao, like customs inspections, regulations, and mutual recognition.

Keywords: Macao, Hengqin, the Greater Bay Area, cross-boundary cooperation, soft space, soft planning.

1. Introduction

Transboundary development associated with the mainland, Macao, and Hong Kong has a long history that can date back to the late 1970s following the Reform and Opening-up policy. At that time, China had just opened its doors to the world. There was a lack of funds, talent, and understanding of the international market. To attract foreign capital, technology, and management expertise became a necessity. Taking advantage of its proximity to Hong Kong and Macao, Shenzhen began to import funds and technology from Hong Kong and engaged in commercial activities such as "processing supplied materials," "assembling supplied parts," "processing based on samples," and "compensation trade."

Stepping into the 2000s, this traditional commercial model retreated from the arena and new development models gradually emerged. For instance, the Closer Economic Partnership Arrangement (CEPA) was launched in 2003, which aimed to eliminate barriers

between the mainland and Hong Kong, promoting trade and service liberalization, cross-border investment, and facilitation of customs clearance. Between 2017 and 2022, the central government issued a series of significant national and regional policies with an emphasis on enhancing the collaboration between mainland cities, Hong Kong and Macao. This research paper narrowed down the story in the mega-region Guangdong-Hong Kong-Macao Greater Bay Area (GBA for short, in Chinese, 粤港澳大湾区) and check the cooperation within it.

The GBA is located in the south of China, consisting of two special administrative regions of Hongkong and Macau, and nine cities in Guangdong Province including Shenzhen, Dongguan, Huizhou, Guangzhou, Foshan, Zhaoqing, Zhongshan, Zhuhai, and Jiangmen. This area is first proposed in 2015 and gradually defined in a series of national documents from 2017 to 2019 (Guangzhou United Front, 2017). It is designed to work as an engine to enhance the development of manufacturing, innovation, and economic growth between cities(Xinhua News, 2019a). Some say that the Chinese government aims to make it come up with San Francisco Bay Area, New York Bay, and Tokyo Bay.

Figure 21. Greater Bay Area (GDP of cities in 2021)

Source: authors, adaptation based on (Foshan Census and Statistics Department, no date; Government of Macao Special Administrative Region Statistics and Census Service, no date; National Bureau of Statistics, no date; Government of Hongkong Special Administrative Region Census and Statistics Department, 2022); Note: 1 USD=6.91 RMB, 1 USD=7.85 HKD, 1 USD=8.08 Macanese Pataca, the exchange rate at 2023.5.6

One reason that makes this region out of the ordinary is its economic position in China. With 56098 km^2, it is home to 86.7 million people in 2021, achieving a GDP (Gross Domestic Product) of 12.6 trillion yuan, accounting for 11% of the national GDP (Shenzhen Dream, 2022; Xinhua News, 2022). Another reason is the 'one country, two systems' principle. This principle is formulated in the early 1980s and describes a constitutional rule of China to deal with the development of Hongkong and Macau. It provides that 1) there is only one China; 2) mainland China uses the socialist system while 'other regions', like

Hongkong and Macau, could retain and continue their own economic and administrative systems. Although dramatic economic growth and political changes have taken place over the last two decades since 1997 and 1999, this proposal has been always insisted on by China with no changes. Under this proposal, Hongkong and Macau have built a special partnership with the mainland as well as developed their own governmental structures, legal systems, and financial rules to manage internal affairs and external trade with foreign countries. All of them are independent of those of the mainland.

As a member of an urban design team from the South China University of Technology, we participated in the international competition 'Urban Design for the Hengqin Guangdong-Macao Deep Cooperation Zone' in 2022. We, thus, have the opportunity to put forward some design proposals and recommendations to the local government on how to promote transboundary cooperation initiatives. Based on this background, this paper explores 1) how transboundary development is developed at different levels against the GBA background, and 2) how urban design as a tool rebuilds spatial imaginations or visions across boundaries.

Section 2 uncovers the state-driven regional development in the GBA and the measures to promote transboundary cooperation. It reveals the complex and contested spatialities associated with dynamic transboundary cooperation. Section 3 examines the emergence of soft spaces at Hengqin Island, and uncovers the local initiatives to mitigate administrative-political boundaries between Hengqin and Macao. Our design practices are included as well. Finally, section 4 concludes with experience and lesson learning.

2. State-driven regional development and transboundary cooperation in the Greater Bay Area

2.1 Flagship infrastructure projects at the macro-regional level

For many years, a series of projects have been launched to enhance the cooperation between Hong Kong, Macao, and other cities in the GBA. Taking Hong Kong-Zhuhai-Macao Bridge as an example, the construction commenced in December 2009 and the bridge was opened for traffic in October 2018. It reduces the distance between the east and west coasts of the Pearl River and creates a swift regional passage corridor (Xinhua News, 2019a). Guangzhou-Shenzhen-Hong Kong Express Rail Link started to build the Guangzhou section in December 2004 and was fully open to service in September 2018. It shortens the travel time from Hong Kong to Beijing to nine hours. Other infrastructures like Shenzhen-Zhongshan Bridge and Humen Pearl River Bridge facilitate the regional movement between Shenzhen, Zhongshan, Guangzhou, and Dongguan.

Figure 22. Hong Kong- Zhuhai- Macao Bridge
Source: (Xinhua News, 2019a)

A driving force of these projects is to address the imbalanced development in the GBA. Figure 3 presents the GDP of 11 cities in the GBA. It indicates that Hongkong, Shenzhen, and Guangzhou are the top-three cities. Foshan and Dongguan's GDP are in the second league (around 1/3-1/2 of the top three cities in 2021). The remaining cities are in the third league (around 1/14-1/5 of the top three cities in 2021). As with the locations of all these cities in the GBA, the cities at the eastern bank of the Pearl River or in the center of the Pearl River Delta have better economic conditions. The western bank and marginalized areas are not in good shape for many years.

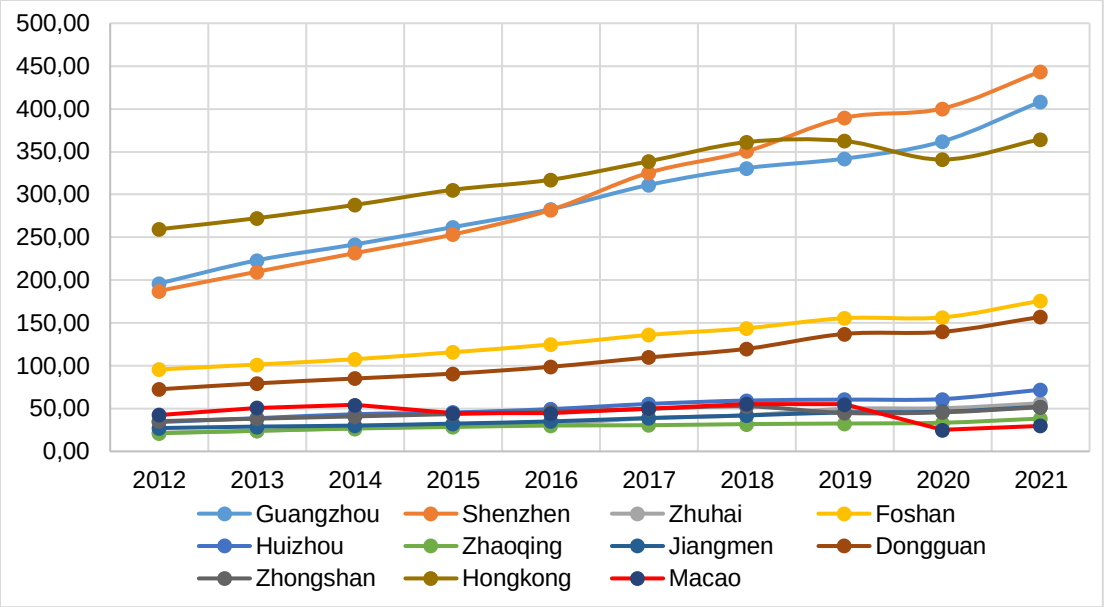


Figure 23. GDP of cities in the GBA from 2012-2021 (USD, billions)

Source: authors, based on (Foshan Census and Statistics Department, no date; Government of Macao Special Administrative Region Statistics and Census Service, no date; National Bureau of Statistics, no date; Government of Hongkong Special Administrative Region Census and Statistics Department, 2022); Note: 1 USD=6.91 RMB, 1 USD=7.85 HKD, 1 USD=8.08 Macanese Pataca, the exchange rate at 2023.5.6

The entire region is supposed to have benefits from a more integrated market, if the movement of people and resources is smoother (BBC News, 2019). These flagship projects contribute to this vision. For Hong Kong, facilitating the relocation of Hong Kong citizens to the mainland could potentially alleviate the pressure on its overheated housing market. It can also make use of its collaboration with the manufacturing industries in the GBA cities such as Shenzhen, Dongguan, and Zhongshan to diversify its industry landscape and mitigate the risks associated with excessive financialization. The same applies to Macao, given its overcrowded living conditions and heavy reliance on the casino industry (Eilo, 2014). For other cities in the GBA, Hong Kong and Macao have advantages in their trades with the global market, for instance, broadly recognized brands and standards. Taking them as a finance and trade hub can facilitate their foreign trade and internationalization.

2.2 National strategic policies for regional cohesion and transboundary cooperation

Promoting cooperation between Hong Kong, Macao, and other cities in the GBA, however, is not easy. Significant reductions in bureaucratic procedures concerning transportation, customs, and immigration are essential to genuinely facilitate the seamless movement of people, goods, and capital across these areas(BBC News, 2019). Since the late 2010s, the

Chinese government has launched a series of strategic policies to deal with these challenges (see Table 1).

The *GBA Development Plan* was a key document launched by the State Council In 2019, which called for an economic increase, commonwealth (correcting imbalances), technic innovations, strong manufacturing, improved infrastructures, green and low-carbon living environment, wide opening-up, and deep city-region cooperation in the GBA cities(Xinhua News, 2019b). In this policy document, Qianhai (Shenzhen), Hengqin (Zhuhai), and Nansha (Guangzhou) are selected as three target areas to enhance the deep transboundary cooperation with Hongkong and Macao under the umbrella of 'one country, two systems'. Qianhai and Hengqin are adjacent to either Hongkong or Macao. Nansha is fast linked with Hongkong by high-speed railways (35min) and shipping lines(1-2.5hours). In particular, this cross-boundary cooperation is more precisely described as cross-customs-border cooperation, because Hongkong and Macao are a part of China but with different systems.

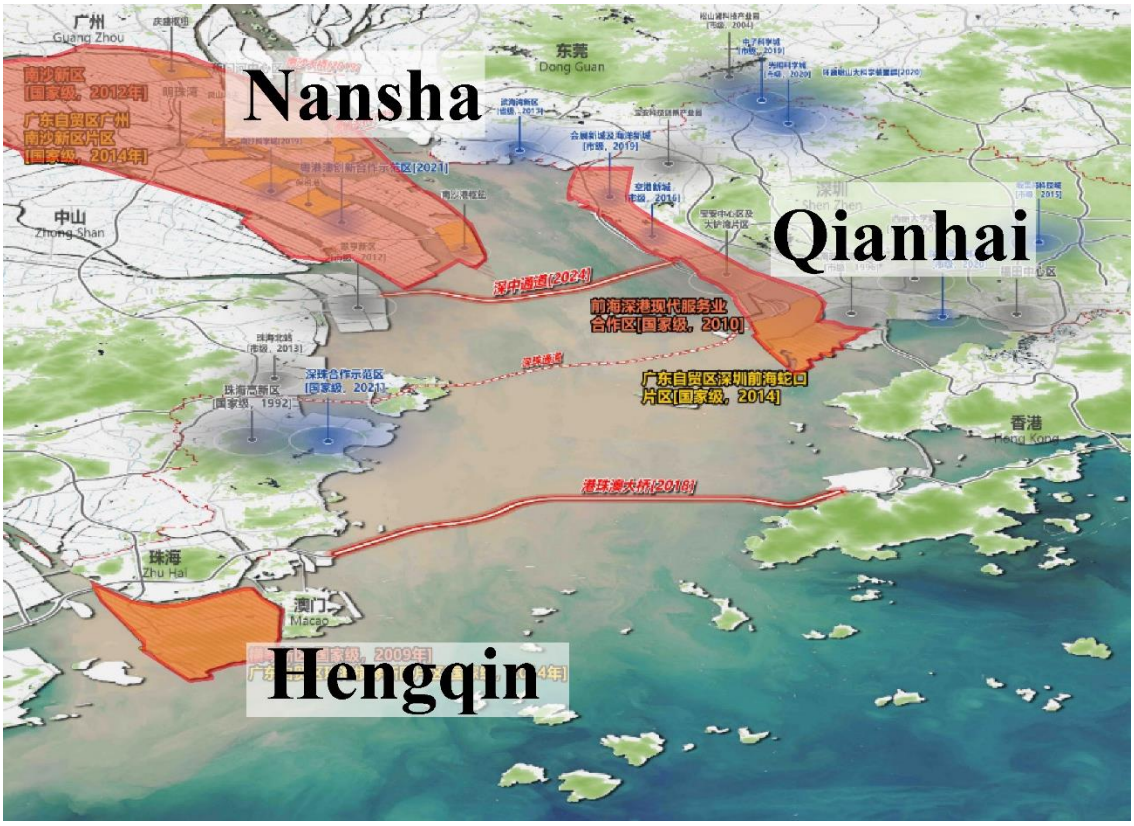


Figure 24. Three target areas: Qianhai , Hengqin, and Nansha
Source: author based on the *GBA Development Plan*

The routes for the transboundary cooperation between Hong Kong, Macao, and the target areas are further explained in three national policies in 2021 and 2022. They are 1) the

overall plan for building a Guangdong-Macao in-depth cooperation zone in Hengqin, 2) the opening-up reform of Qianhai (Shenzhen)-Hong Kong modern service industry cooperation zone, and 3) the development of Nansha (Guangzhou) to deepen the comprehensive cooperation in the Guangdong-Hong Kong-Macao Greater Bay Area and expand the high-standard opening-up (see Table 1). These documents share concentration on initiatives to promote:

- Industrial development/transition
- Social welfare and public service integration
- transport infrastructure connection
- Laws and rules connection
- Cross-border investment, trade, and finance

On account of localised conditions, peculiar measures are also proposed case by case. For instance, the *overall plan for building a Guangdong-Macao in-depth cooperation zone in Hengqin* puts priority to coordinate the local visions and rules with the long-term development of Macao. This document highlights 1) diversifying industrial structure to support the resiliency of Macao, 2) facilitating goods transport, people movement, and capital investment across the customs boundary, 3) developing co-governance between Hengqin and Macao under the principle of "one country, two systems, and 4) taking use of Macao-Zhuhai's cooperation to stimulate the economic development of the west bank of the Pearl River for the commonwealth.

Table 2. National policies and projects issued by the State Council in relation to Shenzhen-Hongkong, Zhuhai-Macao, and Nansha in the GBA

Year	**Policy document**	**Key policy activities concerning cross-boundary cooperation**
2019	The GBA Development Plan	1) Promoting economic development and regional balance 2) Building research and innovation clusters 3) Improving transport, ICT, energy, and water systems at the regional level, 4) Enhancing advanced manufacture, service, maritime, and emerging industries 5) Improving living, working, and welfare conditions 6) Enlarging opening-up policy and city-regional cooperation (Shenzhen-Hongkong, Zhuhai-Macao, and Nansha Area)*
2021	The overall plan for building a	1) Diversifying industries by developing technology-intensive industries (like artificial intelligence, biomedicine, smart city, IoT, clean energy, new materials), high-end manufacturing

	Guangdong-Macao in-depth cooperation zone in Hengqin	industries (like integrated circuit, electron components), tourism, cross-border finance, exchange, and insurance, etc, to diverse the industries of Macao, 2) Docking Hengqin's public services and social welfare systems with Macao, in relation to study, work, business, and living, 3) Docking transport infrastructure with those of Macao 4) *Facilitating goods transport, people movement and capital investment across the customs boundary from Macao to Hengqin, 5) *Enhancing the innovative governance of Hengqin to promote the co-decision, co-development, co-management, and benefit-sharing with Macao under the principle of "one country, two systems", 6) *Supporting the cooperative Macao-Zhuhai relations and driving the development of the west bank of the Pearl River, 7) Explore the connection of different legal systems and cross-border legal rules to manage international affairs and regional disputes in the GBA. Macao experience is the reference. 8） Recognition of the qualification of Macao's financial practitioners, architects, and urban planners, and allowing professionals in the medical field to start business in Nansha
2021	The opening-up reform of Qianhai (Shenzhen)-Hong Kong modern service industry cooperation zone	1) Furthering the support for technology-intensive industries, like artificial intelligence, biomedicine, financial technology, smart city, IoT, clean energy, new materials, and marine science, 2) Provide convenience for young people from Hong Kong and Macao to study, work, reside, live, and start a business in Qianhai, as well as convenience for visas, residence permits, and permanent residence permits. 3) *Deepening the liberalization of service trades with Hong Kong and Macao, docking with the rules in the service industry professional qualifications, service standards, communication, information, and payment, 4) Strengthening the transport connections in ports, airports, and highways.

		5) *Deepening the open-up of the financial industry, for instance, the cross-border RMB business, foreign exchange, cross-border investment, insurance, 6) Explore the connection of different legal systems and cross-border legal rules to manage international affairs and regional disputes in the GBA. Hongkong experience is the key reference.
2022	The development of Nansha (Guangzhou) to deepen the comprehensive cooperation in the Guangdong-Hong Kong-Macao Greater Bay Area and expand the high-standard opening-up	1) Enhancing technology-intensive industries (like artificial intelligence, biomedicine, smart city, IoT, big data, new material), high-end manufacturing industries (new energy vehicles, robots), marine science, cross-border finance, exchange and insurance, 2) *Providing convenience for young people from Hong Kong and Macao to study, work, reside, live, and start a business in Nansha, as well as convenience for elder people in medical care and elderly care 3) Docking with the rules of Hongkong in the service industry professional qualifications, service standards, communication, and information, 4) Strengthening the transport connections in ports and rails. 5) *Strengthening international economic and trade cooperation with Japan, South Korea, and ASEAN countries, and supporting the implementation of the "Regional Comprehensive Economic Partnership Agreement" (RCEP) and 'One Belt, One Road' policy 6) Recognition of the qualification of Hong Kong's architects, structural engineers, and building surveyors, and allowing Hongkong and Macao's engineering companies to work on infrastructure construction in Nansha.

Source: authors, based on (Xinhua News, 2021a, 2021b; State Council, 2022).

3. Soft space, transboundary development, and spatial designs at the local level

3.1 Co-governance between Macao and Guangdong Province in Hengqin

Hengqin is an island in Zhuhai, adjacent to Macao, with the Crossgate Channel separating them (see Figure 5). It was formerly made up of two islands, Xiaohengqin (小横琴) and Dahengqin (大横琴), which were recently connected as a result of land reclamation in the 1970s. Now it is 106.46 km2. This study refers to the use of the concept of 'soft space' to

understand Hengqin, as its development has been always influenced by both Macao and Guangdong Province while under the jurisdiction of Guangdong's Zhuhai City (Pengpai News, 2021).

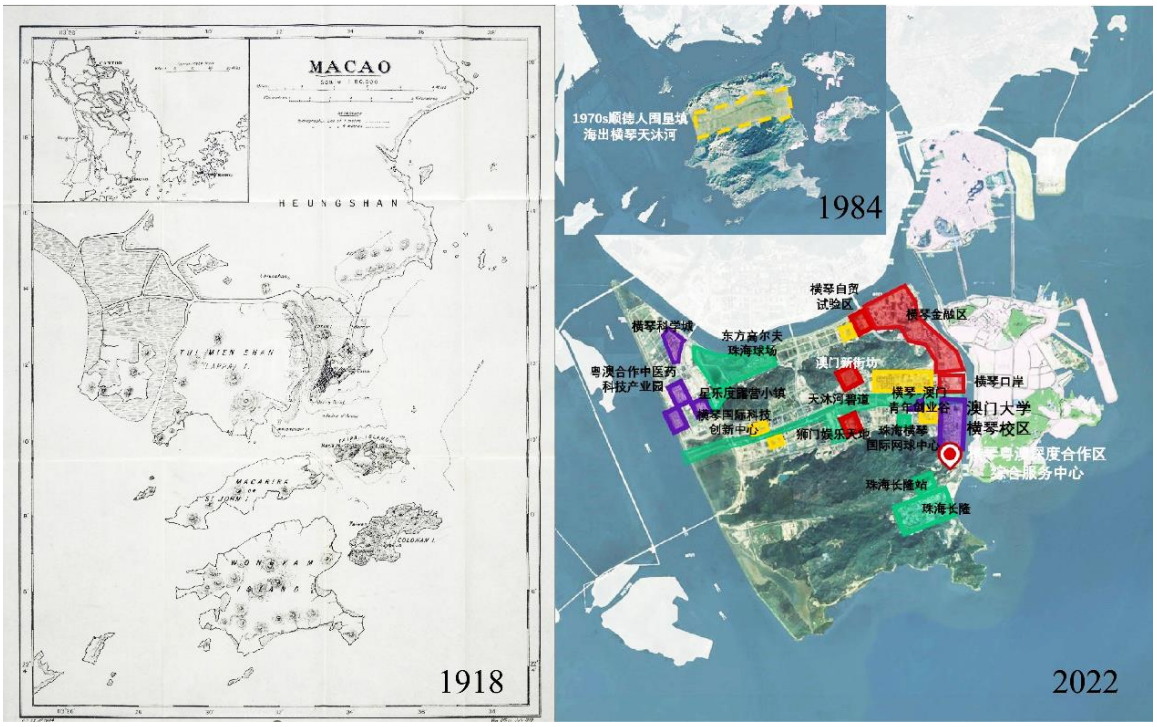


Figure 25. Hengqin and Macao in1918,1984,2022
Source: authors

It is a special area for the long term with limited land availability for urban development because of unconfirmed visions. A turning point came in 2003 when Guangdong Province and the Macao Special Administrative Region reached a consensus to jointly develop Hengqin (China News, 2003). In 2009, the Macao government leased 1.09 square kilometers of land on Hengqin Island in Zhuhai for a land rental fee of 1.2 billion Macau patacas. The lease grants the right to use the land until the year 2049, specifically for the construction of the new campus of the University of Macao. After the expiration, the ways to continue the lease remained open, allowing for continued co-discussions. The Macao government retains jurisdiction over this land in accordance with Macao laws (Xinkuai News, 2009), which was consented by Macao Legislative Assembly and the Chinese central government.

It is a good thing that Guangdong province and Macao have found ways to manage transboundary development. Since then, a series of major projects were initiated and the development of Hengqin stepped into an accelerating route. In 2010, Guangdong Chimelong Group Co., Ltd., a mainland company that owns and operates theme parks

and tourism, started to build the Chimelong Ocean Kingdom in Hengqin (News Express, 2010). In 2015, Hengqing Financial Island (a financial center) commenced (Pengpai News, 2021). Enterprises in Macau have also started investing in the development and construction of Hengqin. For instance, in 2020, Macao Urban Renewal Limited (MUR) has been participating in the construction of the Macao New Home Residential Development Project (Macao Urban Renewal Limited, 2020).

3.2 The latest planning practices in response to the Overall plan for building a Guangdong-Macao in-depth cooperation zone in Hengqin

Our team was invited, as one of the participating teams, to attend the international competition 'Urban Design for the Hengqin Guangdong-Macao Deep Cooperation Zone' in 2022. This competition was a local response from Hengqin to the national call in the *Overall plan for building a Guangdong-Macao in-depth cooperation zone in Hengqin*. We propose many 'transboundary' initiatives, which are associated with regional railways, customs, local transport, water supplement, industry, etc.

The first initiative is associated with customs. According to the 'first line simplification, second line regulation' decision in the *Overall plan for building a Guangdong-Macao in-depth cooperation zone in Hengqin.* The first line refers to the boundary between Hengqin island and Macao while the second line refers to the boundary between Hengqin island and other mainland areas (see Figure 6). Goods entering Hengqin through the second line from the mainland are treated as exports. Value-added tax (VAT) and consumption tax can be refunded, but export tariffs are levied. Goods entering the mainland from Hengqin via the second line are regarded as imports. Customs collect customs duties and import-related taxes[1].

People entering Hengqin from the mainland need no inspections but should follow the current costumes rules if they cross through the first line to enter Macao. People entering Hengqin from Macao follow the current costumes rules. However, inspections are supposed to be simplified to facilitate fast crossing between the two areas.

[1] Goods produced by enterprises within Hengqin that do not contain imported components or have a 30% added-value or more are exempt from import tariffs when entering the mainland through the "second line."

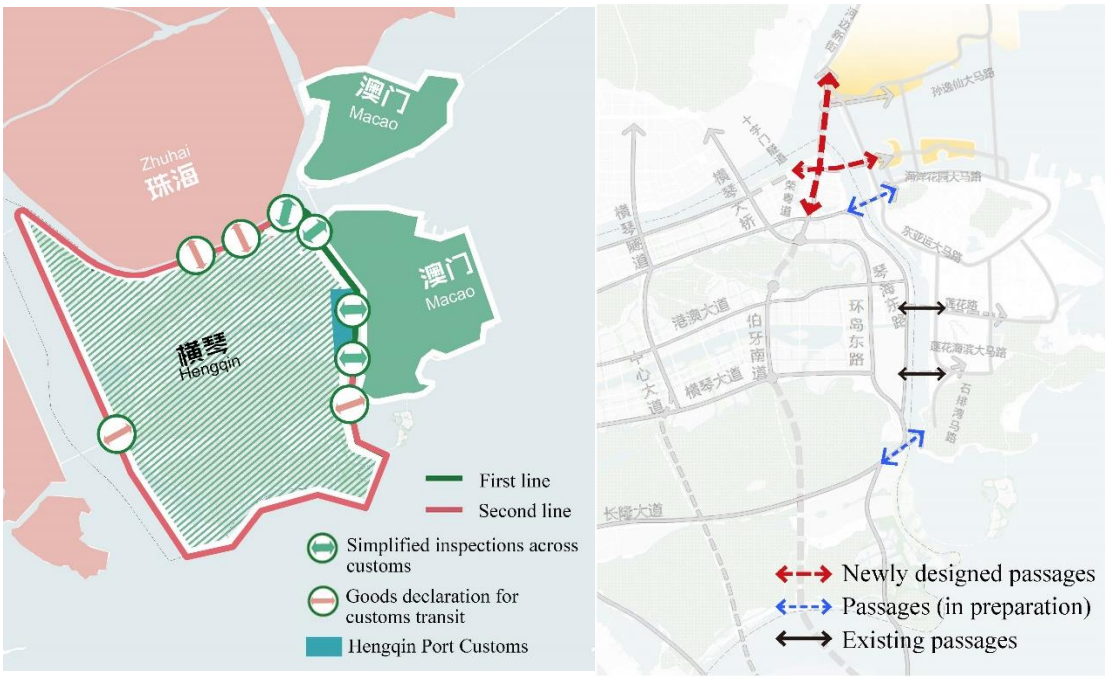


Figure 26. 'First line simplification, second line regulation' (left), newly added passages in our proposal (right)

Source: authors, based on the international competition 'Urban design for the Hengqin Guangdong-Macao Deep Cooperation Zone'

We suggest adding two more passages between Hengqin and Macao. Considering the planned two passages before and the existing two passages, six passages will be available for people moving. It aims to mitigate the complaints from Macao residents that transboundary moving is time-consuming and passages are limited (ref.).

Second, we envision a bright future in which residents living in this area - no matter from the mainland or Macao - have convenient transportation with the railway network in the GBA as well as a good connection with Macao and Hongkong. The previously designed Guangzhou-Zhuhai-Macao high-speed railway is supposed to be extended to Macao Airport and Hongkong-Zhuhai-Macao Bridge rather than a full stop at Hengqin customs.

Figure 27. Regional railways (current vision-up) and our proposal (future vision-down)
Source: authors, based on the international competition 'Urban design for the Hengqin Guangdong-Macao Deep Cooperation Zone'

The third initiative is to facilitate the connection between Hengqin and Macao via local rail traffic. We suggest three new light rail lines so that people living in two islands of Macao can have easy access to Hengqin. Two lines are proposed in Hengqin which are connected to Macao's subway systems. One is located in Macao along the coast, which stretches to Hongkong-Zhuhai-Macao Bridge.

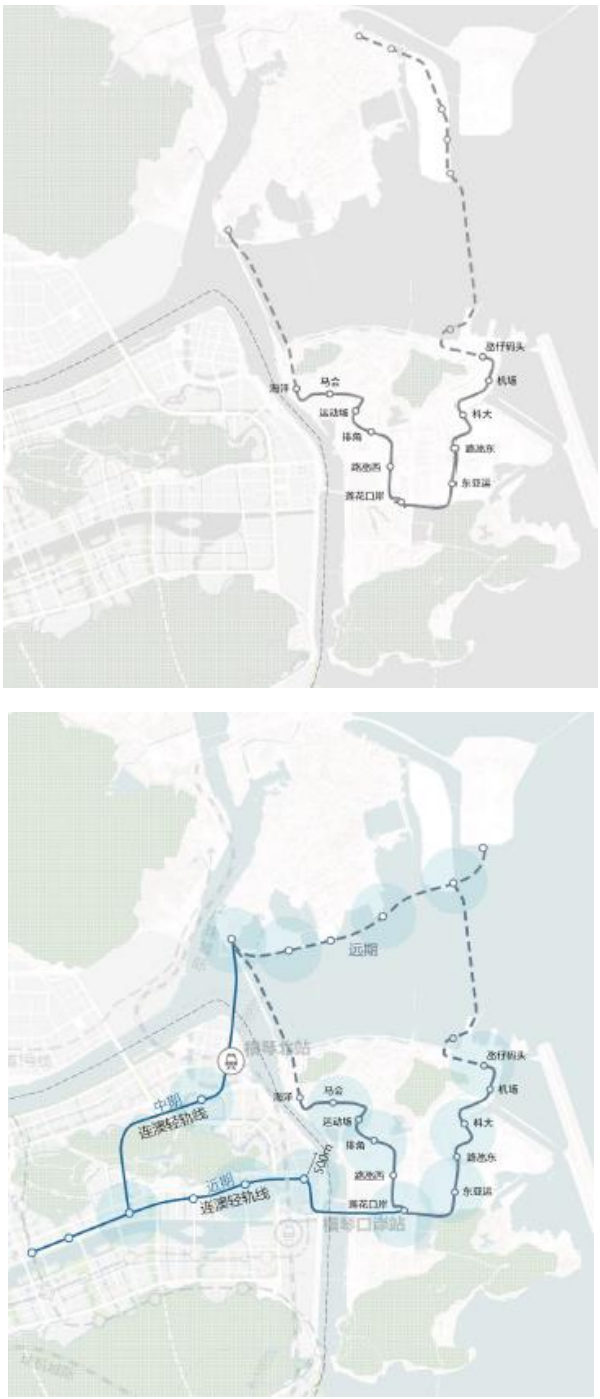


Figure 28. Local subways (current vision-left) and our proposal (future vision-right)
Source: authors, based on the international competition 'Urban design for the Hengqin Guangdong-Macao Deep Cooperation Zone'

Water supply is another issue that we care about but is neglected by the *overall plan for building a Guangdong-Macao in-depth cooperation zone in Hengqin*. We propose to build

a freshwater cycle in Hengqin on account of precipitation collection and seawater desalination (see Figure 9). The concepts of 'the area as a sponge based on nature-based solutions (NBs)', the 'collection, storage and reuse of water', and 'clean-energy-driven water purification' are encouraged to restore the water balance between the urban area and its environment. The proposal is also regarded as an option to offer fresh water to Macao as a bonus, which helps to diversify its water resources, now heavily relying on Zhuhai (the mainland part) by over 96%.

Figure 29. Water supple in our proposal (future vision)
Source: authors, based on the international competition 'Urban design for the Hengqin Guangdong-Macao Deep Cooperation Zone'

We have an ambition that Hengqin will attract foreigners, Macao residents, as well as the mainland to live here. A diverse range of houses are proposed in Hengqin's market in response to Macao's housing structure transition which predicts a demand for 44500 units (see figure 10). These include:

- Public rental housing (20-40%): Similar to Macao's social housing and elderly apartments, these are government-funded housing units intended for foreigners, Macao residents, and talents from the mainland.
- Semi-owned housing (20-40%): Corresponding to Macao's affordable housing and sandwiched housing, these government-funded properties are mainly targeted at Macao residents, especially the citizens with lower incomes.
- Private/Commercial housing (40-60%): This category encompasses various types of commercial housing units to cater to different groups of people. Examples include single-person apartments, elderly care households, and multi-generational households.

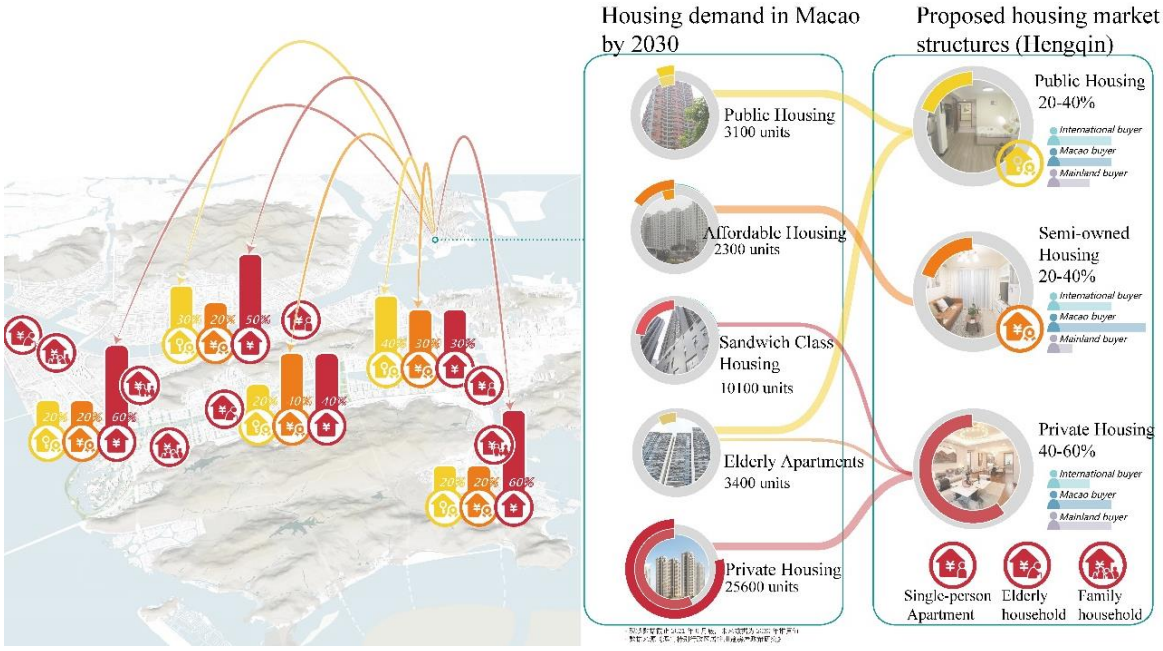


Figure 30. Housing strategies for Hengqin

Source: authors, based on the international competition 'Urban design for the Hengqin Guangdong-Macao Deep Cooperation Zone'

We propose the development of Hengqin along four axes.

- Firstly, the horizontal core development axis connects Macau's Lotus Flower Checkpoint to Hengqin Port, extending westward along the Guangzhou-Zhuhai-Macao Railway (under construction). Along this axis, we propose the development of industries such as financial services, legal consulting, consumer services, ICT, technology headquarters, manufacturing industry, etc.
- The second axis follows the Crossgate Channel to the south, leveraging the riverfront area's environmental advantages and connecting historical landmarks on both sides.

This axis can be developed with clusters of exhibition services, commercial finance, educational and research institutions, etc.

- The two secondary horizontal axes, north, and south, adopt different development models. The north axis will primarily focus on the development of industries such as biomedical research, enterprise incubation, and technology logistics. The south axis will leverage the advantages of the coastal area to develop industries such as tourism, leisure, and healthcare.

By strategically developing along these four axes, Hengqin would maximize its potential for economic growth, diversify its industries, and create a well-connected and vibrant region that complements the development of Macao and the Greater Bay Area as a whole.

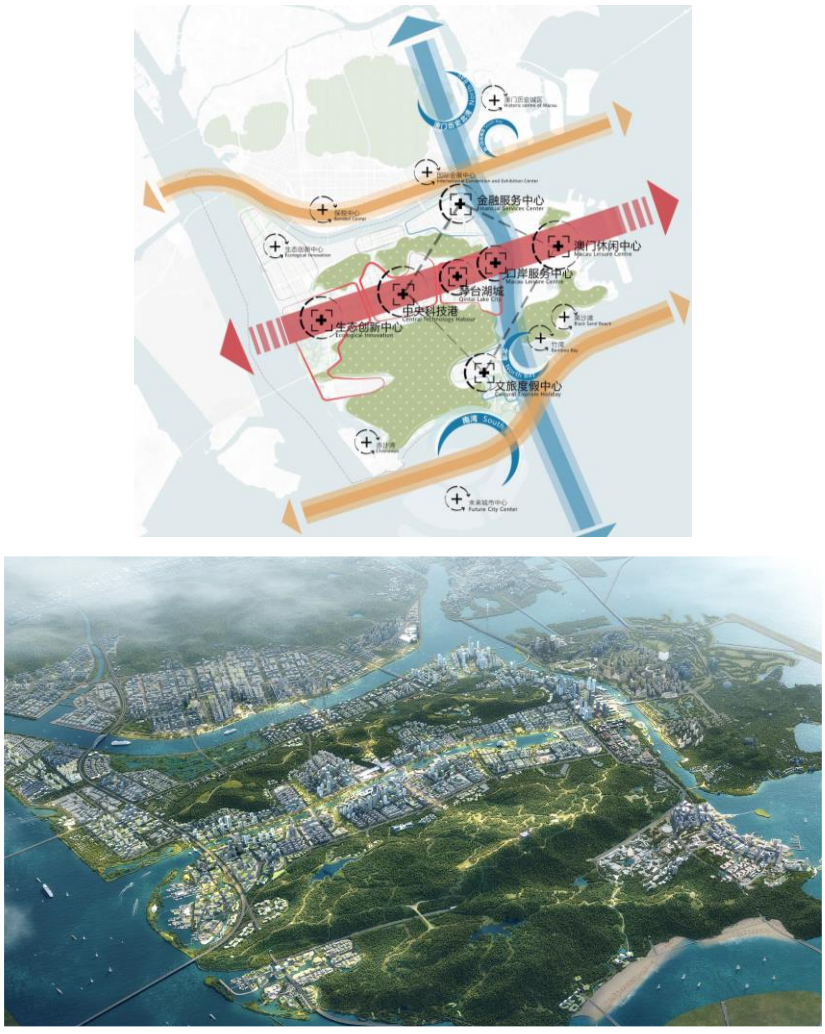


Figure 31. Hengqin's development along four visions

Source: authors, based on the international competition 'Urban design for the Hengqin Guangdong-Macao Deep Cooperation Zone'

4. Discussion

Our proposals in Hengqin can be regarded as a kind of 'soft solutions' or ' soft designs' to manage transboundary issues between the mainland and Macao. Even though they have received positive feedback and appreciation from local authorities, their implementation would still be faced with many barriers. For instance, we suggest extending the Guangzhou-Zhuhai-Macao railway across Hengin to Macao to enable better ease of travel within the Greater Bay Area. This proposal comes with the complexity of the inspection. Two options can be potential solutions. One relies on the 'one site, two checkpoints' policy. After a pre-check at either Hezhou Station, Tianmu Station, or Hengqin Port Station, people from the mainland can enter Macao. People enter the mainland after a pre-check at the Macao Airport Station or Hongkong-Zhuhai-Macao Bridge Station. The other option relies on the current rules that people enter or exit Macao after the inspection procedures at Hengqing customs.

The second challenge lies in the alignment of rules and regulations between Hengqin and Macau, such as the integration of different metro construction standards as we suggest integrated subway systems. Efforts should be made to align technical standards, specifications, and design criteria for metro systems between Hengqin and Macau. This can involve conducting joint studies, sharing best practices, and adopting a harmonized approach to ensure compatibility and interoperability between the two systems.

The third challenge would be the appeal of Hengqin for Macao residents. Macao is still attached to the casino industry. Whether the residents are willing to work in Hengqin and whether the capital is interested in investing in ICT, manufacturing industries, finance industries, etc, needs more observation.

5. Conclusion

This article examines the transboundary development process of the Greater Bay Area from both a mega-regional and local perspective. It highlights the roles played by the central government and local authorities as drivers of this development since the onset of reform and opening-up. In the early stages, the focus was primarily on flagship or major projects, with both the central government and local governments taking proactive roles in promoting cross-border initiatives. These projects served as catalysts for regional integration and cooperation.

Since the launch of the O*verall plan for the Greater Bay Area* in 2019, there has been a shift towards more strategic policies that encompass broader regional concerns, for instance, cross-boundary cohesion, convenient connectivity, and balanced development. Three targeted regions are regarded as the frontier to realise ambitions including Hengqin, Nansha, and Qianhai.

Our design experience in Henqing shows a potential future in response to the national call from the *Overall plan for building a Guangdong-Macao in-depth cooperation zone* in Hengqin. Even so, implementing these proposals is faced with many challenges. More efforts are needed from both central government and local stakeholders.

Future research can be explored in the following case:

- What are the impacts of the *Overall Plan for Building a Guangdong-Macao in-depth cooperation zone*, for instance, on laws, institutional setting, financial rules, immigration policies, etc?
- What are the facilitators and obstacles that can either promote or hinder the transboundary between Hengqin and Macao?
- Compared with Hengqin, what is the situation of the other two targeted areas mentioned by the O*verall Plan for the Greater Bay Area, l*ike Hengqin and Nansha?

Acknowledgement. Funding. This research is co-funded by the National Youth Science Fund Project of the National Natural Science Foundation of China (52108050), the Guangdong Basic and Applied Basic Research Foundation (2023A1515011653), the Guangzhou Science and Technology Program (202201010503), the State Key Laboratory of Subtropical Building Science at South China University of Technology (2022ZB08), and the China Postdoctoral Science Foundation (2021M701238).

References

BBC News (2019) *Greater Bay Area: China's ambitious but vague economic plan*. Available at: https://www.bbc.com/news/business-47287387 (Accessed: 19 May 2023).

China News (2003) *The next step of Guangdong-Macao cooperation: plans to jointly develop Hengqin and build a tourist resort*. Available at: http://www.chinanews.com.cn/n/2003-12-09/26/378930.html (Accessed: 19 May 2023).

Eilo, W. Y. (2014) *China's Macao transformed: Challenge and development in the 21st century*. City University of HK Press. Available at: https://www.google.com.hk/books/edition/China_s_Macao_Transformed/FbDIBAAAQBAJ?hl=en&gbpv=0.

Foshan Census and Statistics Department (no date) *Foshan Census and Statistics*. Available at: http://www.foshan.gov.cn/gzjg/stjj/tjnj_1110962/index.html (Accessed: 20 May 2023).

Government of Hongkong Special Administrative Region Census and Statistics Department (2022) *Yearbook of GDP*. Available at: https://www.censtatd.gov.hk/sc/EIndexbySubject.html?pcode=B1030002&scode=250

(Accessed: 20 May 2023).

Government of Macao Special Administrative Region Statistics and Census Service (no date) *Yearbook of statistics*. Available at: https://www.dsec.gov.mo/zh-CN/Home/Publication/YearbookOfStatistics (Accessed: 20 May 2023).

Guangzhou United Front (2017) *'Guangdong-Hong Kong-Macao Greater Bay Area' is written in the government work reports*. Available at: https://web.archive.org/web/20190225103029/http://www.zytzb.gov.cn/tzb2010/wxwb/201703/5b293f5573e4494e81ccd2d7891dbe8e.shtml (Accessed: 19 May 2023).

Macao Urban Renewal Limited (2020) *Hengqin 'Macao New Neighborhood' project land signed for sale today*. Available at: https://www.gov.mo/zh-hant/news/326811/ (Accessed: 21 May 2023).

National Bureau of Statistics (no date) *Anual data*. Available at: https://data.stats.gov.cn/easyquery.htm?cn=C01 (Accessed: 20 May 2023).

News Express (2010) *Chimelong spends 20 billion on building Zhuhai Resort*. Available at: http://finance.sina.com.cn/roll/20101217/09179122266.shtml (Accessed: 21 May 2023).

Pengpai News (2021) *The Management Organization of Hengqin Guangdong-Macao Deep Cooperation Zone was officially unveiled!* Available at: https://m.thepaper.cn/baijiahao_14547246?sdkver=e06426d6&clientprefetch=1 (Accessed: 21 May 2023).

Shenzhen Dream (2022) *The GDP of the Greater Bay Area in 2021: 12.6 trillion!* Available at: https://www.163.com/dy/article/H5ODTT2S0511HMV0.html (Accessed: 19 May 2023).

State Council (2022) *The State Council issued Guangzhou Nansha Deepening the World-Oriented Plan Notice on the overall plan for comprehensive cooperation between Guangdong, Hong Kong and Macao*. Available at: http://www.gov.cn/zhengce/content/2022-06/14/content_5695623.htm (Accessed: 20 May 2023).

Xinhua News (2019a) *China's Greater Bay Area seeks to catch up with world's leading economic clusters*. Available at: https://global.chinadaily.com.cn/a/201905/20/WS5ce255d9a3104842260bcae0.html (Accessed: 19 May 2023).

Xinhua News (2019b) *The Central Committee of the Communist Party of China and the State Council issued the 'Outline of the Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area'*. Available at: http://www.gov.cn/zhengce/2019-02/18/content_5366593.htm#1 (Accessed: 19 May 2023).

Xinhua News (2021a) *The Central Committee of the Communist Party of China and the State Council issued the 'Comprehensively Deepening the Reform and Opening-up Plan of Qianhai Shenzhen-Hong Kong Modern Service Industry Cooperation Zone'*. Available at: http://www.gov.cn/zhengce/2021-09/06/content_5635728.htm (Accessed: 1 May

2023).

Xinhua News (2021b) *The Central Committee of the Communist Party of China and the State Council issued the 'Overall Plan for the Construction of the Hengqin Guangdong-Macao Deep Cooperation Zone'*. Available at: http://www.gov.cn/zhengce/2021-09/05/content_5635547.htm (Accessed: 19 May 2023).

Xinhua News (2022) *The final verification of China's GDP in 2021 is 114923.7 billion yuan*. Available at: http://www.gov.cn/xinwen/2022-12/27/content_5733701.htm (Accessed: 19 May 2023).

Xinkuai News (2009) *China considers leasing land in Guangdong to Macao for university expansion*. Available at: http://english.cctv.com/20090623/100969.shtml (Accessed: 20 May 2023).

VOLUNTARY TERRITORIAL PLANNING TOOLS AND BOUNDARIES CHANGES: SOFT SPACES FOR BETTER ADDRESSING CHALLENGING TERRITORIAL ISSUES IN THE LAZIO REGION[1] (1124)

Daniela De Leo[1*], Sara Altamore[1]

[1]Sapienza University of Rome, Rome, Italy; daniela.deleo.uniroma1.it

Abstract. Based on longstanding research conducted in the Lazio Region about the implementation of two recent and innovative territorial policies, this contribution reflects on those findings by shedding light on the connection between administrative/not administrative boundaries and efficiency in the goals achievement. The analysis provides insights and prompts a reconsideration of the approaches taken in defining these new soft spaces for better addressing challenging territorial issues.

Keywords: boundaries, variable perimeters, innovative territorial planning tools, soft spaces.

1. Introduction

While tracing borders remain crucial aspects of urban and regional planning (Gaeta, Rivolin, and Mazza, 2013), the concept of territorial boundaries in planning practices has evolved significantly. In recent decades, the discussion about boundaries in planning policies has shifted towards the need to transcend rigid and inadequate administrative perimeters in response to contemporary urban and territorial challenges. Consequently, in pursuit of more effective territorial transformations, planners have embraced alternative policies perimeters beyond the traditional planning framework at the city, province, and regional levels. Along this, integrated territorial tools have facilitate to build connections among ecosystems, settled communities, stakeholders, and territorial resources (Peano, 2000; Gambino, 2003; Ferrara, 2006). This has given rise to various distinct territorial entities, accompanied by innovative planning tools and policies that seek to define boundaries through bottom-up or negotiating processes, often driven by specific objectives and available resources (Lovell, 2002; Bixler, 2014).

In this framework, the 'Alta Tuscia-Antica città di Castro' Inner Area, as part of the SNAI-Italian Inner Area National Strategy, and the 'Marta-Bolsena-Tarquinia' River, Lake, and

[1] The paper is the result of shared research work. However, for practical reasons, it is possible to attribute to Daniela De Leo, §1, §2, §4; and to Sara Altamore §2, §3; §4.

Coast Contract serve as two useful examples of voluntary territorial planning tools and policies. These are characterized by: a) the selection of the most operative and functional boundaries, b) the aim to establish new territorial relationships, dynamics, and connections. Nonetheless, the analysis presented in this paper reveals that despite the potential these new 'soft spaces' to foster more effective transformations, they have faced challenges in practice due to the prevailing traditional administrative approach at the Municipality level.

In summary, the purpose of this paper is twofold. Firstly, it aims to stimulate critical discussions about perimeters in territorial planning. Secondly, it offers suggestions to enhance the functionality of these 'soft spaces' for innovating planning policies.

The paper is structured into three paragraphs. The first paragraph introduces the selected theoretical framework. The second focuses on the processes of the two policies within a 'soft space' area in the Lazio Region. Lastly, the third presents the findings and conclusions of the study.

2. Theoretical Framework

It is widely acknowledged that administrative boundaries often fall short of capturing the interconnected nature of social, economic, and environmental processes that transcend these boundaries. The recognition of ecosystems and landscapes as essential elements have challenged the traditional understanding of administrative boundaries (Magnaghi, 2018). Thus, the growing recognition of environmental challenges has driven the development of planning tools that prioritize interaction, adaptability, and the generation of knowledge (Ali, 2003; Hage et al., 2010; Evans, 2011). That needed a sight towards more integrated approaches to defining policies perimeters that align with ecological systems and functions. This shift is particularly evident in the field of environmental management, where planners have progressively moved away from traditional approaches (Healey and Shaw, 1994; Schoeman et al., 2014). Starting from a renovated environmental planning perspective, the importance of continuity and interdependence of ecosystems and landscapes has been raised. Within this context, planning processes have embraced the notions of complexity and uncertainty, recognizing the interconnectedness between societies, economies, and the environment spanning across multiple administrative boundaries (Pahl-Wostl et al., 2011).

Not only according to Italian law, the administrative perimeters of cities, provinces, and regions determine the spatial extent to which specific planning tools and policies apply. Alongside this, the recognition of negotiable perimeters in planning practices, as opposed to traditionally adopted administrative ones, has prompted various attempts to conceptualize the boundaries as open, porous, and other forms (Secchi and Viganò, 2011;

Paasi and Zimmerbauer, 2016; Jones, 2022). Moreover, the endeavour to interpret policies' perimeter in a relational way remains a complex and crucial challenge, intricately connected to innovations in governance dynamics (Ayres and Stafford, 2014).

Undoubtedly, the issue of boundaries in territorial planning includes the related topic of administrative efficiency and the need for more collaborative approaches to address complex spatial challenges. As well as it demands a distinct awareness of the spatial scale, interconnections, and issues dynamics, as well as the active involvement of various stakeholders within the planning process. These approaches involve bottom-up participation and the consideration of diverse stakeholder interests. They seek to foster more inclusive planning processes (Born and Purcell, 2006; Selman, 2006; Mendes, 2007).

In this context, the proposed concept of 'soft spaces' (Haughton et al., 2009) refers to the creation of dynamic and differently connected areas where planning plays an increasingly important role in integrating the related new 'soft' institutional spaces of governance (Allmendinger et al., 2015). However, since these tools are often linked to specific, contingent projects or are driven by time-bound economic interests (Allen and Cochrane, 2007; Paasi and Zimmerbauer, 2016), there is a risk that the newly formed territorial entities may not be effectively activated.

Nevertheless, soft spaces of governance are increasing in number and significance within the institutional framework of spatial planning. The concept of 'soft spaces' alongside the traditional 'hard spaces' has led to several key observations (Haughton and Allmendinger, 2008):

- Soft spaces are intentionally introduced to provide new opportunities for innovative thinking, especially in areas where public engagement and cross-sector consultation face resistance, hindering the progress of new development.
- The interplay between 'hard' and 'soft' spaces of governance is essential, as they rely on each other. The goal is not to replace existing 'hard' institutional spaces with new 'soft' ones, but rather to create complementary and sometimes competing avenues for development at sub-regional or sub-local government levels.
- Soft spaces often exhibit a deliberately adaptable nature, allowing them to be easily adjusted and shaped to accommodate different interests and challenges.

The creation of soft spaces is a rising trend in implementing multilevel interventions characterized by multiple, non-unidirectional relationships. However, as noted, it is crucial to recognize that the relationships shape the dynamics of power and knowledge within the institutional structures and dynamics (Kronsell and Mukhtar-Landgren, 2018). Furthermore, it is related to the creation of processes across scales and domains, that have to deal both with well-established and emerging boundaries.

3. Two Examples Of Soft Spaces In The Lazio Region

The study area is located between the province of Viterbo and the regions of Tuscany and Umbria. Within this area, two voluntary policies and tools have been implemented, partially overlapping with each other. These two policies and tools have distinct (yet interconnected) objectives[2], resulting in the emergence of two different types of soft spaces.

The SNAI-Italian National Strategy for the Inner Area is a nationwide strategy designed to address and reverse the trend of abandonment in peripheral areas. Established in 2013, the policy provides central guidance and monitoring, coordinated by the Department for Cohesion Policies [3] and is responsible for selecting areas, defining strategies, and monitoring progress. It also establishes local management units to drive systemic government reform. The policy identified 72 pilot-project areas with historically demonstrated self-organizing capabilities. That corresponded to the redefinition of 72 new perimeters[4]. In the area of Tuscia, the 'Alta Tuscia-Antica città di Castro' Inner Area defined a new perimeter composed of 19 municipalities[5].

Similarly, River Contracts are a form of voluntary cooperation implementing European directives and guidelines to achieve integrated water management beyond sectoral plans[6]. These contracts serve as a tool for experimenting with alternative territorial dynamics through participatory processes involving various actors, including non-institutional ones, and citizens at different levels of planning. The contract perimeter extends beyond administrative boundaries, encompassing the entire hydrographic basin[7]. The 'Marta-

[2] Further exploration of the two policies can be undertaken reading the second contribution of the two authors in Track 7 'Planning for Resilience: Territories, Communities and Environment' of this book of proceedings.

[3] The central guidance is facilitated through the institution of the Technical National Committee for Inner Areas (CTAI).

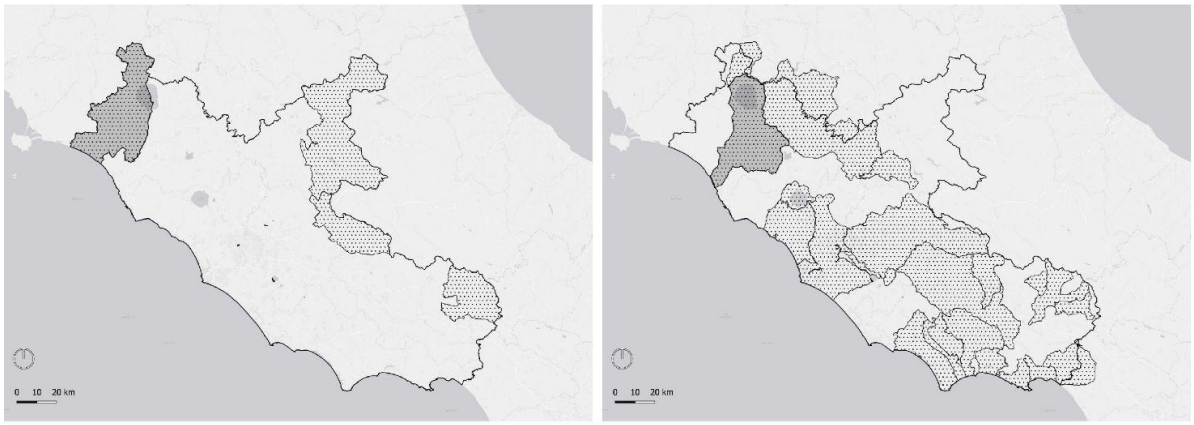
[4] These areas are selected based on their historical association and serve as a prerequisite for establishing a long-term partnership. Indeed, they must have demonstrated that they manage at least two fundamental functions in an associated manner. The SNAI adopted an integrated approach to address demographic challenges and meet the needs of territories with significant disadvantages.

[5] In addition, the process involved various public and private actors, including the municipalities in the Inner Area, the National Energy Authority (ENEL), the Local Health Authority of Viterbo, regional school offices, and educational institutions such as the University of Tuscia.

[6] The implementation of River Contracts in Italy began in 2007 with the establishment of the National Round Table of River Contracts

[7] In 2015, the Lazio Region formally became a part of the National Charter for the River Contracts. In 2017, the Region, in collaboration with the University of Tuscia, engaged in discussions with the mayors of the municipalities situated around Lake Bolsena.The initial proponents of the project were the municipalities close to the lake. In December 2017, the first signing involved: 7 public bodies, including the Province of

Bolsena-Tarquinia' River, Lake, and Coast Contract defined a perimeter that does not correspond to any administrative boundaries but includes three different water bodies: river, lake, and coast.



The four Inner Areas in the Lazio Region and the Area of "Alta Tuscia-Antica città di Castro"

The twenty-one River Contracts in Lazio Region and the "Bolsena-Marta-Tarquinia" Lake, River, and Coast Contract

Figure 1. The perimeters of the two policies in the Lazio Region
Source: elaborated by the authors

The whole area involved in these two processes comprises small and intermediate cities with an increasing depopulation and rapid ageing of the community. These cities, with populations slightly exceeding 5,000 inhabitants, are facing depopulation and abandonment, while others are affected by environmental risks (floods, landslides and pollution among the most prevalent)[8].

Viterbo, 3 trade associations, 1 agricultural company, and 10 civil associations. Later in the creation of the Lake, River, and Coast Contract, 6 municipalities, 3 labour unions, 8 new associations, 3 additional trade associations, 5 private citizens, one Local Action Group, the Local Health District of Viterbo, and the authors' University joined.

[8] For more information see: Trigila et alii, 2021 and the Strategy document of Alta Tuscia Antica città di Castro, 2020.

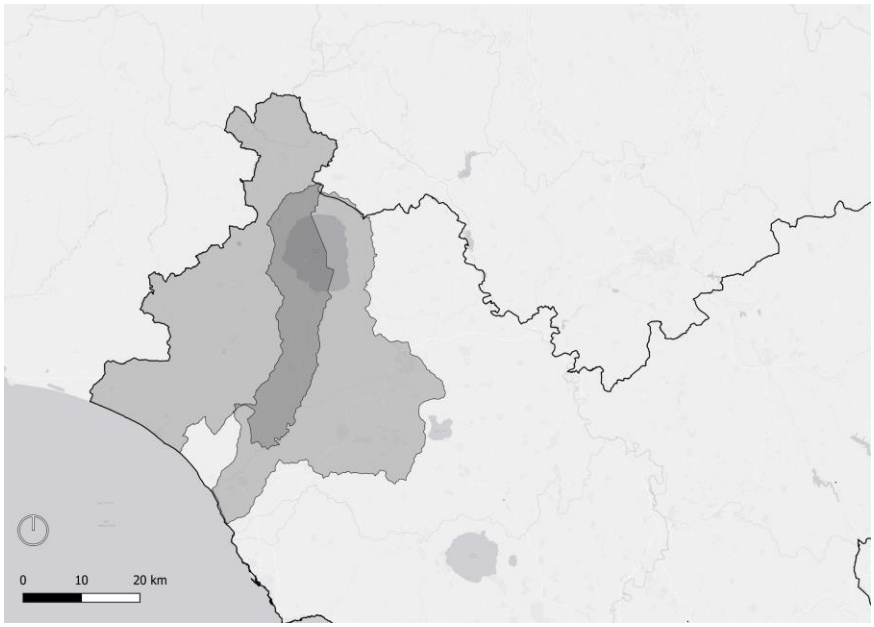


Figure 2. The overlapping of the two policies perimeters
Source: elaborated by the authors.

The territorial research carried out on the two processes[9] highlighted the limits of this softness.

From one side, the SNAI policy encouraged the overcoming of administrative boundaries, effectively creating soft spaces within the perimeter of the defined Inner Area, building a common vision and associating technical and administrative functions (usually performed within 'hard spaces'). In the effort to create an effective perimeter for the implementation process, some municipalities were excluded, leading to a boundary that disrupts certain territorial continuities (such as, for example, Lake Bolsena).

The municipalities within the 'Alta Tuscia-Antica città di Castro' Inner Area have entered into an agreement with the shared vision of creating a 'polycentric city'. This vision is entrusted to the associating function of planning. To facilitate the process of associationism, the Strategy Document emphasizes the need for a gradual approach that promotes a cultural shift. It recognizes that through collective decision-making and collaborative action, there is a greater ability to enact change, gain influence, benefit from economies of scale, and ultimately achieve improved outcomes.[10] However, difficulties

[9] For details about the research method see De Leo and Altamore, 2022; 2023.

[10] Here, the text translates the meaning of a sentence from the Strategy Document. In Italian: «un percorso educativo lento che presuppone un cambio culturale per comprendere che nel decidere e nell'agire insieme si acquista maggiore capacità di azione e di potere, si creano economie di scala, si ottengono migliori risultati» (Strategia 'Alta Tuscia-Antica città di Castro': 32).

have emerged in implementing joint planning efforts. In the case of land use and territorial planning, soft space has proven ineffective because mayors tend to revert to their usual hard space. From the interviews, one of the reasons highlighted concerns the fear of losing decision-making - and therefore political - power over municipal space.

On the other side, the contract boundaries were defined based on the hydrological basin even though the institutional representatives, including the Province and the 12 Municipalities involved remained strictly anchored to their existing administrative boundaries. As a result, participants in the process highlighted the lack of active involvement of local institutions in the collaborative process, despite significant changes occurring in both internal and external relationships. Furthermore, the fieldwork revealed challenges in collaboration not only between institutional levels but also between institutions and citizens. From the interviews and observatory participation, local institutions primarily attended essential meetings and showed minimal involvement in the participatory process. At the same time, the low level of citizen participation emphasized the need for institutions to fulfil their role as active participants in the process. This lack of structured engagement hindered the potential for learning processes and networking opportunities. Consequently, coordination and collaboration skills were primarily concentrated in external individuals such as project managers, visionary retirees, and representatives from the third sector, rather than being developed and shared as a collective public asset. This diminished the potential impact of soft spaces, rendering them uncertain and aleatoric.

4. Findings And Conclusions

The long-standing research behind this paper has shed light on how the 'Alta Tuscia-Antica città di Castro' policy – within one of the 72 inner areas' national perimeter – attempted to define a new boundary for the area involved in the strategy design as a whole. However, municipalities were unable to overcome the administrative boundaries to address shared urban issues. In this case, the new boundary of the Inner Area resulted in the risk of isolating the area from its surroundings.

In the case of the Contract, although the water basin challenged the single administrative municipal boundaries, it did not effectively establish a new space of practice. Despite the new soft boundary was defined and recognized by the Region, stakeholders did not fully recognize it. Consequently, there was limited capacity for action, and then the voluntary instrument was largely ineffective.

Nonetheless, the conceptual framework of soft spaces offered suggestions for reinforcing the voluntary tool's efficiency by considering that:

- new boundaries need to be used intentionally for providing new opportunities for innovative thinking and public engagement, by structuring permanent learning and training processes for all the actors involved (administrators, institutions, project manager, etc) enhancing their skillset by spreading knowledge and sharing responsibilities,
- the interplay between 'hard' and 'soft' boundaries must create a stable local network based on mixed actors with heterogeneous skills at different levels, so being effective/efficient by avoiding concentration of knowledge and power,
- soft boundaries often exhibit a deliberately adaptable nature even though institutional participants have to learn to consider territorial planning as a shared practice among different local institutions and with inhabitants and associations, and not a private domain.

In conclusion, the creation of soft boundaries through voluntary spatial planning tools can be effective only when multilevel interventions are implemented, fostering multiple relationships. These interventions recognize the interconnectedness and interdependence of different actors and institutions involved in the planning process. However, achieving this requires reshaping the distribution of power and knowledge within institutional and administrative structures and boundaries.

Reference

Ali, Saleem H (2003) Environmental planning and cooperative behavior: Catalyzing sustainable consensus. *Journal of Planning Education and Research* 23(2), pp. 165-176.

Allen, John, and Allan Cochrane (2007) Beyond the territorial fix: regional assemblages, politics and power. *Regional studies,* 41(9), pp. 1161-1175.

Allmendinger, Phil, Graham Haughton, and Jörg Knieling (2015) Soft spaces, planning and emerging practices of territorial governance. In: Allmendinger, Phil, Graham Haughton, Jörg Knieling, Frank Othengrafen *Soft Spaces in Europe*. London: Routledge.

Allmendinger, Phil, Graham Haughton, Jörg Knieling, and Frank Othengrafen (2015). *Soft Spaces in Europe*. London: Routledge.

Ayres, Sarah, and Ian Stafford (2014) Managing complexity and uncertainty in regional governance networks: A critical analysis of state rescaling in England. *Regional Studies*, 48(1), pp. 219-235.

Bixler, R. Patrick (2014) From community forest management to polycentric governance: assessing evidence from the bottom up. *Society & Natural Resources* 27 (2), pp. 155-169.

Born, Branden, and Mark Purcell (2006) Avoiding the local trap: Scale and food systems in planning research. *Journal of planning education and research* 26(2), pp. 195-207.

De Leo, Daniela, and Sara Altamore (2022) Territori intermedi del Lazio e Contratti di

Fiume. Interpretazioni e strumenti per territori né metropolitani né interni. *Archivio di Studi Urbani e Regionali,* LIII, 135.

De Leo, Daniela, and Sara Altamore (2023) Why multi-stakeholder practices don't work: looking beyond the extent and diversity of actors for co-producing collective action; a case study from an inner area in Italy. *Planning Practice & Research*, 38(3), pp.1-17.

De Leo, Daniela, and Sara Altamore (2023) The resilience perspective for better dealing with territorial planning policies in non-metropolitan areas. In: Integrated planning in a world of turbulence, Track 7 Planning for Resilience: Territories, Communities and Environment, *AESOP proceedings* 35(1), Lodz, 11-15 July.

Evans, James P (2011) Resilience, ecology and adaptation in the experimental city. *Transactions of the institute of British Geographers* 36(2), pp. 223-237.

Ferraro, Giovanni (1996) "Mappe e sentieri. Una introduzione alle teorie della pianificazione", *CRU - Critica della razionalità urbanistica 6*, pp. 52-63.

Gambino, Roberto (2003) "Idee di paesaggio: elogio del pluralismo e tentativi di ricomposizione", *CRU - Critica della Razionalità Urbanistica* 13.

Gaeta, Luca, Umberto Janin Rivolin, and Luigi Mazza (2013) *Governo del territorio e pianificazione spaziale.* Torino: Città studi edizioni.

Hage, Maria, Pieter Leroy, and Arthur C. Petersen (2010) Stakeholder participation in environmental knowledge production. *Futures* 42(3), pp. 254-264.

Haughton, Graham, and Philip Allmendinger (2008). The soft spaces of local economic development. *Local Economy*, *23*(2), pp. 138-148.

Haughton, Graham, Philip Allmendinger, David Counsell, and Geoff Vigar (2009) *The new spatial planning: Territorial management with soft spaces and fuzzy boundaries*. London: Routledge.

Healey, Patsy, and Tim Shaw (1994) Changing meanings of 'environment' in the British planning system. *Transactions of the Institute of British Geographers*, pp. 425-438.

Jones, Martin (2022) For a 'new new regional geography': Plastic regions and more-than-relational regionality. *Geografiska Annaler: Series B, Human Geography* 104(1), pp. 43-58.

Kronsell, Annica, and Dalia Mukhtar-Landgren. Experimental governance: The role of municipalities in urban living labs. *European planning studies* 26 (5), pp. 988-1007.

Lovell, Chris, Alois Mandondo, and Patrick Moriarty (2002) The question of scale in integrated natural resource management. *Conservation Ecology* 5 (2).

Magnaghi, Alberto (2018) The territorialist approach for a local self-sustain-able development. In: De Leo, Daniela, and John Forester (eds.) *Reimagining Planning: How Italian Urban Planners are Changing Planning Practices.* Roma: INU edizioni, pp. 22-31.

Mendes, Wendy (2007) Negotiating a place for 'sustainability'policies in municipal planning and governance: The role of scalar discourses and practices. *Space and Polity* 11(1).

Paasi, Anssi, and Kaj Zimmerbauer (2016) Penumbral borders and planning paradoxes:

Relational thinking and the question of borders in spatial planning. *Environment and Planning* A 48 (1), pp.75-93.

Pahl-Wostl, Claudia, Paul Jeffrey, Nicola Isendahl, and Marcela Brugnach (2011) Maturing the new water management paradigm: progressing from aspiration to practice. Water resources management (25): 837-856.

Peano, Attilia (2000) Le politiche e la pianificazione regionale ambientale e paesistica, *Urbanistica Informazioni 169*, pp. 5-35.

Schoeman, Jess, Catherine Allan, and C. Max Finlayson (2014) A new paradigm for water? A comparative review of integrated, adaptive and ecosystem-based water management in the Anthropocene. International Journal of Water Resources Development 30(3), pp. 377-390.

Secchi, Bernardo, and Paola Viganò (2011) *La ville poreuse.* Genève: Métis Presses.

Selman, Paul (2006) *Planning at the landscape scale*. Routledge, London.

Strategy document of Alta Tuscia Antica città di Castro (2020) Available online: https://www.agenziacoesione.gov.it/wp-content/uploads/2020/12/Lazio-Alta-Tuscia-strategia.pdf (accessed 4 July 2022).

Trigila, Alessandro, Carla Iadanza, Martina Bussettini, Barbara Lastoria, Angela Barbano, and Michele Munafò (2021) Dissesto idrogeologico in Italia: pericolosità e indicatori di rischio. ISPRA, Rapporti 356/2021.

TRACK 05: PLANNING FOR MOBILITY: ACCESSIBILITY, AFFORDABILITY AND SUSTAINABILITY

RESEARCH ON FUTURE URBAN COMPREHENSIVE TRANSPORTATION DEVELOPMENT STRATEGY: BASED ON WUHAN YANGTZE NEW TOWN (1056)

Gangyu Hu[1], Jianing Shi[1], Jianzhong Huang[1]*

[1] Tongji University College of Architecture and Urban Planning, Yangpu District, Shanghai, China; *huang03213@tongji.edu.cn

Abstract. Taking the master planning of Wuhan Yangtze New Town as an opportunity, we propose that the traffic development of Wuhan Yangtze New Town should conform to the four basic principles of 'regional co-ordination, multiple sharing, interaction and coordination, moderate advance'. Based on these four principles, we put forward three specific strategies which are 'building multi-dimensional transportation network', 'creating seamless mobility' and 'TOD+ short trip' mode. Among them, 'building multi-dimensional transportation network' refers to the construction of 'air-ground-underground' multi-dimensional transportation network. 'Seamless mobility' includes three basic elements of 'shared and autonomous driving', 'car electrification' and 'mass public transit'. 'TOD+ short trip' mode is actually a 'public transportation + slow traffic' mode of travel organisation, which could help to reduce commuting traffic and promote living quality.

Keywords: Future cities; Multi-dimensional transportation; Seamless mobility; TOD+ short trip; Wuhan.

1. The Future Development Trend of Urban Transportation in the Research

With the rapid development of science and technology, the future development of urban transportation will also face great changes (Singh and Gupta, 2015). Weng (2017) proposed that four major features of future transportation might be intelligent, networked, clean and shared. Wang (2017) believed that intelligent transportation will have three key development directions in the future: big data + traffic service, focusing on multi-perception and real-time collaborative processing of integrated traffic big data; mobile internet + comprehensive transportation, focusing on cooperative organisation

and operation optimisation of comprehensive transportation hubs, intelligent multimodal transport of goods, etc.; artificial intelligence + system collaboration, focusing on vehicle-vehicle collaboration and safety control, vehicle group collaboration and optimisation, three-dimensional unmanned intelligent transportation system, etc. Zhao (2017) believes that future transportation should be considered from the perspective of urban development, human needs as well as ecological system. Various modes of transportation should be combined effectively to realise people's on-demand travel.

As city is a changeable complex, the future traffic development strategy should be closely related to the overall urban development process. According to McKinsey & Co (2016): A comprehensive vision of the future travel mode (mobility) in 2030, three mobility models are expected to emerge in the near future for cities at the forefront of the mobility revolution: First, clean energy and sharing. Densely populated cities in developing countries like Delhi, Mexico City and Mumbai are undergoing rapid urbanisation and suffering from traffic congestion and air pollution. For cities like these, widespread adoption of autonomous vehicles might not a viable option, at least in the short term. The relatively viable option is to shift to clean energy transportation, namely electric vehicles. It also needs to limit the number of private cars, optimise shared mobility and expand public transport. Second: private self-driving cars. This mode of travel costs higher and might be suitable for cities expanding to the suburbs in developed countries, such as Sydney, Houston, Ruhr and so on. Third: Seamless mobility. This mobility pattern shows the biggest change compared to current travel patterns. It is most likely to occur in the short term in a number of densely populated, high-income cities such as Chicago, Hong Kong, London and Singapore. In this model, mobility is essentially ‘house-to-house’ and on-demand. Travelers have many clean, cheap and flexible options to choose from and the lines between private cars, sharing and public transport are blurring (Golmie,2009).

Under the discussion and exploration of future transportation development, this paper takes the Wuhan Yangtze New Town as an example to clarify how Wuhan try to build a future comprehensive transportation development system in the new urban area, hoping to provide certain reference value for other cities.

2. Four Principles of the Future Comprehensive Transportation Development for Wuhan Yangtze New Town

2.1 Promote an Integrated and Open Urban Road Network to Realise Regional Co-ordination

We should establish the concept of ‘growable’ urban roads, gradually open the original ‘central closed-loop and radial’ skeleton road structure and promote the formation of ‘grid open’ skeleton road network in Wuhan to effectively support the transformation of urban

structure mode and promote the development of regional integration (Figure 1).

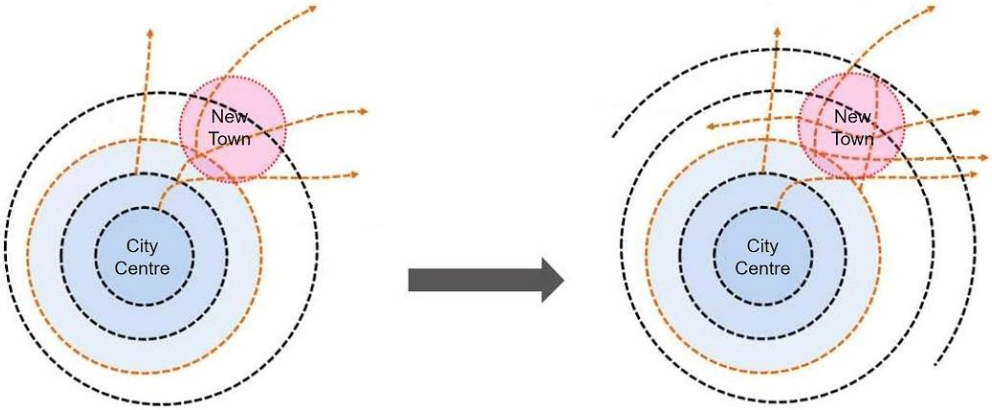


Figure 1. Partly 'broken loop into a network' expressway model
Source: Drawn by authors

2.2 Establish a Multiple Sharing and Public Transport Oriented Urban Transportation System

The transportation facilities construction of the new urban area takes urban rail transit and bus trunk (BRT (Bus Rapid Transit)/ ART (Autonomous rail Rapid Transit)/ conventional bus) as the backbone of the public transport system, supplemented by 'community bus + public bike'. It also creates a slow traffic system integrating traffic, leisure and recreation. Yangtze New Town focuses on building intelligent public transit routes and slow traffic corridors around the lake so as to achieve convenient, efficient, low-carbon and inclusive transportation system (Figure 2).

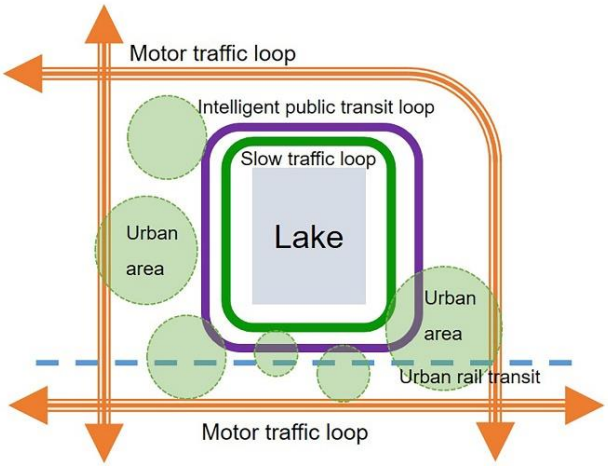


Figure 2. Organisational form of transportation around the lake
Source: Drawn by authors

2.3 Promote the Interactive and Coordinated Development of Transport and Land

We plan to construct large-capacity rail transit to strengthen the transportation links between the new town and the central city to improve the level of transportation services. Develop medium-volume public transport according to local conditions and improve the internal public transport system to drive the development of urban land and space (Figure 3). The planning focuses on the 'TOD+ short trip' mode as the basic mode, combined with the characteristics of land use and spatial layout of the new town to establish different types of traffic zones and provide different bus, car, pedestrian supply and management guidance strategies for each zone, so as to realise the interactive and coordinated development of transport and land.

Figure 3. Coordinated development of transport and land
Source: Drawn by authors

2.4 Provide Moderately Advanced and Flexible Transportation Facilities

Based on the protection of the lake district, we promote the elastic adaptation of urban transportation and land use through constructing the growable road network structure and the progressive supply of transportation facilities, so as to realise the smart growth of the urban development of the Yangtze New Town. We will try to adopt some international advanced new modes of transportation, such as capsule train, maglev train, WalkCar, balancing car, magnetic levitation skateboard, etc. in the planning of the new town to make it more technological, fashionable and full of vitality.

3. Construction Strategies of Comprehensive Transportation System for Yangtze New Town

Under the guidance of the above four basic principles, we put forward three specific strategies for building a comprehensive transportation system in Wuhan Yangtze New

Town, which are ‘building multi-dimensional transportation network’, ‘creating seamless mobility’ and ‘TOD+ short trip’ mode.

3.1 Build Multi-dimensional Transportation Network

Considering the conditions of multiple low-lying land in Yangtze New Town, we try to construct a multi-dimensional spatial transportation network of ‘air-ground-underground’ by filling and lifting some land (Figure 4).

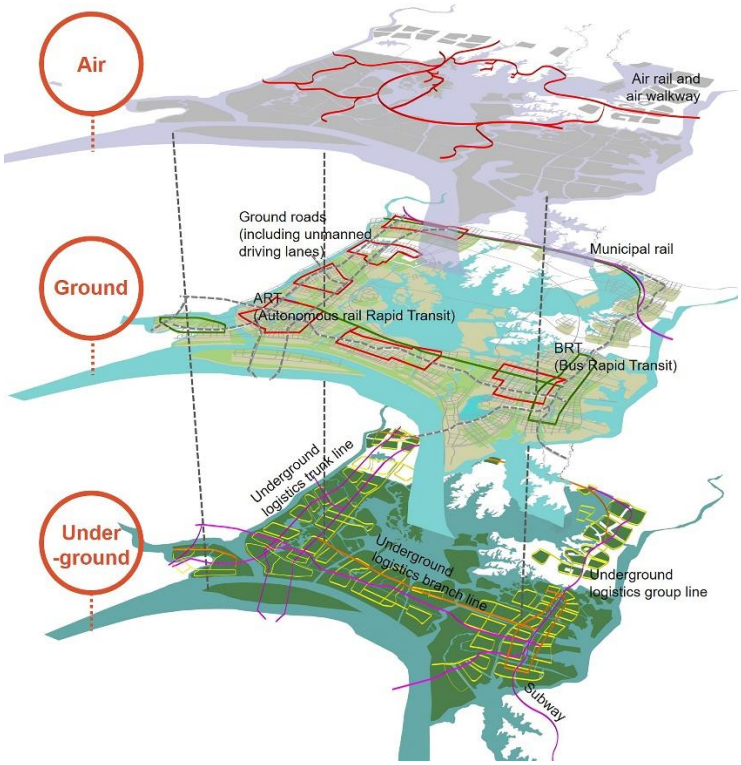


Figure 4. Multi-dimensional transportation schematic diagram

Source: Drawn by authors

The air traffic is mainly composed of air rail and air walkway, integrating rapid transportation and landscape sightseeing functions. The ground traffic is mainly composed of BRT, ART and ground roads (including unmanned driving lanes). High-capacity rapid transportation - medium speed traffic between nearby urban zones - medium and low speed traffic within a zone - slow traffic (walking and cycling) collectively form an integrated network of traffic on the ground. The underground part consists of subway, underground roads and underground logistics. Underground logistics transport and supply solid goods through large-diametre underground pipelines, tunnels and other channels, which are not easily affected by climate and can achieve intelligent and uninterrupted transportation. We plan to put underground logistics trunk lines and rail lines in the same underground corridors to save space and improve efficiency.

3.1.1 Air Traffic

Air traffic systems combine with light vehicles, structures and technologies to personalise service. It can bypass congestion and connect land routes and water routes. Advances in battery and material technology may also enable lightweight elevated ramps to carry small self-driving vehicles and bicycles. In the planning scheme, air rails and air walkways are built in some areas (Figure 5). The form of air rail can include mounted monorail train, capsule train, etc. The planning scheme focuses on building intelligent air rails around Wuhu Lake, integrating rapid transportation and landscape sightseeing functions.

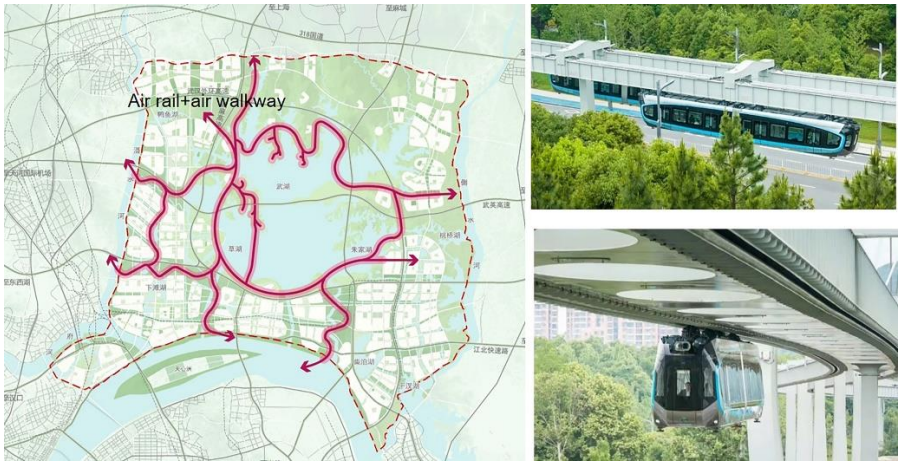


Figure 5. Air traffic schematic diagram

Source: Photos from《People's Daily》of China

3.1.2 Ground Traffic

Ground public transportation systems mainly include BRT lines, ART lines and conventional bus lines, aiming to realise the convenient transfer between different modes of transportation. ART system has the advantages of short construction cycle, low infrastructure investment, high urban adaptability and strong comprehensive capacity. It is a new solution for urban rail transit of medium volume. We try to open unmanned driving channel to transport multiple passengers efficiently through the network control. Initially, driverless vehicles can share High Occupancy Vehicles (HOV) with other vehicles, and when driverless vehicles become common, the lanes become exclusive for driverless vehicles (Figure 6).

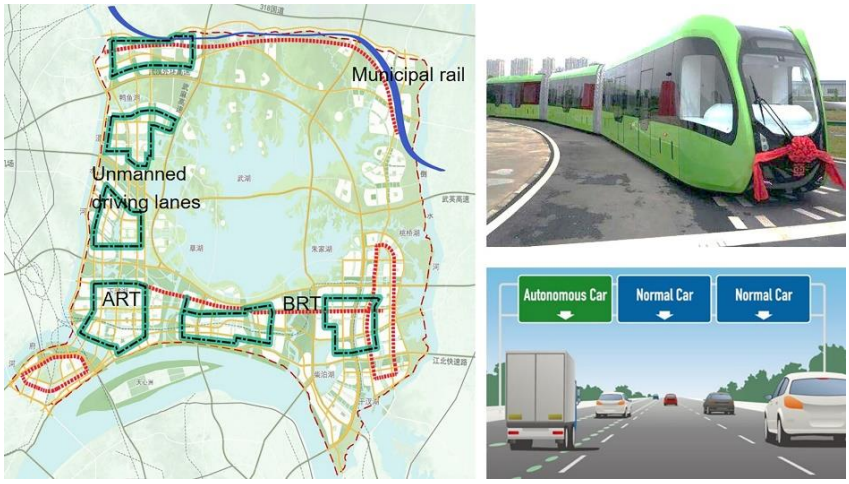


Figure 6. Ground traffic schematic diagram
Source: Photos from baike.baidu.com

3.1.3 Underground Traffic

Underground transportation systems mainly include subway, underground logistics and underground roads. In the case of Germany's CargoCap underground pipeline logistics system, the system driverless transport vehicle runs in an underground pipeline with a diameter of about 2 metres and the transport vehicle can freely enter and exit a transport group without reducing the running speed. The ultimate development goal of this system is to form a logistics network of underground pipes connecting various residential buildings or living areas in the city and to achieve a high degree of intelligence, so that people only need to click the mouse to buy any goods and the purchased goods quickly 'flow' into their homes like tap water through the underground pipes (Figure 7).

Figure 7. Underground traffic schematic diagram
Source: Pictures from www.cargocap.com

It is feasible for underground logistics system to cooperate with subway system. First of all, from the perspective of demand, there are many commercial enterprises with logistics business distributed along the subway, which may form effective demand for subway freight services. Secondly, from the perspective of time, the system can adopt the way of transporting people in the daytime and goods at night or reduce or increase the freight frequency according to the peak and trough of the flow of people in each subway line to strengthen the scheduling. Finally, from the technical view, when the subway lines and logistics lines are planned together, several special loading and unloading platforms should be designed according to the flow and distribution of logistics in the subway planning. It is better to plan the stations with two functions of passengers and freight. If necessary, special freight lines of subway can be built through key areas and be connected with freight connection lines of major suburban logistics centres and major stations.

We also plan to construct underground road system, which effectively connects with the surface transportation and realise the efficient conversion between walking and various modes of traffic. Underground transportation can effectively reduce the traffic pressure on surface roads and the scale of road facilities, reducing surface carbon emissions and surface vehicle noise, so as to improve environmental quality.

3.2 Create ‘Seamless Mobility’

On the basis of the construction of multi-dimensional transportation network, according to a comprehensive study of McKinsey & Co: A comprehensive vision of the future travel mode (mobility) in 2030, the study believes that ‘seamless mobility’ is more in line with the high target positioning of Yangtze New Town and the general trend of future urban life. Here, the ‘seamless mobility’ transportation includes three basic elements: first, sharing + autonomous driving. The sharing autonomous driving fleets will be gradually formed in Yangtze New Town. Second, cars will achieve a high degree of electrification. In seamless mobility areas, car electrification needs to reach more than 60 percent. Third, rail transit and bus rapid transit are still the backbone of long-distance travel. With a seamless mobility system, people may travel 20 to 50 percent more miles because of the low cost and ease of travel. However, the number of cars will remain the same or even decrease, as vehicle utilisation is higher and more people use the sharing model. By then, electric vehicles will account for two-thirds of total vehicle ownership and self-driving cars will exceed 40 percent (Figure 8).

Figure 8. 'Seamless mobility' area schematic diagram
Source: Drown by authors' project team

The 'seamless mobility' area should be a three-dimensional multilevel composite area and the underground space should be fully developed and utilised. The underground space will be efficiently connected to the surface space and also have intelligent characteristics (Fig.9).

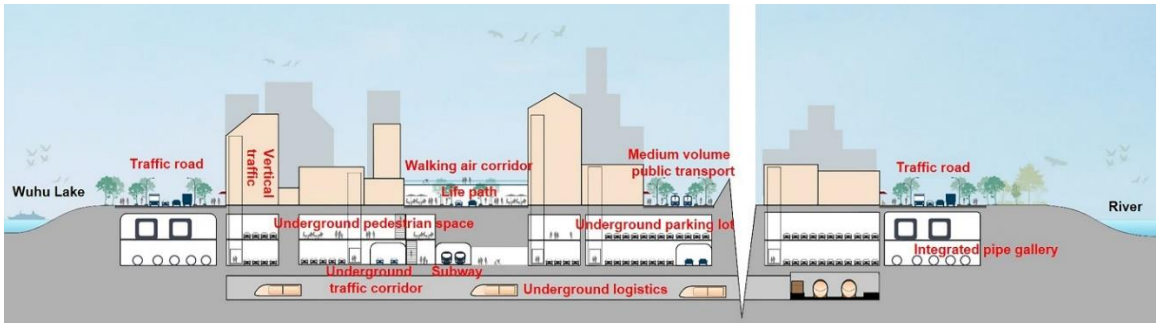


Figure 9. 'Seamless mobility' vertical traffic schematic diagram
Source: Drown by authors' project team

The freight system also features 'seamless mobility'. Urban freight transport mainly serves urban living consumption and high-end manufacturing industry. It is planned to form a logistics distribution system consisting of logistics centre, group distribution centre and community distribution node (a total of three level logistics nodes). We organise the freight according to the principle of 'mainly underground form, supplemented by ground and underground forms'. We encourage the development of underground pipeline

transportation to build a modern fast logistics transportation system. We also set up some freight passages on the ground at night, as a supplementary way of urban logistics. Above ground, when underground logistics transport branch lines and household lines have not been fully completed, new technologies such as low-altitude UAV (Unmanned Aerial Vehicle) delivery will be used to solve the 'last kilometre' problem of logistics distribution in the near future (Fig.10).

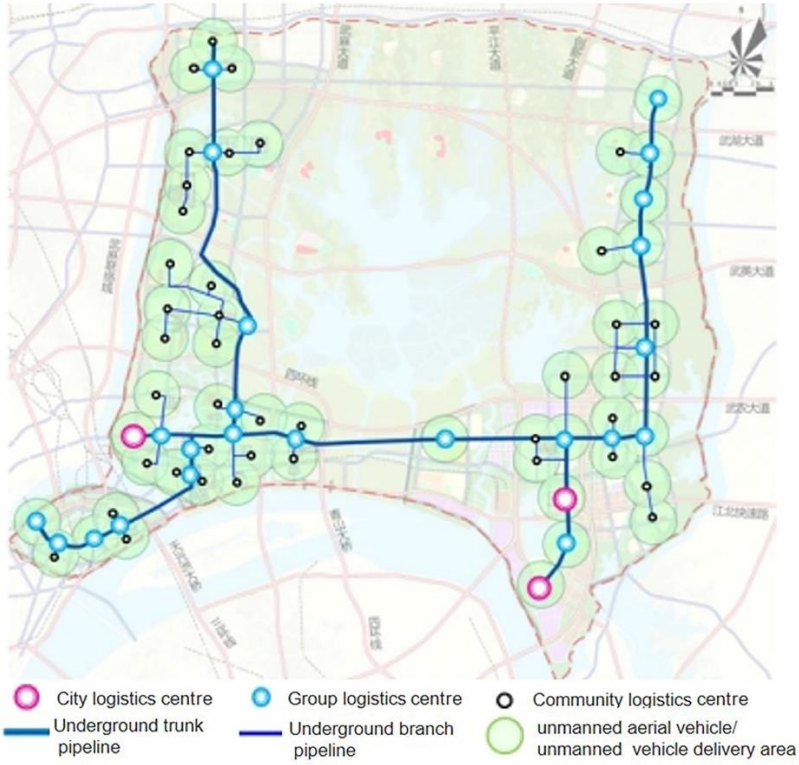


Figure 10. 'Seamless mobility' freight system schematic diagram
Source: Drown by authors' project team

3.3 'TOD + Short Trip' Mode

'TOD + short trip' mode is actually a travel organisation mode of 'public transportation + slow traffic'. 'TOD' refers to 'Transit-Oriented Development' (Ibraeva et al, 2020). Here the 'transit' mainly refers to 'public transit'. The 'short trip' mode first need to divide the whole urban area into several areas and then form own centres within different areas to reduce long-distance travel and relieve axial traffic pressure. The 'TOD + short trip' transportation mode will be an important mode for the future transportation development of Yangtze New Town.

3.3.1 'Transit-Oriented Development' Mode

The bus corridors in Yangtze New Town are composed of rail transit or bus trunk lines. The

bus corridors are staggered with regional trunk roads and can serve major functional areas in the city. In these bus corridors, TODs with a radius of 500-800 metres are formed with rail transit stations and main ordinary bus stations as the cores. These areas are mainly urban TODs (Fig.11).

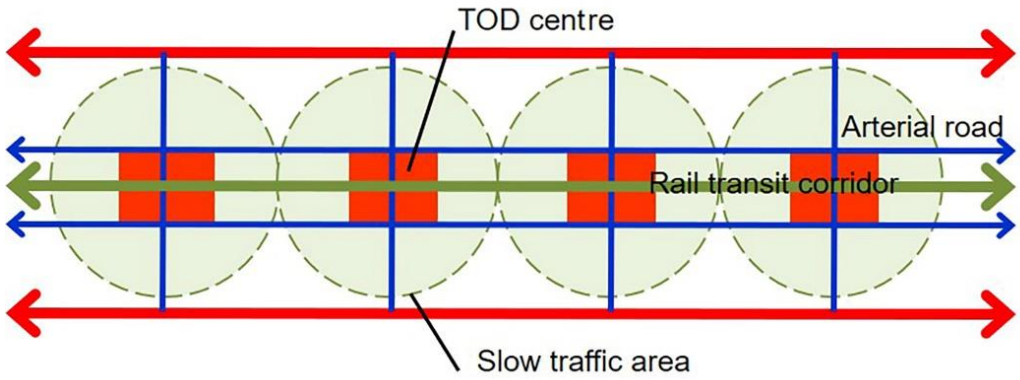


Figure 11. TOD axis development schematic diagram

Source: Drown by authors

Urban TODs are located in comprehensive activity centres in the city and are the cohesion points of urban public activities. These urban TOD areas work independently, or in pairs or even multiple groups to achieve economies of scale. Urban TOD's spatial organisation mode is mainly multi-rail transfer and three-dimensional mixing. It usually includes green space and arranges public service functions around the central park. In the TOD, multi-rail interchange station normally directly connects to central commercial complex. The central commercial complex may have radial corridors, improving the regional three-dimensional walking network to achieve seamless connection. The central commercial complex presents its outstanding image and normally gets high-intensity cluster development (Figure 12).

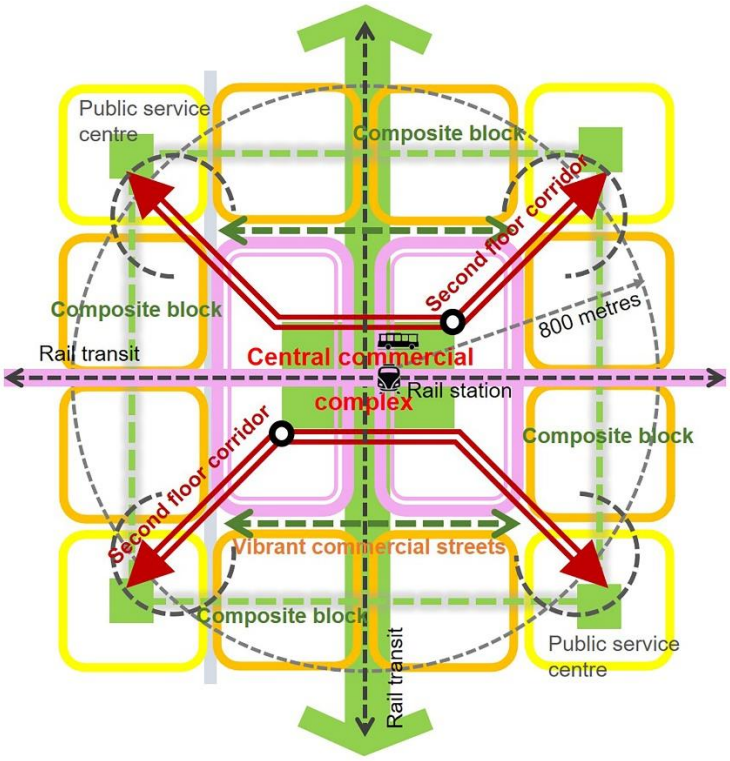


Figure 12. Urban TOD schematic diagram

Source: Drown by authors' project team

3.3.2 Short Trip Mode

Short trip transportation system is composed of slow travel system and public transportation system. Firstly, a continuous and high-density slow traffic system should be constructed to cover the whole slow traffic area. On the one hand, it provides the basic skeleton for the slow traffic space and on the other hand, it is easier to connect with public transportation. Secondly, we should improve the density of public transit network and the coverage of bus stations. Furthermore, 'P+R' and other measures are adopted to achieve efficient connection of various modes of transportation. For example, parking lots (for motor vehicle or non-motor vehicle) will be set up in combination with a rail transit station or a bus station to connect the slow traffic system with the public transportation system.

For short trip mode, due to the difference in travel distance, its travel structure has different characteristics (Figure 13).

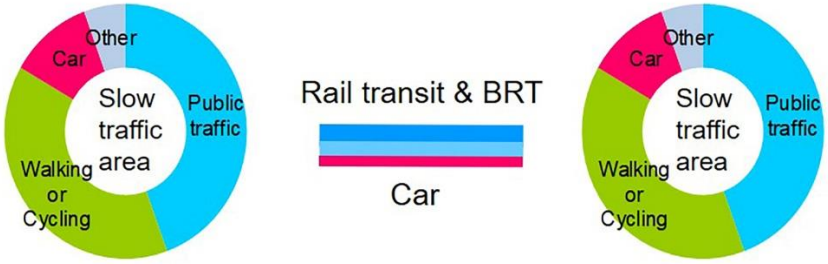


Figure 13. Short trip mode schematic diagram

Source: Drown by authors

(1) Inside the short trip area: The short trip area centre can meet certain needs of daily life and production. Most trips take place within the area and the travel distance is short. Therefore, green travel modes such as public transport and slow travel (walking or cycling) occupy a large proportion in the internal travel structure of short trip area.

(2) Between short trip areas: the travel distance between short trip areas is longer, which exceeds the advantage of slow traffic modes such as walking and cycling. Therefore, cars and public transportation (rail transit) are the main transportation modes between short trip areas.

The areas-based development makes the internal development of each area relatively independent. There are employment centres and residential land in one area, which can solve certain employment problems internally. The increase of residential land promotes the development of industrial land, which in turn promotes the generation of new residential land, thus constantly forming new clusters (areas). These areas are independent and closely related to each other, forming a balance between jobs and housing in development and reducing commuting traffic.

3.3.3 An Example of 'TOD+ Short Trip' Mode -- Central Vitality Zone of Yangtze New Town

Two longitudinal and one horizontal main transportation corridors are formed along the planned rail transit lines. Rail transit undertakes long-distance and large-capacity transportation between areas. ART and conventional buses shuttle between each area and undertake the medium speed traffic between nearby areas. The community bus mainly operates within the area and undertakes the medium and low speed traffic travel within the area. The water system combined with green space becomes the main ecological corridor in the area. Public bicycle lanes can be set up to protect the ecological environment and meet the needs of residents for leisure and entertainment. Commercial land and green space inside residential land will become the main human flow attraction points in the community. These nodes are usually the centres of the community and the

core nodes of slow travel (Figure 14).

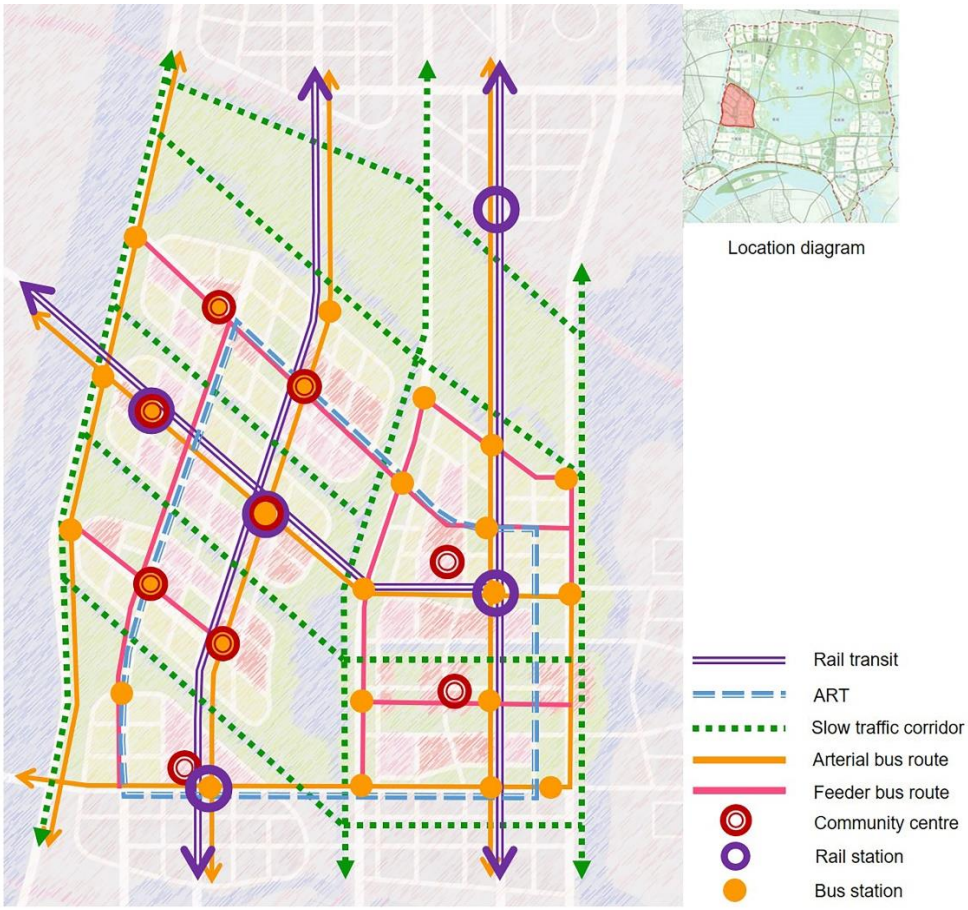


Figure 14. Central Vitality Zone 'TOD+ short trip' layout schematic diagram

Source: Drown by authors

The slow traffic system is the most basic and important traffic system in the area. We plan to improve the connection between the slow traffic system and the public transportation system, build the slow traffic corridor by the use of water system, so as to optimise the slow traffic environment and provide people with good leisure experience of slow traffic. In the future, the plan of 'clearing car congestion out of the city centre' proposed by Stockholm, the capital of Norway, may be followed to realise complete walking in the centre of the area in order to reduce car space in the urban streets, extend pedestrian streets, improve bike lanes, give people more public space to enjoy the urban public facilities and encourage more exercise and healthy travel.

4. Summary

Based on Wuhan Yangtze New Town, we propose four basic traffic development principles

of ‘regional co-ordination, multiple sharing, interaction and coordination, moderate advance’. And based on the four principles, we put forward three specific strategies to meet the needs of future traffic development, which are ‘building multi-dimensional transportation network’, ‘creating seamless mobility’ and ‘TOD+ short trip’ mode. Due to the unpredictability of the development of science and technology, the future urban transportation development has infinite possibilities. The future-oriented urban comprehensive transportation development strategies proposed in this paper are also an attempt and exploration from a limited perspective, which needs to be constantly updated, discussed and advanced in the future urban development.

Funding. National Natural Science Foundation of China (52178049)

References

Golmie N (2009) Seamless mobility: are we there yet. IEEE Wireless Communications, 16(4), pp.12-13.

Ibraeva A, de Almeida Correia G H, Silva C and Antunes A P (2020) Transit-oriented development: A review of research achievements and challenges. Transportation Research Part A: Policy and Practice, 132, pp.110-130.

McKinsey & Co, Bloomberg New Energy Finance (2016). McKinsey & Co: A comprehensive vision of the future travel mode (mobility) in 2030. Report, McKinsey & Company, October.

Singh B and Gupta A (2015) Recent trends in intelligent transportation systems: a review. The Journal of Transport Literature, 9(2), pp.30-34.

Wang Y (2017) Medium and long term plan for intelligent transportation. World Transport Convention 2017——Forum on the Future of Transportation, Beijing, China.

Weng M (2017) The future of transportation will be more intelligent, connected, clean and shared. Future Transportation Conference 2017, Hangzhou, China.

Zhao F (2017) Human needs are fundamental, not for technology's sake. World Transport Convention 2017—Forum on the Future of Transportation, Beijing, China.

URBAN TRAFFIC STATUS ANALYSIS AND PLANNING EVALUATION BASED ON MOBILE BIG DATA: A CASE STUDY OF JINGHONG CITY (1098)

Gangyu Hu[1], Jianing Shi[1], Jianzhong Huang[1*], Jingxin Wang[1]

[1] Tongji University College of Architecture and Urban Planning, Shanghai, China; [*]huang03213@tongji.edu.cn

Abstract. Taking the central urban area of Jinghong city in Yunnan Province of China as an example, this paper mainly introduces the methods of traffic status analysis and evaluation of traffic planning scheme based on mobile big data. In the section of traffic status analysis, we analyse the OD features, job-housing spatial structure and the traffic performance of the city based on big data and Visum traffic current model. In the planning evaluation part, based on the traffic current situation, we use the method of scenario simulation to evaluate traffic planning scheme. Through traffic flow and saturation calculation in the Visum traffic planning model, we can see the traffic performance of different scenarios to advise the project team on future transportation development strategies.

Keywords: Mobile big data, Traffic status analysis, Planning evaluation, Scenario simulation, Jinghong.

1. Introduction

The application of mobile big data provides new ideas and perspectives for urban traffic planning. Traffic system analysis under the condition of big data does not simply apply or transplant big data technology to the traffic field, but integrates big data technology into the analysis system of traffic system. It is an information processing process in which we organise data into information, extract features from information, find patterns from feature changes and track and evaluate countermeasures (Yang and Duan, 2015). Under the guidance of this principle, we empirically analyse urban traffic status based on one kind of mobile big data—signaling data and then conduct scenario simulation evaluation on the planning scheme. We hope to provide reference and technical support for the evaluation of urban traffic operation, the division of transportation modes, the formulation of transportation channel strategy, the determination of urban spatial structure, etc.

2. Review of Relevant Research

Related traffic big data include taxi GPS, bus IC card, vehicle license plate recognition, mobile big data, etc. And more and more research based on mobile big data has been conducted in recent years. Yang and Duan (2015) summarised the analysis techniques and latest research results from information collection and quality control, traffic system status feature extraction, traffic demand and behavior feature extraction, correlation analysis and model building, information fusion, etc. Their research mainly focused on the overall and macro-level analysis of traffic system. Some scholars also study the application of big data in traffic analysis from other perspectives, such as individual or vehicle travel (Yang, 2007), analysis and prediction of activity characteristics and patterns (Song et al, 2010; Liu et al, 2013), urban spatial distribution of commuter travel which affects urban space a lot (Yang et al, 2016; Sun et al, 2013), traffic scenario simulation evaluation based on the current situation (Huang et al, 2014), etc. Based on existing research, an important feature of mobile big data which is different from traditional data is that the behavior patterns of large-scale individuals can be obtained through long-term observation, based on which individual behavior modeling and prediction can be made (D'Alconzo et al, 2019).

Some scholars have compared traditional methods with big data research methods (Lv et al, 2014; Nagy and Simon, 2018). Based on relevant research, the differences between the two methods have been shown in Table 1.

Table 1. Comparison of traditional research methods and big data research methods

Research methods	Main data	Research subjects	Advantages	Disadvantages
Traditional Methods	Traffic survey data, etc.	Small sample data based on sampling	1.Survey depth is large and comprehensive. 2. The social and economic attributes of the respondents are clear.	1. Data quality depends on the cooperation of respondents and their understanding of the survey questions. 2. The sample size is small and the real-time performance is poor. 3. The data are hard to support elaborate analysis. 4. Weak analysis of the spatial structure and insufficient analysis of the relationship between traffic and space.

Big Data Methods	Signaling data, Mobile internet Location Based Service (LBS) data, etc.	Large sample data based on acquisition methods	1. High spatial accuracy, able to refine to each traffic cell. 2. Large sample size, long time, comprehensive spatial coverage and dynamic continuity. 3. Commuting OD can reflect the spatial structure of the city to a certain extent. 4. It can obtain raw data, which can be used for various analyses.	1. The data structure is limited by the data collection method. For example, some children and elderly people do not use smartphones so their information cannot be collected. There is structural bias in the sample. 2. It is difficult to see the economic and social attributes and travel mode of the collected people. 3. The accuracy of data collection is not uniform and the quality of data is uneven, which need to be screened and calibrated. 4. The data volume is large and difficult to process.

Source: Drown by authors

Under current conditions, it is difficult to obtain all kinds of basic data. Although different cities and regions have diversified data sources, the data resources available for actual research and project implementation are very limited, which brings great obstacles to the research work. Therefore, it is also worth paying attention to how to analyse and use possible data to support various research directions of traffic planning. The application of mobile big data provides broader basic data sources, newer research ideas and perspectives for the study of urban traffic system, the coupling relationship between urban spatial structure and traffic mode, etc.

3. Research Data Introduction

At present, in China, commonly used mobile big data include signaling data and mobile internet Location Based Service (LBS) data. In this study, signaling data have been used.

Signaling data is originally the control signal needed to ensure normal communication in mobile communication networks. Signaling data is recorded for events such as power on, power off, calls, text messages, location updates and base station switching. Since mobile

devices are usually carried around, signaling data is equivalent to recording the spatio-temporal activity trajectory data of a 'person'.

One record of signaling data represents a point on the spatio-temporal activity trajectory of a user and combining multiple records can synthesise a more complete spatio-temporal trajectory within a time period. The study usually identifies the characteristic points within the spatio-temporal trajectory according to the general spatio-temporal pattern of human behavior. For example, we determine a point as the user's place of work by judging the cumulative maximum dwell time position between 9 a.m. and 4 p.m. of each working day within one month. Meanwhile, the dwell time needs to exceed two hours. We determine a point as the user's place of residence by judging the cumulative maximum dwell time position between 8 p.m. and 6 a.m. of each day to the next day and the dwell time needs to exceed two hours. The rest can be done in the same manner. We can find other spatio-temporal characteristic locations such as recreation areas. Through the determination of feature points, the OD feature table of the samples can be obtained and used for the subsequent diverse analysis of traffic.

As Jinghong is a famous tourism city, the OD data we obtained include tourism OD of tourists, commuting OD of local residents on working day and total OD of all purposes. The OD data is raster data and the size of the raster is 250 metres *250 metres. The data table mainly includes: time period (24 hours), grid ID at original point, grid ID at destination point and number of people (the captured sample). The fragment of OD data table has been shown in Table 2. In order to facilitate subsequent analysis, we divided the whole Jinghong central urban area into 85 traffic zones and collected the raster data by the traffic zones to obtain OD connection data between traffic zones for subsequent calculation.

Table 2. The fragment of OD data table (example)

Hour(0-23h)	O_ Grid ID	D_ Grid ID	Count
0	100630021540040	100615021525040	1
0	100650021480040	100630021540040	1
0	100665021725040	100665021725040	1
0	100675021580040	100665021560040	1
0	100675021580040	100675021580040	2
0	100675021580040	100705021610040	2

Source: Cut from the whole signaling data OD table

4. Introduction of the Case Area

Jinghong City is located in Xishuangbanna Dai Autonomous Prefecture in the southern part of Yunnan Province of China. It is the core tourism city of Xishuangbanna Prefecture. The scope of this research is the central urban area of Jinghong City (Figure 1). The central urban area of Jinghong City includes three large spatial clusters, which are Main city, Mengyang sub-city and Olive Ba sub-city. It also includes several core tourist attractions such as Laiyang River-Citong Old Cottage Reserve, Sanda Mountain, Nanlian Mountain Country Park, Lunan Mountain Nature Reserve, Farm District, Naban River Reserve, etc. The travel in the central urban area of Jinghong shows obvious dual characteristics of commuting travel and tourism travel.

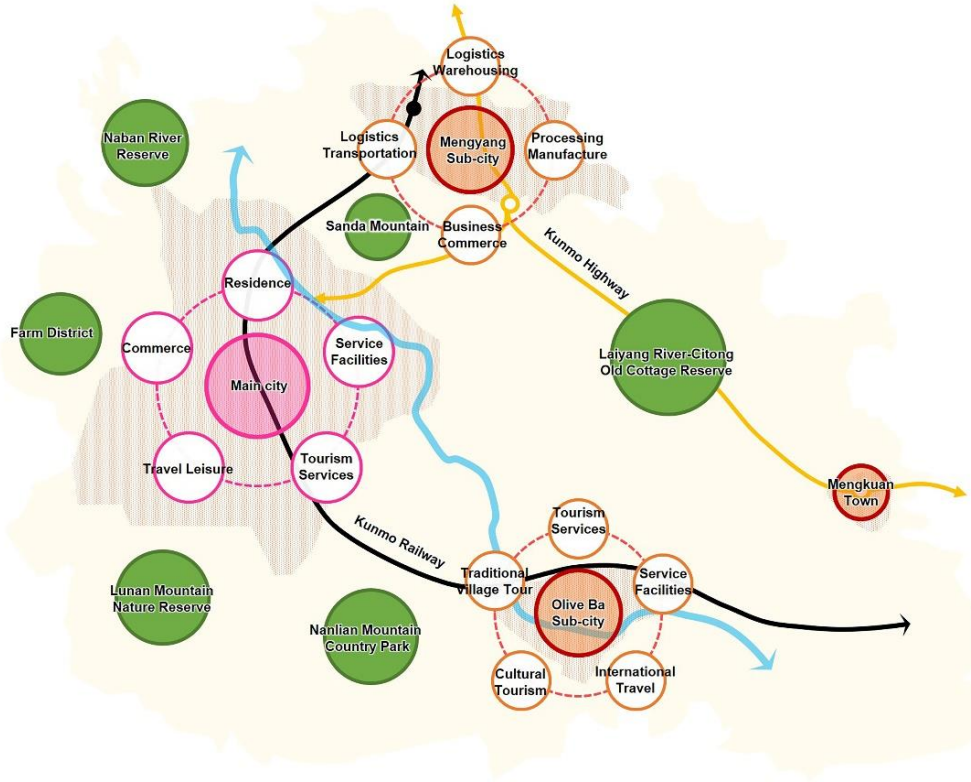


Figure 1. The spatial structure schematic diagram of the central urban area of Jinghong City

Source: Drown by authors

5. Urban Traffic Status Analysis

5.1 Analysis of OD Features

Based on commuting OD, tourism OD and total OD obtained from signaling data, we can analyse different kinds of relationships among Main city, Mengyang sub-city, Olive Ba sub-city and some other important tourist attractions. We can see that the main external

connections of Main City are the tourism connections and the commuting connections are much fewer. Among the outlying tourist attractions, Laiyang River-Citong Old Cottage Reserve is the most popular one. And then come the Lunan Mountain Nature Reserve, Sanda Mountain and Nanlian Mountain Country Park (Figure 2).

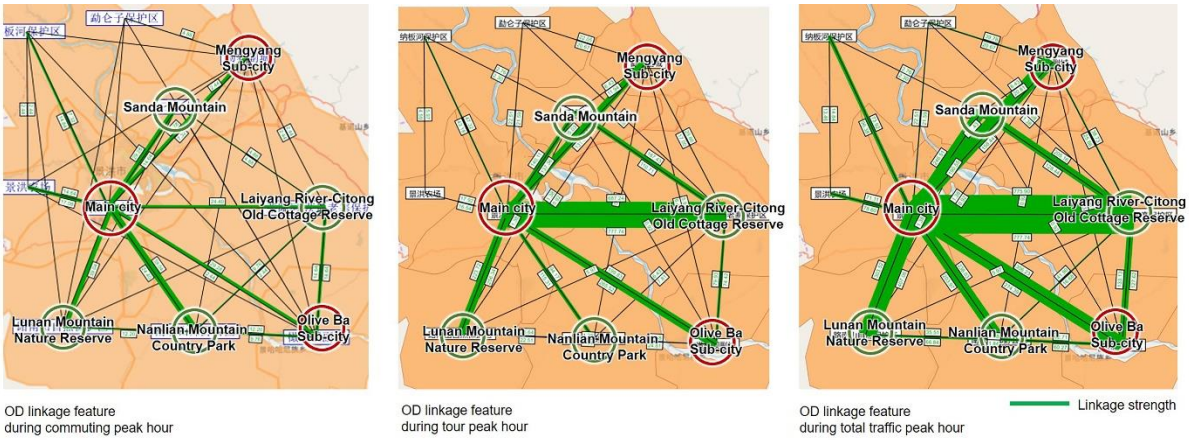


Figure 2. OD linkage features during peak hour

Source: Drawn by authors from signaling data

When we focus on the interconnectedness between the three major urban areas, we can get the table blow (Table 3).

Table 3. Linkage strength of three major urban areas

Commuting linkage strength				Tourism linkage strength				Total linkage strength			
Unit:%	Main city	Meng-yang	Oliver Ba	Unit:%	Main city	Meng-yang	Oliver Ba	Unit:%	Main city	Meng-yang	Oliver Ba
Main city	97.1	<1	<1	Main city	94.9	<1	<1	Main city	96.7	<1	<1
Meng-yang	16.7	79.1	<1	Meng-yang	48.7	42.6	<1	Meng-yang	32.5	57.1	<1
Oliver Ba	7.4	<1	85.8	Oliver Ba	18.3	<1	72.4	Oliver Ba	12.1	<1	80

Source: Drawn by authors from signaling data

In terms of commuting, the vast majority of travel is done within Main city and the two sub-cities themselves. In terms of tourism, Mengyang sub-city and Main city have a relatively strong connection. Generally speaking, the three areas are relatively independent and the connection between Mengyang and Main city is stronger than that between Olive Ba and Main city.

5.2 Analysis of Job-housing Spatial Structure

Considering that commuting travels are mainly completed within Main city and sub-cities themselves and the commuting volume in Main city is the largest, we further pay attention to the interior of Main city and analyse the job-housing spatial structure characteristics through the calculation of job-housing balance degree.

In previous research, the relationship between jobs and housing in cities is often expressed by static occupation-residence ratio. Static occupation-residence ratio is only a theoretical value due to the fact that the proportion of nearby employment cannot be directly determined. It is necessary to accurately measure the real employment equilibrium degree by further analysing the dynamic correlation between the commuting destination and residential place. Here, we put forward the concept of dynamic job-housing ratio, namely 'job-housing balance degree'. The job-housing balance degree is the percentage of commuting trips within an urban area in the total commuting trips (Huang et al, 2017).

We have analysed the commuting OD feature and calculated the job-housing balance degree of each area in Main city. The result showed that commuting travel occurs mainly in the northern part of Main city. And the job-housing balance degree is mostly concentrated between 50 percent to 60 percent, which means the cross-district commuting is relatively common (Figure 3).

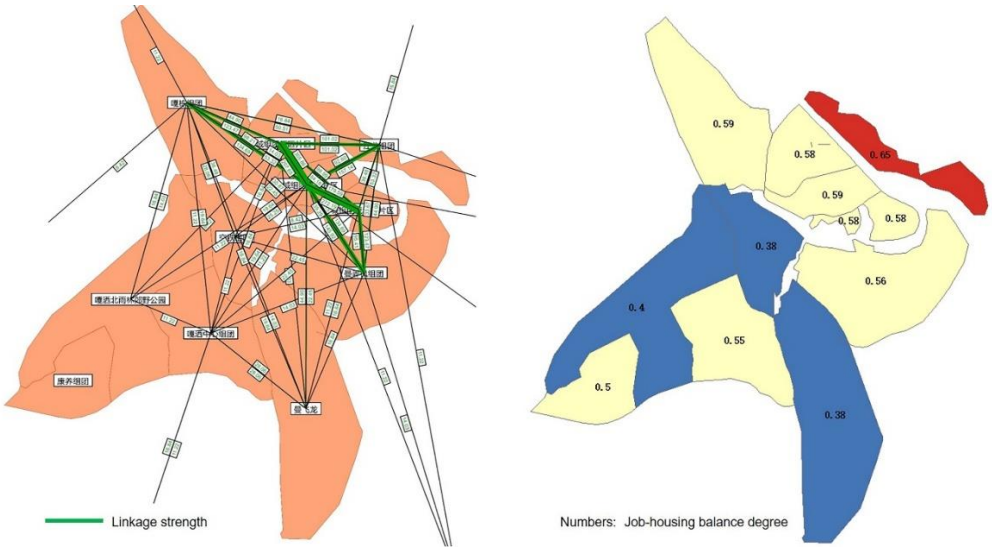


Figure 3. Commuting OD feature and job-housing balance degree of Main city

Source: Drawn by authors from signaling data

5.3 Establish Urban Traffic Status Model

The current traffic network of Jinghong central urban area includes four levels: Highway, trunk road, secondary trunk road and branch road, as shown in Figure 4. In addition, it is

necessary to manually identify the number of lanes on each road based on field research and satellite image. The number of lanes on each road should be added to the attribute field. The road network will be input into the Visum model. In Visum, the speed attribute is attached to the road according to the road level and the one-way capacity of the road is calculated according to the single-lane capacity and the number of lanes. The speed and capacity of each lane of different levels of road have been shown in Table 4. In this way, the current road network model is basically established.

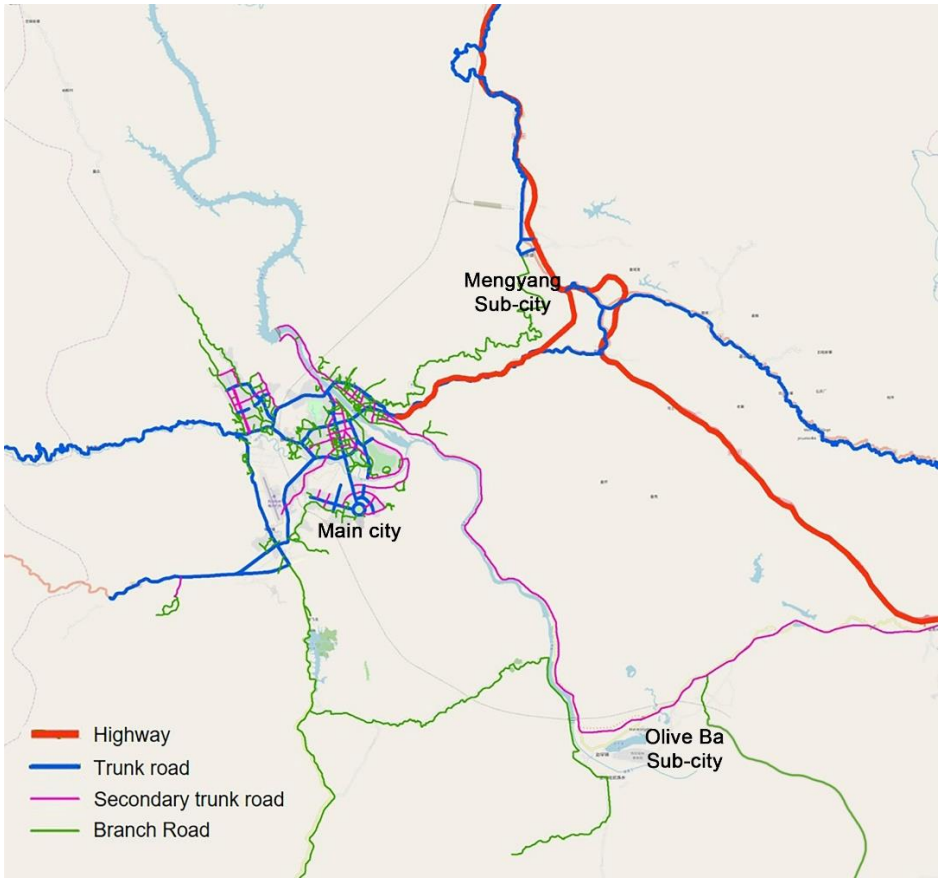


Figure 4. Current traffic network of Jinghong central urban area
Source: Drawn by authors

Table 4. Speed and capacity of different levels of roads

Road level	Speed (km/h)	Single-lane capacity (pcu/h/lane)
Highway	100	1600
trunk road	60	1000
secondary trunk road	40	800
branch road	30	500

Source: Drawn by authors

5.4 Analysis of Traffic Performance

After constructing the traffic status model by Visum software, with entering OD data into Visum, we calculate the traffic flow and saturation of Jinghong central urban area, so as to analyse the traffic performance of the city. Take the Main city as example, the traffic flow and saturation of the roads in Main city are shown in Figure 5.

As can be seen from the flow and saturation analysis results of the model, the Main city mainly has a large flow on external traffic roads, which are easy to be saturated in peak period. Some roads have a small flow. However, due to the poor road capacity, congestion is also obvious in peak period. Traffic flow and saturation analysis can clearly visualise road performance and help planners determine where road infrastructure needs to be enhanced or how travel patterns need to be adjusted to change congestion.

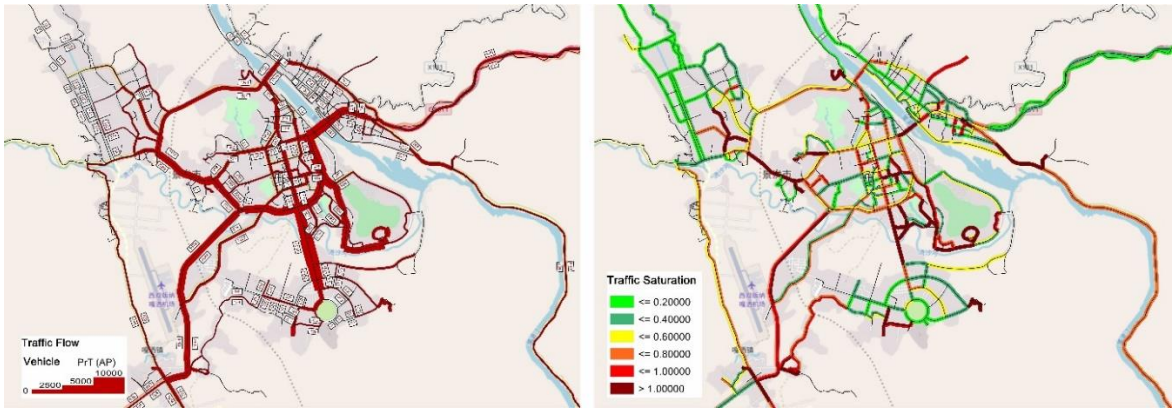


Figure 5. Urban current traffic flow and saturation in morning peak hour in Main city
Source: Drawn by authors by Visum

6. Planning Scheme Evaluation

In the section of planning evaluation, based on the analysis of the traffic current situation, we use the method of scenario simulation to evaluate the planning scheme of year 2030. First, we also need to build Visum traffic model with the planning traffic scheme. Second, we calculate the total number of trips in Jinghong in 2030 according to the projected population and give different traffic modes for different trip purposes. After the two steps, we give two different scenarios of bus travel in the future. One is that all bus travel is on the road, mainly in the form of normal buses, shuttle buses and tourist buses. The other is that the trams replace part of the road buses, especially between the tourist attractions. Through the analysis of the traffic flow and saturation calculation in the model, we can see the traffic performance of different scenarios.

6.1 Establish Urban Traffic Planning Model

Same as section 5.3, we build a planning traffic model. It can be seen from the planned road network that the planning scheme has greatly supplemented and improved the current road network (Figure 6). Whether such a road network structure can support the development of urban land use and population in the planning year needs to be evaluated.

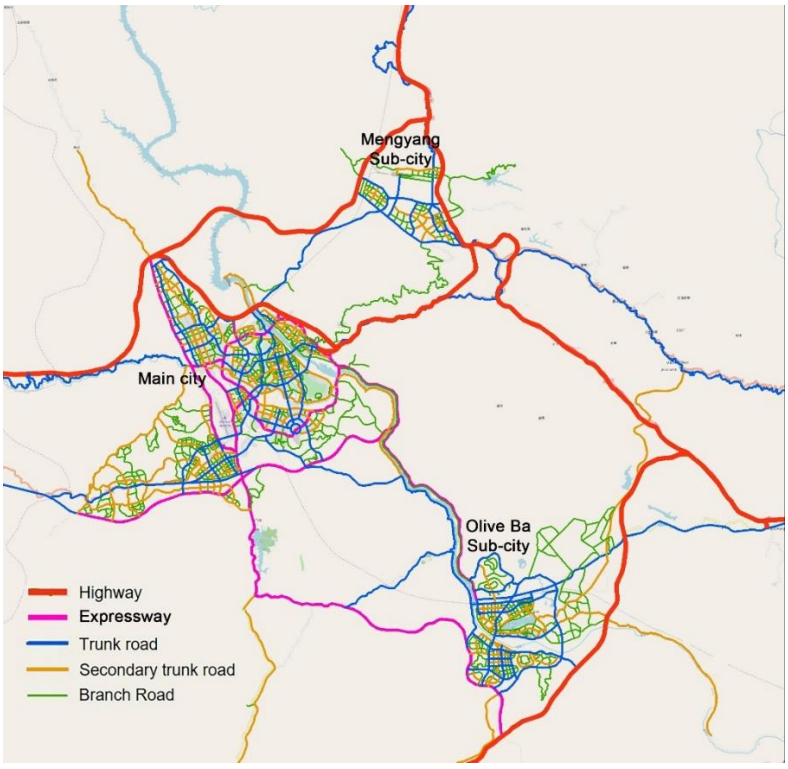


Figure 6. Urban planning traffic network of Jinghong central urban area
Source: Drawn by authors

6.2 Calculate Traffic Production and Attraction and OD Distribution in 2030

Due to the particularity of Jinghong as a tourism city, in the process of predicting the traffic production and attraction volume and generating OD in 2030, we divide the prediction into two parts: all-purpose travel of local residents and tourism travel.

In the all-purpose travel prediction of local residents, we first allocate the planned population to each traffic zone according to the overall planned population and the residential land area of each zone (Tab.5). Then, according to the 'Comprehensive Transportation System Planning of Jinghong', the travel rate of the central urban area in 2030 is 2.7 person-times per day. The population of each zone is multiplied by the travel rate to obtain the traffic production of each zone. Then, according to the land use plan in 2030, the area of different types of land in each traffic zone is calculated. The attraction amount of each zone is calculated according to the land area of each type and the attraction rate of this type of land.

Table 5. The area of each land type and planned population in each traffic zone (example)

Traffic zone number	Residential land (hectare)	Public service land (hectare)	Commercial land (hectare)	Industrial land (hectare)	Logistics land (hectare)	Road facilities land (hectare)	People (person)
1	30.9	20.1	9.8	0.0	0.0	3.1	9872
2	43.2	6.8	61.0	0.0	0.0	1.0	13814
3	26.9	0.0	5.1	0.0	0.0	0.0	8605
4	23.1	13.5	5.5	0.0	0.0	0.0	7380
5	27.6	0.0	11.0	0.0	0.0	0.9	8818

Source: Cut from the whole land and population statistical table

For tourism travel, we first get the forecast tourism population of Jinghong in 2030 from the project team and then make it divided by the current tourism volume to obtain a sample expansion coefficient. Then we expand the current tourism OD based on the sample expansion coefficient to get the distribution of tourism OD in the future year. The total OD is obtained by adding the all-purpose OD and tourism OD to meet the needs of subsequent operation.

6.3 Travel Mode Division and Scenario Simulation

Based on the characteristics of the current situation, according to the law of urban transport development and the policy guidance for the future modes of transport, such as slow travel first, public transport first, etc., we predict the proportion of transportation

modes in the future, mainly about bus and car proportion based on the Visum model need. Considering the particularity of Jinghong as a tourism city and the different characteristics of residents' all-purpose travel and tourism travel, we give the proportion separately. The travel proportion adopted in this forecast has been shown in Table 6.

Table 6. Travel mode division

	Bus + shuttle + tour bus	Car + taxi
All-purpose travel	35%	20%
Tourism travel	50%	15%

Source: Drawn by authors

According to the requirements of the general project team, we give two different scenarios of bus travel in the future (Figure 7). The purpose is to get traffic performance of different scenarios to advise the project team on future transport development strategies.

Figure 7. Two different scenarios of bus travel in the future

Source: Drawn by authors

6.4 Comparison of Traffic Performance of Two Scenarios

We put the above prepared data into the Visum model to do the simulation to get the traffic operation performance results of different scenarios of Jinghong central urban area in traffic peak hour (Figure 8).

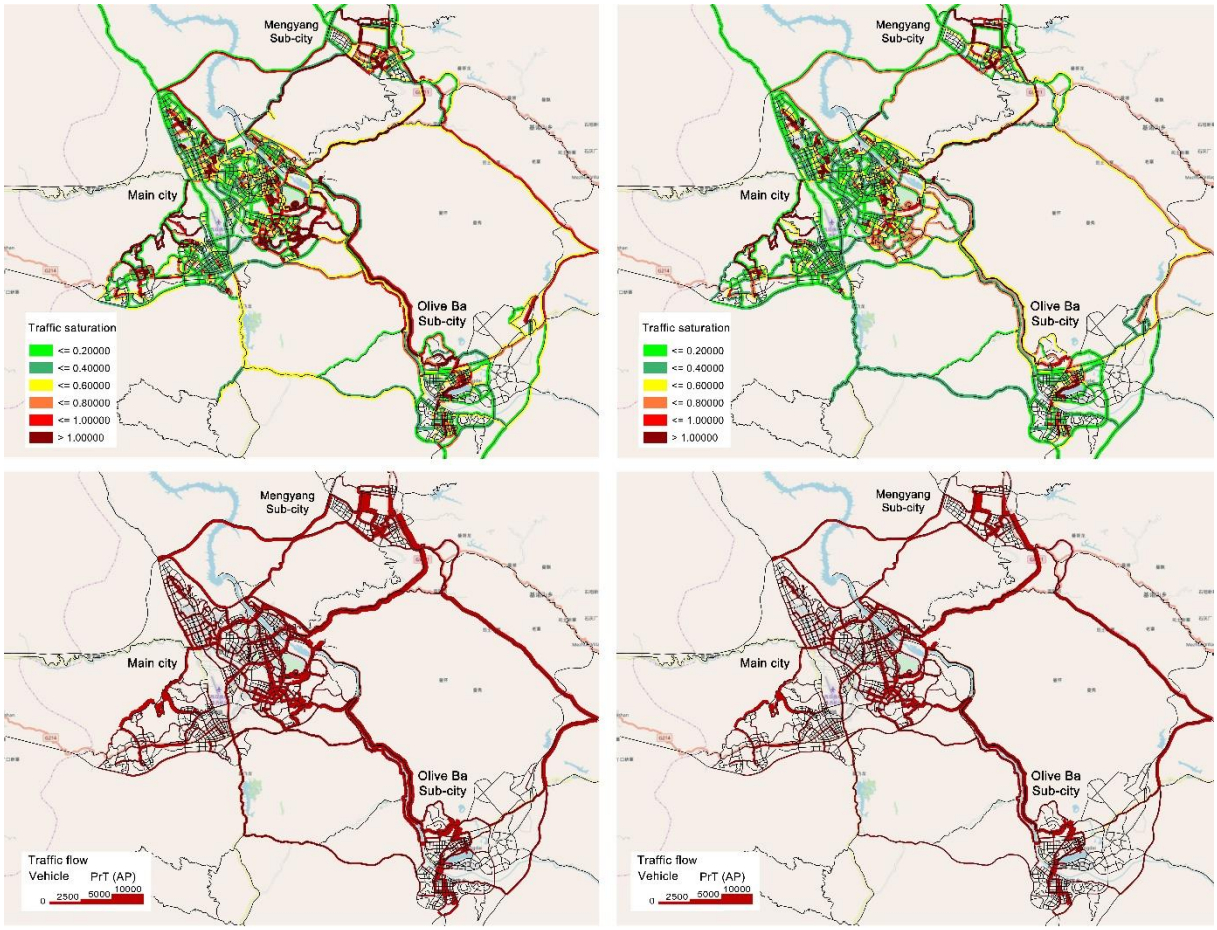


Figure 8. Traffic performance in peak hour of two scenarios (above: saturation; below: flow)

Source: Drawn by authors by Visum

By comparing the traffic flow of the two scenarios, it can be seen that the road traffic flow of scenario 2 is obviously lower than that of scenario 1. In terms of road saturation, in scenario 1, the link between Main city and the two sub-cities still shows obvious congestion in peak hour. The congestion in the southeast part of Main city is also obvious. In scenario 2, under the condition with the tram, the traffic pressure of the contact channels between Main city and the two sub-cities is significantly reduced. The road congestion is effectively improved, especially in the southeast part of Main city. It can be seen that the opening of trams between tourist attractions in scenario 2 is of great help to the good operation of urban traffic.

The results of the traffic performance will help the project team choose the scenario they need and the corresponding traffic planning scheme. Of course, scenarios can be changed according to planning requirements and the model will help the project team test

different scenarios continuously.

7. Conclusion and Discussion

The research believes that the mobile big data can be used to analyse urban traffic. Based on the analysis of big data and combined with the method of scenario simulation, it is effective to evaluate the planning scheme through Visum traffic model. However, in this process, we need to pay more attention to the actual situation of different cities. For example, Jinghong as a tourism city, the capacity of tourist attractions has been further measured and included in the overall analysis of the city, so as to make the analysis results more accurate.

This paper explores the technical methods of urban traffic analysis and evaluation based on mobile big data in the context of urban planning practice, with a view to providing reference for the preparation of urban macro-level planning. At present, the above research is still in the exploration stage and some preliminary conclusions may still be open to debate. In the future, detailed research on the calibration of mobile big data is still needed and the application of mobile big data in the preparation of different levels and types of planning should be more in line with the planning needs. More practice is needed from theoretical construction to project application.

Big data does not directly lead to objectivity and science. Policy makers and the public are looking at the world through the eyes of data analysts (Yang and Duan, 2015). It is the responsibility of data analysts to obtain credible data in the wide ocean of big data. The advantage of big data lies in the more comprehensive observation of the research object and the disadvantage of big data lies in the lack of rigorous cause-and-effect modeling ability. Therefore, the comprehensive analysis of multiple data such as mobile big data, traditional traffic surveys, population data and economic census data is the development trend in the future. The rational use of big data by planners is an important foundation for big data to serve urban planning effectively.

Funding. National Natural Science Foundation of China (52178049).

References

D'Alconzo Alessandro, Drago Idilio, Morichetta Andrea, Mellia Marco and Casas Pedro (2019) A survey on big data for network traffic monitoring and analysis. *IEEE Transactions on Network and Service Management*, 16(3), pp.800-813.

Huang Jianzhong, Hu Gangyu, Zhao Min, Li Fengqing, Shen Chang and Xu Yedan (2017) On the interconnection of spatial structure and traffic mode of mega-cities: multi-scenario

simulation in Xiamen city. *Urban Planning Forum*, 6, pp.33-42.

Huang Jianzhong, Wu Meng, Zhang Qiao (2014). Research on urban spatial development strategy of Xining city based on transport scenario simulation. *City Planning Review*, 38(7), pp. 42-47,56.

Liu Feng, Janssens Davy, Wets Geert and Cools Mario (2013). Annotating Mobile Phone Location Data with Activity Purposes Using Machine Learning Algorithms. *Expert Systems with Applications*, 40(8), pp. 3299-3311.

Lv Yisheng, Duan Yanjie, Kang Wenwen, Li Zhengxi and Wang Feiyue (2014) Traffic flow prediction with big data: a deep learning approach. *IEEE Transactions on Intelligent Transportation Systems*, 16(2), pp.865-873.

Nagy Attila M and Simon Vilmos (2018) Survey on traffic prediction in smart cities. *Pervasive and Mobile Computing*, 50, pp.148-163.

Song Chaoming, Qu Zehui, Nicholas Blumm, Albert-Lásczló Barabási (2010). Limits of Predictability in Human Mobility[J], *Science*, 327(5968), pp.1018-1021.

Sun Bindong, Tu Ting, Shi Wei and Guo Yanling (2013). Test on the Performance of Polycentric Spatial Structure as a Measure of Congestion Reduction in Megacities: The Case Study of Shanghai. *Urban Planning Forum*, 2, pp.63-69.

Yang Chao, Zhang Yuliang and Zhang Fan (2016). Commuting Characteristics Analysis Based on Mobile Phone Calling Records: A Case Study in Shenzhen. *Urban Transport of China*, 14(1), pp. 30-36.

Yang Dongyuan and Zhengyu Duan (2015). *Urban traffic analysis technology in big data environment*. Shanghai: Tongji University Press.

Yang Fei (2007). Traffic OD data collection based on cell phone location technology. *Systems Engineering*, 25(1), pp.42-48.

IDENTIFYING LINKAGES BETWEEN DEMOGRAPHICS, BEHAVIORS, AND ROAD ACCIDENT FREQUENCY: A MACHINE LEARNING APPROACH IN ENGLAND (1108)

Dakota Aaron McCarty[1]
[1] Department of Urban Policy & Administration, Incheon National University, Yeonsu-gu, Incheon, Korea

Abstract. This study addresses the challenge of collecting comprehensive data on individual drivers' behavior, which has been found to contribute to over 70% of road accidents. It focuses on demographic factors and their indirect impact on accident rates by leveraging existing literature on the connection between demographics and risky driving behaviors. A review of literature identifies demographic characteristics correlated with risky driving behaviors. Using regression-based machine learning models, the investigation covers all of England, UK, aiming to establish connections between driving behaviors, demographics, and accident frequency. The study's results align with previous findings and provide a valuable methodology to investigate behavior-accident links on a broader scale despite data limitations. The findings support utilizing readily available demographic information to estimate road accident rates.

Keywords: Driving behavior; Traffic accidents; Cohort analysis; SHAP values; Extra Trees Regressor.

1. Introduction

The study of human behavior presents inherent complexities within the field of behavioral sciences, primarily due to the challenges associated with measuring behavior across diverse populations and timeframes. Comprehensive research in this area necessitates a thorough understanding of various influences and relationships, aiming to control for a wide range of external factors (Kelly and Barker, 2016). While extensive research exists on other behavioral issues, such as substance abuse and eating habits, there has been relatively less attention given to risky driving behavior. This is a notable issue as driving behavior is dissimilar from many other potentially risky behaviors. For instance, modifying behavior related to ‘rare events’ like road accidents poses challenges since individuals engaging in such behavior often do not experience immediate negative consequences in their daily lives. Additionally, habits—both positive and negative—such as exercising or smoking, gradually develop and become ingrained in daily routines, whereas the need to change driving behavior is typically prompted by accidents or reflexive responses (Kelly and Barker, 2016).

When studying the general population, further challenges arise when attempting to control for factors like exposure and experience (Brown, 1982). These complications are particularly relevant when attempting to investigate the impacts of risky driving behaviors on road safety. To overcome some of these limitations, researchers often narrow the scope of their investigations by focusing on specific demographics, geographic areas, or other controllable factors that facilitate data collection (e.g., through surveys or in-car monitoring devices). However, this narrowing of focus inadvertently reduces the generalisability of the research to new areas and populations. Consequently, there is a need to explore new variables that can serve as proxies to estimate driver behavior and the risk of road accidents, as highlighted in previous studies. Thus, the primary objective of this research is to identify potential proxies for estimating risky behaviors that can be utilised in future road accident prediction models.

Numerous studies have established the significant role of human behavior in causing road traffic accidents (Andrew Yockey and Barroso, 2023; Bener et al., 2009). Moreover, an expanding body of research supports the effectiveness of behavioral science approaches in identifying and mitigating accident-prone behaviors (Gielen and Sleet, 2003). This study aims to explore readily obtainable features, mitigating a limitation in the field around data collection and availability, which have been found to have connection with risky driving behaviors. The study builds upon existing literature that has established connections between demographics and propensity to engage in risky driving behaviors and further explores how the related features may influence road accident frequency. Through the use of regression-based machine learning modeling methods, this study seeks to develop potential proxies that can approximate risky behavior, utilising a comprehensive literature review as the foundation for our analysis.

2. Human Behavior, Demographics, and Road Accidents

The literature presents consistent findings indicating that human behavior is significantly responsible for road accidents, attributing over 70 percent of such incidents to human factors (Abdullah and Sipos, 2022; Chand et al., 2021). In order to achieve a substantial reduction in road accident rates, it is critical to understand and investigate human behavior in specific areas. This approach could lead to more accurate predictions and risk assessments, hence forming the primary goal of this research.

The web of human behaviors that notably impact road accident risks is intricate. Each factor, though discussed individually, is part of a complex interrelated system with shared causes, highlighting the complexity of human behavior (Brown, 1982; Kelly and Barker, 2016).

Vehicle speed, influenced by a mixture of human and environmental factors, plays a

critical role in accidents. With human factors being a combination of driver, passenger, and also pedestrian condition, age, experience and other defining factors; and environmental factors encompassing the actual environment that the humans are acting in, made up of features such as road quality, urban form, traffic flow, weather, time, and so forth (Khayesi et al., 2005; Yusuf et al., 2016). Furthermore, socioeconomic status has been identified as an additional, and notable, influencing human factor having an influence on risky behaviors such as drunk driving (Li et al., 2013).

Fatigue is another prominent risk factor in road accidents. Certain demographics, including younger drivers, shift workers, individuals with sleep disorders, and those operating vehicles during the early morning hours, are particularly (Bharadwaj et al., 2021). Similarly, distractions, which can arise from various factors such as cell phone use, loud music, or roadside advertisements, have been recognised to increase road accident risk (Papantoniou et al., 2017; Zokaei et al., 2020).

Reckless driving, often associated with alcohol consumption, exerts a substantial influence on accident risk (Borgialli et al., 2000). Emotional states, particularly depression and anxiety, have also been found to increase the risk of road accidents (Alavi et al., 2017).

Age and gender also play significant roles in accident risk. Younger drivers, particularly men, are more prone to engage in risky driving behaviors, while older drivers generally exhibit safer habits (Bener et al., 2009; Rhodes and Pivik, 2011; Russo et al., 2014). However, older individuals, especially pedestrians, face a higher risk of injury. Women, regardless of road conditions, are less likely to be involved in accidents or engage in dangerous driving behaviors (Morgan and Mannering, 2011; Russo et al., 2014).

One previous study investigated the relationship between the level of deprivation in residential areas and the rate of road accidents, finding that injury rates in the poorest areas were double compared to the wealthiest areas, particularly with pedestrians (Abdalla et al., 1997). Another comprehensive study examined the number of pedestrian injuries in English wards and revealed that road accidents involving child pedestrians were four times more frequent in the poorest wards than in wealthier wards, with adult pedestrian deaths nearly twice as high in impoverished areas (Graham et al., 2005).

Despite the second study utilising improved methods, both concluded the same findings of there being a higher risk of casualties related to accidents in areas with lower socioeconomics statuses. In summary, understanding human behavior and demographic factors, as well as their interconnected nature, is crucial in developing effective interventions and strategies to reduce road accidents. Future research is needed to continue refining our models and approaches, ensuring that we can predict and mitigate risks efficiently.

3. Behavioral Factors Influencing Road Accidents in the United Kingdom

This study examines the 2019 data from the UK Department of Transportation, representing the most recent year with complete and normalised data prior to the COVID-19 pandemic. The investigation is focused on understanding the behavioral elements contributing to road accidents in the United Kingdom.

Demographic data suggests a significant gender disparity in road accidents across the United Kingdom, with male drivers implicated in nearly twice as many accidents as their female counterparts (Figure 1). Specifically, male drivers accounted for 283,291 accidents, compared to 141,699 for female drivers. Age was also shown to play s a significant role in road accident frequency. Through an analysis of accident frequency by age in the study area, it was found that those aged 20 to mid-30s were most likely to be involved in an accident, while also finding that the elderly and teenagers were less likely to be involved in an accident (Figure 1).

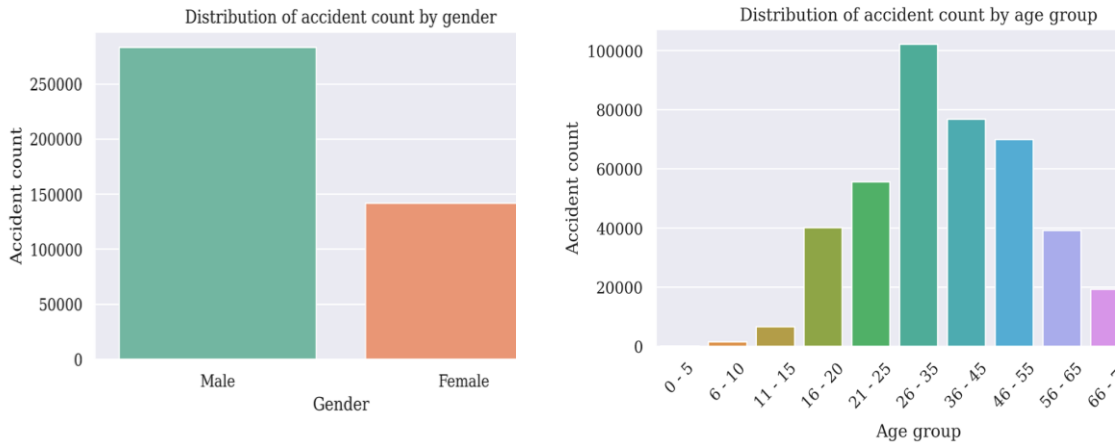


Figure 1. Gender and age distribution of accident counts

When visualizing the data by gender and age cohort together, the trend is still present showing that in each of the age groups that male drivers have a higher count of accidents. With those aged 26 to 35 being the group with the highest number for both genders (Figure 2).

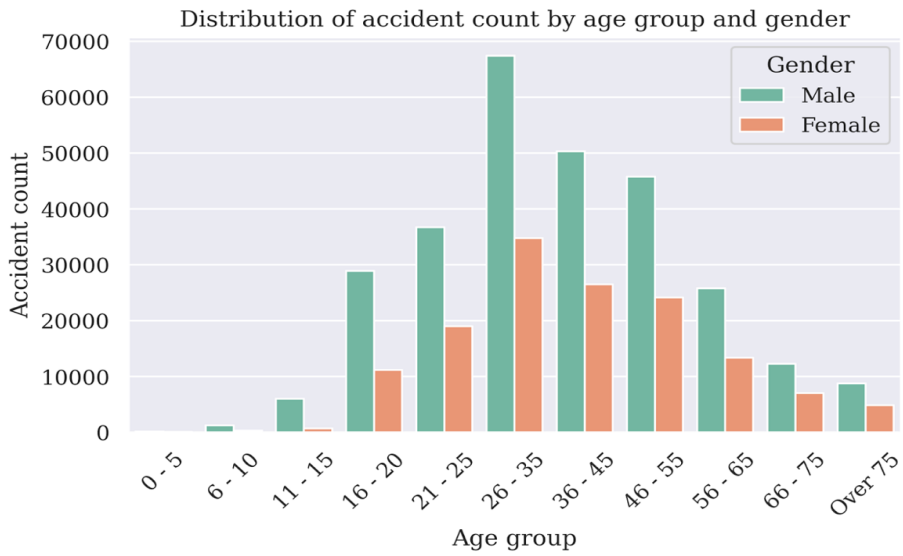


Figure 2. Distribution of accident counts by age and gender splits

While basic, these trends do align with previous literature on the correlations between gender, age, and road accident counts. This initial analysis makes the basis for the remainder of this paper, which aims to explore this relationship more in-depth.

The Annual Report on Road Casualties provides valuable insights into the primary causes of road accidents in England, with behavioral elements such as driver error, impairment, injudicious actions, reaction, distraction, and inexperience identified as the most prevalent contributors. Among these, driver behavior stands out as a leading cause, underscoring the importance of effectively estimating this feature in road accident prediction models.

Speeding, for instance, is a significant contributing factor to road accidents in the United Kingdom. It accounted for 7 to 18 percent of road accident casualties in 2019 across various subcategories such as exceeding speed limits, traveling too fast for conditions, and driver carelessness or recklessness. Similarly, fatigue driving directly caused only 2 percent of all accidents, while those involving drivers under the influence of alcohol or drugs made up 6 percent and 2 percent of all accidents, respectively.

Despite accounting for a relatively small percentage of accidents in the dataset, distracted driving remains a concern, including distractions from cell phone use, within the vehicle, and outside the vehicle. The lack of policy enforcement and detection could underlie these statistics.

Inexperience stands out as a significant causal factor, implicated in 5 percent of all road accidents. Meanwhile, reckless driving, defined by driver carelessness, recklessness, or being in a hurry, contributed to 18 percent of all casualties. Related behaviors, such as following too closely, sudden braking, and swerving, also pose substantial risks.

Emotions, though challenging to quantify due to their subjective nature, also play a role in road accidents. Aggressive driving, often linked to emotional stimulation, accounted for 4 to 8 percent of all road accidents in the study area.

The Annual Report on Road Casualties paints a complex picture of the contributing factors to road accidents, with behavioral aspects such as driver error, impairment, and inexperience playing significant roles. Speeding, reckless driving, and distractions emerge as particularly potent threats to road safety. It's essential to continue efforts to raise awareness of these issues, enhance law enforcement and develop policies that address these risk factors more effectively. The data also highlight the need for predictive models that can better consider these variables to effectively mitigate the occurrence of accidents. While certain aspects, such as emotional factors, remain challenging to measure and integrate into these models, their acknowledged influence on road safety necessitates further research and methodological innovation. With targeted intervention strategies that are informed by comprehensive and nuanced understandings of these contributors, there's potential to significantly reduce road casualties in the future.

4. Materials and Methods

At the time of this study, the Department for Transport does not provide non-aggregate data on road accidents and their respective causes, which poses a challenge for quantitative analyses. Therefore, there is a heavy reliance by this study on existing literature, taking a more inferential approach to examining the relationships between risky driving behavior and demographic factors and their subsequent relationship with road accident frequency.

The study utilises a dataset created by combining accident frequencies and gender-age cohorts. Tobler's pycnophylactic interpolation method was employed to aggregated the data to an hexagonal grid, with each cell covering an area of approximately 730 square meters. This cell resolution is approximately the of the urban Lower Layer Super Output Areas (LSOAs) in the United Kingdom. The dataset includes 34,554 hexagons in total being areas with a minimum of 5 accidents per hexagon cell. To analyse the spatial correlations between the risk of road accidents and demographic characteristics of an area, the accident counts per hexagon were divided by the total population of the area to calculate the accident rate per capita, which also makes the dependent variable in the machine learning regression analysis.

The dataset includes various features such as accident per capita, population share across different age cohorts, and the ratio of men to women within each age cohort. The population features were normalised as proportions and the gender-age cohort data was calculated as ratios of men to women. This study has elected to use rates (accident per

capita) instead of frequencies helps account for variations in population size.

To better analyse the relationship between accidents per capita and demographic characteristics, the dataset was used to build multiple regression-based models. PyCaret, an open-source AutoML tool, was used to generate several models for further analysis (Table 1). The Extra Trees Regressor model performed the best, with an R-squared (R2) value of 0.2695, a Mean Absolute Error (MAE) of 0.0024, and a Root Mean Square Error (RMSE) of 0.0039. For both the MAE and RMSE, all models performed relatively the same. However, for R2, the top performing model was over double that of the baseline (Linear Regression) model. Considering the limited scope of data, the model was fed for these predictions, the results can be considered meaningful. With only demographic features of an area, the model was able to account for nearly 27% of the variance in road accident frequency.

Table 1. Modeling results

MODEL	MAE	RMSE	R2
EXTRA TREES REGRESSOR	0.0024	0.0039	0.2695
LIGHT GRADIENT BOOSTING MACHINE	0.0024	0.0040	0.2391
RANDOM FOREST REGRESSOR	0.0025	0.0040	0.2134
GRADIENT BOOSTING REGRESSOR	0.0024	0.0041	0.1986
K NEIGHBORS REGRESSOR	0.0025	0.0042	0.1699
BAYESIAN RIDGE	0.0026	0.0042	0.1365
RIDGE REGRESSION	0.0026	0.0042	0.1329
LINEAR REGRESSION	0.0026	0.0042	0.1326

5. Results and Discussion

This research has followed a conceptual model of an in-depth literature review to identify risky driving behaviors along with their links to demographic characteristics; an analysis of accident rates per capita across gender and age cohorts through the development of machine learning models; and the generation of feature importance and SHapley Additive ExPlanation (SHAP) plots for visual examination of the results and comparison to the previous literature.

In the context of an Extra Trees Regressor model (a type of decision tree ensemble algorithm), a feature importance plot (Figure 3) illustrates the contribution of each feature to the predictive power of the model. Specifically, in an Extra Trees Regressor, feature

importance is typically computed from the average reduction in impurity that results from splits on that particular feature, averaged over all trees in the ensemble.

If a feature has a high value in the feature importance plot, that suggests the feature has a significant role in the model's prediction. Conversely, a lower value suggests that the feature has a lesser impact on the model's decision making.

In Figure 3, we can see that the top four most important features were related to age, being, in order of importance, the total population aged 20 to 34, aged 35 to 49, under 10 years of age, and over 65 years of age. This shows that those aged 20 to 34 and aged 35 to 49 have a higher impact on predicting road accident frequency with those aged 20 to 34 having a slightly higher importance in the model.

The next three most importance features are related to the male to female ration at different age groups. With areas having more males than females aged 20 to 34 having the highest importance among these.

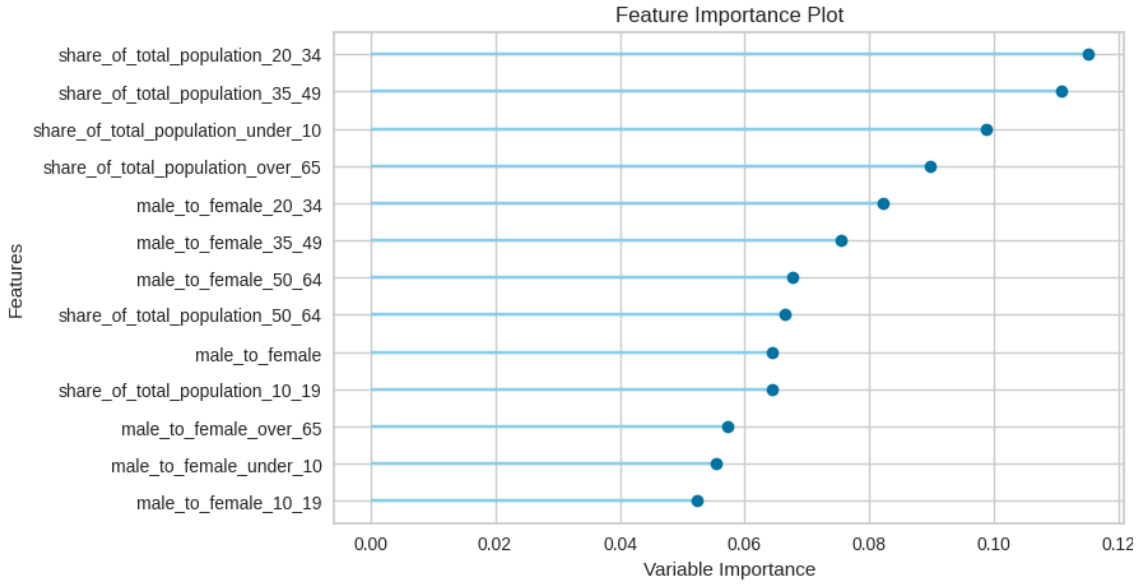


Figure 3. Feature Importance Plot

It's worth noting that while feature importance can give a good sense of which features are most predictive, it doesn't provide insight on how changes in those features impact the target variable - for that, other methods such as Partial Dependence Plots or SHAP (SHapley Additive exPlanations) values can be useful.

For this study, the SHAP values are utilised (Figure 4) to provide a more precise interpretation of the results. The SHAP values explain the predictions of the machine learning model by assessing the impact of each feature. The plot shows the features arranged in descending order of importance, with each point representing a sample point of the data. The colors in the plot indicate the value of the point, with red indicating a

higher value and blue indicating a lower value.

The SHAP value plot generated by the Extra Trees Regressor model supports the trends observed in previous analyses regarding the relationship between road accident risk and gender-age cohorts. The plot indicates that road accident rates increase when there is a greater proportion of population aged 20 to 34 and aged 35 to 49. When looking at those aged 35 to 49, it is interesting to note that there is a nearly equal relationship between the increase and decrease of road accident frequency corresponding to the increase or decrease in this age cohort. Again, as seen in the feature importance plot, the gender of the population also plays a role, with road accidents being more common in areas with a higher proportion of men between 35 and 49 years of age but also a slightly lower frequency of accidents in areas where there are more men aged 50 to 64 than women.

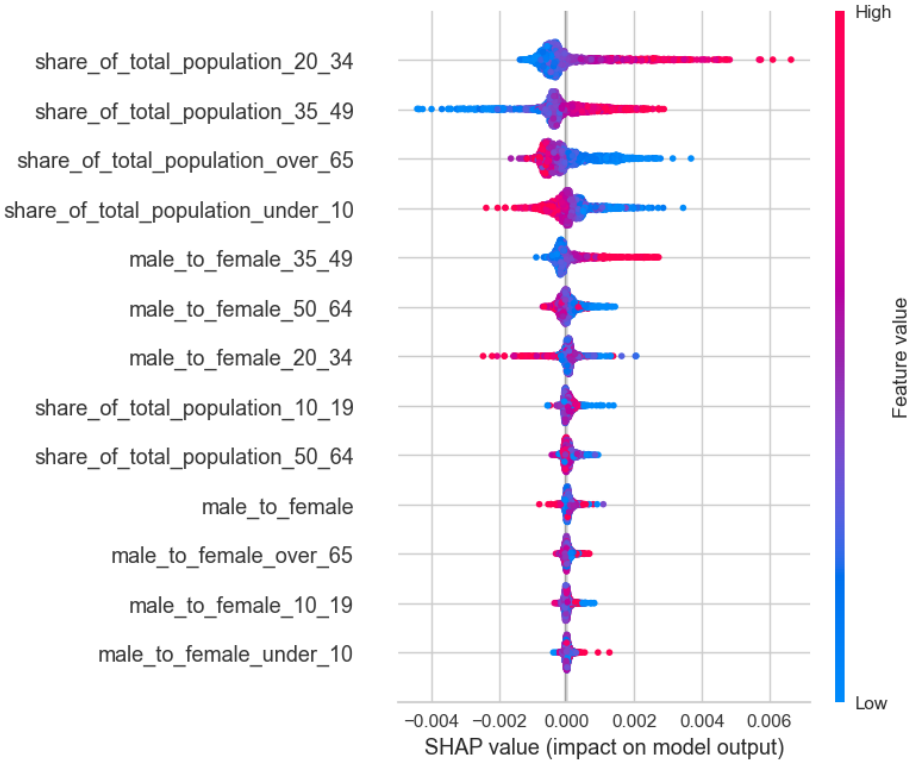


Figure 4. SHAP plot

It is important to mention that the presence of these trends does not imply a direct correlation between demographics and road accident rates. However, with that being said, with the inclusion of strong empirical connections found in the previously reviewed literatures, a conclusion can be made that there is a relationship between the features and road accident rates.

Behavior has been identified as a significant influence on road accidents, and measures targeting risky behaviors have been successfully implemented, such as drinking and

driving laws, improved lighting, speed limits, and traffic calming engineering. Reducing road accidents requires a multidisciplinary approach. While obtaining detailed data on individual drivers at a large and consistent scale poses challenges, this research demonstrates the ability of gender-age cohorts to estimate road accident risk and provides a methodology for assessing the impact of new linkages between driver behavior and other characteristics. These findings contribute to the development of more accurate and powerful road accident prediction models.

In conclusion, this study establishes linkages between driving behaviors, demographic data, and road accident frequency based on existing literature. The results align with previous trends and provide a methodology for assessing the impact of new linkages. While this study does not replace more detailed research on driver behavior, it offers valuable insights and serves as a foundation for future road accident research.

6. Conclusions

Building upon existing literature, this study has applied advanced methods to thoroughly examined the relationship between risky driving behavior, demographics, and road accident rates. The findings are consistent with previous research, as demonstrated through descriptive statistical analysis, feature importance plots, and SHAP values generated by the Extra Trees Regressor model. While this study does not replace more comprehensive investigations into driver behavior, it provides a useful methodology and further strengthens the connections between driver behavior, other factors, and road accident risk.

Funding. This research was funded by xxx (International Cooperative) Research Grant in 2022, grant number 2022-0153.

References

Abdalla IM, Barker D and Raeside R (1997) Road accident characteristics and socio-economic deprivation. *Traffic Engineering & Control* 38(12): 672–676.

Abdullah P and Sipos T (2022) Drivers' behavior and traffic accident analysis using decision tree method. *Sustainability: Science Practice and Policy* 14(18). MDPI AG: 11339. DOI: 10.3390/su141811339.

Alavi SS, Mohammadi MR, Souri H, et al. (2017) Personality, Driving Behavior and Mental Disorders Factors as Predictors of Road Traffic Accidents Based on Logistic Regression. *Iranian journal of medical sciences* 42(1): 24–31. DOI: 10.2105/AJPH.2014.301919.

Andrew Yockey R and Barroso CS (2023) Drugged driving among U.S. adolescents, 2016-

2019, USA. *Journal of safety research* 84: 1–6. DOI: 10.1016/j.jsr.2022.10.002.

Bener A, Burgut HR, Sidahmed H, et al. (2009) Road traffic injuries and risk factors. *Californian journal of health promotion* 7(2). California State University Fullerton: 92–101. DOI: 10.32398/cjhp.v7i2.2017.

Bharadwaj N, Edara P and Sun C (2021) Sleep disorders and risk of traffic crashes: A naturalistic driving study analysis. *Safety science* 140: 105295. DOI: 10.1016/j.ssci.2021.105295.

Borgialli DA, Hill EM, Maio RF, et al. (2000) Effects of alcohol on the geographic variation of driver fatalities in motor vehicle crashes. *Academic emergency medicine: official journal of the Society for Academic Emergency Medicine* 7(1): 7–13. DOI: 10.1111/j.1553-2712.2000.tb01882.x.

Brown ID (1982) Exposure and experience are a confounded nuisance in research on driver behaviour. *Accident; analysis and prevention* 14(5): 345–352. DOI: 10.1016/0001-4575(82)90012-4.

Chand A, Jayesh S and Bhasi AB (2021) Road traffic accidents: An overview of data sources, analysis techniques and contributing factors. *Materials Today: Proceedings* 47: 5135–5141. DOI: 10.1016/j.matpr.2021.05.415.

Gielen AC and Sleet D (2003) Application of behavior-change theories and methods to injury prevention. *Epidemiologic reviews* 25: 65–76. DOI: 10.1093/epirev/mxg004.

Graham D, Glaister S and Anderson R (2005) The effects of area deprivation on the incidence of child and adult pedestrian casualties in England. *Accident; analysis and prevention* 37(1): 125–135. DOI: 10.1016/j.aap.2004.07.002.

Kelly MP and Barker M (2016) Why is changing health-related behaviour so difficult? *Public health* 136: 109–116. DOI: 10.1016/j.puhe.2016.03.030.

Khayesi M, Mohan D, Nafukho FM, et al. (2005) *Road Traffic Injury Prevention Training Manual*. Genève, Switzerland: World Health Organization. Available at: https://books.google.at/books?id=9_dU2MFGA6UC.

Li YC, Sze NN and Wong SC (2013) Spatial–temporal analysis of drink-driving patterns in Hong Kong. *Accident; analysis and prevention* 59: 415–424. DOI: 10.1016/j.aap.2013.06.033.

Morgan A and Mannering FL (2011) The effects of road-surface conditions, age, and gender on driver-injury severities. *Accident; analysis and prevention* 43(5): 1852–1863. DOI: 10.1016/j.aap.2011.04.024.

Papantoniou P, Papadimitriou E and Yannis G (2017) Review of driving performance parameters critical for distracted driving research. *Transportation Research Procedia* 25: 1796–1805. DOI: 10.1016/j.trpro.2017.05.148.

Rhodes N and Pivik K (2011) Age and gender differences in risky driving: the roles of positive affect and risk perception. *Accident; analysis and prevention* 43(3): 923–931. DOI: 10.1016/j.aap.2010.11.015.

Russo F, Biancardo SA and Dell'Acqua G (2014) Road safety from the perspective of driver

gender and age as related to the injury crash frequency and road scenario. *Traffic injury prevention* 15(1): 25–33. DOI: 10.1080/15389588.2013.794943.

Yusuf IT, Adeleke OO, Salami AW, et al. (2016) THE FACTORS THAT AFFECT THE FREE FLOW SPEED ON AN ARTERIAL IN ILORIN, NIGERIA. *Nigerian Journal of Technology* 35(3): 473–480. DOI: 10.4314/njt.v35i3.2.

Zokaei M, Jafari MJ, Khosrowabadi R, et al. (2020) Tracing the physiological response and behavioral performance of drivers at different levels of mental workload using driving simulators. *Journal of safety research* 72: 213–223. DOI: 10.1016/j.jsr.2019.12.022.

SPATIAL STRATEGY PLAN AS A METHODOLOGICAL APPROACH IN ENSURING ACCESSIBILITY: THE CASE OF ISTANBUL (1128)

Hilal Çepni
Instituto Superior Técnico - University of Lisbon, Center for Innovation of Terriroty, Urbanism, and Architecture, Lisboa, Portugal; hilal.cepni@tecnico.ulisboa.pt

Abstract. This study aimed to investigate the question, 'Can the spatial strategy plan be a tool for ensuring accessibility?' In the first stage of the study, six general objectives were determined for the Istanbul Metropolis. In the second main stage of the study, 17 needs were identified by discussing which facilities were necessary to ensure accessibility. Using the collective structure of the spatial strategy plan, special professional fields and institutions related to these topics were identified. A 'Relational Wheel' was devised to illustrate the relationships between access needs, the fields of study these needs are the subject of, the institutions that should work on these issues, the analysis methods they will use, the outcomes they might obtain when they complete their work, and the relationship of these outcomes to the initial objectives.

Keywords: Strategic Spatial Planning, Accessibility, Walkability, Sustainability, Multiplier effect.

1. Introduction

Comprehensive planning has kept planning in the technical domain by focusing on instrumental rationality and placing planner expertise at the heart of the planning process (Sanderock, 1998). A range of approaches, such as defensive, progressive, and egalitarian planning, were born as criticisms of comprehensive planning. The field was then shaken to its foundations by the view of Marxist geographers and sociologists, Harvey (1973) and Castells (1977) chief among them, that planning is a function of the capitalist state**.**

The recent transformation of the global socio-economic order has produced new problems and focal issues in urban areas, e.g. increasing urban complexity, environmental challenges at every scale, rapid depletion of resources and increase in pollution, a widespread increase in poverty, and an ever-increasing amount of natural disasters. As a response to these challenges, strategic approaches have once again come to the fore of urban planning (Albrechts, 2004; 2006). Where traditional methods have been criticised for their rigidity and insufficiency, strategic spatial planning, a more flexible approach, has become prominent, with two main root causes: globalisation processes and the introduction of postmodern thought to urban planning in the later 1980s (Ersoy, 2007).

While postmodern thought places emphasis on the consensus of everybody involved, it also points out that there are other methods of obtaining information beyond positivist processes (Blotevogel, 1999). It has thus contributed to the creation of a communicative arena wherein stakeholders establish horizontal relations, inspiring a paradigm shift towards communicative rationality.

This new approach is based on the idea of communicative action developed by Habermas and supported by work carried out by Forester (Communicative planning, 1989, Argumentative planning, 1993), Sager (Communicative planning, 1994), Innes (1995), Healey (Planning Through Debate, 1992; Inclusionary Discourse, 1994; Collaborative Planning Discourse, 1994; 1997, 1998) and supported by many other others (Allmendinger, 2000). The core logic behind this paradigm is that communication is a means of solving spatial problems (Boswell, 2000)..

Strategic spatial planning as a concept, which inspired Habermas's concept of strategic action, was initially described by Yiftachel (1989), and can be considered as a collective action-oriented model (Alexander, 1966). Friedmann in 2004 defined strategic spatial planning as 'unplanned planning', a term which speaks to the multitude of different interests and flexibility of the model; that interconnectivity is a form of collaborative planning that underpins the governance regime, especially under local conditions with high levels of diversity (Gualini, 2005). Strategic planning has also been referred to as an active social process (Healey et al., 1999), one which can have a transformative effect on inter-institutional relations, which is a view shared by Mazza (2000), who pointed out that strategic spatial planning at its core is about designing a coalition around shared strategies and considered those two ideas inseparable, as each only becomes functional in the other's presence. For Albrechts (2004), strategic spatial planning is not a single method or tool, but rather a set of concepts and strategies that must be continually adapted for each individual set of conditions in order to achieve the desired results.

Strategic spatial planning is capable of responding to the changes outlined above, by dealing with the effects of widespread globalisation on cities (Ersoy, 2007). As it allows interaction and communication between stakeholders in the way post-modernist philosophy envisioned (Ersoy, 2007), it is becoming more pervasive as an urban planning approach, particularly given the equal importance it assigns to how planning processes are organised as well as the actual content of any given plan.

According to Albrechts (2004), strategic spatial planning as experienced in the public sector addresses a finite number of fundamental strategic areas. The process involves a detailed evaluation of the environment, in order to spot both strengths and weaknesses as well as to identify trends, influences, and resources. Taking any uncertainties into account, a long-term plan is developed and a framework created, which must be able to not only influence and manage the flow of events and new forms of understanding, but

also develop situation-appropriate means and methods of action. As such, strategic spatial planning both identifies and unifies stakeholders and allows for a much broader degree of participation than traditional urban planning.

For Sartorio (2005), the fundamental elements of strategic planning include the necessity of a long-term perspective; comprehensiveness with regards to the scope of the plan; a degree of sophistication produced not by expert knowledge but rather the input from as many stakeholders as possible; interconnectivity between all invested parties; and a process-oriented mindset.

Strategic spatial planning therefore has at its core active participation, open dialogue, accountability, and a cooperation and reconciliation dialectical paradigm, all of which is itself rooted in relational geography. As a normative and selective process that focuses on the concepts of relational space, strategic spatial planning emphasises the significance of horizontal relations between stakeholders, aims to work more with relations and processes than objects and functions, and tries to create a collective vision based on societal acceptance. Assuming the role of a method that can provoke and influence change, and always keeping in mind the roles and concepts of communicative rationality, it possesses the potential to connect previously disparate areas, emphasise several different scales and the relations between them, and highlight the possibilities for different places to have different degrees of potential, which in turn require the definition of multiple axes of development (Albrechts, Healey, and Kunzman, 2003).

The literature review has made clear that a core dimension of the spatial strategy plan is deliberative democracy, i.e., discussing until consensus is reached in order to settle on a certain idea, which itself can serve as a replacement for a Newtonian, absolutist conception of time and space, as pointed out by Friedmann in 1993, who highlighted the multiple time-space geographies that overlap in the non-Euclidean new world. Planners, armed with new conceptions of time-space (Graham and Healey, 1999) argue that space must be understood as relations and processes and not just as an object and a form. Planning has as such recently assumed a more wide-ranging role with regards to influencing both local and global dynamics within the broader context determined by relational time-space geography.

The two core foundations of the spatial strategy plan involve the potential spatial organisation of the city in question, and the means of designing the process that facilitates those who are affected by the plan to collaborate in order to further the advancement of the urban system. In line with the philosophy behind the concept, any collaboration between the pertinent stakeholders should include every stage of the planning process, including decision-making, implementation, monitoring, and evaluation. The organisational structure of the spatial strategy plan doesn't only include the public sector, but also involves the private sector, multiple interest groups, different experts in a range

of fields, and non-governmental organisations in the planning process. No longer the sole decision-maker, the planner has instead assumed the role of one of several actors in the broader process, and indeed acts as a facilitator of the work as well, which shift in function aligns with the more general philosophy that underpins spatial strategic planning and contributes to the core goals of focusing on processes and relations.

This study aimed to investigate the question, "Can the spatial strategy plan be a tool for ensuring accessibility?". The aforementioned features of the spatial strategy plan have been used as a tool for ensuring accessibility in Istanbul. In the first stage of the study, seven general objectives were determined for the Istanbul Metropolis. After the objectives were determined, the situation determination phase was started, and special spatial analyses related to the theme of each objective were made. As each analysis comprised a different number of parameters, a multiplier coefficient was determined to quantify each analysis's impact on the final synthesis sheet, which was created using an overlapping method and the first-, second-, and third-degree intervention areas of the city of Istanbul were determined at the neighbourhood scale. The walkability parameters put forward by various theorists in the existing literature were grouped in relation to each analysis and further analysed to determine a hierarchy, with Accessibility found to be the most important parameter.In the second main stage of the study, 17 needs were identified by discussing which facilities were necessary to ensure accessibility. Using the collective structure of the spatial strategy plan, special professional fields and institutions related to these topics were identified. A “Relational Wheel” was devised to illustrate the relationships between access needs, the fields of study these needs are the subject of, the institutions that should work on these issues, the analysis methods they will use, the outcomes they might obtain when they complete their work, and the relationship of these outcomes to the initial objectives. In the following sections, these development stages of the Istanbul Spatial Strategy Plan are presented.

2. Accessibility strategic spatial planning: Istanbul

2.1. Creating Objectives From Regional Dynamics in the Context of Transportation

Istanbul finds itself in a promising position to compete with world cities in the global race for development thanks to several key factors, namely: its geographical location (which is of historical, cultural, and political importance); its multifaceted interaction networks; its historical, cultural, and natural richness, all of which contribute to its unique identity; its high economic performance; and the strong, dynamic social infrastructure it has built. This section presents a summary of the analyses carried out on economic diversity and empowerment, social-spatial justice, earthquake and disasters, matters relating to public space, and the climate crisis and ecology, all shaped around transportation and infrastructure, in order to better understand the regional dynamics of Istanbul.

Cultural consumption in İstanbul, as well as the bulk of the tourism and creative sectors, are concentrated in a region that includes Beyoğlu, Beşiktaş, Şişli, the Historical Peninsula and Kadıköy, an area also known as the 'culture triangle'. However, creative workplace clusters are not evenly distributed throughout the area, and the potential offered by the region is not being fully utilized. Despite the historical and cultural diversity Istanbul has to offer, visitors to the region find themselves bottlenecked at certain points, leading to an imbalance in the pedestrian and traffic pressure points. Similarly, vital services such as education and health are concentrated in the central parts of the city and inner peripheries; and while public transportation facilities are well-developed in the inner peripheries and city center, traffic poses a significant threat. As a result, the randomly distributed functions that stem from unplanned spatial development lead to social-spatial inequalities.

The spatial imbalance of Istanbul's service sector employment, combined with the asymmetrical progress of service development between the two halves of the city, contributes significantly to daily travel distances. As the volume of journeys between the two halves increases, the amount of traffic on the bridges naturally increases as well. Istanbul's own economic structural shift from industry to the service sector was necessitated by the effects of industry on the natural landscape, with the bulk of the industrial work being directed outside of the city, which in turn affected the daily travel required to be undertaken by workers. Housing areas have developed along with the industrial work, in large part due to worker preference of living close to the workplace.

A considerable risk factor for Istanbul is traffic density in the historical center, which is quite high, and exceeds the existing parking capacity. This problem is only exacerbated by the lack of maritime public transportation services. Another risk is posed by the development of large projects that negatively impact natural and cultural values. It's the location of these mega projects that determines the development direction and population distribution of Istanbul, rather than urban policies rooted in location selection criteria; this situation affects both population density in the districts and the vehicle density accordingly. Despite a rapidly increasing need for road and transportation following on from sudden project decisions made by the central government, public transportation remains insufficient, while private vehicle ownership has increased and, with it, carbon gas emissions, all of which negatively contributes to climate change.

The inadequacy of the existing infrastructure is further highlighted by sudden population growth in the periphery and rapidly developing industrial projects, all of which contribute to reduced quality of life. Natural tourism is threatened by projects that pierce the northernmost natural landscape of the city, while poor location selection decision-making for unplanned spatial developments has led to the possibility of power plants overlapping

with settlements or the existence of energy facilities that have been placed close to residential or natural areas.

Istanbul is notable for its high coastal potential, but this potential is not currently being used enough, due to the difficulty of accessing the coast. The excessive use of motor vehicles in transportation is doubly problematic, for environmental reasons (like decreased air quality) as well as an increase in traffic. To remedy this, incentives should be provided to the use of rail systems in public transportation by prioritizing taking steps that reduce greenhouse gasses. One of the ways the climate crisis manifests in Istanbul is heavy rainfall, which has further damaged the infrastructure in recent years in addition to causing flooding and instances of coastal collapse.

Accessibility in transportation is related to the unequal use of public spaces between the sexes. Security is another issue that shouldn't be ignored; at present, Istanbul's transportation system does not serve the elderly, women, children, and the disabled effectively and safely.

But though Istanbul is lagging behind when it comes to newly developing transportation technologies, progress is being made. Vehicle charging stations were built in the Şişli and Kadıköy districts, where population is high, although the use of electric vehicles in public transport remains low.

Any transportation network plays an important role where natural disasters are concerned; however, access remains a crucial element, and in that sense, Istanbul is not ready for a potential earthquake from a transportation perspective (among other points-of-view from which it can be considered unprepared). By developing an emergency transportation plan, uninterrupted access between the determined energy transportation network and certain points can be ensured.

Vitally, Istanbul's multi-actor management structure and the lack of importance assigned to the topic of participation impacts all of these issues. Furthermore, the lack of communication between units resulting from distinctions between public institutions leads to both infrastructural and transportational inadequacy. The physical development of the city has only been planned with a focus on economic growth; other important elements of life, such as the natural and the social, are ignored. Istanbul has always been the scene of power in Turkey, and the current conflict between the local and central governments can be seen in Istanbul itself. This problem, ostensibly a managerial one, affects every urban issue, transportation included. Relevant examples seen through the context of transportation include increased metro construction activities with the change of local administration as well as central government decisions, e.g. the third bridge, which damage the natural landscape.

Based on the aforementioned regional dynamics, seven objectives have been determined for Istanbul, with transportation as the focus.

- 1: Ensuring equal and fair access to transportation and infrastructure services by all segments of the society
  2: To create a resilient transportation and infrastructure system that is sensitive to climate change and considers the protection-use balance of the ecosystem
- 3: To ensure the integration of transportation centers and urban functions with a compact transportation network
- 4: To create a human-oriented transportation system by increasing the share of alternative transportation vehicles in urban transportation
- 5: To develop transportation and infrastructure systems that create inclusive, information and communication technology networks
- 6: Creating risk scenarios for possible disaster situations in transportation and infrastructure systems, ensuring their resilience and resilience
- 7: Establishing the planning process in which the governance system is adopted, in which various stakeholders are involved in the process of ensuring coordination in the establishment of transportation and infrastructure systems, development of implementation tools for the control mechanism and management of financial resources

2.2. Identification of Intervention Areas Along the Walkability Axis

Having determined the spatial strategy plan objectives for the Istanbul region, their relationship with Walkability was examined and its potential to be a wide-ranging solution that addresses each objective was discussed. Following the determination of the focal issue (walkability-accessibility) and despite the regional dynamic analyses that had been put forward, it became clear there was a need to divide Istanbul once more into structural spatial parts in line with the aforementioned objectives. As a result, areas with high intervention and potential became clearer with the given framework.
The following is a brief description of the construct (the target - the relationship between the objective and walkability - the structural spatial analysis of the objective - the parameters used in the analysis) and a brief description of the relevant literature that contributed to certain stages of the construct.

Walking isn't just a mode of transportation: it's also an important way for people to feel visible, represented, and like they're participating actively in public life (Krambeck, 2006). As a form of ambulance, it's notable for being fair, equitable, and inclusive of a multitude of socio-economic strata. But those characteristics can't be experienced without the

provision of a balance between vehicles and pedestrians in any given space. The importance of this equilibrium is only heightened when disadvantaged groups—such as people with disabilities, the elderly, or parents with young children—are concerned (Forsyth and Southworth, 2008).
Walkable environments, by definition, offer a secure environment for all pedestrians, increase the level of social interaction within a given urban system, and enhance the strength of the social ties being built by all participants (Forsyth and Southworth, 2008). Given the vital importance of walkable spaces in the arena of social cohesion, ensuring they're available in livable communities is of significant importance (Dumbaugh, 2005). We can also say that environmental justice is directly linked to increased walkability, and that making spaces walkable can be considered a way to achieve the first goal of providing equal and fair access to transportation and infrastructure services by all segments of society (Forsyth and Southworth, 2008,).

During the next stage of the study, Istanbul was divided into structural spatial segments in line with the first objective. An analysis of inequality in transportation was carried out by examining these spaces under the parameters of poverty, low-income housing estates, gender inequality (education, number of children, access to economic and life resources), security, transportation costs, and ready access to public spaces.

As an environmentally friendly method of transportation, walkability can be considered a basic condition for creating sustainable cities. Increasing walkability not only reduces traffic congestion, but also leads to a decrease in air and noise pollution, as well as a diminishment in vehicle dependency (Kramback and Shah, 2006). When accomplished, it should be possible to prevent uncontrolled urban sprawl, which is one of the major problems facing Istanbul, which itself leads to excessive energy consumption and ever-increasing greenhouse gas emissions, further exacerbating the climate crisis. Creating walkable spaces is therefore not only an important goal, but a matter of high priority given the imminence of the climate crisis.

Consequently, we can say that the broader goal of 'creating a resilient transportation and infrastructure system that is sensitive to climate change and that takes care of the conservation-utilisation balance of the ecosystem' can be worked towards by increasing the preponderance of 'walkable' environments.

Istanbul was again divided into structural spatial parts related to the above goal, and an analysis on the areas causing ecological destruction was created by focusing on levels of traffic, amounts of air pollution, population figures, increased amounts of private vehicles, frequency of buses, number of industrial projects which have an adverse effect on the environment, and the amount of agricultural, natural, and forested areas.

Walkability may be increased by developing compact, polycentric, or network city forms, and by restricting and limiting the development of the city; reducing the distances

between core spaces like workplaces, homes, commercial centers, and public transport stops (Hildebrand, 1999; Jabareen, 2006). As such, walkability is also related to the goal: 'To ensure the integration of transportation centers and urban functions with a compact transportation network'.
To perform an 'Access to Services Analysis' with the above goal in mind, Istanbul was divided into structural spatial parts by examining travel attractions, the distribution between service and industrial sectors, access to services, and rural neighborhoods.

The human-oriented approach to transportation is based on the core philosophy that transportation planning should have as its main focus pedestrians and their needs, in order to better shape urban development around sustainable transportation with the integration of controlled automobile use. As such, walkability is directly related to the goal of 'creating a human-oriented transportation system by increasing the share of alternative transportation vehicles in urban transportation'.

For that goal, Istanbul was divided into structural spatial parts related to it, creating a 'Human Centric Transportation Potential Analysis' by focusing on alternative transportation vehicles, pedestrian access, public transportation opportunities, irregular urbanised areas, traffic density, and pedestrianised areas.

More livable, sustainable, and intelligent city forms with high population and building density require walkable spaces, which also promote increased usage of public transportation. Walkability's importance also extends to other areas of importance in the field of urban form, including Smart Growth, New Urbanism, Location Efficient Development, and Transit-Oriented Development (Newman and Kenworth, 1996; Hildebrand, 1999; Jabareen, 2006).

Above, we noted that reducing dependency on vehicles is one method of preventing uncontrolled urban sprawl. The consequences of doing so include reduced infrastructure costs, and a resultant efficiency increase in the use of public resources, which should involve a knock-on effect for developing more economical life options. One way to use the surplus left over from these reduced costs could be the field of technology. Thus can walkability be said to be related to the objectives of, 'Developing transportation and infrastructure systems in which inclusive, information and communication technology networks are created,' and 'Making urban infrastructure systems resistant and effective via development'.

An analysis of 'Technological Systems and Infrastructure Potential' of the city was carried out by dividing Istanbul into structural spatial parts by examining mobile communication points, wifi access, infrastructural features (water, natural gas, and electricity specifically), the amount of electric vehicle charging stations, electric scooter preponderance, and parking facilities.

Narrow roads and one-way traffic features in urban and suburban transportation can be problematic for a number of reasons, but one of the most important when it comes to the case of Istanbul (as with other areas that are at risk of earthquakes) is the intervention challenge they pose following natural disasters. Increasing walkability, on the other hand, by definition leads to more resilient urban systems, as the intervention challenges following natural disasters are reduced. As such, walkability can be considered to play a vital role in 'Creating risk scenarios for possible disaster situations in transportation and infrastructure systems, ensuring their durability and resistance'. Finally, to investigate the above goal, a 'Disaster risk areas analysis' was created, involving the division of Istanbul into structural spatial parts, focusing on settled catchment areas and areas that are at risk of disaster.

The parameters used for each of the analyses mentioned above were evaluated over three points. The analyses obtained by establishing vertical relations were then brought together in the next step by use of an overlapping method, and two core area forms were determined at the neighborhood level: 'walkability intervention areas' and 'areas with high walkability potential'.

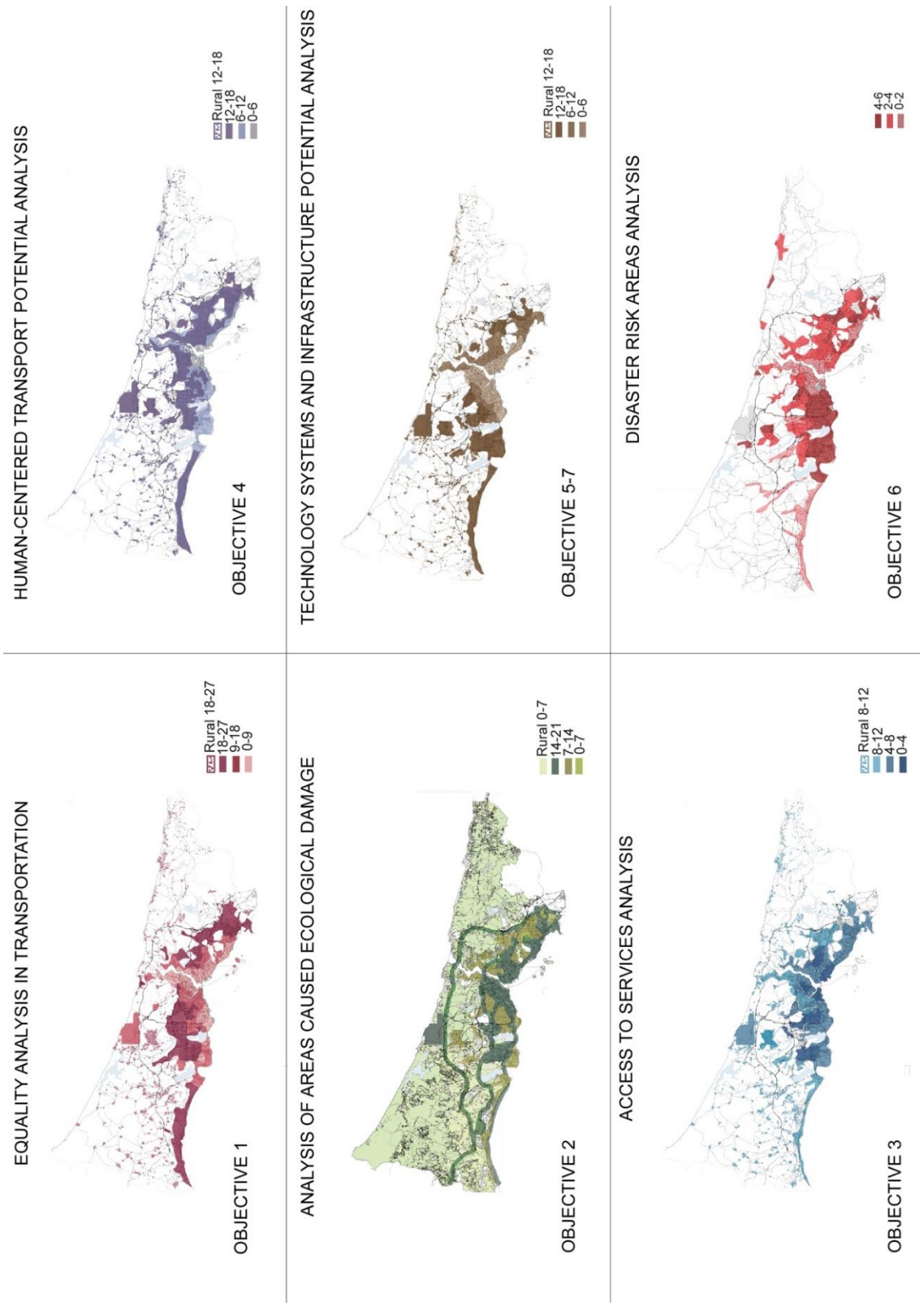


Figure 1. Objective Oriented Spatial-Structural Analyses

First-degree intervention areas are generally located on the outer periphery of the city. Second-degree intervention areas are generally located on the outer fringes but relatively close to the shore. Potential areas are located in the inner parts of Istanbul (around the Bosphorus and the historical peninsula), which is mostly characterised as the center of Istanbul.

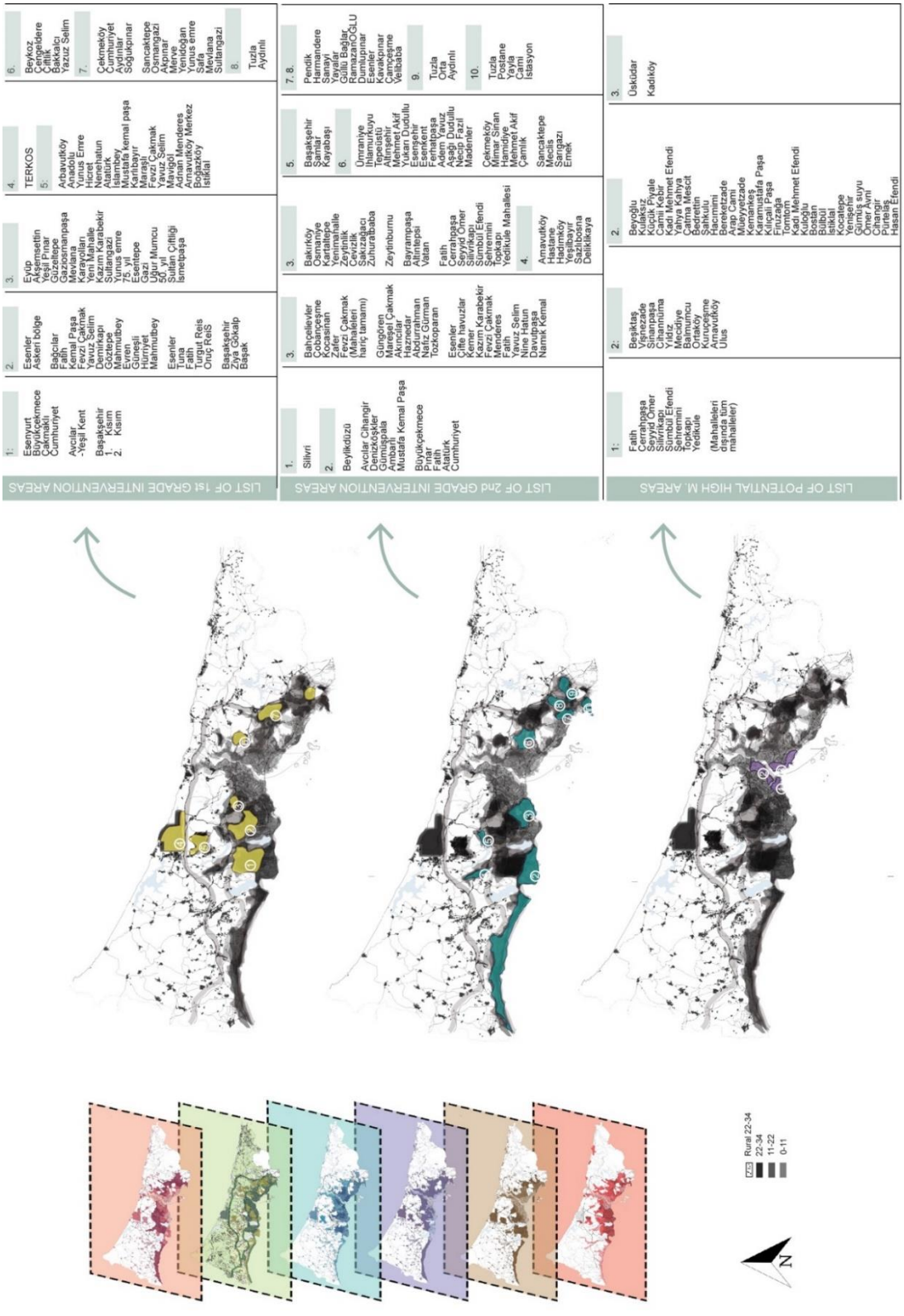


Figure 2. Areas of Intervention and Areas With High Potential

2.2. From Mobility to Accessibility

The next stage of the spatial strategy plan required a detailed examination of walkability as a concept, with the goal of identifying specific, measurable parameters which could then be further analyzed to determine their own importance, as well as which actions would need to be taken in order to fulfill each one.

Nine different parameters that contribute to any given space's walkability were drawn from the existing relevant literature: attractiveness; comfort; security; the sidewalk network's quality; the quality of the street texture; the connectivity of the road network; the level of connection between open space systems; the level of connection between transportation systems; and accessibility.
Alfonzo (2005) proposed five walkability parameters—feasibility, accessibility, safety, comfort, and enjoyment—and outlined a hierarchical relationship between them. As feasibility was possible for all participants, this study focused on accessibility as its top priority, since when accessibility is accomplished, a multiplier effect will be observed, i.e. all the other parameters will be improved as well.

Below is a brief description of the parameters and the relevant literature from which they were identified. In addition, this section sets out how the walkability parameters relate to the focal issues of urban planning identified in the analysis of Istanbul's regional dynamics before the objectives were set in section 2.1., such as economic diversity and empowerment, social spatial justice, earthquakes and disasters, issues related to public space, and climate crisis and ecology (all centered around transportation and infrastructure).

Aspects relating to the attractiveness and comfort of a space included walkable environments, well-maintained and clean sidewalks, ample room for pedestrian movement, and the presence of natural landscape elements, visually appealing scenery, buildings or artifacts of historical or aesthetic relevance, and works of art (Krambeck and Shah, 2006). It is thus understood that the attractiveness and comfort parameters are both related to several broader topics, among them cultural heritage, public space, the climate crisis and ecology, and economic diversity and empowerment.

Pedestrian safety in a walkable environment is a vital element of walkability. Measures that can be taken to increase physical safety include taking into consideration the width and closure of the street; placing limits on vehicular speed; installing speed bumps on roads; separating vehicular and pedestrian traffic where appropriate; and creating safe pedestrian crossings where necessary (Lambert, 2005; Southworth, 2005). Walkability is itself affected by perceived safety levels, as areas with higher perceived safety are themselves more walkable. As such, the security parameter can be considered to be related to the social spatial justice and public space focal issues.

The quality of the pedestrian network is related to the physical design of the streets themselves and aims to increase each pedestrian's comfort levels in the public space. 'Unhindered movement 'refers to the ability of people of all ages and capabilities to walk without interruption in a space (Duany et al., 2010). Walkable environments require pedestrian access networks to be directly linked to various modes of transport, including non-motorised transportation vehicles, public transport (such as buses, minibuses, trains, trams, etc), and private transport The pedestrian network parameter is related to the focal issues of social spatial justice, public space, and earthquakes and disasters.

Since street texture quality directly affects walkability (Southworth and Owens, 1993), walkability can be evaluated according to different types of street texture. Grid-iron street texture provides the easiest movement to vehicular and pedestrian traffic (Southworth and Owens, 1993), because by providing robust connections, it offers opportunities for shorter periods spent traveling, as well as a multitude of alternative possible routes. Modified-grid street textures make possible the integration of all transportation modes with regards to ease of movement (Duany et al., 2010). On the other hand, curvilinear street textures provide a limited number of connections, intersections, and access points, so even though they offer advantages in the arenas of security and privacy, their walkability capacity is relatively low (Southworth and Owens, 1993). Like pedestrian network quality, street texture quality is related to the focal issues of social spatial justice, public space, and earthquakes and disasters.

The connectivity of the road network is related both to the continuity of the street texture and pavements (Kolody, 2002). Connectivity can be ensured or enhanced by making available uninterrupted alternative routes between any two given destinations for pedestrians, cyclists, and disadvantaged groups (Litman, 2016). Road network connectivity is most strongly related to the focal issue of social spatial justice. Open space systems can improve walkability when connections between natural areas, local areas, and gathering places are combined with a strong street network that offers pedestrian access and good quality of roads (Southworth, 2005). The provision of uninterrupted movement for pedestrians and introduction of open areas on sidewalks, e.g. by offering pedestrian road continuity and freedom from physical obstacles, also increase the walkability levels of the space. Participating in activities and accessing public spaces and gathering areas through walking play a vital role in enhancing social life and creating a livable environment, which in turn increases walkability (Montgomery, 1998). Road network connectivity is most closely related to the focal issue of social spatial justice.

Lastly, an important element of livable and walkable environments is reliable access to meeting areas and spaces that involve public services (Lotfi and Koohsari, 2009). As Jacobs (1995) and Southworth (2005) noted, measures of accessibility include access to

education, health, administrative and religious service areas, meeting and public gathering places, public transport and parking facilities within a maximum of 800 meters (i.e., walking distance), and uninterrupted access to the above via the pedestrian network. In order to provide orientations, both permeability and readability are necessary, where permeability refers to the degree of physical and visual access provided by an environment to people, and readability indicates the extent to which a person can cognitively understand any given urban environment's plan (Lynch, 1960; Carmona et al., 2010). A space can be said to be successful in terms of orientations if its users can make a mental map through its urban elements (Lynch, 1960); street patterns that involve short and direct route possibilities provide both high permeability and high readability (Kolody, 2002). Accessibility can be considered to be related to the focal issue of social spatial justice.

By achieving accessibility and walkability, a multiplier effect will be observed across several other areas, such as economic diversity and empowerment, social spatial justice, earthquake and disasters, matters relating to public space, and the climate crisis and ecology, all shaped around transportation and infrastructure.

Once the importance of accessibility among the Walkability parameters was once again understood, accessibility needs were identified (figure 2.).

The next section describes the methodological approach that would facilitate the definition of the planning process, including the spiral interrelationships of the entire process described so far, from the identification of Istanbul's regional dynamics to the dentification of accessibility needs.

Figure 3. Walkability in Relation to Different Dimensions and Accessibility

2.3. The Relational Wheel: A Comprehensive Approach to Urban Planning

Urban systems are complex, interconnected entities by definition, with multiple different stakeholders playing individual roles in their overall cohesiveness. It therefore stands to reason that urban planning should as a field adopt a multidimensional, dynamic approach to devising methodologies that can be used to further the creation of equitable, fair, and sustainable urban systems. However, traditional urban planning has had a tendency to be too linear to accomplish this goal, leading to a narrow-minded view of its goals and the pertinent analyses that need to be undertaken in order to accomplish them. By way of response to these issues with the field, the Relational Wheel method offers a modern, holistic approach to urban planning in general, and the issue of accessibility specifically, based in this case in the region of Istanbul. Providing accessibility offers a multiplier effect, in that as a byproduct of achieving accessibility, several other goals will be achieved as well. To that end, seven goals were devised by examining Istanbul under the lens of crucial urban planning focal issues, namely: economic diversity and empowerment, social spatial justice, earthquake and disasters, matters relating to public space, and the climate crisis and ecology.

The Relational Wheel, at its core, is a graphical representation of the relationships between these seven goals, core accessibility needs, focal issues in the field of urban planning, the stakeholders that have a role to play in achieving accessibility, and the analyses that need to be undertaken in order to make the realisation of accessibility—and, as a consequence, the other seven key goals—a reality. It also makes clear the aforementioned multiplier effect realised by achieving accessibility, in that by making urban systems truly accessible, there will be a significant knock-on impact throughout multiple other elements of those urban systems, such as stakeholders, focal issues, and core needs.

Core accessibility needs encompass a wide range of urban components, each of which is vital to a functioning urban system. A few examples of these components include services (such as markets, health services, and community gardens); wellness needs (like affordable housing, safe public spaces and streets, and job opportunities); and infrastructural elements (e.g. hospitals, schools, and public transport). Providing accessibility necessarily means ensuring equal and fair access to all of these core resources for all residents, irrespective of their socio-economic conditions or physical capabilities. The core accessibility needs can also be broadly grouped under the focal issues that were initially used to define the seven main goals.

Another key element of the Relational Wheel lies in defining the methods different actors will use in the stages of decision-making, implementation, monitoring, and evaluation. Decision-making is made easier by highlighting which core accessibility needs must be taken into consideration (by moving horizontally from the stakeholder in question

inwards towards the first concentric circle of the wheel). With regards to the implementation of specific analyses (which are themselves defined in the outer ring of the Relational Wheel), it becomes immediately clear where that work should take place by looking at the additional elements included between the final ring and the seven key goal bubbles. Stakeholders can also understand which other stakeholders they may need to interface with in order to achieve their goals by looking at the other actors in their segment. Finally, to help each stakeholder better understand how to monitor and evaluate the consequences of the analyses they undertake, each of the key goal bubbles includes a series of consequences that will have occurred as a result of having accomplished the main goal.

As an illustrative example, consider the challenges required in making the 'healthy and affordable housing for all' accessibility need a reality, which is related to the social spatial justice focal issue. One example of a stakeholder involved in making this possible is a corporate housing administration, which needs to work with several other related stakeholders to perform an analysis of inequality in transportation on the relevant parameters (transportation facilities, gender equality, safety, etc) to identify areas of intervention. In the identified areas, implementing interventions to address the accessibility need for 'healthy and affordable housing for all' will ensure the accomplishment of the more general goal of ensuring equal and fair access to transportation and infrastructure services for all segments of society. As part of this analysis, key intervention areas will be defined, identifying where the greatest potential for improvement lies. Lastly, as a consequence of having achieved this goal, the intervention area in question will experience higher levels of visibility, safety, equality, environmental justice, etc. (Figure 4.)

The Relational Wheel, therefore, isn’t merely a graphical representation of the multifaceted, interconnected nature of complex urban systems; it also provides a modern, comprehensive framework for key stakeholders to streamline the decision-making process, reduce collaborative friction, and maintain a holistic view of the consequences of providing accessibility. As it is based on two core features of the recent strategic spatial planning methodology, namely the communicative rationality paradigm and relational geography, the Relational Wheel may offer certain advantages over traditional, linear urban planning decision-making processes.

Finally, the relational wheel has a structure that can adapt and transform according to the local context. By considering the local dynamics of different cities, the content of the relational wheel can be reshaped and adapted to the city's planning process by including stakeholders, parameters, spatial analysis, etc. that are specific to that city.

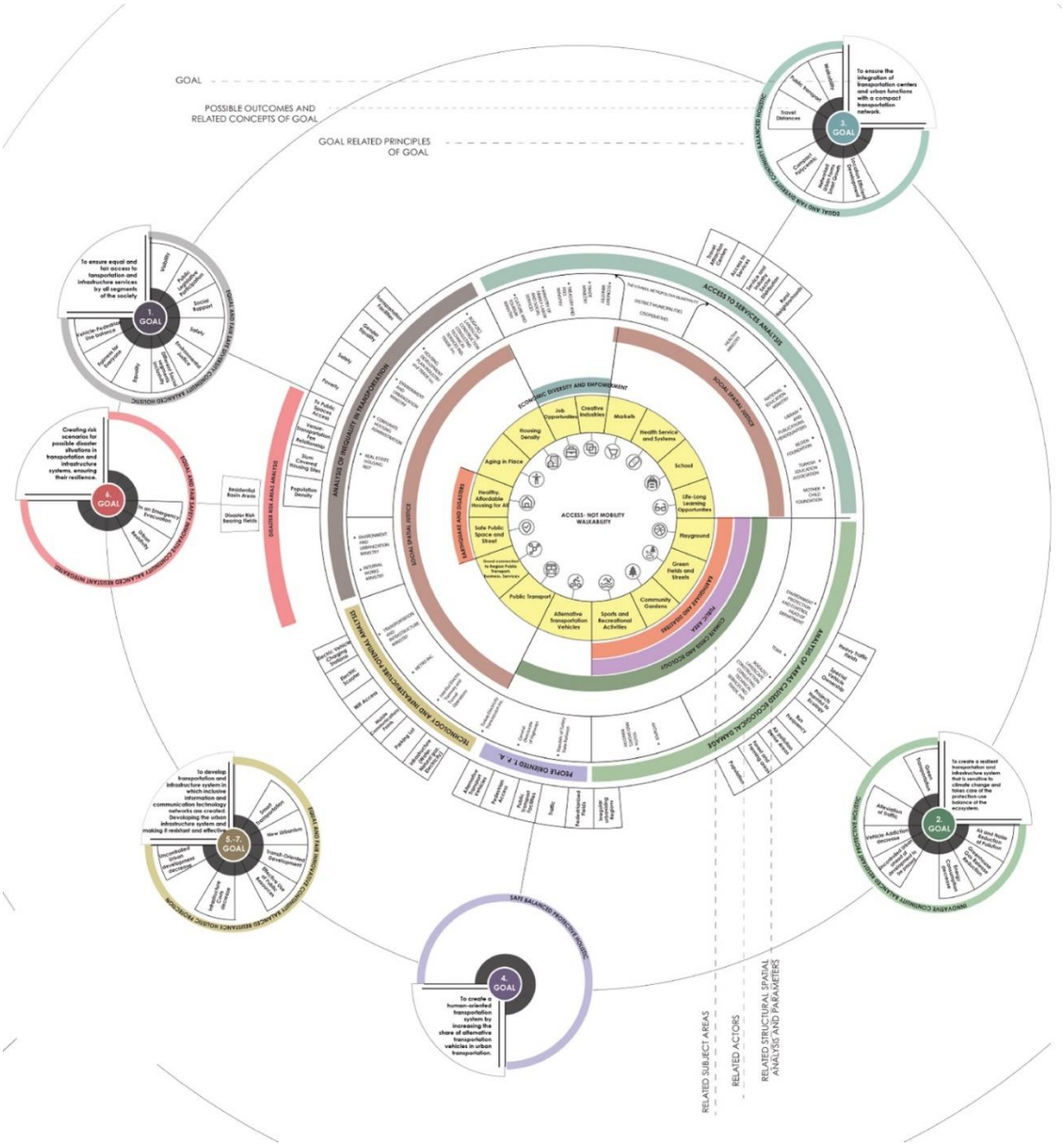


Figure 4. The Relational Wheel

3. Conclusion

Over time, planning has shifted focus from being rational to being communicative in nature. This paradigm shift has resulted in the emergence of the spatial strategic spanning approach, which can be defined as constituting elements of relational geography, participatory planning, establishing horizontal and vertical relations, flexibility, long-term,

inclusive, holistic, collaborative, process-oriented (Albrechts, Healey, and Kunzman, 2003).

By working within the holistic framework of the spatial strategic planning approach, it has been understood that a wide range of issues cannot be considered separately, i.e. unbalanced and unjust transportation and infrastructure, earthquake and disaster risk, insufficient economic diversity, and matters related to public space must all be examined together, especially in the case of multi-layered cities such as Istanbul.

The above elements of the spatial strategy plan were used as a tool for ensuring accessibility in Istanbul. The first stage of the study involved determining seven general objectives for the city; once they had been defined, the situation determination phase began, and special spatial analyses related to the theme behind each objective were carried out. The synthesis sheet itself was created using an overlapping method, and intervention areas for the city were determined at the neighborhood scale and prioritised via a grading system (first, second, and third-grade).

Having carried out the analyses and a review of the relevant literature, a correlation was determined between walkability and other dimensions, and it was determined that the most fundamental parameter was accessibility (Alfonzo, 2005). Ensuring accessibility would create a multiplier effect, and as such it was identified as an important tool in ensuring sustainability. Because different focal issues exist in an interconnected relationship with each other, these 'spiral' relationships must be established in every planning process, and any final planning decisions must respond to these relationship networks and offer solutions to more than one problem.

The second main stage of the study involved identifying 17 needs by discussing which facilities were necessary to ensure accessibility. By using the collective structure of the spatial strategy plan, professional fields and institutional stakeholders related to these topics were identified; and by using the flexibility of the spatial strategy plan as a methodological approach, a Relational Wheel that can adapt and transform depending on local context was devised. The Relational Wheel was created to illustrate the relationships between access needs, the fields of study those needs are the subject of, the institutions that should work on these issues, the analysis methods they will use, the outcomes they might obtain when they complete their work, the relationship of these outcomes to the initial objectives.

The Relational Wheel, in using features of strategic spatial planning, further emphasises the following concepts:

- Especially in complex metropolitan urban systems such as Istanbul, an integrated planning approach must be developed, taking into account the social, cultural,

economic, and organisational development strategies of the city as well as the physical development of the city, keeping the focus all the while on the living space

- Relational Wheels, the coordinated work of decision makers and other stakeholders, and the influence of local collaborations and organisations emphasise the importance of adapting to the multidimensional structure of the city
- The selectivity of strategic spatial planning, its focus on what really matters, is reminiscent of Lindblom's progressive planning model. In the method developed based on the progressive planning model, it is emphasised that the problem should be solved by considering the parts rather than the whole so that the interventions are more effective (Göksu, 2008)
- The Relational Wheel focuses on concepts of relational space and place, focuses on relations and processes (as individuals play different roles in different networks), brings together actors in arenas located at the intersections or nodes of relational networks, and establishes new relationships, including in the political system. As such, the developed method will contribute to increased individual and collective potential, encounter solutions to problems, and force structural change to take an active part in the multifaceted planning, decision-making and implementation processes.
- In order to break the dominance of the technical bureaucratic vision, which closes off the future from other possibilities, the processes involved in creating a collective vision become clear.
- Instead of focusing only on integrating objects and functions, the developed method also focused on the process, describing horizontal integration between administrations and vertical integration between spatial scales
- An action-oriented plan process is defined that clearly states the need for effective links between political authorities and active stakeholders. What is meant here is not merely the presupposition that a plan will be implemented in its own accord, but that the plan should be considered as one of the tools that can provoke or influence change

Employing the Relational Wheel also revealed that accessibility is a crucial element among a wide range of problems, and that by tackling the issues related to providing accessibility, planners will necessarily address interrelated problems, thus creating a multiplier effect in the future. Furthermore, the Relational Wheel highlighted the flexibility of the spatial strategy plan, its adaptability to the complex structure of a city, and its potential to be an important tool in ensuring sustainability.

Acknowledgments. I would like to express my deepest gratitude to the lecturers of the fourth-year Project course of the 2021-2022 academic year at Mimar Sinan Fine Arts

University Department of City and Regional Planning for their guidance and insights throughout this research. Their expertise and knowledge were invaluable during this study. The data collected by the students on understanding the regional dynamics of Istanbul has been used in this study, I would also like to thank the students of the 2021-2022 fourth year Project course for their contributions.

References

Albrechts, L. (2004). Strategic (Spatial) Planning Reexamined. Environment and Planning B: Planning and Design, 31, pp.743-758.

Albrechts, L., Healey, P., Kunzman, K. (2003). Strategic Spatial Planning and Regional Governance in Europe. Journal of the American Planning Association, 69, pp.113-129.

Alexander, E. (1996). After Rationality: Towards a Contingency Theory for Planning. In: Mandelbaum, S., Mazza, L., Burchell, R. W. (eds.), Explorations in Planning Theory. Center For Urban Policy Research, New Jersey, pp.45-64.

Alfonzo, M. A. (2005). To Walk or not to walk? The Hierarchy of Walking Needs. Environment and Behavior, 37(6), pp.808-836.

Allmendinger, P. (2000). Planning in a Postmodern Age. Florence, KY, USA: Routledge.

Blotevogel, H. H. (1999). Rationality and discourse in (post) modern planning. In: Salet, W., Faludi, A. (eds.), The Revival of Strategic Planning Proceedings of the Colloquium. Amsterdam: Royal Netherlands Academy of Arts and Sciences.

Boswell, M. R. (2000). Redefining Environmental Planning: Evidence of The Emergence of Sustainable Development and Ecosystem Management in Planning for The South Florida Ecosystem. Unpublished dissertation, Department of Urban and Regional Planning, Florida State University, College of Social Sciences.

Carmona, M., Heath, T., Oc, T., Tieldesll, S. (2010). Public Places– Urban Spaces. Oxford: Architectural Press.

Duany, A., Speck, J., Lydon, M. (2010). The Smart Growth Manual. United States of America: McGraw-Hill.

Ersoy, M. (2007). Kapsamlı Planlama Kavramının Tarihsel Gelişimi ve Bugünü. In: Ersoy, M. (ed.), Kentsel Planlama Kuramları. Ankara: İmge, pp.115-170.

Forester, J. (1988). Rationality, Dialogue and Learning: What Community and Environmental Mediators Can Teach us about the Practice of Civil Society. In: Douglas, M., Friedmann, J. (eds.), Cities for Citizens. London: Wiley.

Forsyth, A., Southworth, M. (2008). Cities Afoot— Pedestrians, Walkability and Urban Design. Journal of Urban Design, 13(1), pp.1-3.

Friedmann, J. (1993). Toward a non-Euclidian mode of planning. Journal of the American Planning Association, 59(4), pp.482-485.

Friedmann, J. (2004). Strategic spatial planning and the longer range. Planning Theory & Practice, 5(1), pp.49-67.

Gehl, J. (1987). Life Between Buildings: Using Public Space. New York: Van Nostrand Reinhold.

Göksu, S. (2008). Stratejik Mekânsal Planlama ve İlişkisel Coğrafya Üzerine Düşünceler. Planlama Dergisi, 2008(3), p.21.

Graham, S., Healey, P. (1999). Relational concepts of space and place: Issues for planning theory and practice. European Planning Studies, 7(5).

Gualini, E. (2005). Reconnecting Space, Place, and Institutions: Inquiring into "Local" Governance Capacity in Urban and Regional Research. In: Albrechts, L., Mandelbaum, S. J. (eds.), The Network Society: A New Context for Planning. London: Routledge, pp.284-306.

Habermas, J. (2001). İletişimsel Eylem Kuramı. İstanbul: Kabalcı Yayınevi.

Healey, P. (1996). Planning Through Debate: The Communicative Turn in Planning Theory. In: Campbell, S., Fainstein, S. S. (eds.), Readings in Planning Theory. Blackwell, pp.234-257.

Healey, P. (1997). Collaborative Planning: Shaping Places in Fragmented Societies. Vancouver: UBC Press.

Hildebrand, F. (1999). Designing the City: Towards a More Sustainable Urban Form. London, New York: Spon Press.

Innes, J. E. (1995). Planning Theory's Emerging Paradigm: Communicative Action and Interactive Practice. Journal of Planning Education and Research, 14(3).

Jabareen, Y.R. (2006). Sustainable Urban Forms: Their Typologies, Models, and Concepts. Journal of Planning Education and Research, 26, pp.38-52.

Jacobs, A.B. (1995). Great Streets. Cambridge, Massachusetts: MIT Press.

Kolody, A.D. (2002). Planning for Physical Activity, The Need for Comfortable and Convenient Pedestrian Movement in the Urban Form. Unpublished master's thesis, The University of Calgary, Calgary.

Krambeck, H., & Shah, J. (2006). The global walkability index: talk the walk and walk the talk. Paper presented at the Better Air Quality Conference (BAQ).

Lambert, K. (2005). A Critical Evaluation of Livability in Garrison Woods. Unpublished master's thesis, University of Calgary, Calgary.

Lotfi, S., Koohsari, M.J. (2009). Analyzing Accessibility Dimension of Urban Quality of Life: Where Urban Designers Face Duality between Subjective and Objective Reading of Place. Social Indicators Research, 94(3), pp.417-435.

Lynch, K. (1960). The Image of the City. Cambridge, Massachusetts: The MIT Press.

Mazza, L. (2000). Strategie e strategie spaziali. Territorio, No. 13. Milan: FrancoAngeli.

Newman, P.W.G., Kenworthy, J.R. (1996). The Land Use-Transport Connection - An Overview. Land Use Policy, 13(1), pp.1-22.

Sager, T. (1994). Communicative Planning Theory. Aldershot: Avebury.

Sartorio, F. S. (2005). Strategic Spatial Planning: A Historical Review of Approaches, Its Recent Revival, and an Overview of the State. DisP-The Planning Review, 41(162), pp.26-40.

Southworth, M. (2005). Designing the Walkable City. Journal of Urban Planning and Development, 131(4), pp.246-257.

Southworth, M., Owens, P.M. (1993). The Evolving Metropolis: Studies of Community, Neighborhood, and Street Form at the Urban Edge. Journal of the American Planning Association, 59(3), pp.271-287.

Yiftachel, O. (1989). Towards a New Typology of Urban Planning Theories. Environment and Planning B: Planning and Design, 16, pp.23-39

NAVIGATING THE GANGES: EXPLORING THE ROLE OF INLAND WATER TRANSPORT IN ENHANCING ACCESSIBILITY, AFFORDABILITY AND ACCEPTABILITY IN VARANASI (1138)

Shivangi Singh[1*], Karan Barpete[1]

[1] Department of Urban Planning, School of Planning and Architecture, Delhi, India; [*]shivangisingh2507@gmail.com

Abstract. As the world population continues to grow, increasing congestion on road and rail transport systems in urban areas demands to explore alternative modes of transportation. Inland water transport (IWT) is one such mode with potential to alleviate congestion and provide additional mobility options for urban residents, but its citizen acceptability has been a major challenge.

This research paper examines the potential of IWT as a viable passenger and freight transportation option in the city of Varanasi, India. Through mixed methods approach, it correlates various impact factors such as transit nodes, land use, tourism, environmental factors, and citizen acceptability in terms of accessibility and affordability.

This research highlights the importance of addressing urban infrastructural challenges, when planning for IWT, and provides insights for urban planners and policymakers to explore River Ganges as a transportation corridor.

Keywords: Water Transport, accessibility, affordability, linkages.

1. Introduction

Inland Water Transportation is an inter-modal transportation for moving goods and passengers through water network. Water Transport is one of the oldest modes of Transport. Since ancient civilisations, water transport was widely used in India. From Mauryas and Guptas Era to the Colonial Era, need of moving bulky goods to the ports the inland water transportation developed until Industrial Revolution. During the revolution, Rapid Urbanisation, Slower vehicle speed, lack of Innovation gave a major blow to Development of Inland Water Transport. With the increasing demand of alternative transport modes to achieve sustainability, Water transport has come out as a preference due to many reasons, be it low emissions, reducing congestion, being comparatively cheaper etc.

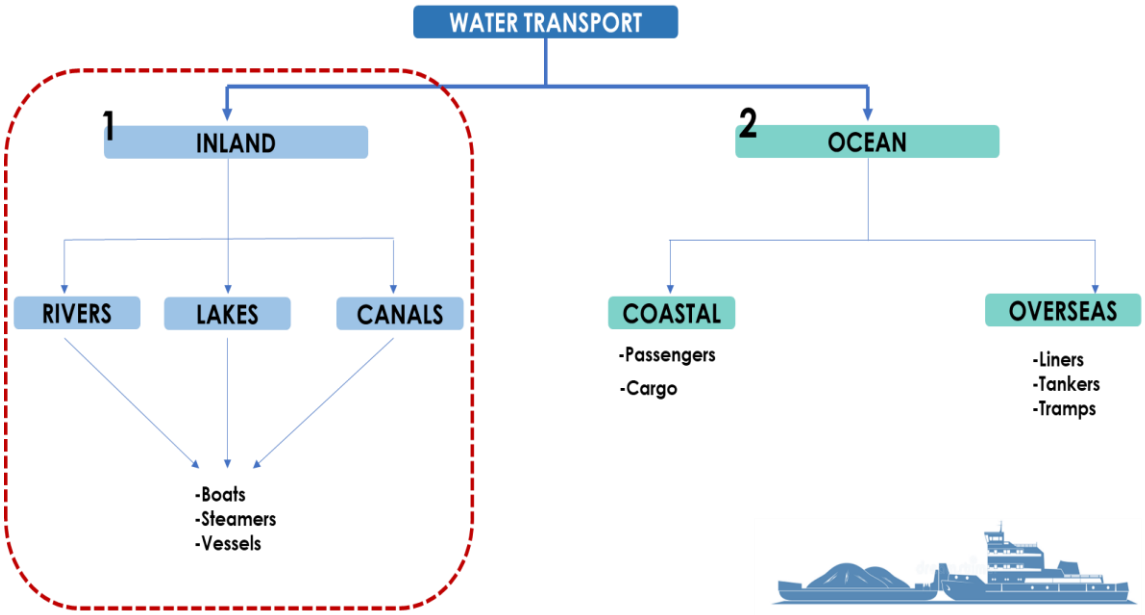


Figure 132. Flowchart showing Water Transport typology

Source: Author

1.1. Problem Statement and Need of the Research

Ever since the Water channels started being exploited for transportation purposes in various countries across the globe, there are major planning challenges that needs to be addressed with respect to the dynamic urban growth pattern corresponding to different geographies. European cities like Venice (Italy), Amsterdam (Netherlands), Lucerne (Switzerland) etc. have utilized the Water Transport better than Asian cities due to geographical advantages and thus improving citizen's acceptability for IWT as a mode.

In populated countries like India where urbanization rate is 35-36% (India@100 Report by IFC), and limited infrastructure, there are various planning challenges that impact the accessibility, affordability and acceptability of Inland Water Transport in cities. The mismatch between Urban Development and transport arteries, Variation in degree of dependence on water in different cities etc. are some of the issues that impact the acceptability (Hoyle et. al., 1993). This research hence, aims to address such issues affecting the citizen's acceptability in Indian Scenario in Varanasi, India.

1.2. The Case City: Varanasi, India

Varanasi, one of the oldest cities which is also Banaras or Benares or Kashi is a city on the east of Ganges River in the Purvanchal region of Uttar Pradesh in India. The city is also called Cultural City of India. It is also the headquarters of the Varanasi Division which

contains 4 districts (including Varanasi). The city is known worldwide for its many ghats. The city with a huge tourist potential has a very good connectivity in terms of transit stations. It is connected by air through one international airport namely Lal Bahadur Shastri International Airport. For Railways, it is connected via three railways stations i.e., Varanasi Cantt. Railway Station, Banaras Manduadih Railway Station and Kashi Railway Station. The city has only one bus terminal at present. For Waterways, the city has one IWAI Terminal located on National Waterway-1 and India's first Multi-Modal Terminal to be set up in Ramnagar across Assi Ganga Ghat.

However, the existing Public Transport is found to be congested in the city. The Bus Service Load Factor is more than 1.5 which proves the saturation of Road ways. The PCU count is more 5000 along the major roads. The V/C Ratio is more than 2 on certain networks and especially within Old City Area. Thus, to solve the problem of congestion on roads and in public transport, The Master Plan of Varanasi proposes alternate mode of Transport like Metro, Electric Buses, Ropeway and Inland Waterways being one of the alternate modes has its own impact on the Urban Scenario which needs to be studied in detail and suitable recommendations can be made.

2. Aim & Objectives of the Research

This aim of this research is "To *strategize planning for maximising the acceptability, accessibility and affordability of inland water transport (IWT) in Varanasi*."

The objectives of the Thesis are as follows:

a) To assess the existing conditions of Inland Waterways in Varanasi w.r.t Feasibility, pollution, Land use, tourism, public & freight transport etc.

b) To identify and analyse significant parameters for increasing the accessibility and acceptability though integrating the existing modes with inland waterways in Varanasi.

c) To identify the infrastructural requirements of various waterway vessels and routes.

d) To develop planning strategies for Inland water transport to maximize the service potential.

3. Data Collection and Methodology

Based on the Indicators identified in various literature reviews, Various indicators have been identified for the research to analyse the feasibility of Inland Water Transport and the scope of improving the accessibility and affordability of IWT service. For analysing the indicators, both secondary and primary data were collected from different sources such as Kashi Geo Hub Portal, Varanasi Development Authority, RITES, Department of Transport Planning, School of Planning and Architecture, New Delhi etc.

The methodology consists of analysing selected parameters using qualitative and quantitative methods like spatial analysis using GIS and in depth analysis of user survey done in the city.

3.1. Data Analysis

Analysis Framework: For the analysis of Inland Water Transport in Varanasi, the framework has been divided into three major parts namely Operability, Existing scenario and Accessibility analysis has been done. The parameters have been identified under each head and hence been mentioned in the figure given below.

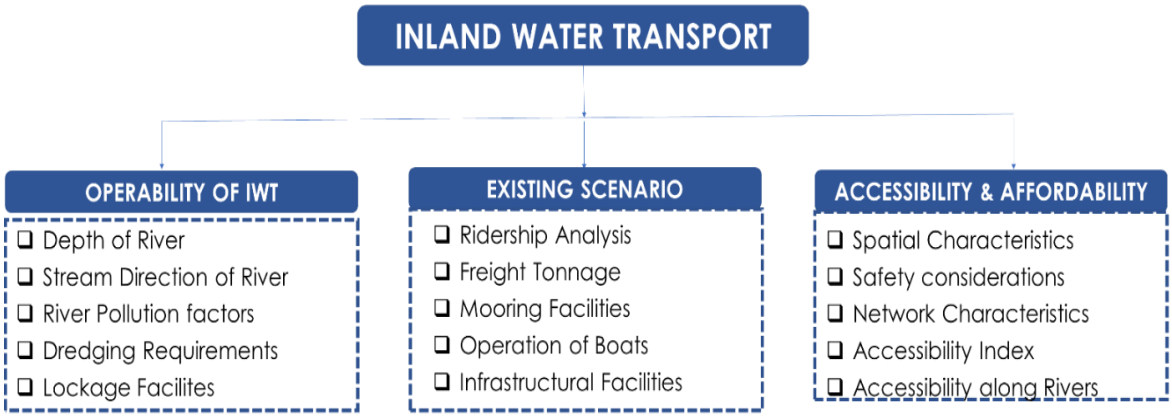


Figure 2. Figure showing parameters Analysis
Source: Author

3.1.1. Operability of Inland Water Transport in Varanasi

The rivers in Varanasi have already been assigned three waterways namely National Waterway-1 for Ganga, National Waterway 108 for River Varuna and National Waterway 12 for River Varuna. However, for operation of Inland Waterways, the river channel shall have a depth of minimum 2 m. Thus, the Viability of IWT operation on River Varuna and Assi was checked by IWAI and it was found that River Varuna is feasible for IWT operation whereas River Assi is not found suitable for the same due to the Depth and width required.

*Feasibility of IWT along River Varuna***:** The Varuna River is a minor tributary of the Ganges River in Uttar Pradesh, India. It originates at Phulpur in the Prayagraj district and merges into the Ganges near Sarai Mohana in the Varanasi district.. The river has an Optimum width of 40-45 m along the whole stretch in Varanasi Urban Area. It also maintains an optimal depth throughout the seasons for operation of Class I Inland Water Transport without any dredging requirements. 52 percent of the stretch has been found feasible for the same purpose.

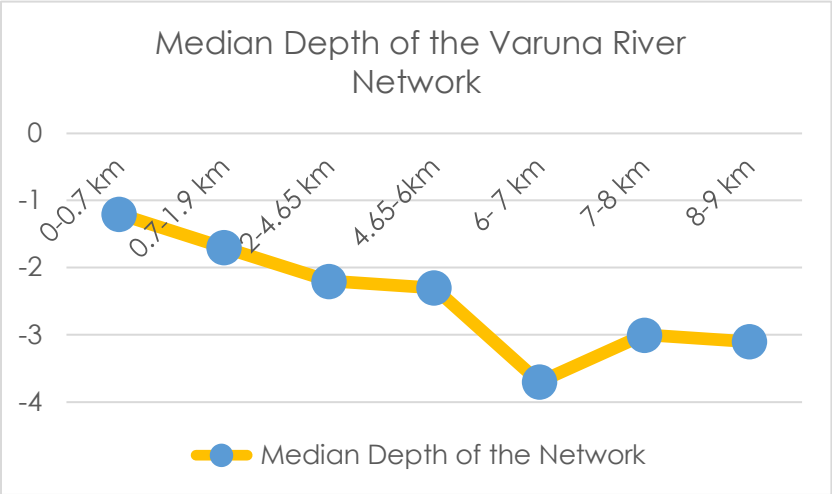


Figure 4.34 Depth of River Varuna along its chainage in Urban Area

Source: IWAI

Feasibility of River Assi: The total 5.5 km length of the river flows through the Varanasi city. Assi River is carrying drainage & sewage waste to Ganga. Numerous narrow nallas are being conjoined to Assi with untreated waste, for which the river is called as Assi Nala. The 6- to 10-meter-wide river confluence at Assi Ghat, which has historical values. Assi Ghat is the southernmost Ghat in Varanasi, where pilgrims bathe before paying their homage to Lord Shiva in the form of huge lingam.

However, when IWAI surveyed the stretch, the river was oud unsuitable for IWT operation. Even the River width was not suitable for the said purpose. It would require huge amount of dredging for seasonal operations. Hence, it has been scoped out of our study.

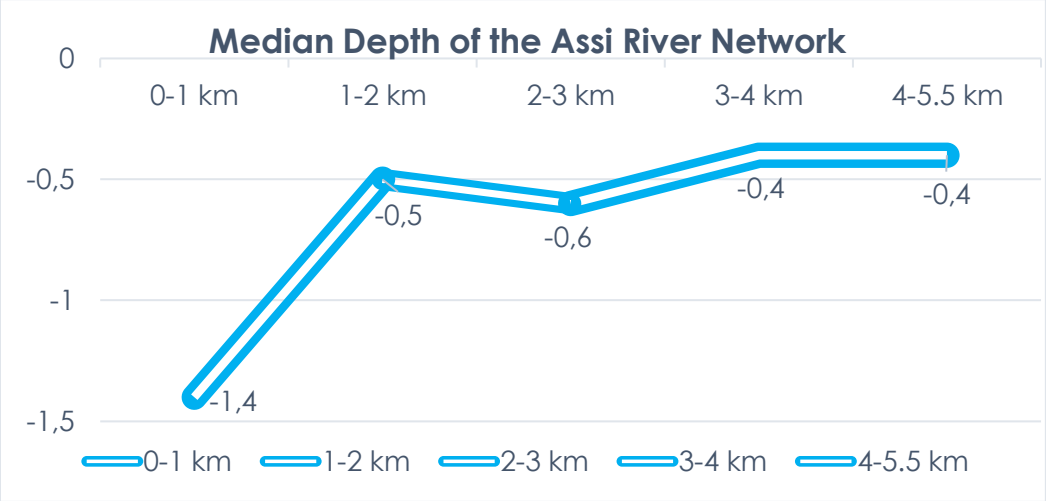


Figure 5. Depth of River Assi

Source: IWAI.

3.1.2. Existing Scenario of Inland Water Transport along Ganga

The Water Transport along Ganga is one of the oldest in India. Since ancient times, people have been using Water Transport for religious purposes and recreational purposes. Hence, there is optimal ridership in the water transport along Ganga in Varanasi. At present, with around 800 boats being operated in the city and a ridership of approximately 45000, the stretch is one of the busiest stretches of Ganga.

The Stretch is also used for Freight Transport. Varanasi has only one Freight Terminal at Raj Ghat identified by Inland Waterway Authority of India as a part of National Waterway I, The City of Varanasi has a variety of freight commodity which comprises of Food Grains, Silk, Handicrafts and General Commodities. The city has four major industrial areas producing different items and is also in close proximity with Ramnagar Multi-modal Transport and Ramnagar Industrial Area. As per RITES, The Freight carriage from Varanasi is 1.2 million tons per year which is projected to increase up to 2.5 million tonnes in the year 2031-32.

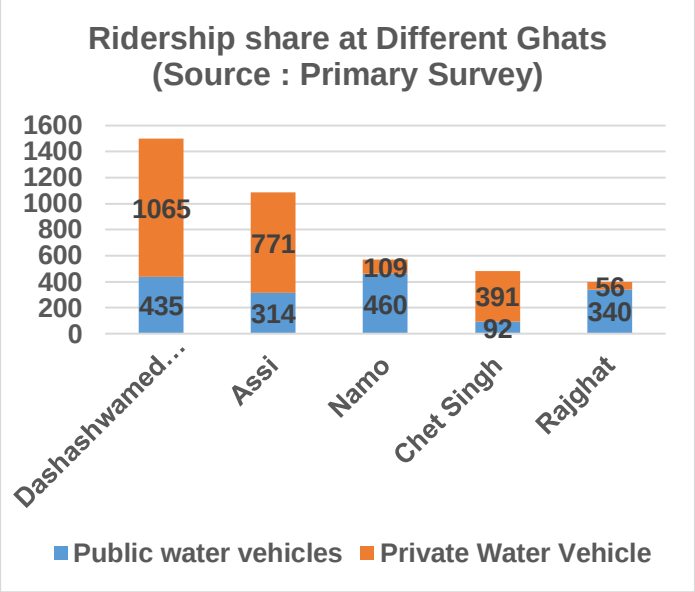


Figure 635. Ridership share at different Ghats along Ganga

Source: Primary Survey.

Despite of so many resources, 98 percent of the ridership share belongs to tourists. Only 2 percent of the riders are using the water transport for non-recreational purposes and facing the congestion on road. Out of the tourists also, majority of the tourists utilize it for religious/pilgrimage purposes as it can be seen in Figure 19. It is also used for crossing River from Cities like Mughal Sarai, Chandauli. It is also used for mobility along the river commute from districts like Ghazipur, Bhadohi, Jaunpur etc.

Along Ganga, the ridership share varies and it depends on the Ghats. Only the Tourist Ghats like Dashashwamedh Ghat and Assi Ghat has the highest ridership share per day. In terms of the Ownership of the water transport vehicle, The Public Vehicle share is also more at the newly built Ghats than the heritage Ghats. The heritage Ghats still has the maximum number of Vehicle and private ownership. This implies that the usability of private vehicles is more than that of public vehicles.

Private Water Transport Vehicles in Varanasi are sufficing the demand supply gap and are manually operated which is comparatively time taking. Also, Diesel run vehicles are contributing to the sustainability issue. Thus, There is an effort from the government to convert the diesel run vehicles into CNG which will be cheaper and sustainable in terms of operation. Currently, 53 percent of the Boats are manually operated and only 11 percent are operated by CNG.The Water Transport system in Varanasi is one of the disorganized sectors, Due to which there has been issues with mooring spaces along the Ghats. Everyone wants to park their boats in front of the tourist ghats leading to chaos along the ghats.

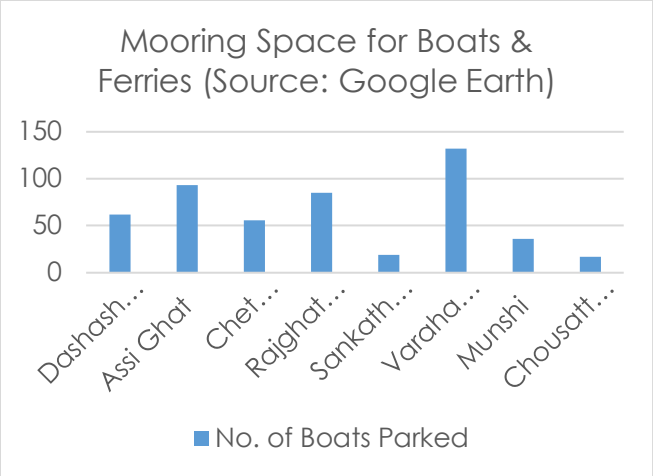


Figure 736. Mooring Space for Boats along Ghats

Source: Primary Survey.

3.1.3. Infrastructural Facilities along Ghats

Despite of an existing waterway system in Varanasi, its usage is restricted only to tourists. And the citizens are not utilizing it to its maximum potential. This issue is due to the absence of infrastructure along the Ghats of Ganga. There is a huge shortage of modal integration facility along major Ghats of Varanasi like Non-Motorized Transport access route to the area. 90 percent of the Ghats have access route of ROW less than 10 metres. Access route to the Ghats having road width more than 12 metres have encroachments of Informal sector along the Ghats. 56 of the 84 Ghats have encroachments by the informal sector along the Ghats. The lack of pedestrian paths or footpaths are also a major accessibility issue. Apart from the connectivity issues, there is also lack in Maintenance, Repair and Operations facility along the Ghats for the boats terminating there. There are also Lack of Basic amenities like Washrooms, Drinking Water facility, Waste management system along access routes to Ghats.

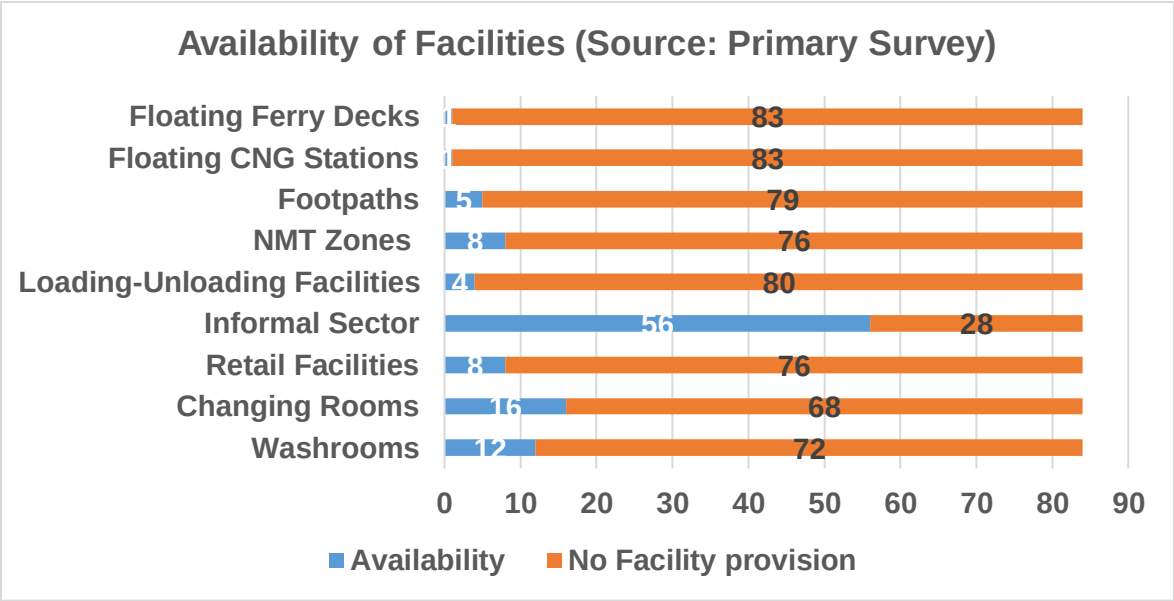


Figure 837. Infrastructural Facilities along Ghat

Source: Primary Survey

3.1.4. Tourist Potential along Water Channels in Varanasi

Varanasi has a huge floating population in terms of tourists. As per the data provided by the Department of Tourism, Uttar Pradesh, The city had a total in flow 71 lakh tourists in the city. Out of which, 69 lakhs were domestic tourists and 3.5 lakhs international city flowing into the city for cultural studies and spiritual enlightenment purposes. The gradual growth of tourists in the city is shown in figure 26 and 27 below.

Most of the tourists utilizing Water Transport at present are the people whose tourism purpose is either pilgrimage or heritage. However, Tourists with different purposes also use water transport for recreation etc. If we see the map 2 given below, all the pilgrimage site are located near the bank of Ganga and in the old City area. Major Tourist destinations also lie along Water Channels and with 500 m buffer radial distance. Moreover, the very famous Panchkoshi Yatra also has its route along Ganga and Varuna. This implies, IWT can be effectively utilised for Tourism mobility in the city and it will also enhance the tourism experience in the city.

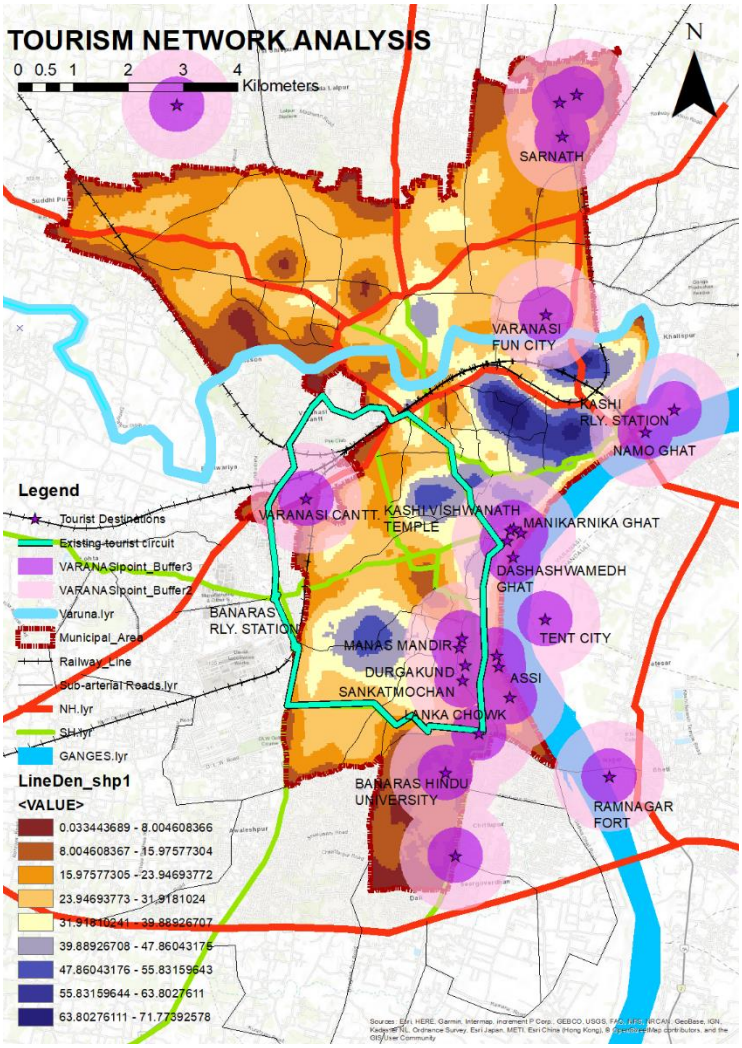


Figure 9. Map showing concentration of tourist sites near River network
Source: Author.

3.1.5. Spatial Character along the Water Channels in Varanasi

The spatial character along River Ganga is characterized by large built-up density and huge number of floating population inflow along the Ghats. The area is also characterized by narrow streets leading to most of the Ghats. The Densely built character along the ghats with only 3 percent undeveloped land creates Land management issue for any kind of redevelopment of Ghats and converting them into waterway terminals.

Since, there is not much development along River Varuna within Varanasi Municipal Boundary, the places have become a crime spot in absence of openness, crowd and Visibility along the water channel. This is a major issue related to User safety in the city which also affects the accessibility of the inland water terminals. In addition to this, the

spatial character of the spaces along river does not contribute to the user experience. Slums along water channel within the flood plains is responsible for deteriorating water quality and affects the accessibility adversely. Around 12 percent of the total area in slums are along or on water channels which is a major issue. The slums are a barrier to infrastructural provisions, abandons the sense of safety and people are unlikely to take such routes.

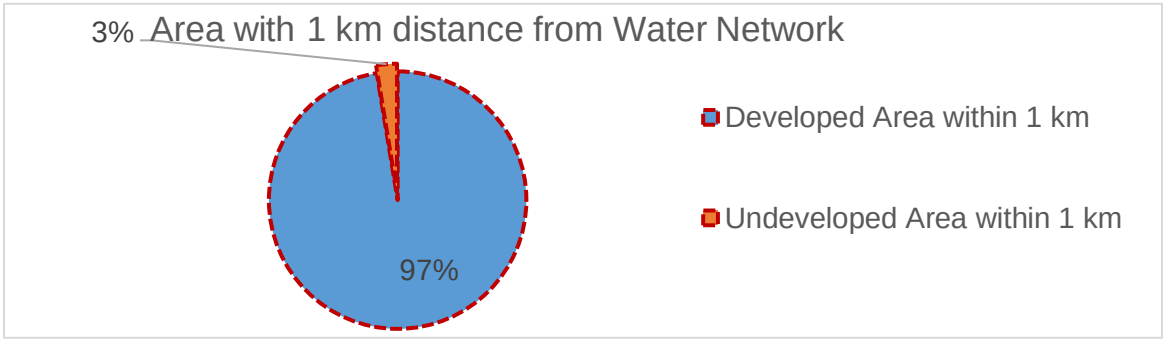


Figure 10. Pie charts showing Land use and Landcover along Water Channels
Source: Author.

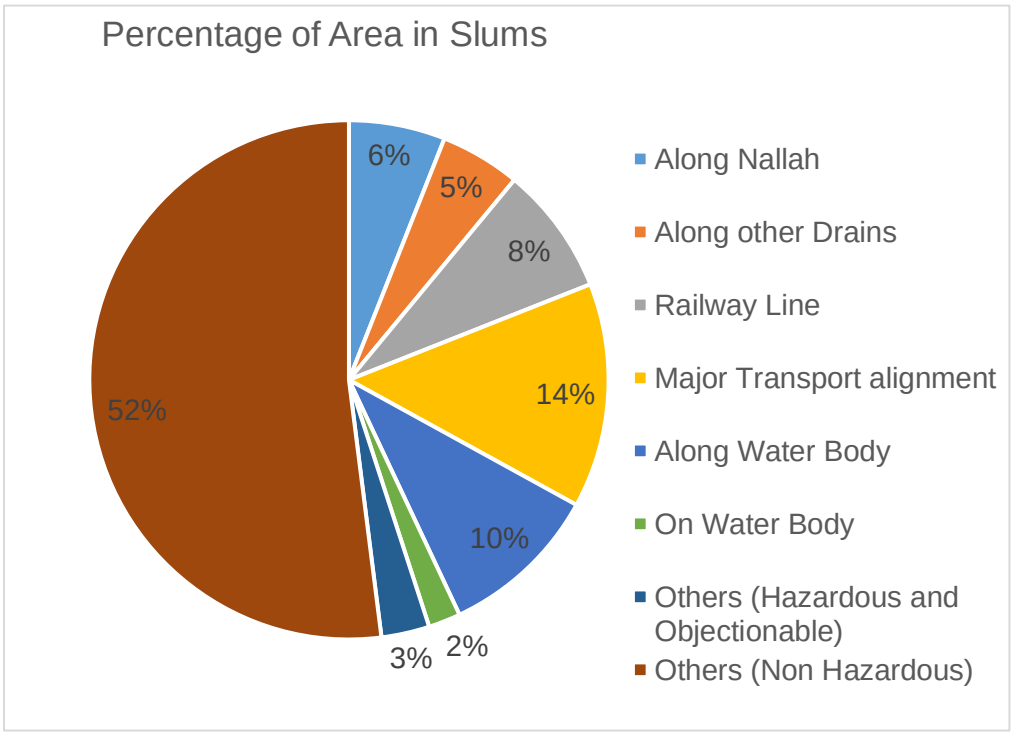


Figure 11. Pie chart showing percentage of area in slums
Source: Osmania University Survey, 2018.

3.1.6. Network Characteristics along water channels in Varanasi

Overview

The road network in Varanasi is characterized as narrow roads and heavy traffic leading to congestion on streets. The city has three railway stations namely Varanasi Cantonment, Banaras Railway Station located at Manduadih and Kashi Railway Station in the Old city area. Out of these three Varanasi Cantonment Railway Station is the busiest and Manduadih Railway Station is the recent one and hence the most technologically advanced. Since, Varanasi Cantt. Rly. Station is the busiest one it is also connected to the only intercity bus terminal in the city.

OD Location	Capacity	V/C Ratio
OD-1	3000	0.22
OD-2	2400	2.75
OD-3	2400	1.85
OD-4	2000	1.05
OD-5	3500	0.875
OD-6	2400	1.277
OD-7	1200	1.269

Figure 12. V/C Ratio along the OD locations

Source: Author.

The city of Varanasi has grown outwards towards the west using the crescent shape of the river Ganga. This growth was facilitated by the growing transport network in this direction. As we move outwards it is observed that road spaces and their hierarchy with respect to road design and function starts to emerge. There are only 4 signalized intersections in the city which is a major on-road safety issue leading to black spots. Apart from the signalized intersection, the existing road usage is not very effective and thus, the resulting congestion.

Congestion on Roads

The roads in Varanasi were found extremely congested. Since, the hierarchy of roads is not followed, even the arterial roads have width less than 18m. Thus, as per the survey conducted in 2022 by the Department of Transport Planning, SPA Delhi, seven OD cordon points were identified and the PCU was recorded. Then, the V/C Ratio was calculated and it was found that except for OD-1 which is located near Pandeypur and Sarnath, all the roads were found to be heavily congested having V/C Ratio greater than one. Maximum PCU was recorded from OD-2 which is the route from Mughal Sarai. Mughal Sarai or the Deen Dayal Upadhyay Nagar being a major transit hub generates maximum traffic inflow into the city of Varanasi.

Along the water network, 80 percent of the roads is less than of width less than 10 meters. the usage of existing roads contributes to the congestion and acts as barrier in optimizing speed and time. Only 58 percent of the land use for roads is utilized in carriageways, rest

25 percent is utilized in on-road parking and 13% of the area is encroached and 4 percent is utilized in median. The encroachment on roads is a major issue on roads along water network.

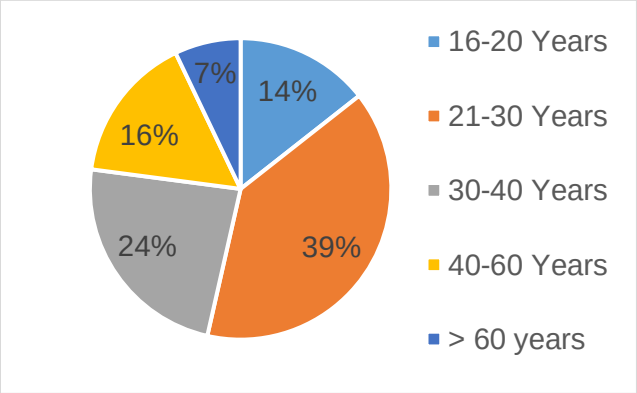


Figure 13. ROW of Access Roads to Ghats along Ganga

Source: Author.

The Average Speed to move around the city is very slow. The Speed Delay survey recorded on Monday at 11:00 am IST also shows that most of the routes along the water network of River Ganga are having speed less than 10 km/ hr. Along River Varuna, the speed is comparatively better with a speed range between 11 km/hr to 20 km/hr but not on par for a city like Varanasi having a floating Population of 69 Lakhs. The condition is so miserable that, 22 percent of road network has speed less than 10 km/ hr and 46 percent of road network has the speed between 11-20 km/hr.

Based on the factors like Trip Frequency, NMT Zones, ROW of Roads, Parking Area, Speed Delay Analysis and V/C Ratio the Zonal Accessibility Mapping has been done and the Map 28 depicts the Zones. Areas like Godowlia, Sarnath have been found accessible due to high trip frequency along the routes of IPT from the Cantonment area and also the road width is more compared to the other collector streets.

3.1.7. User Survey Analysis

The User Survey was conducted to understand the User Patronage for Inland Water Transport in Varanasi. Since, it was very necessary to understand the consumer behaviour before any service has to be implemented. This User Survey covers three types of users namely:

- Citizens of Varanasi
- Tourists of Varanasi
- Industrial Clusters in Varanasi

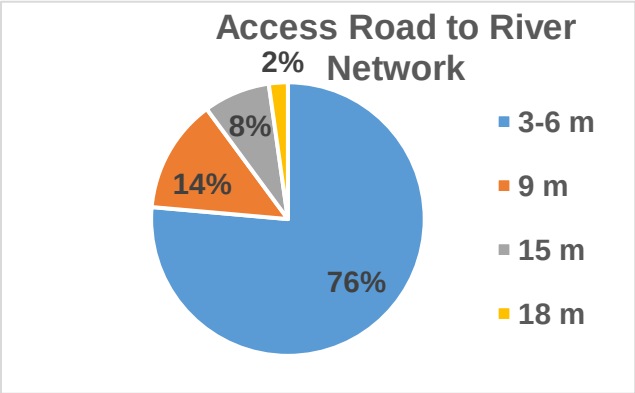


Figure 14.38 Pie Chart showing Age group of the samples recorded for citizen's survey

Source: Primary Survey

3.1.8. Citizens Survey Analysis

The Citizens Survey in Varanasi was done through Stratified Sampling Method where Citizens from certain localities were floated the questionnaire to fill it and the results are drawn after cross tabulation of the answers. In the survey maximum samples from the age group of 25-30 years was recorded followed by the age group of 30-40 years whereas majority of the samples were either a businessman or a public sector employee.

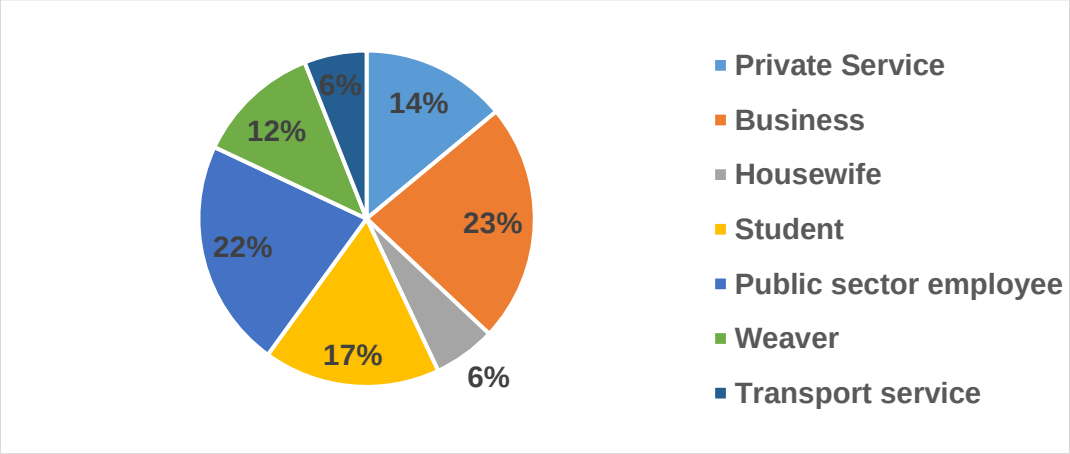


Figure 15. Pie Chart showing Occupation of the samples recorded

Source: Primary Survey.

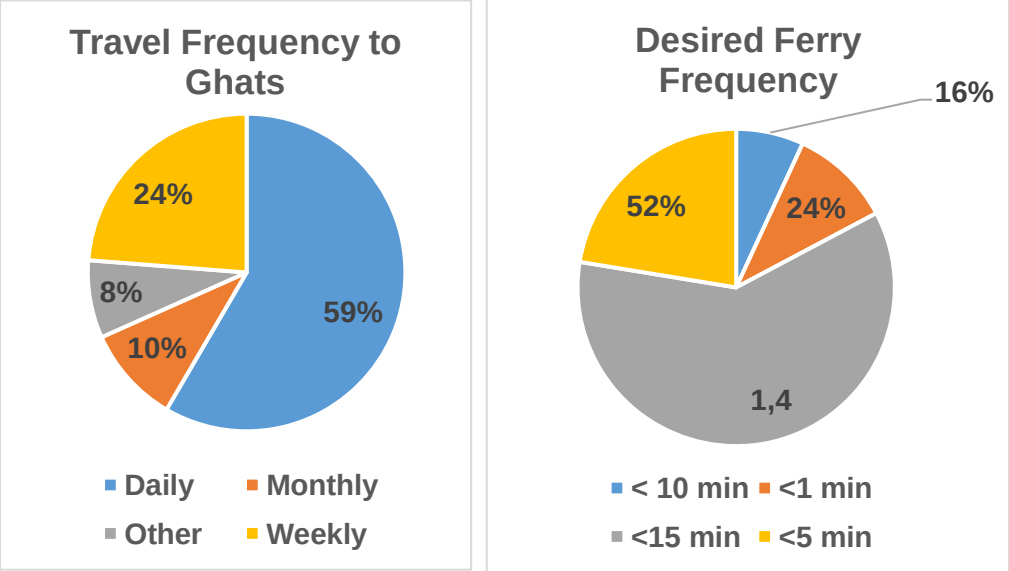


Figure 16. Pie charts showing the desirability on service levels

The survey results clearly shows that 78 percent of the samples are willing to shift to Inland Water Transport if provided given that the accessibility and affordability criteria is fulfilled as the average time of travel in Varanasi for a trip is 30-40 minutes which is more than the average. Also, The Desired Walkable distance recorded for the samples is 1-2 kilometres. 46 percent of the survey samples are ready to walk a kilometre to avail the water transport facility. The survey shows that people who are willing to shift have no certain desirability in terms of the type of Ferry. However, the alignment towards motorised boats is more irrespective of the ownership of the vehicle. On tabulating the amount, the samples were willing to pay, the results range between 100-120 per trip cost.

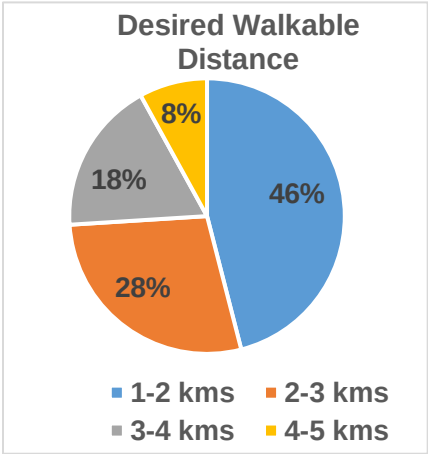


Figure 17. Pie chart showing desired walkable distance of the samples

Source: Primary Survey

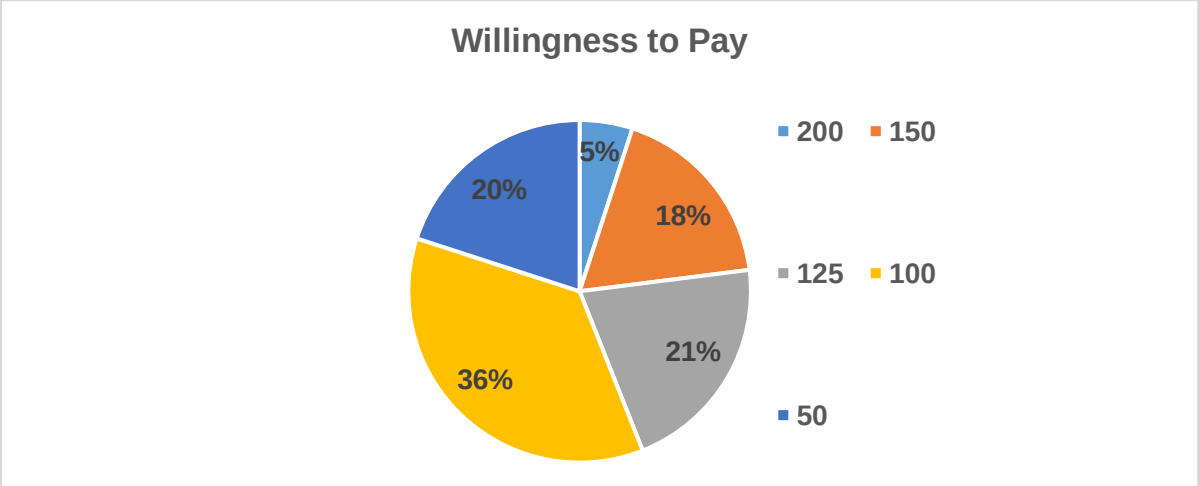


Figure 1839. Pie chart showing Willingness to pay for Samples

Source: Primary Survey.

3.1.9. Tourist Survey Analysis

The Tourist Survey was done using Random Sampling Method along the Ghats of River Ganga. Responses of both types of tourists i.e., Domestic and International tourists were recorded and analyzed for inclusive results. The survey was done in the form of interview and focus group discussion to gain a better understanding of User Patronage. Most of the samples visiting the Ghats were visiting for pilgrimage purpose or Heritage and Culture exploration.

Both the type of tourists have similar demands like basic amenities, infrastructural demands like drinking water, washrooms etc. There were also demands for shaded terminals due to extreme climate of Varanasi.

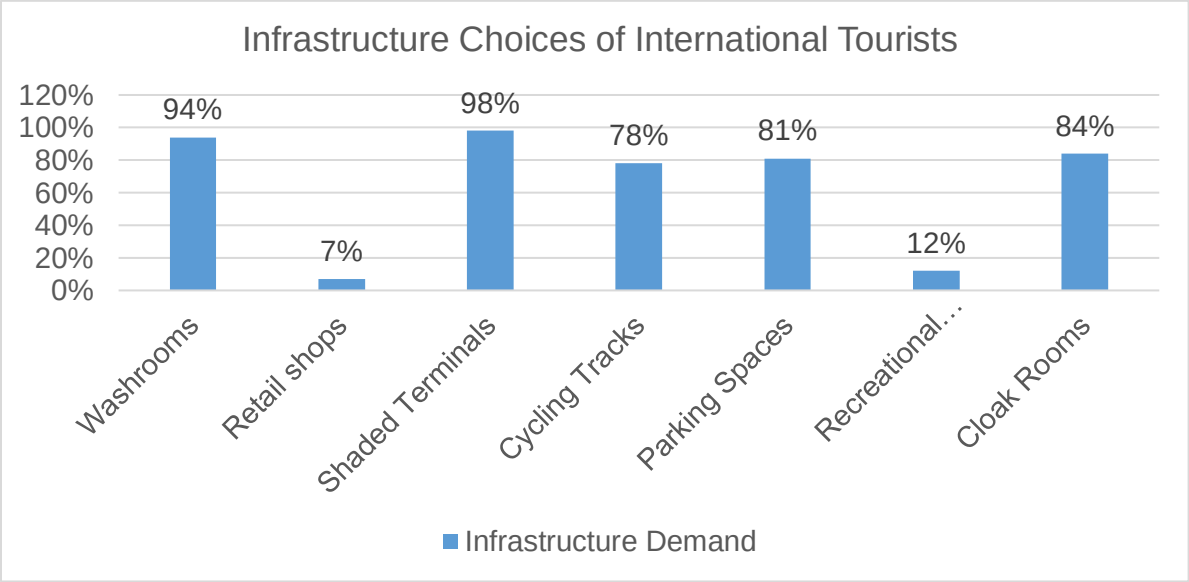


Figure 19. Bar chart showing Infrastructural Requirements Tourists

Source: Primary Survey.

International Tourists have slightly different Infrastructural Demands than that of Domestic Tourists. Since, they have already experienced water transport in different countries, they prioritized their Infrastructural needs in terms for Shaded terminals for climatic accessibility, Washrooms, Cycle tracks for ease of access. One of the Major Demands was of Cloak Rooms to enhance the utilization of Water transport for Recreational purposes.

3.1.10. Industrial Cluster Survey

The industrial cluster survey was done in the Maheshpur Industrial area which is the prime industrial area comprising of Micro, small and Medium Enterprises (MSME) and Lallapura area which is the hub of silk weavers in Varanasi.

However, the Household industries of Handloom and Handicraft were demanding or NMT Access to the streets since there houses only had availability of NMT mode due to narrower lanes along their residences whereas the Industrial clusters demand for motorized vehicles due to weight of the commodity.

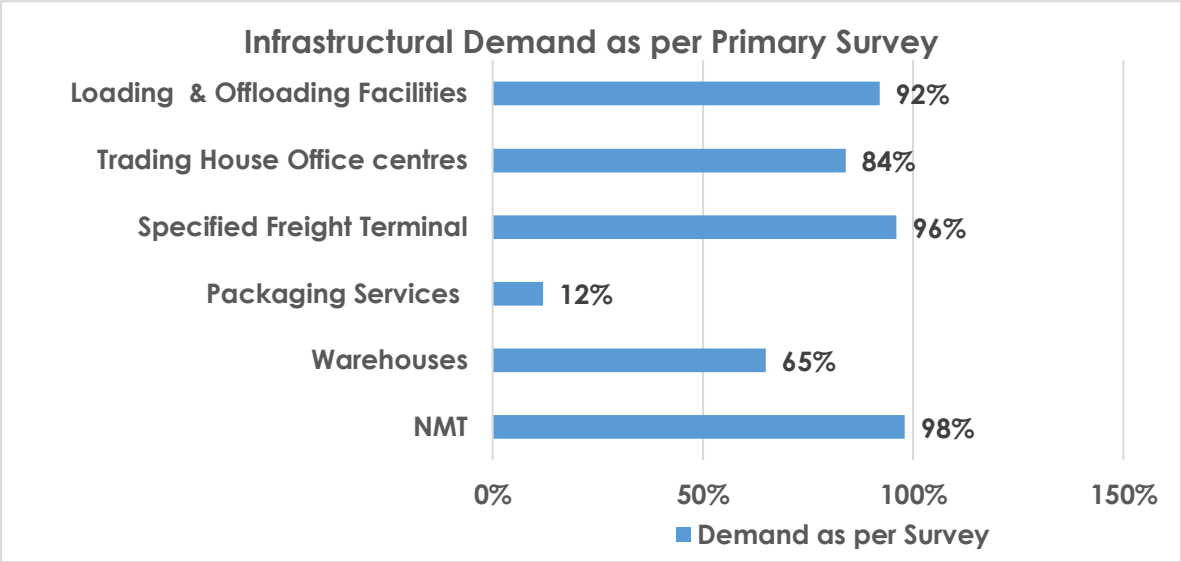


Figure 2040. Bar chart depicting Infrastructural demands on Terminals by the ITC Sector

Source: Primary Survey.

Major Demand was for Loading and Unloading spaces along the terminals followed by trading house offices at freight terminals so as to avoid multiple movements and have a single window clearance. Specified Freight terminals are also in demand as the freight timings can also be different without getting in conflict with passenger mobility across the Water Channels.

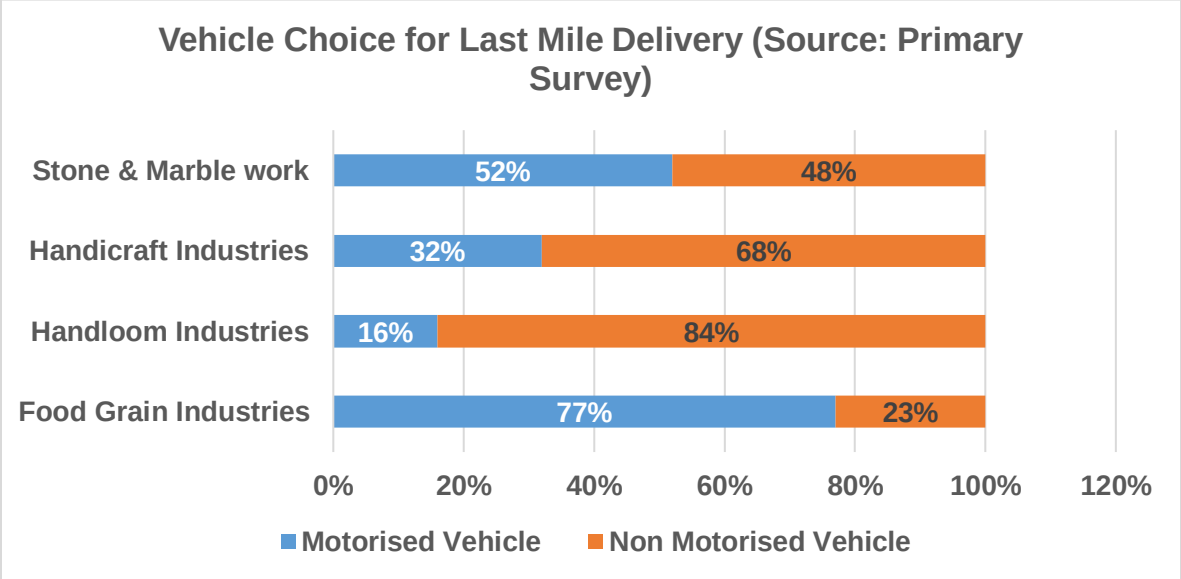


Figure 2141. Vehicle Choice for Freight Last mile Delivery

Source: Primary Survey.

4. Recommendations

On analysing the various influential parameters in case of Varanasi, recommendations are drawn for any land locked territory, particularly in Indian scenario. The recommendations focus on enhancing accessibility, affordability and eventually enhancing citizen's acceptability through sustainable measures. The recommendations have been made on two dimensions i.e., Spatial Recommendations and Policy Interventions.

4.1. Spatial Recommendations

4.1.1. Operability

a) Dredging for maintaining River Water Depth

Based on the analysis of Water levels, the Ganga was found feasible for IWT operations all through the seasons, whereas the river stretch of Varuna was found inoperable due to shallow water levels during the summer season. The river stretches or the Sangam of River Varuna and Ganga was found inoperable due to pollution from slums. Thus, Two Dredging Channels, One of 1.2 km and other of 1 km has been proposed along Ganga. The Dredging Channels A and B has been marked on the maps given below.

b) Stream Flow Management

The Stream Flow is from Varuna to Ganga but since the access route is (as it is a part of National Waterway-1, The focus is consuming less energy and time to access from Varuna to Ganga, Hence A Lock is proposed at the Ganga Varuna Sangam area to support the vehicle and reduce the energy/fuel consumption. Also, High speed CNG Water Transport vehicle is proposed to be operated along the route. The Lock location is marked on the map.

c) Prohibition of Untreated Water Drainage along the channels

There shall be strict prohibition on Untreated water Drainage into the rivers and hence, control the pollution along the river channels.

4.1.2. Modal Integration

a) Upgradation of Kashi Railway Station

Considering the Modal Integration factor, Only Railway Station in proximity to the Water channel is the Kashi Railway Station, The Railway Station should be upgraded to accommodate and serve the waterways as well for both passenger and Freight Transport.

b) NMT Zones and Dedicated Parking Area

NMT Zones should be located within 500 m of the IWT Terminals. Two-wheeler Parking shall be provided within 500 m buffer and four-wheeler parking shall be located within 1 km buffer. Moreover, All the terminals with Freight facility shall have a minimum of 0.1 ha

of Parking space.

c) Pedestrian Access

All the terminals shall have a pedestrian access route without any encroachment a clear 1.8 m path shall be provided on the roads with ROW more than 10 m and the access routes with ROW less than 10 m access shall be fully pedestrianized during IWT Operation Period.

4.1.3. Terminal Point Locations

The terminal points shall be located where maximum trip purpose is fulfilled along both the rivers. Freight and Passenger terminals has been classified based on accessibility of the terminal. They have been recommended with a good mix of land uses are present such as Tourism spots, educational spots, Healthcare institutions etc. The terminal locations are namely Nagwa, Bhadaini, Gayatri, Dashashwamedh, Gaay, Adikeshav, Namo Ghat, Panchganga, Prabhu Ghat. Along River Varuna, four terminals for Passenger terminals has been identified namely PWD, Daniyalpur , Konia , Azad Nagar Ghat. For Freight Terminals, Basavari, Cantonment Area, Jalalipura Terminal, Khajuri Terminal along Varuna and Namo Ghat Terminal, Nagwa Ghat Terminal, Darbhanga Terminal, Bhadaini Ghat, Nagwa Ghat along Ganga Terminal are identified so that it is accessible by Motorised Transport and Water – Road Linkage could be done.

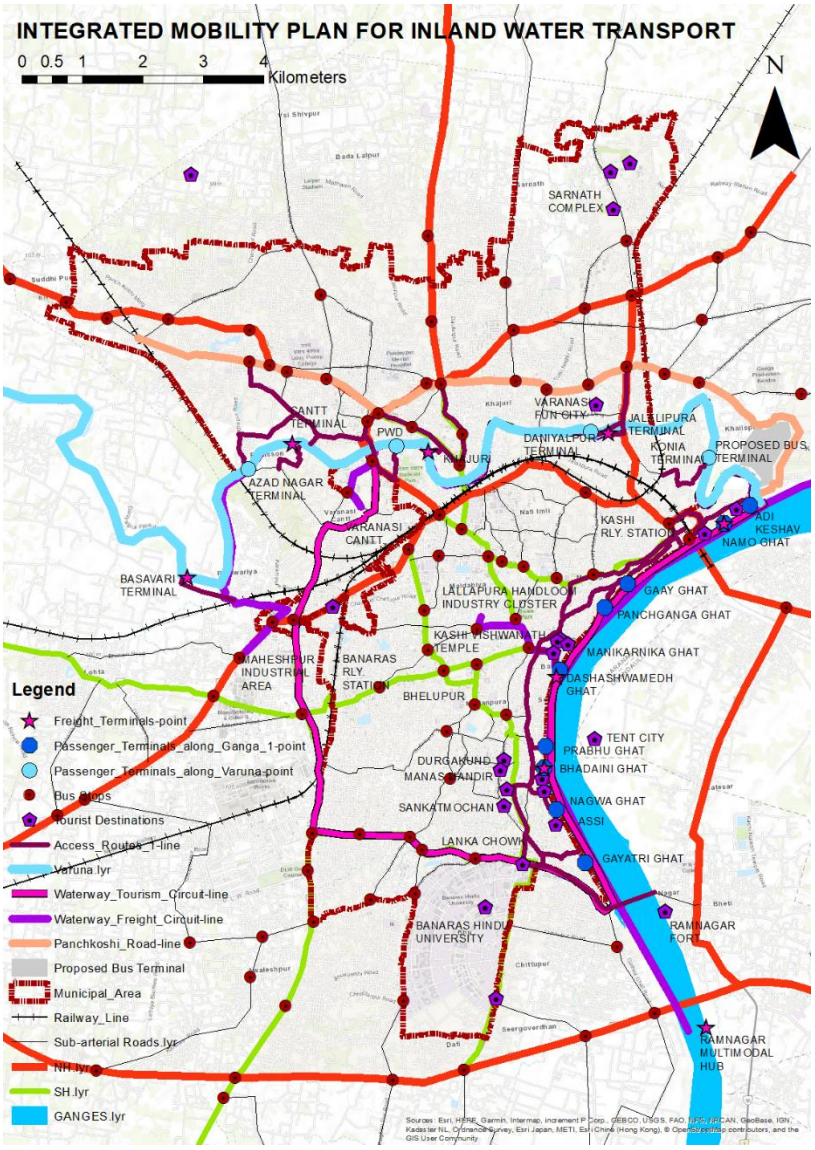


Figure 22. Map showing Recommendations for IWT implementation

4.1.4. Infrastructural Provisions

a. *Basic Amenities including drinking water facilities, waste management facilities, cloak rooms and washrooms* along the access routes along water channels to enhance user experience and increase service utilization.

b. *Street Lights along the marked access routes* in Map shall be provided to ensure safety for all gender along the terminal access routes.

4.1.5. Urban Waterway Freight Terminal

The routes from Industrial Clusters to waterway terminals up to Ramnagar Multimodal Terminal shall be underlined. Separate timings for Freight movement which is after 8:00 pm in the evening till 1:00 am midnight through the underlined route via Raj Ghat Terminal. Darbhanga Ghat terminal is proposed to be a specialised Handicraft and Handloom terminal.

4.1.6. Tourism Waterway Circuit

Since all the tourist sites are located within 1 kilometre distance of the water channels, A tourist circuit through waterways has been proposed. The proposed circuit shall also be used for the annual Panchkoshi Yatra as the route of yatra is along the Water Channels.

4.1.7. Removal of encroachments

Encroachments are a major cause of on-road congestion. Thus, it shall be removed from the access routes and Proper Vending Zones shall be provided on Terminals tosecure their livelihood. This shall also help in easing out the waiting time on terminals. The routes along which encroachments has to be removed is highlighted in the map.

Policy Interventions

- *Governance Hierarchy for accountability:* Proper Governance Hierarchy under IWAI is proposed. The IWAI is on the central level for policy guidelines. In absence of State Water Transport Committee, Varanasi Development Authority (VDA) shall be accountable on regional/divisional level. The implementation of Engineering Works shall be looked after by Uttar Pradesh Public Works Department (UPPWD) and a new department called Department of Waterways shall be constituted under Varanasi Nagar Nigam (VNN) for planning guidelines on city level.
- *Proper Ticketing System* at all the terminals with ticket counter provisions so that there shall be uniformity in fare charging all across the city and hence, enhancing affordability.
- *Regularising the Ferry System*: All Ferries and Boats shall be registered with Municipal body to have count. It will be responsibility of the municipal body to allocate mooring spaces to all the water transport vehicles.
- *MRO facilities at specified terminals*: Maintenance, Repair and Operations Facility shall be provided along terminals. Provision of floating MRO facilities along water channels is a necessity along the operational network.
- *Prohibition of Bathing along Terminals*: Bathing is prohibited along the terminals, Only Religious Ghats will have bathing facilities but before getting into the water body,

people shall take bath in the changing rooms provided and then, only use the water for ritualistic.

5. Conclusion

Inland Water Transport as an alternative mode can be one of the successful attempts to solve the problem of on-road congestion in urban areas. Being proven as one of the sustainable and comparatively cheaper mode, it is conditional to operational variables like Regularising IWT services, Vehicle maintenance, IWT vehicle parking, freight management along river arteries etc. The accessibility factor of Inland Water Transport as a consumer service is impacted by variables such as the spatial character along water channels, access routes to the terminals and infrastructural facilities along it, it also depends on the extent of exploitability of water transport through last mile connectivity. Any terminal shall be covering a variety of trip purposes to ensure cost effectiveness of the service. The service routes shall be such to entertain maximum trip purpose. On the other hand, multiple usability of terminals shall be ensured through vending zones and involving stakeholder participation for land management so that it does not adversely affect the economy. Hence, IWT is a service which can be made accessible mostly through subjective tools rather than objective one as it involves analysis of geographical conditions, pollution, spatial and network character, user demand, safety and more importantly consumer behaviour.

References

Hoyle, B. S. (1993). Water transport and urban development: some geographical perspectives and propositions. Geojournal, 31(4), 439–448. Http://www.Jstor.Org/stable/41146118

Beyer A., 2018. Inland waterways, transport corridors and urban waterfronts. OECD ilibrary.

Praveen, saravanan. (2015). A case study on inland water transportation system in kochi city region. International journal for technological research in engineering. 02. 2802.

The venice transformation. (2017, august). ARCEGU-LAB laboratorio urbano-arquitectonico de ideas. Https://arcegulab.Com/wp-content/uploads/2021/05/the-venice-transformation.Pdf

Barros, B., Carvalho, E. And brasil junior, A., 2022. Inland waterway transport and the 2030 agenda: taxonomy of sustainability issues. Cleaner engineering and technology, 8, p.100462.

Mircetic, d., Nikolicic, S., Bojic, S., & Maslaric, M. (2017). Identifying the barriers for development of inland waterway transport: a case study. MATEC web of conferences,

134, 00039.
Trivedi, A., Jakhar, S. K., & Sinha, D. (2021). Analyzing barriers to inland waterways as a sustainable transportation mode in india: A dematel-ism based approach. Journal of cleaner production, 295, 126301.
Roso, V., Vural, C., Abrahamsson, A., Engstrom, M., Rogerson, S., & Santen, V. (2020). Drivers and barriers for inland waterway transportation. Operations and supply chain management: an international journal, 406–417
Rogerson, S., Santén, V., Svanberg, M., Williamsson, J., & Woxenius, J. (2019). Modal shift to inland waterways: dealing with barriers in two swedish cases. International journal of logistics research and applications, 23(2), 195–210
Dongjoo park. (2005). Strategies enhancing water transportation using econometric model approach. Journal of the eastern asia society for transportation studies, vol. 6, pp. 825 - 837, 2005.
Veldman, S., Alonso, L. G., & Pinto, J. Á. V. (2013). A port choice model with logit models: a case study for the spanish container trade. International journal of shipping and transport logistics, 5(4/5), 373.
Leipziger, D. (2015). Urban mobility and economic shock: how bangkok's transportation system weathered the 1997 financial crisis. Critical planning, 22. Doi:10.5070/cp8221025578.
C40 cities. (2018). The green bangkok 2030 project. [Online] available at: https://www.C40.Org/case-studies/the-green-bangkok-2030-project/.
Yogi (2012). A BOUT CPP R centre for public policy research-sonoro church road-elamkulam-ernakulam-kerala-india web: www.Cppr.In. [Online].
Comprehensive mobility plan for guwahati city 2025.
The study on integrated urban transportation master plan for istanbul metropolitan area in the republic of turkey final report. (2009). [Online] available at: https://openjicareport.Jica.Go.Jp/pdf/11965720_01.Pdf.
Singh, Pardeep, et al. "Assessment of Ground and Surface Water Quality along the River Varuna, Varanasi, India." Environmental Monitoring and Assessment, vol. 187, no. 4, 9 Mar. 2015, https://doi.org/10.1007/s10661-015-4382-0. Accessed 28 Nov. 2020.
Kumar, Pankaj, et al. "Assessment of Seasonal Variation in Water Quality Dynamics in River Varuna- a Major Tributary of River Ganga." *International Journal of Advanced Research*, vol. 3, no. 3, 15 Jan. 2015, pp. 1176–1193.
Das, Nilendu, et al. "Analysing the Change in Water Quality Parameters along River Ganga at Varanasi, Mirzapur and Ghazipur Using Sentinel-2 and Landsat-8 Satellite Data during Pre-Lockdown, Lockdown and Post-Lockdown Associated with COVID-19." Journal of Earth System Science, vol. 131, no. 2, 20 Apr. 2022, https://doi.org/10.1007/s12040-022-01825-0.
Mishra, Sachin , and Ashwani Kumar Agnihotri. "Assessment of Water Quality of River Assi by Using WQI, Varanasi, India." *International Journal of Environment and Sustainability*,

vol. 7, no. 2, 15 Sept. 2008, pp. 114–121.
Integrated Public Transport Plan of Varanasi, Department of Transport Planning, School of Planning and Architecture, New Delhi
Inland Waterways Authority of India, Government of India (no date) Home | Inland Waterways Authority of India, Government of India. Available at: https://iwai.nic.in/ (Accessed: May 8, 2023).
Transportation Research Board (no date). Available at: https://onlinepubs.trb.org/Onlinepubs/trr/1981/817/817-005.pdf (Accessed: May 7, 2023).

THE SPATIAL ACCESSIBILITY AND EQUITY OF PRIMARY HEALTH CARE FACILITIES IN NORTHWEST CHINA FROM THE PERSPECTIVE OF LIFE CIRCLE: A CASE STUDY ON KARAMAY (1139)

LIU Lu[1]

[1] Tongji University, China; liulu1205@tongji.edu.cn

Abstract. The life circle is a concept of the walkability of people in urban space to get the daily public services. Since Shanghai first proposed the 15-minute community life circle, Chinese government has promoted the convenient and walkable community life circle in major cities. Providing primary health care (PHC) is an essential way to enhance physical and mental well-being and social welfare of people. The spatial accessibility of PHC facilities is closely related to residents' health and social equity. In most cities in China, the Community Health Center (CHC) is the main form for delivering primary health care to urban residents. As Small and medium-sized cities in the northwest region are limited by their economic development level and natural geographical environment, evaluating the spatial accessibility and equity of health facilities there is of great significance for achieving the equalization of PHC services across regions. In this research, the spatial accessibility and equity of Community Health Centers (CHCs) in the central urban area of Karamay City are evaluated by improved 2SFCA method and Gini coefficient under the life circle concept. The results show that: 1) The areas with high and low accessibility of PHC facilities were interspersed in space, without exhibiting a concentric pattern. 2) The global Moran's I index was 0.77, indicating that the accessibility of PHC facilities had a significant positive clustering distribution. 3) The Gini coefficient of PHC facility accessibility reached 0.72, which means the spatial inequality was significant.

Keywords: small and medium-sized cities, public facilities, PHC, walkability, 15-minute community.

1. Introduction

The life circle is a concept of the walkability of people in urban space to get the daily public services. In the basic life-circle unit, urban and rural residents are able to enjoy the various services within a suitable daily walking range in their whole life cycle of work and living. The life circle also integrates multiple functions of "suitable for business, living, leisure, health, and learning", leading a future-oriented, healthy and low-carbon lifestyle (Spatial planning guidance： community life unit, 2021).Providing primary health care (PHC) is an essential way to enhance the physical and mental well-being and social welfare of the

people, as well as the most inclusive, equitable and cost-effective approach to achieve universal health coverage (UHC) (WHO, 2018. https://www.uhc2030.org/). In China, PHC is an integral part of the national health system. It is not only the entry point for individuals, families and communities to access the health system, but also the most convenient and continuous channel for obtaining health services in daily life (Ministry of Health, 2006). Urban health care facilities are a general term established to engage in disease diagnosis, treatment, rehabilitation and health care (LIU Zhaowen, 2006). Hospitals and primary health care institutions are their main forms. The hospital primarily offer medical treatment to the city dwellers, whereas the Community Health Center (CHC) focuses on delivering primary health care to them. By arranging CHCs reasonably, residents can access PHC services conveniently and equitably. The spatial accessibility of CHCs is an important indicator to explain urban health service provision, and vital essential for attending universal health coverage and health fairness.

The concept of accessibility was proposed by Hansen (1959), human geographers further extended the concept of accessibility to the spatial dimension, describing the ease of moving from one place to another (Guy C M, 1983). Nowadays, spatial accessibility is widely used in the research of land use, transportation planning, facility location and other fields (Zhan Dongsheng, 2019). It also becomes an important basis for evaluating the spatial layout of public facilities such as health care facilities, urban parks and green spaces, educational facilities and so on (Coulter P B, 2008).

In all kinds of public facilities, the study on spatial accessibility of health care facilities is one of the most extensive and in-depth researches. In recent years, the research on spatial accessibility of health care facilities mainly shows the following trends: 1) Analyzing the spatial accessibility under different transportation scenarios by using the hierarchical features of health care facilities (GUO Chenchen et al, 2022); 2) Applying improved analytical models and techniques to examine health care facilities (Talen, 1998; Luo et al, 2003; Boone et al, 2009); 3) Addressing the disparities in health care accessibility among different groups (ZENG Wen et al, 2017; TAO Yinhua et al, 2018), and shifting from a spatial equity to a spatial justice perspective (TAO Zhuolin et al, 2023); 4) Focusing on the supply-demand relationship and satisfaction perspective (CAO Yang, 2018); 5) Exploring the factors that affect spatial accessibility and the relationship between health care behavior (ZENG wen, 2017; CHEN Shuting, 2022).

These studies also have strong regional characteristics. Large cities are usually the areas with the most abundant medical resources (ZHANG Zhonghao et al, 2020). Therefore, there are many studies on the spatial accessibility of health care facilities in large cities (ZHONG Shaoying et al, 2016; SHEN yue et al, 2021). In China, most of the existing studies focus on the cities such as Shanghai and Beijing, as well as some provincial capitals in the western region such as Xi'an and Lanzhou (ZHANG Qi et al, 2016).However, there is still a

lack of research on small and medium-sized cities, especially those in the Northwest China. Although the health condition of residents in China has improved significantly with the development of economy, there is still a large gap in health care services between small and medium-sized cities in the northwest region and large cities, due to the influence of economic development level and geographical environment (14th Five-Year Plan for Public Services, 2021).

Based on the facts and relative literature review, this study adopts the commonly used 2SFCA method under the walking scenario, and aims to examine the spatial accessibility and equity of PHC facilities in a small and medium-sized city in northwest China. The findings of this study may offer some new insights for the research in this field.

2. Methodology

2.1. Research Area

The region of Northwest China is commonly known as the "Northwest Five Provinces" in China's administrative divisions, which consists of Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang. There are 51 prefecture-level cities in this region, of which 40 are small and medium-sized cities. It means about 78% of cities in this region have a permanent urban population of less than 1 million people (Statistical Year Book, 2022). Almost all prefecture-level cities except the provincial capitals fall into the category of small and medium-sized cities. Karamay, the study case of this research is located in the northern part of Xinjiang, with a permanent population of 490,000 people (Seventh National Population Census, 2020).

Central urban areas are key zones for urban development. This study examines the spatial accessibility of primary health care facilities in the central urban area of Karamay City, with the objective of investigating the spatial variation and inequity of primary health care provision in small and medium-sized cities. The specific scope of this study includes five sub-districts which are Tianshanlu Sub-district, Yinhelu Sub-district, Kunlunlu Sub-district, Yingbin Sub-district and Guhai Sub-district, containing 67 community in total.

Previous studies on spatial accessibility within cities often use sub-districts or neighborhoods as the smallest analysis units (ZHANG Zhonghao et al, 2020), but this method fails to capture the accessibility differences among different residential compounds within the same unit (Zhan Dongsheng, 2019). To better reflect the accessibility situation of specific residents, this study collects data at the residential-compound level and uses residential compounds as the smallest analysis units and neighborhoods as the basic analysis units.

2.2. Data Collection

This study relies on the following data and information sources: We obtained the list and floor areas of PHC facilities in Karamay's central urban area from the Health Commission of Karamay. We collected the spatial coordinates of PHC facilities and residential compound entrances and exits from Baidu Maps. The urban road network data came from OpenStreetMap (www.openstreetmap.org), an open source map data website. The seventh national census provided the permanent population data by age group of each community, with data accuracy reaching the residential compound level. Other socio-economic statistical data came from the China Economic and Social Big Data Research Platform (https://data.cnki.net), which provides the Karamay City Urban Statistical Yearbook (Figure 1).

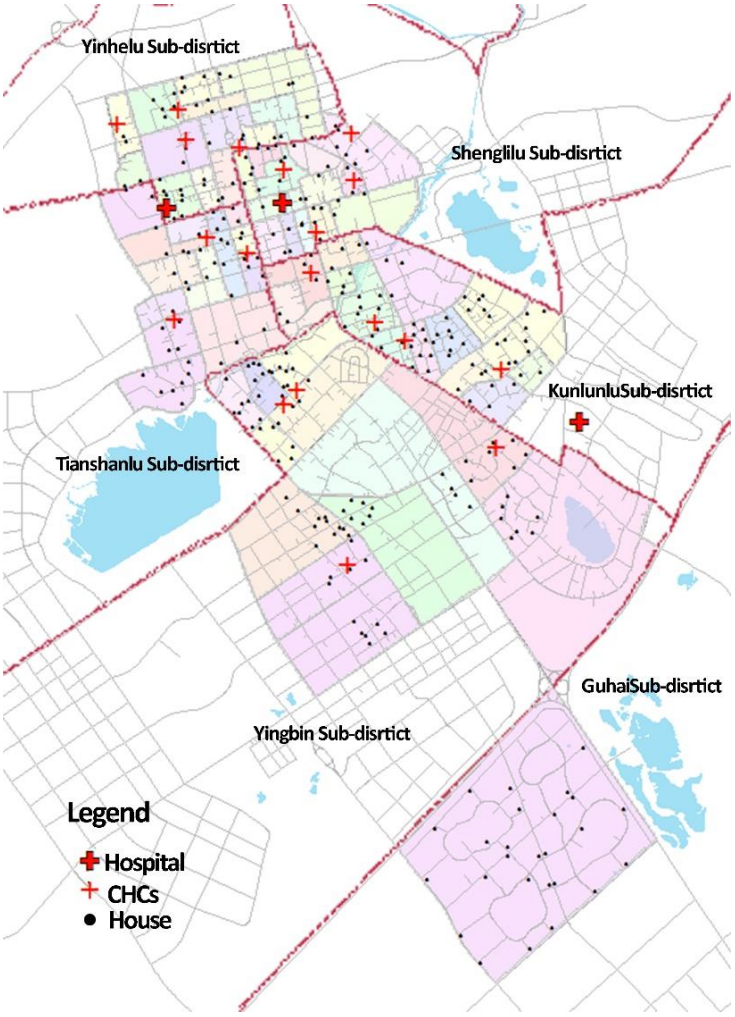


Figure 1. The central urban area of Karamay

2.3. Methods

This study consists of three main parts: (1) Assessing the spatial accessibility of PHC facilities in the central urban zone of Karamay; (2) Examining the spatial variation of accessibility of PHC facilities; (3) Evaluating the inequity of facility distribution according to the outcomes.

1) Gaussian 2SFCA analysis

The traditional two-step floating catchment area (2SFCA) method measures the accessibility of health care facilities by searching twice from the supply and demand locations within a certain search range (Luo et al, 2003). The formula is as follows:

$$A_i^F = \sum_{j \in \{d_{ij} \leq d_0\}} R_j = \sum_{j \in \{d_{ij} \leq d_0\}} \left(\frac{S_j}{\sum_{k \in \{d_{kj} \leq d_0\}} D_k} \right)$$

In this formula: **i** represents the demand point; **j** represents the supply point; $\mathbf{A^F_i}$ represents the accessibility of demand point i calculated by 2SFCA; $\mathbf{d_{ij}}$ is the distance between demand point **i** and supply point **j**; $\mathbf{R_j}$ is the ratio of the facility size of supply point **j** to the population served within the search radius ($\mathbf{d_0}$); $\mathbf{S_j}$ represents the supply size of supply point **j**; $\mathbf{D_k}$ represents the demand size of demand point **k**.

a) Using the supply point S as the center, search for all the demand points k within the service threshold d_0 (the maximum walking distance: 1.5 kilometers) of S, and calculate the supply-demand ratio Gj of the supply quantity Sj at point j and the demand quantity D_k of all demand points;

b) Calculating the medical service accessibility A of demand point i, search for all supply points j within the threshold distance d_0 centered on i, and add up the supply-demand ratios of all j points found.

The improved 2SFCA method incorporates a Gaussian distance decay function to reflect the degree of decline in residents' health-seeking behavior as distance increases. The Gaussian 2SFCA (Ga2SFCA) was proposed by Dai (2010, 2011) and the formula is as follows:

$$A_i = \sum_{j=1}^{n} \frac{S_j f(d_{ij})}{\sum_{k=1}^{m} D_k f(d_{kj})}$$

In the formula: A_i is the accessibility score of demand point i, which means the average facility resources accessible by each demander at demand point i; $f(d_{ij})$ is the Gaussian distance decay function.

The formula of Gaussian distance decay function is as follows:

$$f(d_{ij}) = \frac{e^{-1/2 \times \left(d_{ij}/d_0\right)^2} - e^{-1/2}}{1 - e^{-1/2}},\ d_{ij} \leqslant d_0$$

2) Spatial autocorrelation analysis

This study uses the global spatial autocorrelation analysis to reveal the overall spatial variation of accessibility, and then applies the local spatial autocorrelation analysis to identify the high-value and low-value clusters of accessibility. This approach can intuitively reflect the spatial imbalance of public health service resources.

3) Lorenz curve and Gini coefficient

The Lorenz curve is a graphical representation of the distribution of spatial accessibility of PHC facilities in a population. The Gini coefficient is a measure of inequality of a distribution, a number between 0 and 1, where 0 represents perfect equality and 1 represents perfect inequality. The Lorenz curve and Gini coefficient can be used to evaluate spatial equity of health care facilities by measuring the distribution of accessibility across different regions or neighborhoods.

3. Results

3.1. The spatial distribution of PHC accessibility

This study measured the spatial accessibility of PHC facilities using an improved 2SFCA method. Based on the results, the accessibility of PHC facilities was classified into five levels: excellent (0.22-0.30), good (0.16-0.31), moderate (0.12-0.15), poor (0.06-0.11) and very poor (0.00-0.05). The accessibility values correspond to the per capita facility floor area adjusted by the distance decay function. The results showed that the spatial distribution of PHC facility accessibility did not exhibit a clear concentric pattern, and areas with high and low accessibility were interspersed in space (Figure 2).

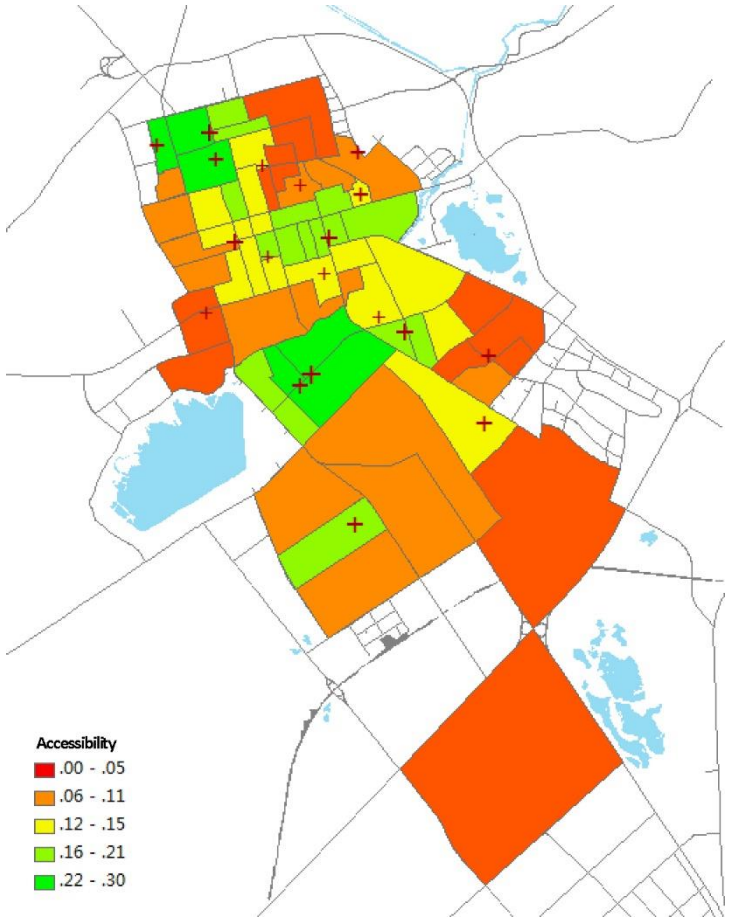


Figure 2. The spatial pattern of accessibility of PHC facilities in Karamay

The accessibility of PHC facilities varies across different areas. The areas with better accessibility are mainly located in some parts of Yinhelu Sub-district, Shenglilu Sub-district, and Yingbin Sub-district, where CHCs are not only concentrated but also have larger scales and stronger supply capacities. These areas are the most convenient for obtaining PHC services. The areas with moderate accessibility are mainly located in some parts of Tianshanlu Sub-district and Kunlunlu Sub-district, where CHCs are fewer and have lower scales and supply capacities. The areas with poor accessibility are more numerous and spatially dispersed, including some parts of Yinhelu Sub-district, Tianshanlu Sub-district, Kunlunlu Sub-district, Yingbin Sub-district, and Guhai Sub-district t. These areas currently lack the coverage of CHCs and are the most deficient in PHC resources.

3.2. The spatial agglomeration of PHC accessibility

According to the spatial autocorrelation analysis of accessibility (Figure 3), the global Moran's I index was 0.77, indicating that the accessibility of PHC facilities had a significant positive clustering distribution. The local Moran's I index analysis further revealed the hot

and cold spots of accessibility. The "High-High" clusters of accessibility of primary health care facilities were mainly distributed in 17 community committees within Yinhelu Sub-district, Yingbin Sub-district, Shenglilu Sub-district and Kunlunlu Sub-district. The "Low-Low" clusters of accessibility were mainly distributed in 12 community committees within Tianshanlu Sub-district, Shenglilu Sub-district, Yingbinlu Sub-district, Kunlunlu Sub-district and Guhai Sub-district. The "Low-Low" clusters of accessibility were more common, indicating a serious lack of PHC resources in the region.

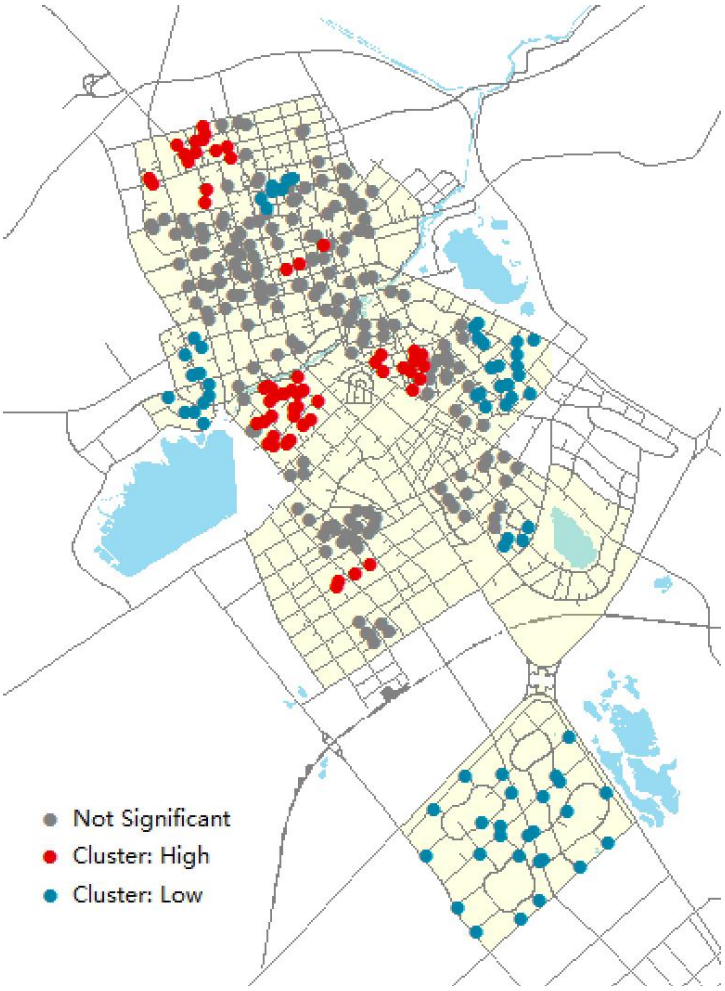


Figure 3. The spatial agglomeration characteristics of accessibility of PHC facilities in Karamay

3.3. The spatial inequality of PHC accessibility

The Gini coefficient of PHC facility accessibility reached 0.72, and spatial inequality was significant. From the perspective of the internal situation of each sub-district, Tianshanlu Sub-district, Shenglilu Sub-district and Kunlunlu Sub-district have low internal Gini coefficients and relatively balanced PHC accessibility indicators, indicating that the PHC resource distribution in the inner city is fairer; Yinhelu Sub-district and Yingbin Sub-district

have high internal Gini coefficients and significant differences in PHC accessibility indicators, indicating that the PHC resource distribution in the new urban area is uneven and prone to unfairness. Since the internal PHC accessibility of Guohai Street is 0, the result of PHC facility analysis is very fair, but very poor.

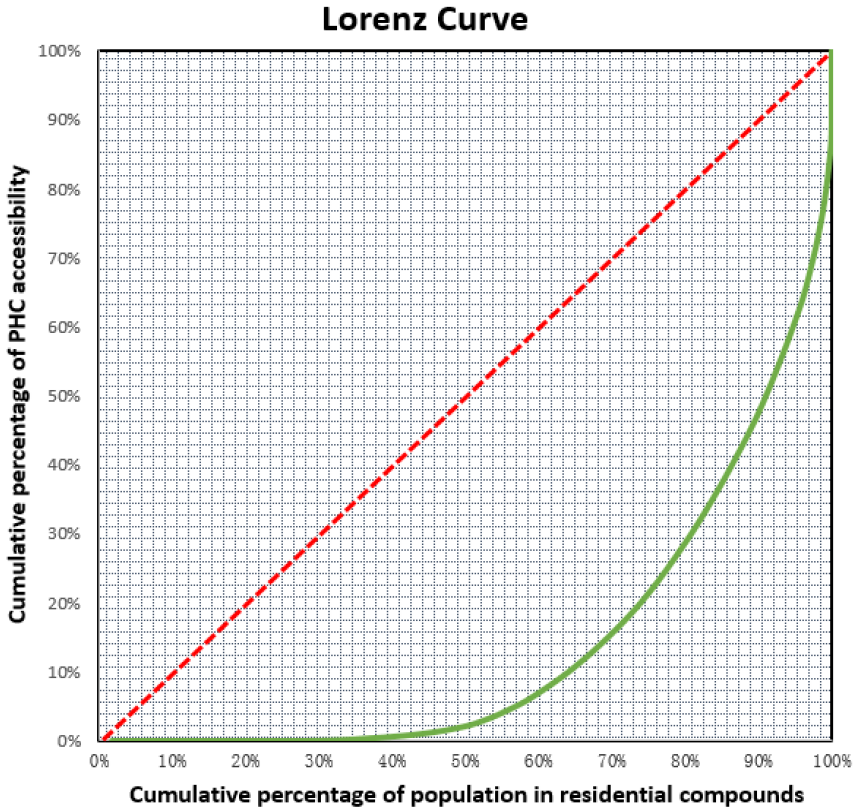


Figure 4. The Lorenz curve of PHC facility accessibility

4. Discussion

4.1. Conclusion

This research uses the central urban area of Karamay City as a case study, and applies an improved 2SFCA method to assess the spatial accessibility of PHC facilities and further examine the equity of facility distribution. The results show that: 1) The spatial distribution of PHC facility accessibility did not exhibit a concentric pattern. The areas with high and low accessibility were interspersed in space, indicating the spatial accessibility level is strongly associated with the clustering degree, scale and size of facilities; 2) The global Moran's I index was 0.77, indicating that the accessibility of PHC facilities had a significant positive clustering distribution. The "High-High" clusters were less than the "Low-Low" clusters indicating a serious lack of PHC resources in the region; 3) The Gini coefficient of PHC facility accessibility reached 0.72, indicating the spatial inequality was

significant. The PHC resource distribution in the inner city is fairer than the PHC resource distribution in the new urban area.

4.2. Prospect

Universal health coverage depends on strong primary health care (PHC). The COVID-19 pandemic highlighted the vital role of PHC as the "frontline" of the health system, enabling cities to respond to public health emergencies and deliver essential public health services. PHC facilities offer basic medical and preventive care that can improve health outcomes and reduce health disparities. To ensure that everyone can access PHC services easily and fairly, we need to examine how health facilities are distributed and reached across different groups, modes of transport, and time periods. We also need to focus more on small and medium-sized cities in future research, and investigate their challenges and opportunities for enhancing health accessibility. The findings of accessibility analysis should inform urban planning and management decisions that optimize urban spatial structure and walkability. Moreover, planners should consider walkability and spatial justice as key aspects of urban design, and seek ways to create better walking environments and public spaces that increase people's access to and satisfaction with health facilities. These important topics have not received enough attention or depth in current research, and we hope to further develop and refine them in future studies.

References

Anselin L, Syabri I, Kho Y. GeoDa: An introduction to spatial data analysis[J]. Geographical analysis, 2006, 38(1): 5-22.

Bao K Y, Tong D. 2017. The effects of spatial scale and aggregation on food access assessment: A case study of Tucson, Arizona [J]. Professional Geographer, 69(3): 337-347.

Boone C G, Buckley G L, Grove J M, et al. 2009. Parks and people: An environmental justice inquiry in Baltimore, Maryland [J]. Annals of the Association of American Geographers, 99(4): 767-787.

Chen L, Zhang W Z, Yang Y Z. 2013. Residents' incongruence between reality and preference of accessibility to urban facilities in Beijing. Acta Geographica Sinica, 68(8): 10711081.

Epperson B K, Li T. Measurement of genetic structure within populations using Moran ’s spatial autocorrelation statistics[J]. Proceedings of the National Academy of Sciences, 1996, 93(19): 10528-10532.

Fan L H, Lin X Q, Wang D. 2015. Spatial-tamporal succession characteristics of public service facilities supply and demand coordinated development in Beijing: A case study of eductional and medical facilities. Human Geography, 30(1): 90-97.

Gao J B, Zhou C S, Wang Y M, et al. 2011. Spatial analysis on urban public service facilities

of Guangzhou City during the economy system transformation. Geographical Research, 30(3): 424-436.

Guangliardo M F. Spatial accessibility of primary care: Concepts, methods and challenges[J]. International Journal of Health Geography, 2004, 3(1): 1-13.

Hansen W G. How accessibility shapes land use. Journal of the American Planning Association, 1959, 25(2): 73–76

Hu Ruishan, Dong Suocheng, Hu Hao. A two-step mobile search method for the accessibility analysis of medical treatment space: Taking Donghai County, Jiangsu Province as an example. Progress in Geography, 2012, 31(12): 1600-1607.

Hu P, Wang X P, Zhang J Z. 2013. Problems of public service facilities and its optimization strategies: A case study on the Nanjing fringe area based on residents' demand. City Planning Review, 37(10): 77-83.

Li L J, Liu J T, Ren F. 2017. Using house level data to evaluating accessibility for public parks in Shenzhen. Geomatics & Spatial Information Technology, 40(9): 38-43.

Luo W, Wang F. 2003. Measures of spatial accessibility to health care in a GIS environment: Synthesis and a case study in the Chicago region [J]. Environment and Planning B, 30(6): 865-884.

Marsh M T, Schilling D A. 1994. Equity measurement in facility location analysis: A review and framework [J]. European Journal of Operational Research, 74(1): 1-17.

McGrail M R, Humphreys J S. 2009. Measuring spatial accessibility to primary care in rural areas: Improving the effectiveness of the two- step floating catchment area method [J]. Applied Geography, 29(4): 533-541.

Omer I. 2006. Evaluating accessibility using house-level data: A spatial equity perspective [J]. Computers, Environment and Urban Systems, 30(3): 254-274.

ShenYue, Shi Yiwen, Wang Hongxiang et al. The impacts of medical facility accessibility on patients' medical treatment space: A case study in Shanghai. Urban Development Studies, 2019, 26(12): 46-52+61.

Spyratos S, Stathakis D. 2017. Evaluating the services and facilities of European cities using crowdsourced place data [J]. Environment and Planning B, 45(4): 733-750.

Song Zhengna, Chen Wen. Spatial accessibility evaluation method of medical facilities based on potential model. Progress in Geography, 2009, 28(6): 848-854.

Tao Yinhua, ShenYue. Spatial differences in accessibility of medical facilities and their influencing factors: Based on the comparison of Shanghai household registration and floating population. Progress in Geography, 2018, 37(8): 6777.

Tao Zhuolin, Cheng Yang, Dai Teqi. Measuring spatial accessibility to residential care facilities in Beijing. Progress in Geography, 2014, 33(5): 616-624.

Tang P F, Xiang J J, Luo Jing, et al. 2017. Spatial accessibility analysis of primary schools at the county level based on the improved potential model: A case study of Xiantao City, Hubei Province. Progress in Geography, 36(6): 697-708.

Tao Z L, Cheng Y, Dai T Q. 2014. Measuring spatial accessibility to residential care facilities

in Beijing. Progress in Geography, 33(5): 616-624.
Talen E. 1997. The social equity of urban service distribution: An exploration of park access in Pueblo, Colorado, and Macon, Georgia [J]. Urban Geography, 18(6): 521-541.
Teitz M B. 1968. Toward a theory of urban public facility location [J]. Papers of the Regional Science Association, 21(1): 35-51.
Wang F, Luo W. 2005. Assessing spatial and nonspatial factors for healthcare access: Towards an integrated approach to defining health professional shortage areas [J]. Health & Place, 11(2): 131-146.
Wang Q, Xiu C L, Wei Y, et al. 2015. Evaluation of job accessibility of Shenyang using Gaussian based 2- step floating catchment area method[J]. Human Geography, 30 (2):78-82.
Zhan D S, Zhang W Z, Yu J H, et al. 2015. Analysis of influencing mechanism of residents' livability satisfaction in Beijing using geographical detector. Progress in Geography, 34(8): 966-975.
Zhan Dongsheng, Zhang Wenzhong, Chen Li et al. Research progress and its enlightenment of urban public service facilities allocation. Progress in Geography, 2019, 38(4): 506-519.
Zhao Yingbo, Wang Jianwei, Yin Chang et al. Research on the equity of health resource allocation in my country based on Lorentz curve and Gini coefficient. Chinese Hospital, 2018, 22(2): 22-25.

INVESTIGATING THE LEGISLATIVE STATUS OF GREEK TRADITIONAL SETTLEMENTS FOR ENSURING ACCESSIBILITY FOR PEOPLE WITH DISABILITIES (1140)

Niovi Tomou[1*], Alcestis Rodi[2]

[1] National Technical University of Athens - NTUA, Athens, Greece; [*]niovi.tom@gmail.com
[2] Department of Architecture, University of Patras, Greece

Abstract. Although urban centres are becoming more inclusive for people with disabilities, rural areas have been overlooked. Greece's traditional settlements, mountain and island, constitute the main resource of tourism revenues. Protected by the "Traditional Settlements Protection Act", since 1978, the historic identity of these settlements impede, and in some cases forbid, the establishment of such infrastructures. However, in spite of the existing regulations for ensuring an inclusive public environment, the necessary modifications are yet to be made, as they are blocked by governmental mechanisms that protect cultural heritages at all cost.

The existing barriers of the built environment are causing the exclusion of people with mental and physical impairments. Despite the peculiar Greek topography and the identity of historic settlements, rural areas can reach the values of an inclusive and accessible environment.

To this purpose, this paper addresses the lack of coherence among spatial governance and law planning. In this framework, a comparative analysis of both legislations in force is presented and new approaches that correspond to current challenges of urban, regional and law planning are proposed.

Keywords: Accessibility for All, traditional settlements, preservation legislations, adaptable architecture, built heritage protection

1. Introduction

Accessibility and inclusiveness for people with disabilities constitute a fundamental prerequisite for sustainable development. According to WHO & The World Bank (2011), disability is an integral part of human life, as most of the human beings may, at some point, find themselves temporarily or permanently physically impaired. In Greece, people with disabilities are estimated at 24% of the total population (Bourgia, 2021).

At the same time, according to the Hellenic Statistical Authority (ELSTAT 2021), the average life expectancy rate has increased to 81 years, while the number of births has decreased. By 2050, it is estimated that the elderly will be 40.8% of the population.

Moreover, the lack of the necessary standards for accessibility in rural areas does not only concern people with disabilities, but the increasing ageing population as well. More specifically, the 2030 Agenda for Sustainable Development, sets out to achieve sustainable development by seeking to serve the human rights of all people, thus leaving no one behind. Acknowledging that the world demography is shifting to an era of population ageing, UNDP (2018) stresses that it is vital to face this emerging social challenge in order to achieve truly transformative, inclusive and sustainable development outcomes. It is crucial to go beyond treating older persons as a vulnerable group but instead as active members of our societies in order to achieve truly transformative, inclusive and sustainable development outcomes.

Traditional settlements constitute an important and famous subcategory of rural areas. Regardless of their geographical distribution in mountains or in islands, they constitute an important part of modern Greek cultural heritage. These rural complexes are mostly small-scale villages that present special architectural characteristics, distinct urban form and unique social and historical features. In general, these settlements form a network of small and large built complexes that covers the entire geographical space of the country (Desyllas & Philippides, 2007), constituting the main resource of its tourism revenues. In this framework, the preservation of their cultural heritage is directly related to sustainability, as the focus turns towards the adaptive reuse of cultural heritage buildings and traditional settlements. However, most of them are located in unwelcoming terrain, where they lack the necessary technological infrastructures and policy provisions for people with disabilities (Tomou, Rodi, 2021).

Taking into consideration the contribution of these historic settlements in the country's evolution and financial growth, while recognizing the importance of an equal right in tourism for people with disabilities, there is an imperative need to regenerate and reform them. As David Gissen (2022) highlights, the current situation demonstrates the shallowness of contemporary engagements with disability relative to historic sites, dealing with it as a technical problem to be solved, rather than as an integral aspect of both cultural and architectural history.

To this purpose, our research argues that the perception of accessibility in the traditional settlements should be reconsidered regarding the existing legislations.

2. Greek traditional settlements and the protective legislation

The notion of protecting the historic areas and traditional settlements as part of Greek cultural heritage was imported for the first time in the national legislative system with the 1975s Constitution enactment (art.24, §6). In particular, the State is obligated to protect all elements of the natural and cultural environment, as well as to adopt special preventive

or repressive measures for the preservation of the environment in the context of the principle of sustainable development (art.24, §1). It is important to acknowledge that the cultural environment includes any man made formation of cultural heritage that appears to be monumental, traditional or architectural.

For this reason, the Greek State implemented the “Traditional Settlements Protection Act” (1978), which aimed to protect the historic identity of rural settlements by categorising and naming them as “traditional” based on their tangible and intangible cultural heritage (historical monuments, rural constructions, human practices and traditions). Following Granada’s Convention in 1985, the Greek State officially adopted the first definition of “traditional settlements'' by issuing Law 2039/1992. Hence, the traditional settlements are considered as “a homogenous set of urban or rural constructions that have special architectural, structural, social or historical features which are unique, valuable and need to be protected”. In general, the competent body for the protection of the traditional settlements is the Ministry of Culture and Sports. However, according to Chapter 8 of the Archeological Law (2002), the Minister introduced specific collective bodies for a better division of tasks. In particular, the Local Councils of Monuments (Article 49) were established at the headquarters of each administrative region in order to give opinions on all issues concerning monuments, public spaces and places in their region. Also, in Article 50 (§1) the Central Archaeological Council (KAS) and the Central Council of Newer Monuments (CSNM) (§2) were formed. On the one hand, KAS is related to matters of protection of ancient monuments, archaeological sites and historical places that were the site of outstanding historical or mythical events up to 1830. On the other hand, KSNM works on matters related to the protection of newer monuments and other historical places. As it appears from the study of this specific law, traditional settlements can be characterised as cultural goods (article 2) as "*witnesses of existence and collective of human activity*" (Metallinou 2013, pp. 34). At the same time, traditional settlements can also belong to the category of “historical places” that are considered “*as historic sites either on land or on seaside or lake areas or on riversides that form ro used to form areas of outstanding historical or mythical events, or lands containing monuments later than 1830, which constitute characteristic and homogeneous spaces, which are possible to demarcated topographically, and whose protection is required because of it folklore, ethnological, social, technical architecture, industrial or of their historical, artistic or scientific importance*” (Article 2 d).

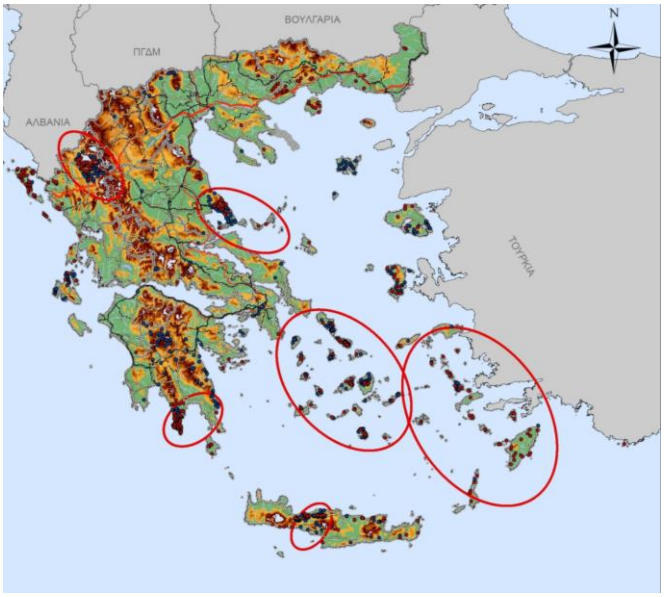


Figure 1. Map of Greek traditional settlements

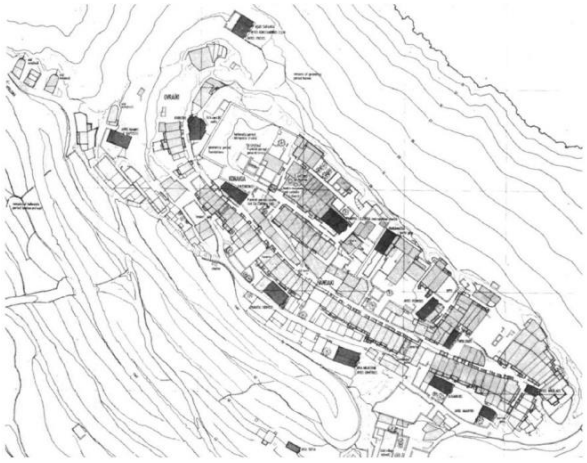
Source: Metallinou, A (2013).

3. The traditional public space

3.1 The evolution of the urban fabric

Strolling in the "Choras" and the old citadels, climbing to the highest points for panoramic views and exploring the labyrinth of cobbled streets, are important examples of experiencing these historic complexes. The majority of Greek traditional settlements followed the same historic evolution, as the primary concern of the settlers was to find a location for survival, socialisation and protection from natural phenomenons or invaders, thus evolving a kind of defensive architecture. The houses, until today, are developed organically, following the landscape's slopes (Figure 2).

During the 19th century, the acceleration of urbanisation, the settlements' houses spread without a predetermined plan (Figure 3), causing several unforeseen problems, such as steep ascents or steps with uneven ridges and narrow widths, making it difficult to move and transfer the goods for the households.



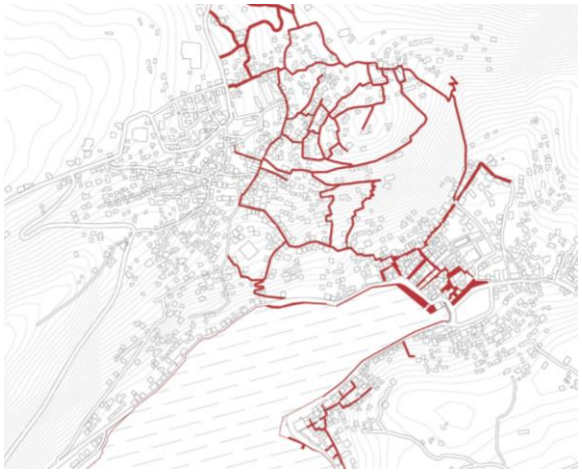


Figure 2. Traditional settlement of Lesvos, Figure 3. Traditional settlement of Symi, from M. Papageorgiou & G. Pozoukidou, 2014 from N. Tomou and A. Rodi, 2021

3.2 Mobility

Consequently, the mountainous morphology and the dense urban fabric of the settlements, shaped the impressive aesthetics of the place. The adaptation to the rugged topography created the need for stepping passages, which up to today constitute the main mobility arteries in every case. Concurrently, the desire to save space and consequently the construction materials, contributed as well in the suffocating layout of the dwellings. Both public and private stairs are placed on the narrow alleys, reducing their width even more. In other cases, such as in Zagorochoria, instead of steps the inhabitants created the so-called “kalderimia”, cobblestone-paved pathways built for inclined traffic. Historically, *Kalderimia* are described as cobbled or paved mule tracks or trails.

The residents were forced to use these sloppy arteries daily, carrying the merchandise either on the shoulders or with donkeys (Figures 5 and 6). Thus, they improvised small ways and tricks to face this unfavourable landscape. Such a solution was to add large landings in the public steps as a resting area in their ascent or descent. It is astonishing how a construction that once played a major role in the social life of the islanders, as a place of gathering and decision-making, is now hindering social participation.

Other important typo-morphological elements of these settlements that hinder social participation of people with disabilities are the outdoor stairs, the yards, the terraces and the pergolas. Moreover, parts of public space are illegally occupied by residents’ for everyday activities. Additional disadvantage is the overall use of materials for the pavings. Most of them, since they're made out of stone, are considered inaccessible for wheelchair users or visually impaired people.

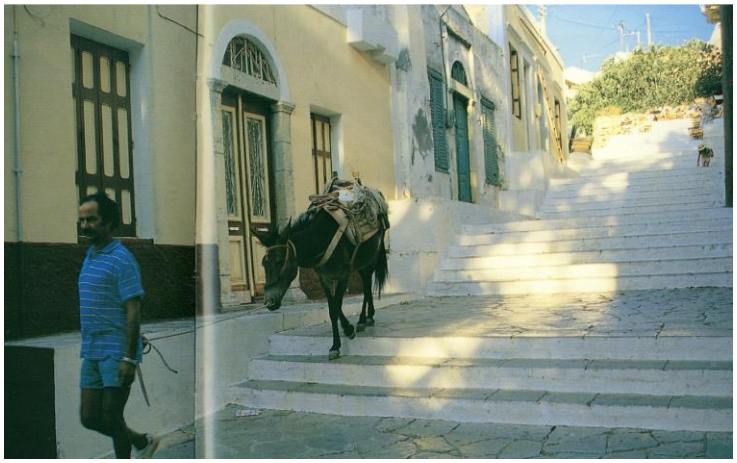


Figure 5. Merchandiser in Symi.

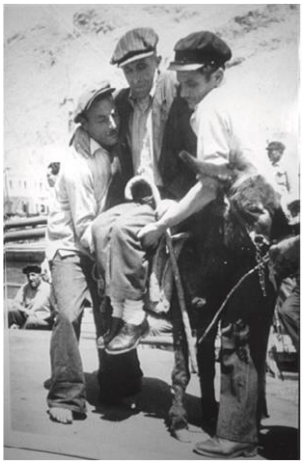


Figure 6. Carrying a person with disability in Kalymnos.

4. The existing regulations for an inclusive public environment

In Greece, the first legislative framework concerning the inclusion and accessibility of disabled people, came into force with the "New Building Regulation" Law 4067/2012 (Government Gazette 79/A/09-04-2012). In accordance with Articles 26 and 27, special arrangements were introduced in order to ensure the accessibility for people with disabilities. Two days later, the introduction of the Law 4074/2012 "Ratification of the Convention on the Rights of Persons with Disabilities and the Optional Protocol to the Convention on the Rights of Persons with Disabilities" (Government Gazette 88 , v. A') followed. The purpose of the Convention was "*to promote, protect and ensure the full and equal enjoyment of all human rights and fundamental freedoms by all persons with disabilities and to promote respect for their inherent dignity"*. Therefore, as stated on Article 4.1 of the ratification, Greece as a member state, has the obligation to ensure all human rights and for all people with disabilities without any discrimination, including the guarantee of accessibility (Article 9) in order to be able to live independently and participate fully in all aspects of life.

"New Building Regulation" Law 4067/2012 (Government Gazette 79/A/09-04-2012)			
Article 26: Special arrangements for serving people with disability		Article 27: Special provisions	
par.1	Access to spaces of new residential buildings	par.1	In buildings, building infrastructures and facilities which are characterized as special public buildings concerning following a decision of the Minister to under which the competent body for approving the license is subordinate let's build, deviations from the present are allowed of law granted after reasoned technique report and approval of the Central Council of Architecture.
par.2	Autonomous and safe circulation on pavements	par.2	In legally existing buildings that do not have an elevator from the time of their construction, it is allowed, by way of derogation from the classes of the present and the special building conditions of the area, construction of an elevator or other machinery means of covering altitude differences and the access space to them with a necessary condition the drafting or updating of the Building Identity. For preserved buildings and traditional settlements, the consent of the Council of Architecture is required.
par.3	Formation of accessible outdoor spaces in the buildings of par.1		
par.4	Ensuring accessibility to all public or recreational buildings before the applicable law		
par.6	During the configuration or reconstruction of public spaces of **settlements** (particularly areas for pedestrian traffic, squares/sidewalks/sidewalks/islands, green areas/groves, stops/docks, etc.), it is obligatory to ensure the accessibility for people with disabilities with pedestrian walkways/ blind walkways/ inclined levels (ramps) without steps and with a slope of up to 5% / accessible mechanical means of covering height differences, appropriate placement of urban equipment, such as canopies, seating areas, light poles, waste bins, signage, etc., as well as 5% of the parking spaces or at least one for the use of cars, according to the Guidelines, standards and regulations referred to in paragraph 1 above.		
par.7	**In the case there is need for an opinion on special accessibility matters, the competent advisory / auditing bodies, such as YDOM, Building Inspectors, Architecture Councils, can appeal to the "Accessibility Committee", which is appointed by decision of the Minister of Environment, Energy and Climate Change and is based in the Ministry of Environment , Energy and Climate Change.**		

Figure 7. Presentation of Articles 26 and 27 from the “New Building Law”

Later on, the Ministerial Decision on "Technical instructions for adapting existing buildings and infrastructures for the inclusion of people with disabilities in accordance with the applicable legislation" (Government Gazette 2998/B/20-7-2020) was introduced, which aimed to provide technical guidelines for adapting existing buildings and infrastructures to the needs of disabled people based on the values of universal design (Figure 8). The latest provision in force was "Modernization of Spatial and Urban Planning Legislation and other provisions” (Law 4759/2020, Official Gazette 245/A/9-12-2020), a correction of the "New Building Regulation".

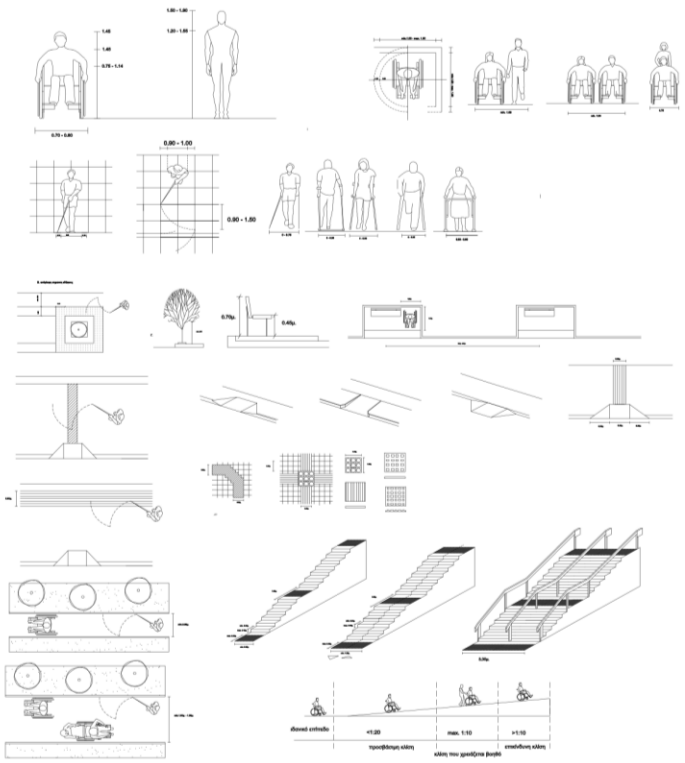


Figure 8. Example of technical guidelines based on Universal Design. Personal record.

5. Conclusions

This research aimed to highlight the importance of reconsidering the intersection between inclusive mobility, spatial planning, architecture, protection of cultural heritage and legislation, in order to ensure a more inclusive and sustainable built environment in the traditional settlement. As literature shows, disability is indeed an integral part of human life. At the same time, traditional settlements, whether island or mainland, are an integral cultural element of our country and an important part for future sustainable development. However, they continue to be inhospitable destinations creating strong discrimination among citizens.

The prevailing Interactional model supports that "disability arises *from the negative interaction between health conditions and contextual factors – environmental and personal factors*'' (WHO & The World Bank, 2011). Consequently, an impairment alone does not lead to disability, if there is a completely inclusive and comprehensible environment (Al Ju'beh K., 2015). Spatial components of public space are major determinants that either enable or restrict the mobility of people with temporary or permanent disabilities; and, as demonstrated by this research, through their flexibility, adaptability and provisional qualities, can become inclusive environments (Figure 9).

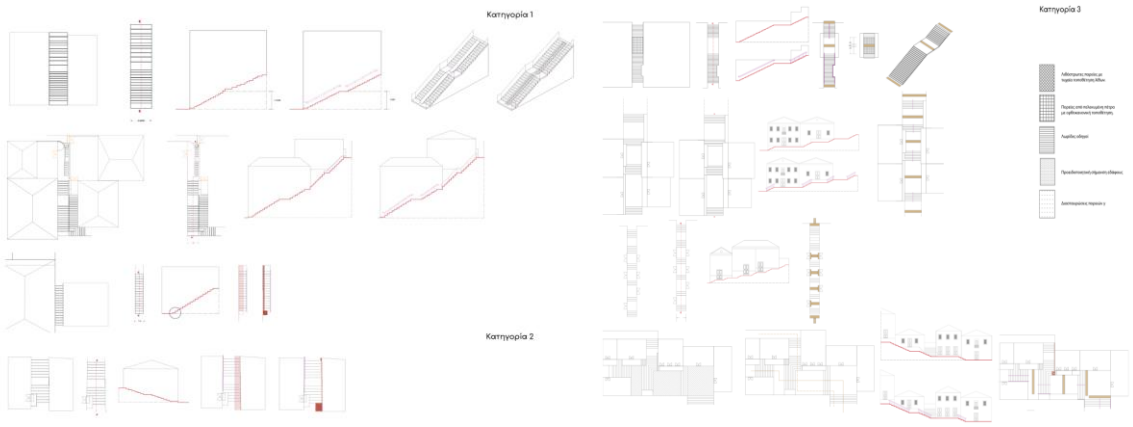


Figure 9. Analysis of the spatial components of traditional settlements' public space. Proof they can become inclusive environments (Tomou and Rodi, 2021).

So far, the provisions create an intense oxymoron since there is no coherence among them. On the one hand there are policies that support accessible public spaces or conventions that promote sustainable development, but on the other hand existing reservation Laws prohibit any intervention in the traditional and touristic settlements. Simultaneously, the same provisions concern exclusively morphological elements of the settlements, historical monuments and churches, but none regards the issue of mobility in the built public spaces. The protection and preservation of the traditional element has become an end in itself, ignoring the existence of any possible middle solution. Facilitating accessibility does not necessarily dissolve the identity of a place. As Devid Gissen pinpoints, the contemporary management of the situation pits historical integrity against demands for accessibility and human integrity.

Therefore, this research proves that there is a strong need to revise existing laws of architecture and urban planning intervention in order to include the need for an inclusive environment. Accessibility for people with disabilities and generally for all, should not be treated as an afterthought to building design or as a technocratic issue that cannot be adapted to the local architecture. As seen in Figures 10 and 11, in Matera, a UNESCO World Heritage Site, the need for inclusive mobility was faced as a creative opportunity and challenge, rather than an obstacle.


Figures 10 and 11. Adjustments on stairs for inclusive mobility, Matera, southern Italy. Personal archive.

References

Al Ju'beh, K. (2015). Disability inclusive development toolkit. Bensheim: CBM.

Bourgia, Georgia, Compliance of ships for people with disabilities, Diploma Thesis, University of West Attica, Athens, Greece, 2021.

Boys, J. (2014). Doing Disability Differently: An alternative handbook on architecture, dis/ability and designing for everyday life. Routledge.

Desyllas, N & Philippides, D (2007) Greek Historical Settlements: Mainland Greece. Synolo Publications. ELSTAT, Greece in figures, Greece, 2021.

Hellenic Parliament, *The Constitution of Greece* [Greece], 7 June 1975, available at: https://www.hellenicparliament.gr/en/Vouli-ton-Ellinon/To-Politevma/Syntagma/.

Gissen, David (2022). The Architecture of Disability: Buildings, Cities, and Landscapes beyond Access.

Mallouhou-Tuffano, F. (2015) Protection & Management of Monuments—Historical and Theoretical Approaches; Association of Greek Academic Libraries: Athens, pp. 12–23.

Metallinou, A (2013) "Traditional Settlements: Institutional protection framework and spatial organisation" (undergraduate research thesis), Thessaloniki, Aristotle University of Thessaloniki.

Ministry of the Environment and Energy of Greece. (2019). National plan for accessibility with emphasis on climate change-climate crisis.

Modernization of Spatial and Urban Planning Legislation and other provisions (Law 4759/2020, Gazette 245/A/9-12-2020).

"New Building Regulation" Law 4067/2012 (Government Gazette 79/A/09-04-2012).

Pozoukidou G., Papageorgiou M. (2013, June 18-21). Protection of traditional settlements

in Greece: Legislation and practice. Proceedings of the International Conference on "Changing Cities": Spatial, morphological, formal & socio-economic dimensions, Skiathos, Greece, pp.501-510. Available at: http://ikee.lib.auth.gr/record/264986/files/2013_Protection_of_traditional_settlements_Greece_Pozoukidou_Papageorgiou_Skiathos_digital.pdf

President of the Hellenic Republic (2012) New Building Regulation (Law 4067/2012, Government Gazette 79/A/09-04-2012).

President of the Hellenic Republic (1978) Traditional Settlements Protection Act (Law 594/Δ/13-11-1978).

Protection of Antiquities and Cultural Heritage (Law 3028/2002, Official Gazette 153/28.06.2003)

Tomou N., Rodi A. P. (2021, September 22-24). Establishing the accessibility of people with disabilities in the traditional settlements: The case study of Symi. Proceedings of the 8th International Conference on Architecture and Built Environment with Architecture AWARDs S.ARCH 2021, virtual ,pp.89-102. shorturl.at/eGK58

Traditional Settlements Act. Presidential Decree 594/13.11.1978.

Ratification of the Convention for the Protection of the Architectural Heritage of Europe (Law 2039/1992, Official Gazette No 61/13.04.1992), available at: http://www.nomoskopio.gr/n_2039_92.php?toc=0&printWindow&.

Ratification of the Convention on the rights of persons with disabilities and the optional protocol (Law 4074/2012, Official Gazette A' 88/11.04.2012), available at: https://www.kodiko.gr/nomologia/download_fek?f=fek/2012/a/fek_a_88_2012.pdf&t=55e278c22e3de9fc49645789adc78c71

Rodi, A. P. (2020) "(De)signs for dignity: Towards an enabling environment in Athens, Greece", Transactions of the Association of European Schools of Planning, 4 (1), pp. 59–79. Available at: doi: 10.24306/TrAESOP.2020.01.006.

Sarigiannis, G. (1978) "The concept, genesis and evolution of the settlement through the etymological evolution and interpretation of the relevant words", *The Greek Review of Social Research*, 33, pp. 371–382. doi: 10.12681/grsr.320.

U.N. Department of Economic and Social Affairs. (2007). Convention on the Rights of Persons with Disabilities (CRPD). Available at: https://www.un.org/disabilities/documents/convention/convoptprot-e.pdf.

United Nations Development Programme. (2018). Ageing, Older Persons and the 2030 Agenda for Sustainable Development. Available at: https://www.undp.org/publications/ageing-older-persons-and-2030-agenda-sustainable-development

Vythoulka, A, Delegou, E.T, Caradimas, C & and Moropoulou, A (2021) Protection and Revealing of Traditional Settlements and Cultural Assets, as a Tool for Sustainable Development: The Case of Kythera Island in Greece, Land, 10 (12), 1324. Available at: https://doi.org/10.3390/land10121324.

World Health Organization & World Bank. (2011). World Report on Disability. Available at: https://www.who.int/publications/i/item/9789241564182.
World report on disability. Available at: https://www.who.int/publications/i/item/WHO-NMH-VIP-11.01.

LIFE SERVICE TOD SPACE ORGANIZATION AND PLACE CREATION FROM THE PERSPECTIVE OF PEOPLE (1153)

Xiaoyi Wen, Xiaoling Zhu, Xiaowen Huang, Yuyong You*, Zhijing Liu

China; *2416383232@qq.com

Abstract. The establishment of the comprehensive hub station has brought about an increase in the flow of people, which is regarded as a positive benefit of the comprehensive development of TOD. With the construction of the station, the surrounding area is not only a transfer station for people, but also a dynamic place for people to stay, communicate, create and even work and live about the flow of people. Based on the fact that the human-statio n-city mode of TOD4.0 model is the mainstream of revitalizing the block and driving the development of the area, the development of the Intelligence-human-station-city mode of TOD5.0 model is proposed for the first time, emphasizing more accurate demand perception, more accurate element allocation, more accurate spatial link and more accurate development timing, reflecting the human perspective design and human concern. Based on the project practice and the problems of parking difficulty, lack of rest area and inconvenient transfer in TOD spatial organization from the perspective of people, this paper explores the development process of life service TOD with people's destination as the end point and people's activities as the core to provide service support of different layers of station-core area-surrounding area-whole city. Explore the life service TOD space organization and place construction from the perspective of people in the new stage.

Keywords: human perspective; Communication; Interaction; Contact; Grey space; Positive space; design.

1. Introduction

1.1 Research Background

At present, the process of urbanization continues to advance, and population mobility and traffic demand continue to grow. In order to meet the travel needs of urban residents and improve traffic efficiency, many areas have begun to build comprehensive hub stations. As an important node of the urban transportation network, the comprehensive hub station connects different transportation modes and routes, and becomes a hub and transfer center for people to travel. With the construction of the comprehensive hub

station, the flow of people in the surrounding area has increased significantly, which is considered to be a positive effect of the comprehensive development of TOD (Transit-Oriented Development, accessibility-oriented urban development). However, traditional integrated hub stations are often only regarded as people's transfer stations, ignoring their potential value and functions(1). With the rise of the TOD concept, people began to re-examine the spatial organization and place creation of the surrounding area of the comprehensive hub station, making it an active place where people can stay, communicate, create, and even work and live. This people-centered TOD development model emphasizes the provision of more convenient, comfortable and diversified services to meet people's ever-changing needs(2). Therefore, from the human point of view, it is very important to study the space organization and place creation of life service TOD.

1.2 Research purpose and significance

This research aims to explore the spatial organization and place creation of life service TOD centered on the human perspective. Through in-depth research, we can better understand people's needs, behaviors and experiences in the area around the integrated hub station, so as to provide targeted suggestions and guidance for TOD planning, design and management. Specifically, the purpose and significance of the research include: (1) Improving the comprehensive development level of TOD: By combining the needs of people with the spatial organization and place creation of TOD, the function and quality of the surrounding area of the comprehensive hub station can be improved, and the People provide better services and experiences; (2) Promote sustainable urban development: The people-centered TOD development model can reduce dependence on private cars, promote multimodal transport and use of public transport, thereby reducing traffic congestion and environmental pollution, Promote sustainable urban development; (3) Improve people's quality of life: By creating a comfortable, convenient, safe and sustainable surrounding environment of the comprehensive hub station, people can more conveniently carry out travel, social, cultural activities, etc., thereby improving their quality of life. Quality of life and happiness; (4) Promoting economic development: The space organization and place creation of life service TOD can attract more people and business activities, and promote the prosperity and growth of the local economy(3). By providing a variety of service facilities and business opportunities, create employment opportunities, improve employment rate and economic vitality; (5) Promote social communication and cultural integration: the space organization and place creation of life service TOD provide different groups of people with an environment for interaction and communication(4). Chance. These are places where people can interact with each other, share experiences and perspectives, promote social exchange and cultural integration, and enhance social cohesion and diversity.

1.3 Research content and structure

This research will explore the space organization and place creation based on human life service TOD from the perspective of human beings. The research content mainly includes the following aspects:

1) People-Station-City Model of TOD4.0 Model: This study will conduct an in-depth study of the People-Station-City Model in TOD4(5). Effects on human need perception, element configuration, spatial connectivity, and developmental timing.

2) Development of the TOD5.0 model based on intelligence-people-station-city: On the basis of the TOD4.0 model, this study will propose the TOD5.0 model based on intelligence-people-station-city for the first time, emphasizing more accurate Demand perception, element configuration, spatial connection and development opportunity reflect the design and attention of people's perspective.

3) Space organization of life service TOD based on people's needs: This research will focus on people's destinations and activities to explore the spatial organization of life service TOD. We will study different levels of service support, including service layout and organization in stations, core areas, surrounding areas and the entire city, to provide people with a full range of life services (6).

4) Creation of TOD places based on human life services: This study will explore how to solve the problems of parking difficulties, lack of rest areas and inconvenient transfers in TOD space organization through innovative practice and experience sharingm(7).

2. TOD Space Organization and Place Creation Theory from the Human Perspective

2.1 The importance of human perspective in the development of TOD

In the development of TOD (Transit-Oriented Development, accessibility-oriented urban development), it is crucial to take the human perspective into consideration. Traditional urban planning often centers on traffic flow and functional zoning, ignoring people's needs and experiences(8). However, the people-centered TOD concept emphasizes the provision of convenience, comfort, and diverse services, enabling people to make better use of integrated hubs and surrounding areas. Therefore, incorporating the human perspective into TOD's space organization and place creation can better meet people's needs and improve their travel experience and quality of life.

2.2 Accurate demand perception and element configuration

In order to realize TOD space organization and place creation from the human perspective, accurate demand perception and element allocation are crucial. First of all, through an in-depth understanding of people's needs, habits and preferences, it is possible to accurately

grasp their needs for service facilities, cultural activities, leisure and entertainment, etc. Secondly, it is necessary to rationally configure various elements, such as transportation facilities, commercial facilities, public spaces, etc., to meet people's different needs(9). Through accurate demand perception and element configuration, the surrounding space of the comprehensive hub station that adapts to people's needs can be created.

2.3 Spatial connection and precision of developmental timing

The spatial organization and place creation of TOD from the human perspective also need to consider the accuracy of spatial connection and development timing. Spatial connection involves the connection between the comprehensive hub station and surrounding areas, as well as the transportation network between different areas. Accurate spatial connections can provide convenient travel paths and streamlines to facilitate people's activities around the comprehensive hub station(10). At the same time, it is necessary to grasp the opportunity of development and adjust and optimize the spatial organization in time to adapt to the trend of population flow and changing demand.

2.4 Human Perspective Design and Embodying Attention

In the space organization and place creation of TOD, the design and attention from the human perspective should be reflected. This includes providing a comfortable, convenient and safe environment that meets people's physical and psychological needs. At the same time, attention should be paid to the creation of social interaction and cultural exchange, providing opportunities for people to communicate, cooperate and share experiences with others(11). Design from the perspective of people also needs to pay attention to the needs of special groups, such as the elderly, the disabled, and children, and provide them with barrier-free facilities and a friendly environment so that they can better participate in community activities and use transportation services. In addition, human perspective design should also focus on environmental sustainability, including reducing energy consumption, reducing carbon emissions, and protecting natural resources, so as to promote sustainable development. In order to realize the human perspective design and concern, it is necessary to fully listen to and participate in the opinions and suggestions of community residents, stakeholders and professionals. Through the process of community participation and joint decision-making, consensus can be formed and the needs of different groups can be met, and the effect of TOD space organization and place creation can be improved(12).

To sum up, the human perspective is of great significance in TOD space organization and place creation. Through accurate demand perception and element allocation, precise spatial connection and development timing, as well as human perspective design and concern, it is possible to create a people-centered comprehensive hub station surrounding environment, provide convenient, comfortable and diverse services, and satisfy people To improve travel experience and quality of life. This will promote sustainable urban

development, promote social exchange and cultural integration, promote economic prosperity and enhance community cohesion.

3. Human Issues and Challenges in TOD Space Organization

3.1 Analysis and solution of difficult parking problem

In TOD space organization, parking difficulty is one of the problems that people generally face. Due to the high traffic flow and limited parking resources of the comprehensive hub station, the shortage of parking spaces has become an important factor restricting people's use of TOD(13). In view of this problem, in-depth analysis and solutions are required. First, consider building more parking facilities. This includes adding parking lots or multi-storey parking buildings around the comprehensive hub station to provide more parking spaces. In addition, the introduction of advanced parking management systems, such as intelligent parking navigation systems and real-time parking space information query systems, can also be explored to improve the utilization efficiency of parking spaces(14). Second, people can be encouraged and guided to use alternative modes of transportation. Reduce the need for private car use by providing a variety of transportation options, such as encouraging walking, cycling, and the use of public transportation. This can be achieved by improving road facilities for walking and cycling, optimizing public transport routes and increasing station feeder services. In addition, parking policy adjustments can also be used to ease parking difficulties(15). For example, guide parking behavior through reasonable pricing and time limits to improve the turnover rate of parking spaces. At the same time, the concept of shared parking can be explored to encourage car owners to share parking spaces to make full use of existing resources.

3.2 Analysis and solutions to the lack of rest areas

Lack of seating areas is another human problem that needs to be addressed in TOD space organization. Due to the fast-paced and high-density activities around the comprehensive hub station, people lack suitable rest places during travel. In view of this problem, in-depth analysis and solutions are required. First of all, a public rest area can be set up around the comprehensive hub station. These rest areas can include comfortable seating, rest pavilions, shade facilities and green environments, etc., to provide places for people to relax and rest. In addition, some infrastructure such as drinking fountains, public toilets and charging facilities can be provided to meet the basic needs of the people. Secondly, commercial facilities and service facilities can be introduced around traffic nodes to provide people with more choices and convenience. For example, set up cafes, restaurants, convenience stores, bookstores, etc. to provide people with shopping, dining and leisure places. These facilities can provide people with more choices, but also increase the

diversity and attractiveness of the rest area. In addition, cultural and artistic elements can be set in the rest area, providing exhibitions, artworks and sculptures, etc., to create a comfortable and artistic environment. This will provide people with a pleasant rest experience and enrich the cultural atmosphere around the comprehensive hub station. Also explore innovative lounge design ideas, such as movable seating and flexible layouts. By setting movable seats and rest equipment, people can choose a suitable rest area according to their own needs and preferences. In addition, the flexible layout design can be adjusted according to the flow of people and the type of activities, so as to adapt to the changes of different time periods and needs.

3.3 Analysis and solution to the inconvenience of transfer

In TOD space organization, the inconvenience of transfer is another challenge that people face. Since the comprehensive hub station involves the connection of multiple modes of transportation, such as subway, bus, taxi, etc., people may encounter difficulties and inconvenience during the transfer process. In view of this problem, in-depth analysis and solutions are required. First of all, reasonable space layout and guidance design can be carried out to provide clear transfer guidance and paths. Set up clear signs and signs inside and around the comprehensive hub station to guide people to accurately find the exit, entrance and platform of the transfer. At the same time, it is necessary to consider the streamline design of traffic and the layout of traffic nodes so that people can transfer smoothly. Secondly, the service facilities and equipment of traffic transfer can be optimized. For example, increase the width and comfort of the transfer channel, and reduce the crowding of people during the transfer process. In addition, seats, rest areas and waiting areas in the transfer area can be added to provide people with better treatment and comfort. In addition, convenient transfer information and tools can be provided. By establishing a real-time traffic information system, people can learn about the arrival time, transfer routes and ticket prices of different traffic modes. At the same time, smart phone applications or electronic navigation devices can be provided to help people better plan transfer trips and obtain relevant information in a timely manner.

To sum up, parking difficulties, lack of rest areas and inconvenient transfers are important aspects of human problems and challenges in TOD space organization. Through in-depth analysis and corresponding solutions, these problems can be effectively dealt with, and the spatial organization and place creation effect of TOD can be improved. Building more parking facilities, encouraging alternative modes of transportation, and adjusting parking policies are key strategies to address parking difficulties. Increasing the number of parking spaces, introducing smart parking management systems, and the concept of shared parking can improve the utilization efficiency of parking resources. At the same time, by improving walking and cycling facilities, optimizing public transportation routes and strengthening station connection services, the demand for private car use will be reduced.

To address the lack of rest areas, setting up public rest areas, introducing commercial facilities and service facilities, and adding cultural and artistic elements are effective solutions. Providing comfortable seating, infrastructure and a variety of options can provide a place for people to relax and rest. At the same time, the introduction of artistic atmosphere and flexible layout design can enrich the experience and attractiveness of the rest area. To solve the problem of inconvenient transfers, it is necessary to consider space layout, orientation design and optimization of service facilities. Clear signs and signs, reasonable flow design and comfortable transfer areas can help people transfer smoothly. Providing real-time traffic information, convenient transfer tools and equipment can increase the convenience for people to obtain information and plan their trips. By solving these problems, the degree of humanization of TOD space organization can be improved, more comfortable, convenient, and diverse places can be created to meet people's needs, and improve travel experience and quality of life. This will promote sustainable urban development, promote social exchange and cultural integration, promote economic prosperity and enhance community cohesion.

4. The development process of TOD based on human life services

4.1 Life Service TOD Ending at People's Destination

In the development process of life service TOD, the destination of people is an important consideration. Traditional transportation planning and urban design often focus on transportation networks and functional facilities, while ignoring people's travel purposes and needs. However, people-based destination design can better meet people's living needs and expectations. First, it is necessary to fully understand the types and characteristics of people's destinations. People's travel purposes can include work, study, shopping, entertainment, medical treatment and other aspects. By studying people's travel behavior and needs, the spatial requirements and functional needs of different destination types can be determined. Second, different types of destinations need to be rationally planned and configured in the TOD spatial organization. For example, office buildings, schools, commercial centers, cultural facilities, etc. can be built around the comprehensive hub station to meet people's work, study and entertainment needs. At the same time, it is necessary to consider the spatial connection and convenience between destinations to ensure that people can travel between different destinations conveniently.

4.2 Life service TOD centered on human activities

In addition to taking people's destinations as the end point, taking people's activities as the core is also an important concept in the development of life service TOD. People's travel is often accompanied by various activities, such as socializing, leisure, sports and so on. Therefore, by putting human activities at the core, it is possible to better provide

support and create places suitable for different activities. First, people's activity needs and preferences need to be fully understood. Through research and user feedback, we can understand people's activity preferences and frequency around the integrated hub station, as well as their expectations and requirements for the activity venue. Secondly, spaces and facilities suitable for different activities need to be designed and created. For example, set up social communication areas, public squares, sports venues, etc. to provide people with places for communication, leisure and sports. At the same time, it is necessary to consider the spatial layout and connection between different activities, so that people can switch and transfer different activities smoothly.

4.3 Different levels of service support: station-core area-surrounding area-whole city

Life service TOD needs to provide different levels of service support, covering stations, core areas, surrounding areas and the entire city. Each level has specific functions and service characteristics, which can provide all-round support for people's life.

First of all, service support at the station level is the core of life service TOD. In the station area, convenient public transport connection services need to be provided to ensure that people can enter and exit the station conveniently. At the same time, facilities such as ticketing services, information consultation, and security guarantees should be set up to meet people's travel needs and safety needs. Secondly, the service support at the core area level is to provide convenient places and facilities for people's work, study, shopping and other activities. In the core area, office buildings, commercial centers, schools, medical facilities, etc. can be built to meet people's various service needs. At the same time, it is necessary to provide a wealth of commercial, cultural and entertainment facilities to create a vibrant city center area. The service support at the level of the surrounding area is the places and facilities that provide convenience for people's daily life. In the surrounding areas, residential areas, shopping centers, leisure and entertainment facilities, etc. can be set up to meet people's living, shopping, and leisure needs. In addition, it is necessary to pay attention to the design and planning of public space, provide green spaces, parks and walking paths, etc., to provide people with a comfortable environment and leisure places.

The service support at the whole city level is the urban planning and service facilities that provide convenience for people's overall life. Including the improvement of the public transportation network, the humanization of urban design, the construction of community facilities, etc., to improve the quality of life and the living environment of the city as a whole. By providing different levels of service support, life service TOD can meet people's needs at different levels and aspects, and build a multi-functional comprehensive space that integrates life, work, study, and entertainment. This will improve the convenience and comfort of people's life, promote the sustainable development of the city and the happiness of residents.

5. Case analysis of TOD space organization and place creation based on human life service

5.1 Cases of innovative solutions to solve parking difficulties

Parking is one of the challenges faced by many TOD projects around integrated hubs. However, through innovative solutions, parking difficulties can be effectively alleviated and convenient parking services can be provided. The following are some successful case studies:

Case 1: Intelligent Parking System

A TOD project around a comprehensive hub station introduced an intelligent parking system. The system utilizes advanced sensor technology and real-time data analysis to provide accurate parking space information and navigation services. Passengers can find available parking spaces and reserve or pay for parking through a mobile phone app. This smart parking system not only provides a convenient parking experience, but also reduces the waste of parking space and traffic congestion.

Case 2: Shared parking concept

Another innovative solution is the introduction of shared parking concepts. In this case, the TOD project around the comprehensive hub station cooperates with surrounding enterprises, residents and parking lot operators to share parking resources. By establishing a parking sharing platform and a reasonable resource allocation mechanism, the optimal use of parking spaces can be achieved, the vacancy rate of parking spaces can be reduced, and more parking options can be provided.

5.2 Design Practice Cases for Providing Adequate Rest Areas

The lack of rest areas is one of the problems faced by many TOD projects around integrated hubs. In order to provide a comfortable rest environment and meet people's leisure needs, some innovative methods have been adopted in the design practice. The following are some successful case studies:

Case 1: Multifunctional rest area

The TOD project around a comprehensive hub station has designed a multi-functional rest area, providing a variety of facilities and services. The rest area is equipped with comfortable seats, leisure areas, charging facilities, public toilets, etc. to meet people's rest and social needs. In addition, green plants and landscape elements are also set up to create a pleasant environment.

Case 2: Creative Rest Area Design

Another innovative design practice is the use of creative lounge area designs. In this case, the TOD project around the comprehensive hub station introduces art installations,

outdoor sculptures, water features, etc. to provide interesting and unique

5.3 Cases of Successful Experience Sharing in Optimizing Transfer Convenience

Transfer inconvenience is an important issue in the space organization of comprehensive hub stations. By optimizing the convenience of transfer, people's travel experience and traffic efficiency can be improved. The following are some successful experience sharing cases:

Case 1: Seamless transfer design

The TOD project around a comprehensive hub station adopts a seamless transfer design. In this case, the connection points and facilities of different transportation modes are tightly integrated so that people can transfer conveniently. For example, convenient pedestrian passages and connecting facilities are designed between bus stops, subway stations and bicycle parking areas, which shortens the distance and time of transfers.

Case 2: Information-oriented transfer experience

Another successful experience sharing is the information-oriented transfer experience. By setting up clear guide signs, digital display screens and information kiosks in the comprehensive hub station and surrounding areas, people can easily find the correct transfer route and traffic information. In addition, mobile applications or online platforms can be used to provide real-time traffic information and navigation services to help people plan the best transfer routes. Through the analysis of these cases, we can see that in the TOD space organization and place creation based on human life services, solving parking difficulties, providing sufficient rest areas and optimizing transfer convenience are crucial. These innovative solutions and successful experience can provide reference and reference for other similar projects to achieve a better living environment and travel experience.

6. Conclusion and Outlook

6.1 Research Conclusions

Based on the perspective of people, it studies how people's needs and concerns are reflected in the TOD space organization and place creation of life services. First of all, the introduction part introduces the increase of people flow brought by the comprehensive hub station construction and the positive benefits of TOD comprehensive development, and proposes the transition from TOD4.0 mode to TOD5.0 smart man-station-city mode, emphasizing more precise demands The importance of perception, element configuration, spatial connectivity and timing of development. The second chapter discusses the importance of human perspective in the development of TOD, and elaborates the theory of accurate demand perception and element allocation, spatial connection and development timing, as well as human perspective design and attention expression. These

theories provide guidance to bring TOD spatial organization and place creation closer to people's needs and concerns. The third chapter analyzes the problems and challenges faced by people in TOD space organization, including parking difficulties, lack of rest areas, and inconvenient transfers. In response to these problems, corresponding solutions are proposed, such as smart parking systems, shared parking concepts, and creative rest area designs, etc., to optimize people's travel experience. The fourth chapter introduces the development process of TOD based on people's life service, taking people's destination as the end point and people's activities as the core, and discusses the service support at different levels, including stations, core areas, peripheral areas and the whole city. This development process emphasizes the importance of meeting people's needs and activities, creating an integrated hub and surrounding area with humanistic care. Finally, the fifth chapter shows the practical experience of TOD space organization and place creation based on human life service through case analysis. Cases covered innovative solutions for parking difficulties, design practices for providing adequate rest areas, and successful experience sharing for optimizing transfer convenience. These cases provide specific reference and reference for other similar projects, and provide ideas for creating a better living environment and travel experience.

6.2 Research Outlook

In the future, TOD space organization and place creation based on human life service will continue to develop and innovate. With the advancement of technology and changes in society, people's needs for travel and life will continue to evolve. Therefore, we need to constantly adjust and optimize space organization and place design to adapt to people's changing needs. At the same time, we should also pay attention to the following prospects: First, with the development of smart technology, technologies such as artificial intelligence, big data and the Internet of Things will play an increasingly important role in the TOD space organization of life services. Through intelligent facilities and systems, people's needs can be better sensed and responded to, and personalized service experience can be provided. For example, the smart parking system can realize accurate parking navigation and reservation, and reduce parking troubles; smart guidance screens and mobile applications can provide real-time traffic information and navigation services to help people transfer easily. Second, sustainability will become an important consideration in the TOD space organization of life services. In design and construction, attention should be paid to resource conservation and environmental protection. For example, renewable energy can be introduced to supply the energy demand of integrated hub stations and surrounding areas, promote low-carbon travel methods, encourage the use of walking, bicycles and public transportation, reduce car usage and traffic congestion, and achieve the goal of sustainable urban development. In addition, people's needs for social, cultural and entertainment are becoming more and more important. In the life service TOD space organization, social and cultural facilities can be introduced, such as

public squares, art exhibition spaces and performance venues, to enrich people's life experience. At the same time, encourage diversified business and entertainment activities, attract people to stay in the area around the comprehensive hub station, and create a prosperous business ecosystem. Finally, interdisciplinary cooperation and community participation are the keys to promote TOD space organization and place creation based on human life services. During the planning and design process, opinions and suggestions from all parties should be widely sought, including the government, designers, residents and relevant stakeholders. Through multi-party cooperation and joint efforts, better overall planning and coordinated development can be achieved, and a comprehensive hub station and surrounding areas with humanistic care and community identity can be created.

To sum up, TOD space organization and place creation based on human life service is a complex and critical task. Through in-depth research on people's needs and concerns, combined with innovative solutions and successful experience, we can continuously improve people's travel experience and quality of life, and create a livable, sustainable and dynamic urban environment. Future development will continue to focus on personalized services and the application of intelligent technology to meet people's diverse needs. At the same time, it pays attention to the development of sustainability and social culture to provide people with a richer and meaningful space experience. Intersectoral collaboration and community engagement will be important drivers of development, ensuring that spatial organization and placemaking meet the expectations and interests of all parties. Looking forward to the future, we should also attach importance to the combination of research and practice, and continue to conduct case studies and experience sharing to accumulate more successful cases and best practices. In addition, regular evaluation and monitoring are carried out to understand people's satisfaction with and changes in demand for the TOD space organization of life services, and timely adjustments and optimizations are made. Continue to carry out academic research and innovative practice, and promote the continuous progress and development of living service TOD space organization and place creation.

In conclusion, human-based life service TOD space organization and place creation is a comprehensive and complex field involving multiple considerations and decisions. Through in-depth research on people's needs and concerns, combined with innovative theories and practices, we can build a humanized, sustainable and vibrant integrated hub station and surrounding areas to provide people with better travel and life experience. With the development of technology and society, we are confident to realize more humanistic TOD space organization and place creation in the future.

References

Su SL, Zhao C, Zhou H, Li BZ, Kang MJ. Unraveling the relative contribution of TOD structural factors to metro ridership: A novel localized modeling approach with implications on spatial planning. J Transp Geogr. 2022;100:14.

Zareba A, Widawski K, Krzeminska A, Dzikowska A, Iop, editors. Multiscale Transit Oriented Development (TOD) for sustainable communities. 2nd International Conference on the Sustainable Energy and Environmental Development (SEED); 2017 Nov 14-17; Krakow, POLAND. BRISTOL: Iop Publishing Ltd; 2019.

Xue CQ, Sun C. "Rail villages" in Hong Kong: development ratio and design factors. Urban Des Int. 2021;26(1):97-113.

Bian JW, Ding M. THE EFFECTIVENESS OF THE CONSTRUCTION OF THE BUS RAPID TRANSIT IN XIAMEN CITY. In: Mackett RL, May AD, Kii M, Pan H, editors. Sustainable Transport for Chinese Cities. Transport and Sustainability. 3. Bingley: Emerald Group Publishing Ltd; 2013. p. 255-75.

Xu YJ, Chen XS. Quantitative analysis of spatial vitality and spatial characteristics of urban underground space (UUS) in metro area. Tunn Undergr Space Technol. 2021;111:18.

Wang XH, Zhang WS, Cui HX, editors. New Opportunities for the Development of Real Estate Industry Based on the Rise of Urban Agglomeration. 4th International Symposium - Management, Innovation and Development; 2017 Nov 25-26; Beijing, PEOPLES R CHINA. HAWTHORN EAST: St Plum-Blossom Press Pty Ltd; 2017.

Burrows M, Liu DM, Moore S, McKay H. Bone Microstructure at the Distal Tibia Provides a Strength Advantage to Males in Late Puberty: An HR-pQCT Study. J Bone Miner Res. 2010;25(6):1423-32.

Vazquez AIA, Gallego XQ, Fernandez RM. AND YOU? DO YOU EDUCATE OR CO-EDUCATE?: A PEDAGOGICAL GLIMPSE FROM AN INTEGRATING PROJECT. Innov Educ. 2016(26):167-80.

Cabrera-Moya DRR. Determining factors of the relationship between the locations of the companies, the dynamics of public transport BRT-type and urban development. Estud Demogr Urbanos. 2022;37(3):839-87.

Stojanovski T. Urban design and public transportation - public spaces, visual proximity and Transit-Oriented Development (TOD). J Urban Des. 2020;25(1):134-54.

Baker DM. Inclusion and Exclusion in Establishing the Delmar Loop Transit-Oriented Development Site. J Plan Educ Res.20.

Dong LL, He YF, Chen X, Cheng N, Liu T. Optimization of underground open intermediary space comfort in TOD complexes: A case study of Chongqing, China. Front Public Health. 2023;11:20.

Dai P, Fu H, Yang XX, Han S, Fu GN, Wang YJ. Exploring the urban renewal strategy based on transit-oriented development concept--A case study of Japan and Hong Kong. Front Mater. 2023;10:9.

Lamour Q, Morelli AM, Marins KRD. Improving walkability in a TOD context: Spatial strategies that enhance walking in the Belem neighbourhood, in Sao Paulo, Brazil. Case Stud Transp Policy. 2019;7(2):280-92.

Matsubara T. Target-Oriented Deformation of Visual-Semantic Embedding Space. IEICE Trans Inf Syst. 2021;E104D(1):24-33.

UNDERSTANDING IMPLEMENTATION OF A STRATEGIC TOOL IN PLANNING LAW – NATIONAL DIVERSIFICATION BY IMPLEMENTATION: REGIONAL PLANNING STRATEGIES, RPS, IN NORWAY (1049)

Ulla Higdem[1], Aksel Hagen[1]

[1] Inland University of Applied Sciences, School of Business - Faculty of Economy and Social Sciences, Norway; *ulla.higdem@inn.no

Abstract. This paper applies the theory on translation and strategic planning theory to address two questions. (1) As a new tool in the Planning and Building Act (PBA), how is the Regional Planning Strategy (RPS) understood and implemented, and how can this implementation be seen as an institutional change of the regional planning system? (2) How is the strategic orientation understood and implemented?

The basis for our analysis is a study of the implementation of the RPS in Norwegian counties over three 'generations'. We find that the translation, contextualization, and re-contextualization of the PBA regarding how the RPS are implemented are clearly diverse in 2011/12, a convergence of concepts between the counties in generation two, and that diversity reappears in new ways in generation three.

Keywords: regional strategic planning, translation, storytelling.

1. Introduction

1.1. Regional planning strategies (RPS) – research questions

We are experiencing an increased European interest in strategic planning, both in practice and in theory. It is a good starting point for our research on a new statutory strategic element in regional planning in Norway, Regional Planning Strategies (RPS).

By following the implementation practice for all Norwegian regions over three generations of RPSs from 2011to 2022, we seek to answer the following research questions. (1) As a new tool in the Planning and Building Act (PBA), how is the RPS understood and implemented in practice, and, consequently, how can this implementation be seen as an institutional change of the regional planning system? (2) How is the strategic orientation understood and implemented?

To our knowledge Norway provides a unique case because no other Anglo-American or European country has introduced the equivalent of this statutory tool at the regional planning level.

This paper contributes to new knowledge of how new strategic elements unfolds within a country's law through its implementation in practice. We add to the planning-theory dialogue

by discussing regional re-contextualization in implementation (Røvik, 1998, 2002), combined with the perspectives of storytelling (Throgmorton, 1992), and co-creation/co-production (Osborne, 2010; Sørensen & Torfing, 2011; Aastvedt & Higdem, 2022).

1.2. New types of strategic planning in Europe

Strategic Planning (STP) has to some extent held a subordinate and fuzzy position. According to Albrechts (2009) strategic spatial planning evolved in the 1960s and 1970s toward a system of comprehensive planning in several western European countries that integrated nearly everything at different administrative levels. When the neo-liberal paradigm replaced the Keynesian-Fordist one in the 1980s, Europe witnessed a retreat from both public intervention and strategic spatial planning (Albrechts, 2009).

By the turn of the 1990s, STP experienced a renaissance. The EU launched many STP processes, such as the ESDP – European Spatial Development Perspective. Since 2000, the EU has developed, adopted, and implemented other strategic documents. Planning researchers broadly agree that this is why there is an increasing European interest in strategic spatial planning today. See for example Albrechts (2012), Healey (2009), Balducci et al. (2011), Abis & Garau (2016).

Though there are many interpretations of STP, this statement captures the main points: *"… action-oriented instead of plan-oriented, transformative instead of regulative, selectively visionary instead of comprehensive, to cope with uncertainty instead of fixing certainties, and to deal with relational space instead of the essentialist spaces of 'zoning' or given administrative boundaries. It is characterized by networked and co- productive governance, to transgressing boundaries between the public, private and the third sector, and between the sectors and scales within the government, as well."* (Mäntysalo et al. 2015).

There also seems to be a general perception in planning research that we are about to see a new style of strategic planning: a combination of traditional and new approaches to planning of sustainable development, regional development and "new" regional politics based on the contemporary development of critical thinking and practical experiences in Europe (see Albrechts, 2006a, 2006b; Healey, 2006a, 2006b; Olesen and Richardson, 2012; Mäntysalo, Kangasoja and Kanninen, 2015a).

Politicians seem increasingly to be in favor of strategic planning by using plans as a frame of reference during decision-making processes (Desmidt & Meyfroodt, 2021). Experiences with local and regional STP processes show they can be imaginative and creatively suitable to frame citizen participation and stakeholder collaboration (Lingua & Balz, 2019; Purkarthofer, et.al, 2019) and that transformative, innovative, visionary STP-processes can cope with wicked problems (Klijn & Koppenjan, 2020).

1.3. A renewal and strengthening of Norwegian strategic planning

In Norway, STP has been present both in the field of practice since the 70s (Kommunal- og regionaldepartementet, 2001; Kommunal- og arbeidsdepartementet, 1997), and in the field of theory (Amdam and Veggeland, 1998, 2011). The Norwegian planning system is based on

the Planning and Building Act (PBA 2008), which designates the planning system as the main tool for directing societal and territorial (spatial) development in municipalities and counties (Kommunal- og Regionaldepartementet, 2002; 2015; (Higdem, 2018). Local and regional elected bodies (municipality council and county council) are the main planning authorities (PBA, 2008; Hanssen and Aarsæther, 2019). A distinct Norwegian example of a 'strategic turn' in planning has been RPSs, which the government of Norway introduced in the revised PBA of 2008.

The regional planning system of Norway is illustrated in figure 1. RPS is thus defined in the statutory text: '… [RPS] *shall give an account of important regional development trends and challenges, assess long-term development potentials and determine which issues are to be addressed through further regional planning'* (PBA 2008).

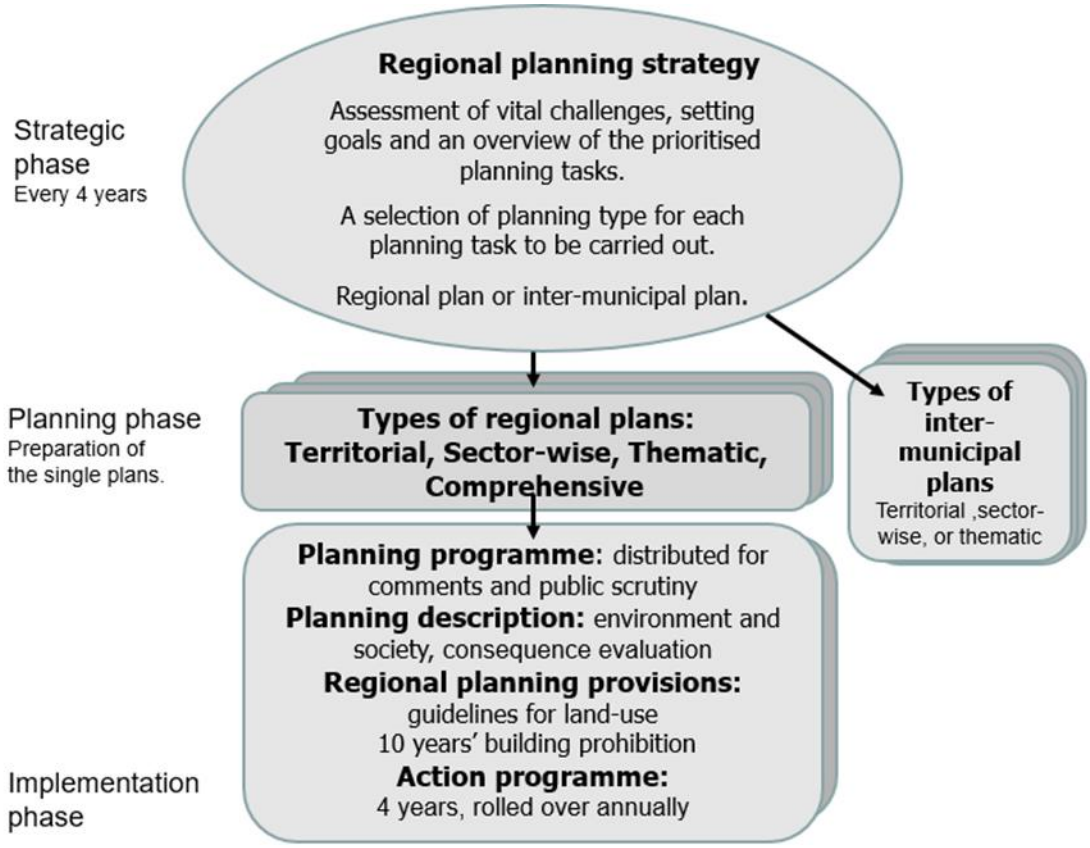


Figure 1. The Regional Planning System of Norway
Source: Higdem, 2018.

The regional planning authority is to prepare an RPS every four years in close cooperation with the municipalities, the county governor, regional state, and other state bodies. The county council may also invite other organizations and institutions to participate.

The main intention for introducing the RPS into the regional planning system was to make the political priorities for regional planning more targeted by focusing on the vital challenges, and increase regional planning's efficiency and flexibility (Miljøverndepartementet, 2007–2008).

These were heavily debated issues within the former PBA and its practices (cf. Falleth and Johnsen, 1996; Higdem, 2001; Asmervik and Hagen, 2001; Vike, 1995; Røsnes, 2001). Additionally, the government strengthened the principle that regional elected bodies must have a significant responsibility for the development of the region. Finally, the RPSs were understood as a better instrument for regionally adapted implementation of the central state's policies and a tool for coordination between the major planning actors of the region (Miljøverndepartementet, 2004).

The idea was to give priority to planning by necessity rather than planning by duty, hence the strategic orientation. The RPS should therefore include an overview of how the prioritized planning challenges should be followed up by planning instruments.

2. Theoretical position

2.1. Institutional theory and translation theory

The Norwegian planning system is a hybrid system comprising different but side-by-side logics of steering and directing (Mahony and Thelen, 2010; Hanssen et al., 2018). Regional planning is a mediating meso-level process in a multi-level democracy (Hanssen et al., 2018). National political ambitions of addressing complex societal challenges, such as sustainable development, are to be translated into regional and local contexts (Healey, 2006), and find their arena in regional planning. A networked multi-actor system where civil actors and interests are also included is addressed by planning as well as institutional scholars (cf. Healey, 1998; Sagalyn, 2007; Bevir et al., 2003; Rhodes, 1991; Sørensen and Torfing, 2005, 2007). The logic of co-creating the future through networks and partnerships is prominent in regional planning (Hanssen et al., 2018; Higdem, 2014, 2018). Our point of departure is the understanding of implementation of new ideas, models, concepts in public sector as translation-processes, where ideas are conceptualized in the implementation phase (Røvik, 1998)

How the introduction of a new idea like the concept or tool of RPSs in the regional planning system (PBA 2008) turns out depends on the country, that is, the counties' implementation. The implementation logic is thus a top-down process from the central government to the county level. In this top-down chain of translation within a hierarchical structure, there is presumably limited freedom of translation. There will be room for local adjustments (Røvik, 1998), but the central government (in this case) may develop mechanisms to control the implementation. The chain of interpretation will develop sequentially as a stimulus-response situation, where the contextualization of a model will proceed in steps from one hierarchical level to another. The possible translators are multiple even in a hierarchical public order (Røvik, 1998; Hardy et al., 1998). Thus, ideas and discourses about how this new element of RPS is to be understood and handled in practice will presumably take many forms and will be contextualized and even re-contextualized (Røvik, 1998) into a new framework at several stages.

The room for regional contextualization and interpretation will also depend on the central government's managerial and control mechanisms, like the "National Expectations of Local and Regional Planning" (NE). In addition, the implementation of the RPS may influence how

the regional planning system is perceived and how it works in practice as a form of further regional institutionalization of a certain regional planning practice. This implies that we *may find* diverse forms of RPSs and therewith forms that may add to the hybridity of the regional planning system of Norway.

2.2. STP Strategic planning – storytelling and co-production

In our analysis of the RPS in Norwegian regional planning, we select two main elements of STP: *storytelling* and *co-production/co-creation.* These two elements contribute to different STP focuses, but also overlap. For example effective storytelling usually requires that they be developed through co-creation.

2.2.1. Storytelling

We have chosen to understand and analyze RPSs as storytelling – about the past, the present and the future, about vital challenges, and about who should participate in the planning process and in what manner. Olesen (2017) claims that strategic spatial planning has since the early 1990s developed into an exercise in persuasive storytelling. The increased interest in strategic planning in the 1990s was often linked to the intended persuasiveness of spatial strategies, which often relied on spatial concepts and metaphors with supportive storylines that sought to mobilize attention and actors around their core ideas and to transform how key actors think and act in urban areas (Healey, 2009; Olesen, 2017).

Throgmorton (1992:17) emphasizes that good planning is "… persuasive storytelling about the future, and that planners are future-oriented storytellers who write persuasive texts that other people read (construct and interpret), in diverse and often conflicting ways." Storytelling is both a model *of* the way planning *is* done, and a model *for* the way planning could or should be done. Storytelling is an important aspect of everyday planning practice" (Van Hulst 2012: x), whether it is intentional or not (Asmervik and Hagen, 2001). Storytelling is a planning method that needs to be developed in praxis, through praxis (cf. Flyvbjerg, 1991; Hillier, 2002; Healey, 2009; Throgmorton 1992; Olesen, 2017). Planning fundamentally revolves around the successful use of language – spoken, written or as maps and images (Hellspong, 1992, 1995; Ramirez, 1995a, 1995b; Asmervik and Hagen, 2001).

Storytelling is closely linked to key planning concepts like dialogical planning, collaborative planning, and communicative planning (Healey, 1997; Forester, 1999; Sager, 2013; Harper and Stein, 2012). These concepts and related theories are obviously also relevant in the analysis of RPS. Albrechts et al. (2003) argue that much of the power of strategic spatial planning lies in its use of concepts and images to mobilize and fix attention.

Healey (2006b) has introduced the concept relational complexity to focus on how complex and demanding dialogue and cooperation in strategic planning can be: "'Relational complexity' is therefore decidedly not 'comprehensive' in its approach. It needs to be highly selective, focusing on the distinctive histories and geographies of the relational dynamics of a particular place. It may recognize borders and cohesions, but also the tensions, exclusions and conflicts which these generate" (Healey, 2006b:542). As long as RPS is a new procedural praxis characterized by multi-level governance and networked multi-actor systems (Bevir et al., 2003; Higdem, 2015; Higdem and Sandkjær Hanssen, 2014), relational complexity appears to be a

useful analytical concept, both for the storytelling and for RPS.

2.2.2. Co-production - Co-creation

Another appropriate concept introduced into the strategic planning by Albrechts (2012) is *co-production*. Strategies, policies, and plans are increasingly realized in collaborative settings and processes of co-production.

The term has been used for many years in different contexts and in different intellectual traditions, from co-production in the delivery of services to co-production as a political strategy and a method of planning (Mitlin, 2008; Watson, 2014; Higdem, 2014, 2018; Hanssen et al., 2018; Aastvedt & Higdem, 2022;). Here, we use the better term of co-creation (Aastvedt & Higdem, 2022), even though it has been used interchangeably with coproduction (Albrects 2012). The activity of co-creation is used to "enhance the production of public value for example in terms of visions, plans and policies" (Aastvedt & Higdem, 2022: 60). It emphasizes the substantial engagement of citizens and grassroots organizations (Le Galés, 2002; Higdem, 2014) and a process 'more realistically grounded in citizen preference' (Irvin & Stansbury, 2004, p. 55).

Co-creation goes right to the core of both RPS and regional planning in the exhortation that all public bodies and all community organizations need to participate and contribute to more innovative and transformative practices (Albrechts, 2006a), in what is called collaborative innovation (Sørensen & Torfing, 2018). In this sense it is an expression of a development of collaborative and communicative planning (Watson, 2014).

Co-producing RPS, or a regional STP, helps to highlight a more managerial approach to regional planning by focusing on the interaction between various layers of an organization or a public sector (cf. Klijn & Koppenjan 1997; Bryson, 2018; George & Desmidt, 2014). The two 'co-terms' are closely related to terms such as 'collaborative methodology' (Wolf, Nogueira & Borges, 2017), 'modern governance' (Kooiman, 1993), 'network governance' (Kickert, Klijn, & Koppenjan, 1997), 'interactive governance' (Sørensen & Torfing, 2007), and 'new (public) governance' (Osborne, 2010).

All this co-creative activity in strategy development and planning also has its own challenges. Collaborative planning approaches are often torn between the legitimate demand for public participation and the necessity for assuring accountability and responsibility of decision-making bodies (Renn et al., 1993). This can cause co-creation to become mainly a ritual activity (McClymont, 2014).

3. Method and data

We evaluate the RPS work limited to (1) the process leading up to the RPS adopted by the county council in all the counties, (2) the product, the actual RPS document, (3) the national approval – relevant only for the 1st RPS generation. The requirement for national approval was later abolished, and the county council itself now approves the RPS.

We have assessed the RPS work against relevant legislation and national expectations. Both the law and the specific national letter of expectations place demands and expectations on the county councils, which will ultimately adopt the final RPS text. We examine how the RPS

is understood, interpreted, and implemented as practice, i.e., as the planning strategy process and the adopted planning strategy document.

At the same time, the entire RPS institute rests on a necessary premise that many different actors must do their part of the work, i.e., making their contribution by 'understanding, interpreting and implementing' the planning strategy.

Our research material (data) comprises documents about and from the RPS processes in all the counties in Norway. There were 19 counties until 2018, 18 until 2020, and 11 until 2024.

Our data are based on the study of these documents: (1) the PBA of 2008 with changes, preparatory work to the PBA and the guidance material to the RPS; (2) all RPSs developed in 2011-2012, 2015-2016 and 2019-2020, and the case papers following the discussion and the adoption of the RPS; (3) the 'National Expectations of Local and Regional Planning' and the central state's letters of final approval to each RPS developed in 2011-2012.

The data from the PRP's generations one and two is published in Norwegian from the now finalized EVALPLAN-research project (Higdem & Hagen, 2017; Higdem & Kvalvik, 2019). Research on the third-generation RPS and the analysis of the whole timespan is therefore new.

4. Analysis

4.1. RPS - criteria for classification

To classify the RPSs, we have developed a list of criteria of key questions related to the RPS. The criteria are taken from what is expected of RPS in the planning act PBA as a document and as a process, and in national expectations (NE) for regional and municipal planning.

4.2. The first generation of RPS 2011/12

The two main dimensions of how the counties have implemented the RPSs are (1) whether, or to what degree, the counties have complied with the PBA's provisions of the RPS, and (2) whether, or to what degree, the counties have addressed, answered, and complied with the National Expectations of the RPS. Table 1 shows the implementation status for the first round with RPS. The two dimensions (axes) constitute (1) the "master model" of how a RPS is to be understood and implemented – the procedural and model side, and (2) the substantial side, meaning the central government's expectations of what policy themes the RPS is to encompass and assess. In the scheme below, the two dimensions are the two axes that form the four-field table below (Table 2).

Table 1. RPS first generation 2011-2012. The counties' four types of adaptations to implementation

PBA's demands, requirement of RPS / **National Expectations (NE) of RPS**	Meet by and large the PBA's requirements **The law-abiding**	Does not meet the PBA's requirements **De disobedient**
Relates and responds to, and possibly fulfills the NE to a great degree. **The dutiful**	The law-abiding and dutiful: **Loyal** 6 counties	The disobedient and dutiful **Challengers** 4 counties
Relates and responds to, and possibly fullfil the NE within their own context and frame of interpretation. Possibly also not relating to the NE. **The independent**	The law-abiding and independent **Translators** 6 counties	The disobedient and independent **Heretical** 2 counties

Accordingly, the two axes produce four possible adaptations when implementing the RPS. The law-abiding counties comply with the law's provisions, whereas the disobedient deviate from these or have significant shortcomings. On the "National Expectation" axis, the loyal are counties that address, answer to, comply with national policy, and adhere to it. The independent are those that contextualize the national policy expectations within their own regional context and frame of interpretation and translation. Consequently, four different types of adaptations occur. We have called the four types as follows: the loyal, the challengers, the heretical, and the translators. There are different degrees and sorts of adaptations within each main type, since there is a continuum along both axes. Consequently, these are ideal types. The vast diversity of implementation practices in this first round in 2011-2012 is illustrated by the presence of RPSs in each group.

The loyal are the counties that comply both with the law and with the National Expectations. However, we find that there are many forms of loyalty. For instance, a county may be loyal to the National Expectations but simultaneously raise critical questions to these and demand a closer dialogue with the central government.

The *challengers* represent the combination loyal/disobedient; they contest the interpretations of the RPS according to the PBA and the guidance booklet, even though they are loyal to the

National Expectations.

The translators are independent/law-abiding, meaning that the execution of the RPS is according to PBA, but they are independent from the National Expectations. Their picture of the actual challenges for the county are more influenced by their own analyses and understandings – rather than the National Expectations. An example from two counties in the middle of Norway illustrate that translation is the dominant view regarding the National Expectations. By way of introduction to this view in the RPSs, they refer to the Government Cabinet's own directive stating: 'The Government Cabinet has in earlier directives on regional planning stated that the goals and directions the central state points to will not be equally important in all counties and municipalities.' Therefore, the main issues for the county and municipal planning are the counties' and the municipalities' own policies. Accordingly, the counties interpret the power of direction of the National Expectations and the counties' own legitimate execution of discretion as follows: 'The Government Cabinet therefore expects that those who participate in the planning processes to develop good comprehensive solutions in a regional and local perspective. Consequently, the Cabinet paves the way for local and regional competence represented by the local and regional political bodies and the elected representatives to practice the necessary discretion and to provide for local and regional added value.'

The independents also tend to offer the central government policy advice or demands based on their assessment of the regional development challenges ahead. The policy recommendations are put forth with issues where the central state holds the authority, such as policy means and measure for agriculture, fishery or employment.

The heretical, which comprise only two counties, comply neither with the PBA's provisions of a regional planning strategy nor with the National Expectations. They define their own political and planning methodological reality. The challengers and the heretical share a characteristic, which is to develop a strategic plan (STP), rather than a strategy of the regional planning to come (RPS). We also observed examples where central actors such as the county politicians, the county as an organization, the municipalities and the regional partnerships utilize the goals and strategies of the RPS as a planning document in their own planning (Bråtå et al., 2014; Higdem & Hagen, 2015). The two types separate on a central provision of the PBA; the challengers have also worked out an overview of which plans are to be made during the four-year period to come, which is a planning strategy.

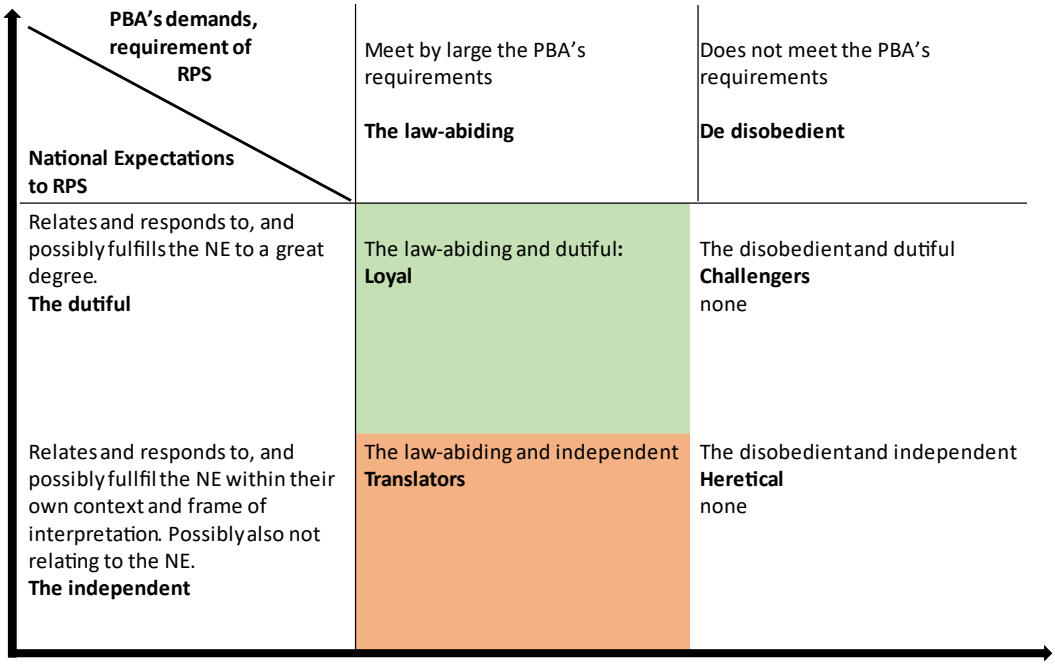
Regardless of this diversity, the government approved all RPSs of the first generation, as our analysis of the letters of approval show (Higdem & Hagen, 2017). However, the government's feedback identified these deviations and deficiencies: a) the absence of an overview of future planning tasks, b) the failure to account for the national expectations, c) national challenges not resulting in regional planning, and d) the presence of too many plans or plans that do not accord with the PBA.

4.3. The second generation of RPS 2015/16

The main picture of the second generation of RPSs is convergence (Higdem & Jacobsen Kvalvik, 2018). (See Table 2.) This is the counties' logical reaction to the government's thorough

feedback of the first generation. Such elaborate translations from the government increases the possibility of the county's compliance to the PBA's requirements and to the National Expectations to regional planning. Hence, we find the RPSs in only two adaptations, the Loyal and the Translators.

Table 2. RPS second generation (2015-2016) of adaptations to implementation



The Government adjusted the PBA before the second generation of the RPS, where the requirement for national approval was removed, giving the county councils the final authority. Secondly, by adding '*to take a stand on long-term development goals'* in § 7.1 (Ot.prop nr. 47 (2003-2004), the RPS is directed towards being a planning document instead of a strategy for the future planning tasks of the county.

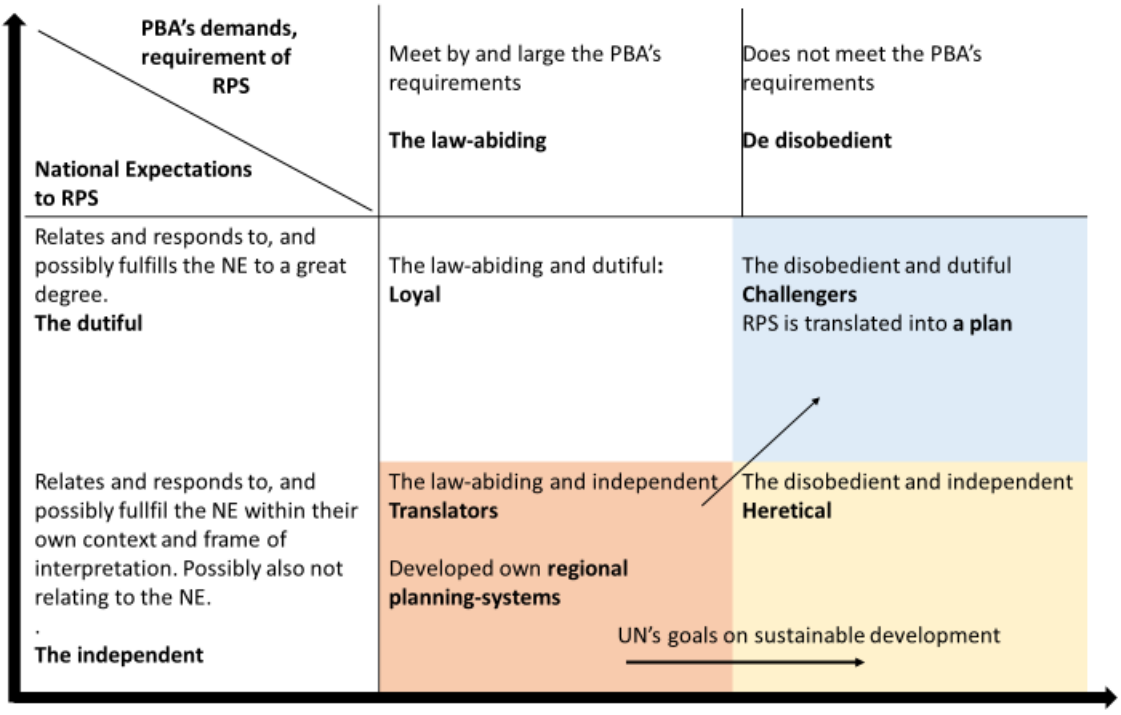
4.4. The third generation of RPS 2019/20

The UN's member states' decisions of the 17 goals of sustainable development toward 2030 were announced in 2015, and the NE (2019- 2023) was launched in 2019 (Nasjonale forventninger 2019-2023).

Owing to the UN's 17 goals, a new NE, and the two major changes in the PBA (presented above in section 4.3.), we were surprised to observe in the third generation of RPSs the renewed development of diverse practices between counties and wider translations of the RPSs, as well

as quite new adaptations or figurations. See Table 3.

Table 3. RPS third generation (2019-2020) of adaptations to implementation



In the third generation of RPSs, our analysis shows there are no adaptations (translations) in the *Loyal* category. No RPSs comply both with the law and the NE of 2019. However, we find RPAs in the three other categories. The *challengers* dispute the goals of RPSs according to the PBA. These counties have translated the RPS from a strategy of future planning tasks into a plan for the county. In doing so the county's political planning authority discusses and decides upon a common strategic spatial plan which sets the direction the county itself, the regional state-bodies, and the local municipalities. For example, one county calls their RPS as '*The development-plan for Rogaland*' (Rogaland fylkeskommune, 2021), which sets the direction for further planning of societal development and the county's economic priorities, organizational development, and governance. These counties are loyal to the NE.

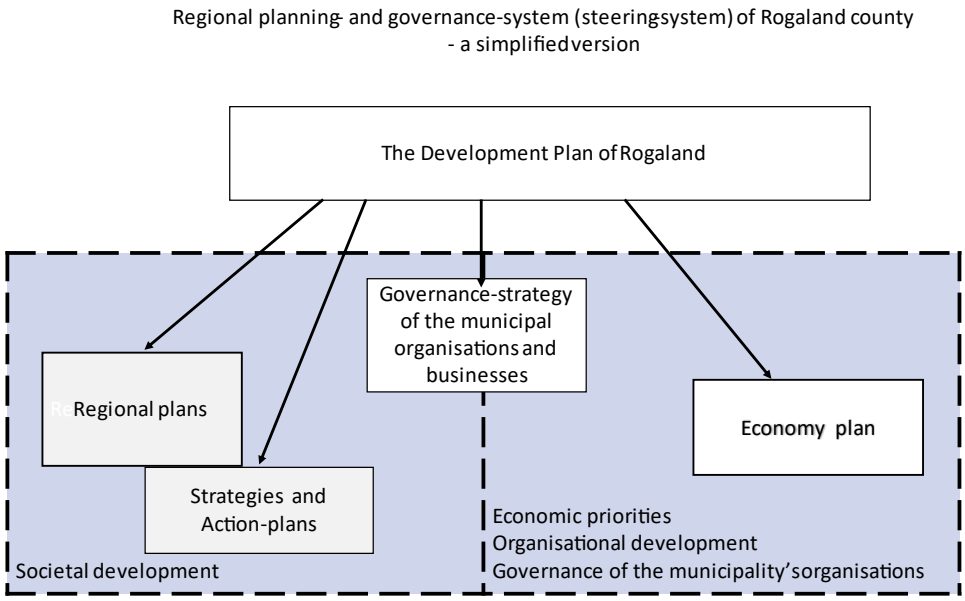


Figure 2. Translations of the RPS into a Regional development Plan, Rogaland County

The *Translators* abide by the PBA's expectations regarding the understanding of a RPS, but they neglect to take the NE into account. As Figure 3 illustrates, the UN's goals of sustainable development (UN17) are implemented as superior to the NE. The RPSs in the translator group focuses on how the UN17 is to be implemented in the RPS. The arrow from the group of *Translators* and into the Heretical group illustrates that the UN17 goals also seem superior to the NE in this group.

The translators share another characteristic in that the RPS also consists of an independent understanding of the county's regional planning system, which applies to the PBA, but also extends the PBA. An example of extension is the operationalization by Møre og Romsdal County of the RPS and the Comprehensive Regional plan by evolving a new layer of *County strategies* for four years, instead of the PBA's Action programmed of the plan itself.

The Heretical counties are disobedient to as well as independent of the NE. The examples here show that these RPSs may not have long-term goals and may neglect the NE in the planning. However, as indicated by the arrow from the category of Translators to the Heretical – the heretical may take the UN17 goals into account.

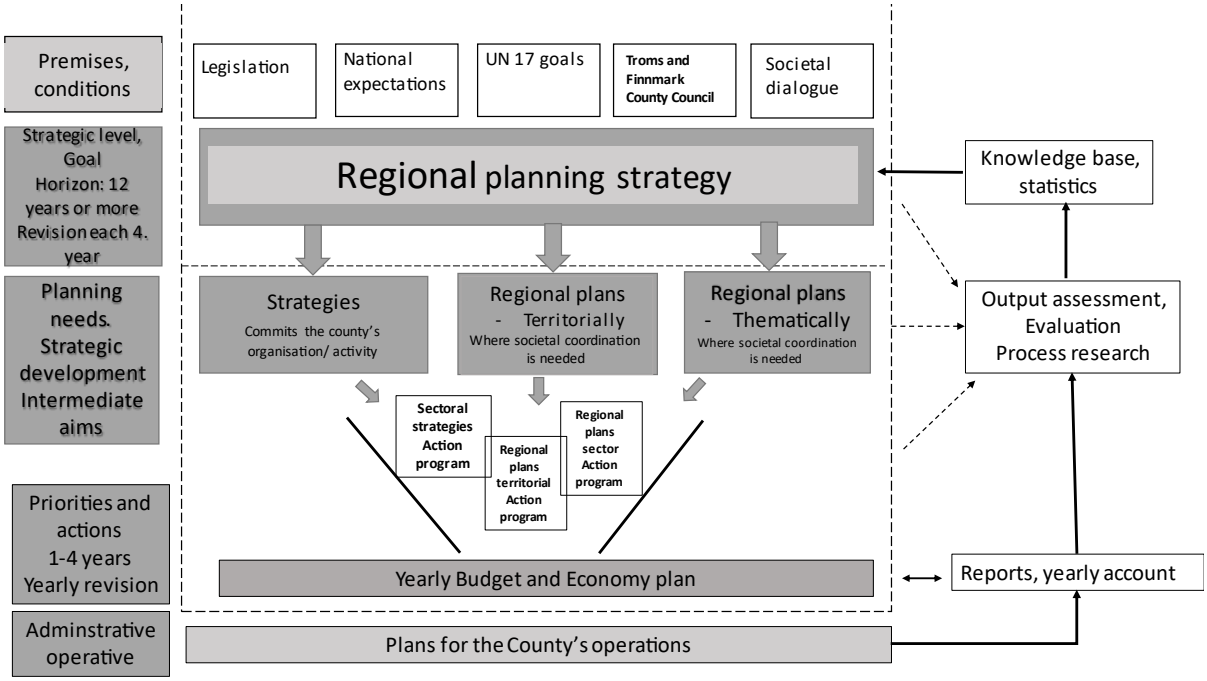


Figure 3. The planning system of Troms and Finnmark County - 'The planning funnel', 2021

5. Discussion

We shall now discuss our collected RPS material, which we have presented and analyzed in section 4, by employing the *translation and re-contextualization in implementation theory* for research question (1) and the theory on *storytelling and co-creation* for research question (2).

5.1. RPS - translation and re-contextualization

The Norwegian model derived its first interpretative stage from the Danish model of municipal planning strategies by reforming it to the concept of not a local, but a Regional Planning Strategy, the RPS, as a 'master version' (Røvik, 1998). Following the new law of 2008, the government supported implementation mainly with a booklet of guidance (ref), and the NE. The counties of Norway were to implement a new regional planning system, where RPS was a tool for strategic and goal-oriented regional planning focused on regional necessity.

As we have seen, there are vital differences in how the counties of Norway implemented the RPS in 2011-2012. Regarding complying with the RPS and complying with the NE to the regional and local planning – we find RPSs in all four of our ideal types: The loyal, the translators, the challengers, and the heretical.

What does this variety of the first generation tell us? The variety confirms the already vast evidence in the literature of the challenges concerning top-down implementation (cf. Hill, 2013; Røvik, 1998). Since this hierarchy consists of regional publicly elected bodies with a certain degree of autonomy from the central government (the counties and the municipalities), the counties feel free to translate the PBA into their own regional contexts. In the case of RPSs, the translations and contextualization are to be assessed along the two axes. First, the degree of regional adjustment is given by law, which should imply a relatively narrow degree of regional freedom in how to implement the RPS as a planning strategy. As we have seen, this

fact does not hamper a third of the counties' regional contextualization and translation. For most of these, we understand the translation as path-dependency (Scharpf, 1997), since these RPSs mostly continue the county planning tradition, as the RPS is contextualized and formed as a long-term plan. Of course, such adaptation also illustrates a need for comprehensive regional planning, which is downplayed in today's PBA. These counties have taken a shortcut by using the RPS as the overall and comprehensive strategic plan and translated the law to make it useful for their own needs or demands. Therefore, we argue that the new regional planning system in its realization may not fulfil the intended consistency *between strategies for planning and the planning itself*, and hence contribute to a hybridization. The central government also contributes to hybridization with the latest amendments in the PBA, from 2014, by requiring long-term development goals to be stated in the RPS for the future.

Compliance along the other axis, the NE, is quite another story. The counties have since the late 1990s been expected to develop a regional policy based on the region's own challenges and resources. This is the "regime shift" from a national allocation or re-distribution of resources for regional development to a more endogenous and regional resource-based approach (Amdam and Bukve, 2004) in collaboration with both public and private actors. Several White Papers stress this shift (Kommunal- og Regionaldepartementet, 2001, 2002, 2013), and by 2015, the counties' paramount task is the strategic and direction-setting function related to regional planning – to assess and contextualize the many priorities of the central state in the actual regional challenges comprehensively (Kommunal- og moderniseringsdepartementet, 2015). Therefore, the counties' re-contextualization of the NE was anticipated. The interesting findings here lie in the government's response. We find that the letters of final approval overlook contextualization, meaning they reveal a narrow interpretation of the regional freedom (and expectation) to assess the national goals into the actual regional situation. The central government is torn between the notion of (and need for) flexibility in planning and the need for control or direction setting in policy- and strategy-making. Here, the direction-setting need won.

Many counties evade the national storytelling processes. They use regional co-production to make their own plans, to tell their own regional stories, and to create their own regional political frames for regional development. None of the RPSs is disapproved by the government, which means that this seems to function both for the regional and national authorities. Consequently, the perceived scope for regional contextualization (Røvik, 1998) was narrowed. The central government re-contextualized the counties' space of action by their role as approving authority, and, as we have seen, their thorough corrections and feedback of what was lacking. This course streamlined the second generation of RPSs.

From diversity in the initial implementation stage, we find convergence in the second generation (2015-2016) into the categories Loyal or Translators. The RPSs represent an almost identical story about the present and the future as we find in the NE, in the PBA. The challenges and the development goals are the same. Few counties make clear thematic and political priorities. It is not in the RPSs most of the counties signal their own political priorities, which is the intention of RPSs.

The cause of the vast diversity in the first generation may also be understood as a lack of understanding of what the new tool RPS is supposed to do. The lack of knowledge and

incompetence was more prominent than the academic and political independence we observed in the RPSs of the first generation. In the second generation the planners, politicians, and other participants have learned their RPS lesson.

However, we find that the PBA and especially the NE (Higdem & Hagen, 2017) lead to highly varied interpretations. The linguistic formulations are vague, and the political priorities are few and weak. It is easy for the counties to be loyal, if they so choose. It is obvious that in the second generation almost all counties are loyal; they have no need to highlight disagreement.

The analysis shows that in the third generation, RPS (2019-2020), now with 11 counties

[1], they recreate their own contextualization, departing from the rather conformist adaptations in generation two. Generation three is more varied and even more nuanced than the first. Our analysis show that we now find RPSs in all four categories, but the re-contextualization of these is new.

There are three main contributing factors; 1), UN17 goals: the implementation of a sustainable society and the green shift which overrules the NE. 2), During the three generations, the counties have developed a systematic overview of their planning activities and tools (types) within and outside the PBA, assessment of these and knowledge-based assessment of the planning that is prioritized. 3) Long-term goals were first implemented in the third generation of RPSs, which spurred regional contextualization, and hence the development of more 'place-based' development goals.

5.2. RPS – a storytelling activity

We argue that RPS can and should be analyzed, discussed, and evaluated as a storytelling activity (cf. Throgmorton,1992; Healey, 2009; Olesen, 2017.). RPS is fundamentally about developing, presenting, and deciding the knowledge base about the current situation, what the main challenges are, and how best to plan to meet these in order to achieve certain goals.

Our research shows that many RPS documents make for good reading, that planners and politicians have tried to be and have become good storytellers. This is especially clear in the third generation. They have realized how important 'persuasive storytelling' is: orally in the RPS processes and in writing, in the knowledge-base document as well as the RPS document in texts, pictures, figures, tables, videos, etc. Thus, they extend the tradition from the 1990s of making STPs in the processes and the documents more persuasive than before (cf. Throgmorton,1992; Healey, 2009; Olesen, 2017.)

It is striking that both the planners and the politicians have a basic understanding that an absolutely necessary prerequisite for success with the RPS work is a 'successful use of language' (Hellspong, 1992, 1995). They show in practice that they agree with Albrechts et al. (2003) who argue that much of the power of strategic spatial planning lies in its use of concepts and images to mobilize and fix attention. The collective development of new knowledge, new understandings, and new goals for the desired future, along with the aim and ability to follow

[1] Norway had 19 Counties until 2018, 18 Counties to 2020, and from January 1. 2020, Norway has 11 Counties.

up on later planning, is therefore also a rhetorical challenge (Ramirez, 1995a, 1995b; Asmervik and Hagen, 2001).

This is particularly demanding all the time the RP work is characterized by many participating actors, from many different environments, who may well have different languages, different ways of communicating, cf. concept 'relational complexity' (Healey 2006b, Bevir et al., 2003; Higdem, 2015; Higdem and Sandkjær Hanssen, 2014).

At the same time, it is precisely in such complicated interactive processes that good storytelling, understanding, and skills are most important.

5.3. RPS – a co-production/co-creation activity

RPS was introduced as a form of 'co-activity'. Our research illustrates that this has varied greatly between the counties and the RPA processes; that is, few or none have actually practiced all the process ambitions in PBA and NE.

We have discussed the RPS processes with participation from many actors in section 5.2 storytelling, and thus already discussed RPS as a co-production activity, as an ideal/norm (PBA and NE), and as well as practice mapped in our research. The analysis suggests; a) a more managerial approach to regional planning by focusing on the interaction between various layers 'collaborative methodology', 'modern governance', 'network governance', 'interactive governance', 'new (public) governance' b) torn between the legitimate demand for public participation and the necessity for assuring accountability and responsibility of decision-making bodies and c) all public bodies and all community organizations both need to participate and contribute to more innovative and transformative practices (Albrechts, 2006a). We argue this expresses a development of collaborative and communicative planning (Watson, 2014).

6. Conclusion

RPS was introduced before the 2011-2015 election period as an institutional change of the regional planning system. It has indisputably established itself as a popular change, among the majority of politicians and planners, for renewing and strengthening the strategic aspects of the counties' societal planning.

We have confirmed that how a new idea like RPS develops in regional planning processes depends on both the central government's need and ability to manage the counties' RPS work, and the county municipalities' ability and need to make regional adjustments. All the other participants in the RPS processes have also contributed to translations and interpretations.

Our observed RPS practices demonstrate the explanatory power of theories about translation and re-contextualization in implementation, cf Røvik (1998) and Hardy et al. (1998). They *describe* a specific strategy element within Norwegian regional planning in a relevant and precise way.

The regional translation and re-contextualization processes in the three generations of RPS have not weakened the original ambitions of RPSs. On the contrary, the increase diverse

practices between counties and the wider translation of the RPSs, as well as quite new adaptations or figurations in the third generation, illustrate that the regional planning authorities are actively using RPS as a tool for taking greater responsibility for their own societal development.

As a strategic activity the RPS provides an arena where the knowledge base, the long-term goals and strategies are co-created through storytelling between a vast set of actors on county level.

Our research indicates that central authorities generally value the regional RPS variations. At the same time, our data also indicate that both the regional and national state evade regional political governance to a certain extent, even though the variations could (or should) have implications for the PBA, a fact that should also engage the national government.

References

AASTVEDT, A. & HIGDEM, U. 2022. Co-creation, Collaborative Innovation and Open Innovation in the Public Sector: A perspective on Distinctions and the Convergence of Definitions. *Nordic Journal of Innovation in the Public Sector,* 1, 53-68.

ABIS, E. & GARAU, C. 2016. An Assessment of the Effectiveness of Strategic Spatial Planning: A Study of Sardinian Municipalities. *European Planning Studies, Vol 24:1*

ALBRECHTS, L. 2006a. Shifts in strategic spatial planning? Some evidence from Europe and Australia. *Environment and Planning A,* 38(6), 1149-1170.

ALBRECHTS, L. 2006b. Bridge the gap: From spatial planning to strategic projects. *European Planning Studies,* 14(10), 1487-1500.

ALBRECHTS, L. 2009. From Strategic Spatial Plans to Spatial Strategies. *Planning Theory & Practice,* 10, 142-145.

ALBRECHTS, L. 2012. Reframing strategic spatial planning by using a copoduction perspective. *Planning Theory,* 12 (1), 46-63.

ALBRECHTS, L, HEALEY, P & KUNZMANN, K. R, (2003) Strategic Spatial Planning and Regional Governance in Europe, Journal of the American Planning Association, 69:2, 113-129, DOI: 10.1080/01944360308976301

ALBRECHTS, L. & MANDELBAUM, S. J. (eds.) 2005. *The Network Society: A New Context for Planning,* Oxon: Routledge.

AMDAM, J. & VEGGELAND, N. 1998. *Teorier om samfunnsplanlegging. [Theories on planning].* Oslo, Universitetsforlaget.

AMDAM, J. & VEGGELAND, N. 2011. *Teorier om samfunnsstyring og planlegging,* Oslo, Universitetsforlaget.

ASMERVIK, S. & HAGEN, A. 2001. Planning as Rhetoric: An Examination of the Rhetoric of County Planning in Norway. *Housing, Theory and Society,* 18, 148-157.

BALDUCCI, A., FEDELI, V. & PASQUI, G. 2011. *Strategic Planning for Contemporary Urban Regions: City of Cities: A Project for Milan*, Ashgate Publishing.

BEVIR, M., RHODES, R. A. W. & WELLER, P. 2003. Traditions of governance: Interpreting the changing role of the public sector. *Public Administration,* 81, 1-17.

BRYSON, J. M. 1988. A strategic planning process for public and non-profit organizations. *Long Range Planning,* 21, 73-81.

BRÅTÅ, H. O., HIGDEM, U., GLØTVOLD-SOLBU, K. & STOKKE, M. 2014. Partnerskap - positivt for regional utvikling og utfordrende for kommunal forankring. En evaluering av partnerskapsinstituttet i Oppland. Lillehammer: Østlandsforskning.

DESMIDT, S. & MEYFROODT, K. 2021. What motivates politicians to use strategic plans as a decision-making tool? Insights from the theory of planned behaviour. *Public management review,* 23, 447-474.

FALLETH, E. I. & JOHNSEN, V. 1996. Samordning eller retorikk? Evaluering av fylkesplanene 1996 - 99. [Coordination or rhetoric? Evaluation of County plans 1996-99]. Oslo: Norsk Institutt for By- og Regionforskning.

FLYVBJERG, B. 1991. *Rationalitet og Magt. Det konkretes videnskap.,* København, Akademisk forlag.

FORESTER, J. 1999. *The Deliberative Practitioner: Encouraging Participatory Planning Processes,* Cambridge, MIT Press.

GEORGE, B., & DESMIDT, S. (2014). A state of research on strategic management in the public sector: An analysis of the empirical evidence. In P. Joyce, & A. Drumaux (Eds.), Strategic management in public organizations: European practices and perspectives. Routledge

HANSSEN, G. S., HOFSTAD, H., & HIGDEM, U. (2018). Regional plan. In G. S. Hanssen & N. Aaarsæther (Eds.), *Plan- og bygningsloven. Fungerer loven etter intensjonene?* Universitetsforlaget.

HANSSEN, G.S & AAARSÆTHER, N. (Eds.), *Plan- og bygningsloven. Fungerer loven etter intensjonene?* Universitetsforlaget.

HARDY, C., PHILLIPS, N. & LAWRENCE, T. 1998. Distinguishing Trust and Power in Interorganizational Relations: Forms and Facades of Trust. *In:* LANE, C. & BACHMANN, R. (eds.) *Trust within and between organizations.* New York: Oxford University Press.

HARPER, T. L. & STEIN, S. M. 2012. *Dialogical Planning In A Fragmented Society: Critically Liberal, Pragmatic, Incremental,* London Transaction Publishers.

HEALEY, P. 1997. *Collobrative Planning,* London, MacMillian.

HEALEY, P. 1998. Building institutional capacity through collaborative approaches to urban planning. *Environment and Planning,* 30, 1531 - 1546.

HEALEY, P. 2006a. Transforming governance: Challenges of institutional adaptation and a new politics of space. *European Planning Studies,* 14(3), 299-320.

HEALEY, P. 2006b. Relational complexity and the imaginative power of strategic spatial planning *European Planning Studies,* 14:4, 525-546.

HEALEY, P. 2009. The Pragmatic Tradition in Planning Thought. *Journal of Planning Education and Research,* 28, 277-292.

HELLSPONG, L. 1992. *Konsten att tala. Övingsbok i praktisk retorik.,* Lund, Lund: Studentlitteratur.

HELLSPONG, L. 1995. Retorik och praktisk logik. *Nordplan Meddelande* 4.

HIGDEM, U. 2001. Planlegging på fylkesnivå. [Planning on County level]. *In:* AARSÆTER, N. & HAGEN, A. (eds.) *planlegging.no! Innføring i samfunnsplanlegging.* Oslo: Kommuneforlaget.

HIGDEM, U. 2014. The co-creation of regional futures: Facilitating action research in regional foresight. *Futures*, 41-50.

HIGDEM, U. 2015. Assessing the impact on political partnerships on coordinated meta-governance of regional government. *Scandinavian Journal of Public Administration,* 19, 89-109.

HIGDEM, U. & HAGEN, A. 2015. Oppfølging av Regional planstrategi for Oppland, 2012 - 2016 - en vurdering. *Working paper.* Lillehammer: Høgskolen i Lillehammer.

Higdem, U., & Hagen, A. (2017). Variasjon, mangfold og hybriditet. Implementering av regional planstrategi i Norge. *Kart og Plan*, *77*(1), 40-53.

Higdem, U., & Jacobsen Kvalvik, K. (2018). Regional planstrategi – strategi for planlegging eller ny fylkesplan? . In G. S. Hanssen & N. Aaarsæther (Eds.), *Plan- og bygningsloven 2008 – fungerer loven etter intensjonene?* . Universitetsforlaget.

HIGDEM, U. & SANDKJÆR HANSSEN, G. 2014. Handling the Two Conflicting Discourses of Partnerships and Participation in Regional Planning. *European Planning Studies,* 22, 1444-1461.

HIGDEM, U. 2018. Regional planlegging – mellom stat og kommune. In Aarsæther, N., Falleth, E., Nyseth, T. & Kristiansen, R. (eds.) *Plan og samfunn.* Cappelen Damm Akademisk.

HILL, M. 2013. *The Pubic Policy Process,* Essex, Pearson.

HILLIER, J. 2002. *Shadows of Power: An Allegory of Prudence in Land-use Planning,* London, Routledge.

IRVIN, R., & STANSBURY, J. (2004). Citizen participation in decision making: Is it worth the effort? European Political Science, 64(1), pp. 55–65. doi:10.1111/j.1540-6210.2004.00346.x

KLIJN, E. H. & KOPPENJAN, J. 2020. Debate: Strategic planning after the governance revolution. *Public money & management,* 40, 260-261.

KICKERT, W., KLIJN, E. H., & KOPPENJAN, J. (1997). Managing complex networks: strategies for the public sector. Sage Publications, London

KOOIMAN, J. (1993). Modern governance. New governmentsociety interactions. Newbury Park: Sage

KOMMUNAL- OG REGIONALDEPARTEMENTET 2001. St. meld. nr. 34 (2000 - 2001)Om distrikts- og regionalpolitikken. Oslo: Kommunal-og
Regionaldepartementet.

KOMMUNAL- OG REGIONALDEPARTEMENTET 2002. St.meld.nr.19 (2001-2002) Nye oppgaver for lokaldemokratiet - regionalt og lokalt nivå. Oslo: Kommunal- og Regionaldepartementet.

KOMMUNAL-OG ARBEIDSDEPARTEMENTET 1997. St. meld. nr. 31 (1996 - 1997) Om distrikts- og regionalpolitikken. [White paper on the rural-and regional policy]. Oslo: Kommunal- og arbeidsdepartementet.

KOMMUNAL-OG MODERNISERINGSDEPARTEMENTET 2015. Meld.St. 22 (2015-2016). Nye folkevalgte regioner - rolle, struktur og oppgaver. (New regions - role, structure and tasks]. *In:* MODERNISERINGSDEPARTEMENTET, K.-O. (ed.). Oslo: Statens forvaltningstjeneste

LE GALÉS, P. 2002. *European Cities: Social Conflicts and Governance,* Oxford, Oxford University Press.

LINGUA, V., & BALZ, V. (Eds.). (2019). Shaping regional futures. Designing and visioning in governance rescaling. Springer

MAHONEY, J., & THELEN, K. (2010). Explaining institutional change: Ambiguity, agency, and power. Cambridge University Press.

MCCLYMONT, K. (2014). Stuck in the process, facilitating nothing? Justice, capabilities and planning for value-led cutcomes, Planning Practice & Research, 29(2), pp. 187–201. doi:10.1080/ 02697459.2013.872899

MITLIN, D. 2008. With and beyond the state: Coproduction as a route to political influence, power and transformation for grassroots organizations. *Environment and Urbanization,* 20,

339-360.
MÄNTYSALO, R., KANGASOJA, J., K., & KANNINEN, V. 2015a. The paradox og strategic spatial planning: A theoretical outline with a view on Finland. *Planning Theory & Pratice, Vol 16:2*
MÄNTYSALO, R., TUOMISAARI, J., GRANQVIST, K., & KANNINEN, V. (2019). The Strategic Incrementalism of Lahti Master Planning: Three Lessons. Planning Theory & Practice, 20(4), 555–572. https://doi.org/10.1080/14649357.2019.1652336
MILJØVERNDEPARTEMENTET 2004. Ot.prp.nr 47 (2003 - 2004). Om lov om endringer i plan- og bygningsloven (konsekvensutredninger). *In:* MILJØVERNDEPARTEMENTET (ed.). Oslo: Statens Forvaltningstjeneste.
MILJØVERNDEPARTEMENTET 2007-2008. Ot.prp. nr 32 (2007-2008) Om lov om planlegging og bygesaksbehandling (plan-og bygningsloven) (plandelen). [On law of planning- and building]. *In:* MILJØVERNDEPARTEMENTET (ed.). Oslo: Statens forvaltningstjeneste.
MILJØVERNDEPARTEMENTET 2011. T- 1497 Nasjonale forventninger til kommunal og regional planlegging. *In:* MILJØVERNDEPARTEMENTET (ed.). Oslo: Miljøverndepartementet.
MILJØVERNDEPARTEMENTET 2012. Regional planstrategi. Veileder. *In:* MILJØVERNDEPARTEMENTET (ed.). Oslo: Statens Forvaltningstjeneste.
MØRE OG ROMSDAL FYLKESKOMMUNE, 2020 *Regional Planstrategi Møre og Romsdal 2020-2024*
file:///C:/Users/700090/Downloads/Regional%20planstrategi%20MogR%202020-2024.pdf
OLESEN, K. 2017. Talk to the hand: strategic planning as persuasive storytelling of the Loop City. *European Planning Studies, Vol 25:6*
OLESEN, K. & RICHARDSON, T. 2012. Strategic Planning in Transition: Contested Rationalities and Spatial Logics in Twenty-First Century Danish
Planning Experiments. *European Planning Studies, Vol 20:10*
OSBORNE, S. P. (2010). The new public governance; emerging perspectives on the theory and practice of public governance. London: Routledge
PBA 2008. Lov om planlegging og byggesaksbehandling. [The Planning-and building act].
PURKARTHOFER, E., HUMER, A. & MÄNTYSALO, R. 2021. Regional planning: an arena of interests, institutions and relations. *Regional studies,* 55, 773-777.
RAMÍREZ, J. L. 1995a. *Skapande mening: Bidrag til en humanvetenskaplig handlings- og planeringsteori* Stockholm, Nordplan Avhandling 13:1.
RAMÍREZ, J. L. 1995b. *Skapande mening. En begreppsgenealogisk undersöking om rationalitet, vetenskap och planering. ,* Stockholm, Nordplan Avhandling 13:2.
RENN, O., WEBLER, T., HORST, R., PETER, D. & BRANDEN, J. 1993. Public Participation in Decision Making: A Three-Step Procedure. *Policy sciences,* 26, 189-214.
RHODES, R. A. W. 1991. Policy networks and sub-central government. *In:* THOMPSON, G., FRANCES, J., LEVACIC, R. & MICHELL, J. (eds.) *Markets, Hierarchies & Networks. The coordination of social life.* London: SAGE Publications
ROGALAND FYLKESKOMMUNE, Regional Utviklingsplan for Rogaland -regional planstrategi 2021-2024. https://www.rogfk.no/vare-tjenester/planlegging/utviklingsplan-for-rogaland-regional-planstrategi/
RØSNES, A. E. 2001. Norsk regional planlegging - umulig enhet eller mulig mangfold? [Regional planning in Norway - an impossible unity or a possible diversity?]. *Kart og Plan,* 94, 213-228.
RØVIK, K. A. 1998. *Moderne organisasjoner. Trender i organisasjonstenkningen ved*

årtusenskiftet. [Modern organisations. Trends in organisational thinking at a new millenium], Bergen, Fagbokforlaget.
SAGALYN, L. B. 2007. Public/private Development. Lessons from Histrory, research and Practice. *Journal of the American Planning Association,* 73, 7-22.
SAGER, T. 2013. *Reviving Critical Planning Theory. Dealing with Pressure, Neo-liberalism, and Responsibility in Communicative Planning,* London, Routledge.
SCHARPF, F. 1997. *Games real Actors Play: Actor-Centered Institutionalism in Policy Research,* Boulder, Westview Press.
SCHMITT, P. & WELL, L. V. (eds.) 2016. *Territorial Governance across Europe: Pathways, Practices and Prospects,* Oxon: Routledge.
SØRENSEN, E. & TORFING, J. 2005. The Democtratic Anchorage of Governance Networks. *Scandinavian Political Studies,* 28, 195-218.
SØRENSEN, E. & TORFING, J. (eds.) 2007. *Theories of democtratic network governance,* Houndmills: Palgrave.
THROGMORTON, J. A. 1992. Planning as Persuasive Storytelling About the Future: Negotiating an Electric Power Rate Settlement in Illinois. *Journal of Planning Education and Research,* 12, 17-31.
THROGMORTON, J. A. 1996. *Planning as Persuasive Storytelling,* Chicago, University of Chicago Press.
TROMS OG FINNMARK FYLKEKSOMMUNE, 2021, *Se nord - Geahča davás - Katto pohjaisheen*. https://www.tffk.no/tjenester/plan-og-horinger/gjeldende-planer-og-strategier/se-nord-geahca-davas-katto-pohjaisheen/
VAN HULST, M. 2012. Storytelling, a model of and a model for planning. *Planning Theory,* 0, 1-20.
VIKE, H. 1995. Evaluering av fylkesplan for Telemark. En vurdering av plan og prosess. [Evaluation of the County plan of Telemark. An assessment of the plan and the process]. Bø: Telemarksforskning.
WATSON, V. 2014. Co-production and collaboration in planning – The difference. *Planning Theory & Pratice, Vol 15:1*
WOLF, C. & FLOYD, S. W. 2017. Strategic planning research: Toward a theory-driven agenda. Journal of Management, 43, 1754-1788.

HOW NETWORK RESOURCES EMPOWER EXPERT INVOLVEMENT? EVIDENCE FROM URBAN PLANNING DECISION-MAKING IN CHINA (1052)

Yuchen Guo*, Huiling Xu, Shi Wu
China; * yuxiaolian_moto@163.com

Abstract. Expert involvement has received increasing academic attention, and expert typology, organisational types and knowledge utilization have been well documented and well theorized. However, the literature on expert involvement is remarkably silent on how to understand the internal structure of expert groups and the influence they bring to bear. This paper seeks to bridge this gap by theorizing and empirically demonstrating the internal discrepancy in expert network. This is achieved through in-depth qualitative analysis of empirical research data on urban planning decision-making in China. This study elaborates on an expert network model that analyses how government choices, organisational characteristics, and capital in network resources shape expert influence. Empirical analysis shows that the role played by experts in policy making is the result of different expert networks. Then, the concept of "resources empowerment expert network" was proposed to understand the logic of resource flow in the network and contribute to the broader literature on expert involvement.

Keywords: Expert Involvement; Network Resources; Expert Network; Urban Planning; Decision-Making

1. Introduction

Expert involvement has spurred accumulating attention both in theory and practice for decades. Experts hold a prominent position in guiding and shaping policy-making and needed by decision-makers in numerous ways (Boswell, 2008; Lundin and Öberg, 2014; Roberts et al., 2020). Expert organisation can play central roles in facilitating new policy ideas and diffusing new forms of expertise (Laage-Thomsen, 2021). Conversely, scholars argues that experts are ineffective or manipulated by bureaucrats (Jasanoff, 1990; Yang et al., 2019), or discuss experts by types and roles (Zhu, 2009; Fleming and Rhodes, 2018).

However, how differences within experts create influence are significantly less studied and understood than typology of policy experts and organisations. Few attempts construct a framework that explains why experts "choose to be" different types or are "formed by" different features, and how these differences produce impact. Thereby, there is no quantifiable or assessable standard for "how to measure the impact of expert in decision-making" (Abelson, 2018). Further, these works focus on developed Western nations, scant empirical research addressing the efforts of governments worldwide to build science advisory capacity, especially lack of evidence for how preferences might vary between different researchers or scientific providers (Akerlof et al., 2022). These lacunae seem to be especially regrettable for studies of expert involvement.

We try to construct a theoretical model of expert influence by analysing action logic of expert network, and test it with empirical evidence. We discuss two related questions. First, when we

consider experts as a sub-dividable organisational structure, what are their respective key factors? Second, how do these structural features generate influence? Our propositions are examined through participatory observation of urban planning decision-making process in China. We conducted this participatory research as one of the main actors in policy process, which is popular in recent years (Seo, 2022; Turner et al., 2020), thus present a more detailed picture of urban planning decision-making in China. As invited observers, we participated in the meetings related to Regulatory Detailed Planning (RDP), which is one of the two statutory planning in China. The process continued for six months. Our data is collected from participant observation and interviews, together with documentation from government and urban planning experts.

Our analysis elucidates that expert network is formed by network resources of different expert groups, derived from government choice, organisational characteristic, and capital, which will generate different expert involvement and strategies. Further, these network resources can be used to enhance expert influence through network structure, or "resource empowerment expert network" as proposed in this study.

By doing so, this study contributes to the existing literature on expert involvement in three ways. First, it goes beyond expert typology and reveals that, similar to decision-makers, there is a complex network within experts, extending the existing literature on expert involvement. Second, it attempts to operationalize the concept of expert influence by constructing an analytical framework, enriches the application of network tools. Third, it extends existing methods by adapting participant observation.

To tackle these issues, this study is structured as follows: in the following section, we review the theoretical insights drawn from the existing literature on expert involvement in decision-making, together with typology of policy expert studies and their recent development. Thereafter, the third section identifies and describes network resources, comprising a short overview of network concept and outlines the analytical framework. We then present research setting and research design, which draws a context of urban planning decision-making in China. Next, we present network resources and strategies in different network through qualitative study. Finally, we summarize combined influence of resources and structures within expert network on decision-making, and discuss generalizability of research findings.

2. Expert Involvement Studies: Gaps In Expert Internal Structure

Owing to the increasingly technical and complex nature of many policy issues, research of expert involvement in decision-making has received increasing attention. While a comprehensive review of the literature on expert involvement is beyond the scope of this study, the majority of studies on this topic can be roughly grouped into three theoretical streams: experts' key role in decision-making, vis-à-vis expert and expertise is unwelcomed by decision-makers, and the study of expert typology. In turn, these three streams provide different theoretical expectations as far as expert involvement is concerned.

Studies of expert involvement are a crucial initiative emphasizing the need for experts and reliance on scientific knowledge by decision-makers. Government officials report that expert and academic research is valuable to them and had a practical influence on their policy advice

and decision-making (Hirschman and Berman, 2014; Bakir et al., 2021). Expert involvement in decision-making system design can provide a forum for political dialogue between different cognition, rationality, and values, which results in a consensus decision-making model that reduces decision-making risk and enhances the effectiveness of administrative decision-making (Busch, 2009; Fischer and Leifeld, 2015; Guo and Yuan, 2022). Decision-makers are increasingly reliant on advanced knowledge to understand and address complex societal problems (Haas, 1992; Jennings and Hall, 2012). Moreover, scholars use the term "useful myth" to describe the contribution of experts and knowledge to policy-making (Boswell, 2018). As the product of expert involvement, the growing role of expertise in policymaking is highlighted.

Conversely, certain authors found that expert and expertise is seen as exceedingly politicized and "unwelcomed by policymakers". Caplan (1979), who first proposed this issue, surveyed 204 high-level decision-makers and showed that there was no significant relationship between expert knowledge and their final decisions. Expert involvement is often used as political ammunition rather than scientific decision-making, and is also regularly rejected or delegitimized by politicians (Nichols, 2017). The legitimacy of knowledge discourse is not respected and its influence on decision-making is not high (Montpetit, 2008; Richards, 2019). Experts and academic research can only make an impact under certain conditions (Haas, 2004; Duina, 2021). In such situations, we need expert involvement in taking appropriate action to guide policy and attenuate the inexorable entanglement of policymakers and experts, if decision-making is to be scientifically sound.

Beyond these disputes, other scholars explore a middle path, highlighting the "extent" of expert involvement (e.g., Metz, 2013; Newman and Head, 2015; Funke et al., 2021), one of which presents research on typology of expert involvement. Epistemologically, expert involvement can be recognized as individual dimension and institutional dimension (Shen et al., 2021). Scholars have studied this by discerning policy experts as actors, or by developing in conjunction with intellectual organisation research. Individual dimension dedicates to role and logic action of experts in decision-making and the logic of action. For example, Medvetz (2010) argues that policy experts draw on a series of idioms such as those of the academic scholars, political aides, entrepreneurs, and media specialists to construct a unique albeit synthetic professional identity. Pielke (2007) proposes four modes of action for experts: Pure Scientist, Science Arbiter, Issue Advocate, and Honest Broker of Policy Alternatives, based on their individual understanding of "science" and "democracy". Institutional dimension is mainly the study of expert organisations. Research on intellectual organisations discusses the concept (Brennan and Connell, 2000) and measure (Dumay, 2009) of intellectual capital. Reed classifies the expert organisational forms into collegiate, bureaucratic, and network organisations by their knowledge base, power strategy, and occupational types (Reed, 1996). Think tank is a typical intellectual organisation. Researches on think tanks mainly identify and classify the organisation by funding, agenda setting, ideological, and research (McGann and Weaver, 2000; Ahmad, 2008; Abelson, 2018). Generally, these types of think tanks clarify the policy outputs, intellectual and other capital, organisation and staffing, funding, and other relevant features.

In summary, despite the proliferation of work on typology of experts' roles from the mid-1990s, the internal structure of expert network has surprisingly received limited attention. Most of previous studies on expert involvement focus on static division of expert types, neither having formed an "understanding of the internal structure of experts" through typology of expert

involvement, nor having emphasized the action patterns of different types of experts in the same policy filed. Thereafter, certain scholars have noted that there may be network structures among experts that are similar to those of decision-makers (Plehwe et al., 2018). Yet, the empirical literature is far behind the normative debate; more specifically, there is a gap between the scholarly literature on the structural features of expert network and publications on the role of experts in the policy process, with a few exceptions focusing on selected cases (eg. Schrefler, 2010; Stephens and Stephens, 2021). This is somewhat puzzling given the key role played by different experts and the impact they can have.

More notably, there is a lack of policy tools to study the logic of the expert actors' actions and to develop a theoretical framework. A few exceptions are focusing on the “dynamics” of the internal structure of experts, for instance, Williams (2021) constructs the behaviour of policy experts as a dynamic process rather than a static role, uses “mapping spatial distance” to provide an explanation for policy experts' network relationships. Inspired by network perspective in expert involvement studies, we apply a theoretical framework to explore the internal structure of expert network and to conduct “dynamic” research on how expert network exerts influence in decision-making process.

3. Network In Policy Expert Research

Network provides an opportunity for expert involvement study. An important stream of public policy research is to explore how experts are connected to different actors and coalitions (Montpetit and Lachapelle, 2016). Complex network of relationships across established fields and professions (Tchilingirian, 2018) that connect various actors in knowledge-policy relationships (Eyal, 2013) and enhance professional credibility. Network analysis approach provides a link between structure types and actor strategies that has been relatively absent in expert research.

Research state that experts may have different regularities from other actors. For example, experts’ action and strategic choices are differently from other policy actors such as government officials, entrepreneurs, NGOs and citizens (Zhu, 2009). Therefore, research on expert networks and policy networks ought to proceed in different directions. However, current research on networks in policy processes focuses on relations with governments and other actors, and less on the internal structure of experts. Most research on expert network views experts as a macrocosm, studying the relationships between expert and other groups rather than internal relations of the expert network (Maasen and Weingart, 2005). This may be due to there is minimal analysis of how network structures are formed and the comparative analysis of these networks (Grossmann, 2013), or previous studies on the impact of various individual motivations on the formation of expert roles are scarce (Zhu and Zhang, 2016).Experts have different tendencies in constructing network, and the way in which networks are formed affects actors’ influence and strategies (Teets, 2018).This could address the fact that “knowledge strategies” in expert networks are difficult to operationalize or study empirically (Marsh, 1998; Christensen, 2021; Hesstvedt, 2021). However, the existing research does not provide a clear answer as to what expert networks demonstrate internally and what the relationship is between this internal situation and actor strategies and how the network generates influence.

Prevailing network research considers network resources and network structure as the two main aspects that generate strategies. Resource Dependency Theory (RDT) provides a major conceptual framework for network research, describing the interdependent participation of organisations and individuals in policy networks in terms of resources. When applying Resource Dependence Theory to policy networks, two types of resources, material-institutional and socio-structural, can be converted to influence the promotion of organisational goals and survival. “Material-institutional resources” (MIRs) describe the direct influence of network resources on actors' strategies. It refers to the set of financial, political, human, informational and institutional goods, services and intangible ‘states of mind’ that organisations deploy in support their preferred political positions and policy options. It indicates the process of generating actor standpoint and capital as a result of organisational preferences and policy choices, reveals the interconnections among organisational characteristics. Focusing on specific network resources, numerous scholars analyse network resources and focus on government choice, organisational characteristic, and capital. Government choice refers to the definition of an intellectual organisation by decision-makers (Abelson and Carberry, 1997; Ahmad, 2008). Organisational characteristic refers to the fact that knowledge and intelligence-related institutions differ in many ways when established, such as organisational structure, operation methods, budget, staff, goals, objectives, and research topics (McGann and Sabatini, 2011). There are more diverse perspectives to measure capital held by actors. Bourdieu (1986) argues that experts’ capital is derived from academic, political, economic, and media. It is noteworthy that while previous studies have considered that capitals, such as cultural capital (Medvetz, 2006), are not associated with network structure, our study considers cultural capital. Based on the above, this study concludes that capitals that influence expert network include academic, political, economic, media, intellectual, cultural, human, and others.

MIRs are crucial to the exercise of actor strategies within policy networks: they create differences in influence and help explain who gets what results and why. The other is ‘social structural resources (SSRs)’, which refers to a continuous pattern of communication and exchange of resources between three or more actors and organisations, describing a network of ‘points’ and ‘lines’ that form a 'network', i.e. the process of generating actors' strategies. This pathway responds to the notion that the main operationalisations of network structure are network nodes or centrality, inter-nodal relationships, and high degree of clustering formed through network (Reagans and Zuckerman, 2001). Further, following on from studies point out that the analytical difficulties of network structure lie in operational indicators of network formation (Sandström and Carlsson, 2008), there are also empirical studies that innovatively integrate resource dependency and social capital into a framework that combines longitudinal data to analyse how individual social capital influences the resources of organisations in policy networks and the structural position of organisations in policy networks, how individual and organisational social capital affects organisational influence in policy networks (Hatmaker and Rethemeyer, 2008), describing how “individuals and the characteristics they possess generate actor strategies as part of organisational resources” and “how individual actors improve the organisation's position in the network structure and thus the process of influence”, provides an analytical ideas for this paper. Meijer, Boon and Moors (2013) analyse technical expertise and knowledge by suggesting that 'knowledge is not

transferred directly from experts to the public, but is constructed in the course of interactions between various expert actors', to characterise the transfer of expert knowledge in network structures. The article develops the analysis by five dimensions: patterns of interaction with high or low network centrality, formal or informal rules, closed or semi-open patterns of participation, convergent or divergent powers and interests, and expert knowledge as knowledge transfer or knowledge creation, focusing on the role of knowledge actors in the policy process and the processes by which expert knowledge flows through the structure.

Accordingly, we combine resource dependency theory's consideration of material-institutional and social structures, and the characteristics of expert knowledge transmitted in network structures, to derive an analytical framework for the influence of policy expert networks, as shown in Figure 1. This framework explicates the processes by which expert network resources and network structures generate influence. Network resources describe the process by which organisational characteristics and policy choices determine actor standpoints and capital, and through which pathways actor strategies are generated. Network structure describes the process by which expert actors use their own characteristics and the resources they have as an individual feature to make connections with others and generate network influence through these connections.

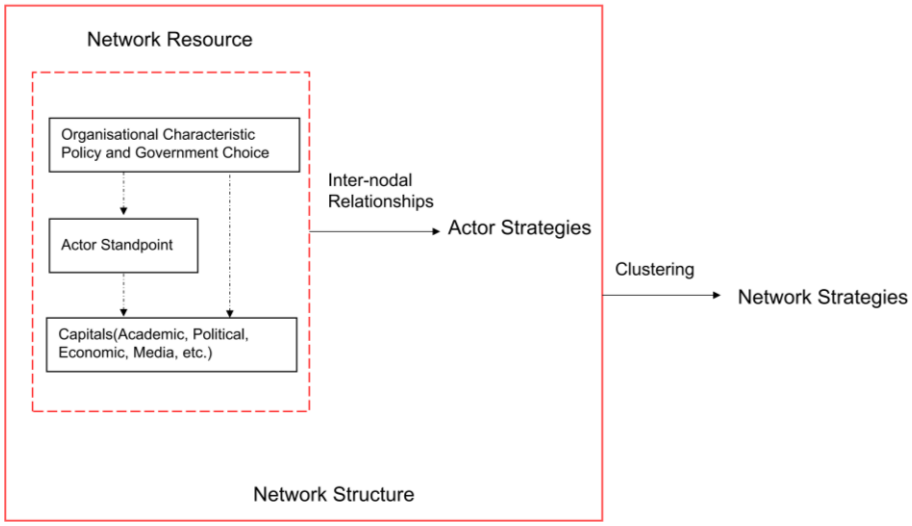


Figure 1. Mechanisms of expert network influence

4. Methods And Features Of Expert Selection Networks

4.1 Case Selection: RDP In China

As one of the two types of statutory Detailed Plan in China, Regulatory Detailed Planning (RDP) is an important measure for the Chinese government to regulate urban public resources and safeguard public interests. The main decision makers involved in the RDP process are the municipal government, municipal bureaus, district government, district bureaus and sub-district government (Figure 2). The document is prepared by the district government and the district bureau and submitted to the municipal bureau. After that, the district government entrusted the district bureau to supervise and guide the sub-district government to entrust

the design team to prepare the specific planning plan. The sub-district government is the main executor and organizes the meeting. The design teams (See the right half of Figure 2) regularly report the project progress to the decision makers. In the decision-making process, the preferences and actions of different levels of governments and different types of experts can be fully seen.

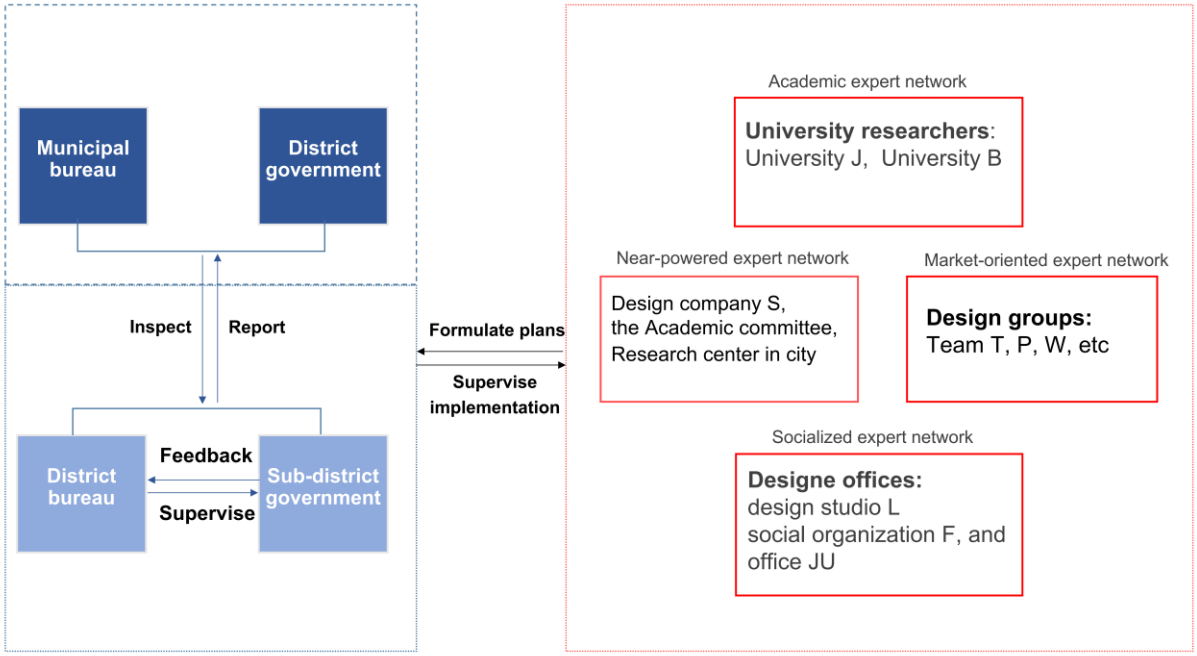


Figure 2. Relationship between decision-makers and design groups in RDP

4.2 Data Collection And Analysis

This study is exploratory. According to “small social scenes house sufficient materials for adequate explanation (Rock, 1979)” and considering completeness of available research data, ongoing, in-depth cases are more reflective of inter-actor relationships. Since it is the main purpose to pay attention to the way detailed experts take action through the network, close observation is adopted to avoid the interference of secondary data. Previous research in this area has been conducted in the form of “after-the-fact” interviews and questionnaires. The importance and difficulty of observing meetings has been recognized (Papadopoulos, 2018). We conducted an empirical study with cases that followed decision-making process of RDP. We were involved as a design team, attending one to two project meetings per week from January to August 2021. When meetings were held, we faithfully recorded participants’ language, and non-verbal interactions such as tone of voice, facial expressions, unspoken gestures, and other potentially relevant elements in circumstances. Complementary to the meetings, we conducted semi-structured and focused group interviews with meeting participants and relevant actors. This analysis is part of a larger study we conducted with the Chinese urban planning experts. While the findings provided here are primarily from conference transcripts and interview data, we also synthesized other data, such as regulatory documents such as legal copies and planning assessments, organisational documents such as

government work reports, annual summaries and plans, In-Government directive documents, and engineering costs, and illustrative documents such as design plans and control plans. These contents served as tests and supplements to enrich our deeper understanding of meetings' content. All interviews are anonymous in accordance with the request of the interviewees.

4.3 Features Of Expert Selection Networks

Through literature on expert characteristics and data collected from case studies, different types of expert networks involved in the decision-making process are identified. Based on the current typological research on policy experts in academia and the types of experts actually involved in this case, we have typified these four types of planning expert networks (as shown in Table 1): One is Near-powered expert network, which has close connections with decision-makers and can be called "government agents". They have abundant political capital. The second is academic expert network, which has established for social or public needs. Such experts have authority due to their rich professional knowledge. The third is market-oriented expert network, which has established for self-needs and has weak political capital. They usually use economic capital to reach cooperation with local governments. The fourth is socialized expert network, who has rich media resources and use these resources to link to other professional networks. Their sources of economic capital are extensive.

Table 1. Features that influence experts' choice of network

Expert Network Type	Expert Example	Organisational Characteristic	Actor Standpoint	Academic Capital	Political Capital	Economic Capital	Media Capital	Intellectual Capital	Cultural Capital
Near-powered expert network	Design company S, the Academic committee, Research centre in city	Assessment, government needs	Policy and government choice	√	√	√			√
Academic expert network	University researchers: University J University B	Research, popular/social needs	Neutral/knowledge biased, University affiliation	√		√		√	√
Market-oriented expert network	Design companies: team T, team P, and team W	Profitability, self-need	Freedom, quasi-independent			√			
Socialized expert network	Design offices: design studio L, social organisation F, and office JU	Profitability, self-need	Freedom, independence and autonomy			√	√	√	

Various capitals are summarized from: Abelson and Carberry, 1997; Medvetz, 2006; Ahmad, 2008; McGann and Sabatini, 2011; Medvetz, 2012.

Note. Respondent information is kept confidential for IRB purposes to protect the identity of the sources.

5. Resources and Strategies In Different Expert Network

As mentioned above, network resources can affect the type of expert network formation. Experts can form different types of expert networks by acquiring and utilizing these network resources, and enhance the influence of knowledge through network structures. Next, the specific characteristics and action strategies of each expert network in the RDP case will be presented.

5.1 Near-powered Expert Network: Possess Strong Political Capital

Such organisations are established under the leadership or carry out actions under the guidance of governments. Typical representatives are design company S and the Academic committee. The relationship between experts and decision-makers is crucial.As demonstrated in Figure 3, such experts propose or evaluate plans, and negotiate with the municipal government whether to proceed with a new round of planning. Thus, the knowledge produced by experts in this institute is a “precondition” for RDP. As a “government-chosen” evaluation team, Academic committee assesses the rationality of projects for both municipal and local governments during the policy evaluation process.

Their research is policy-oriented. Experts in such organisations usually have high political capital and certain academic capital. Their economic capital only comes from government contracts and their media capital is weak. Their intellectual capital is more from professional knowledge, their research topics are decided by governments, and their output is mainly about recommendation reports on design solutions. The relationship between such experts and governments is close, as one such expert said: “District government is supposed to hire evaluation team, but we actually finalize experts together with them... We are responsible for paying for the assessment, including transporting and contacting experts, sending out meeting notices... One of the assessors is an employee of our institute, but the incumbent vice president should not be invited, because he was originally so highly associated with us” (Interview EN1). In fact, when determining evaluation teams, governments directly authorize design groups to hire evaluation teams to ensure project successes, even if they should have hired a team that the design team was not familiar with.

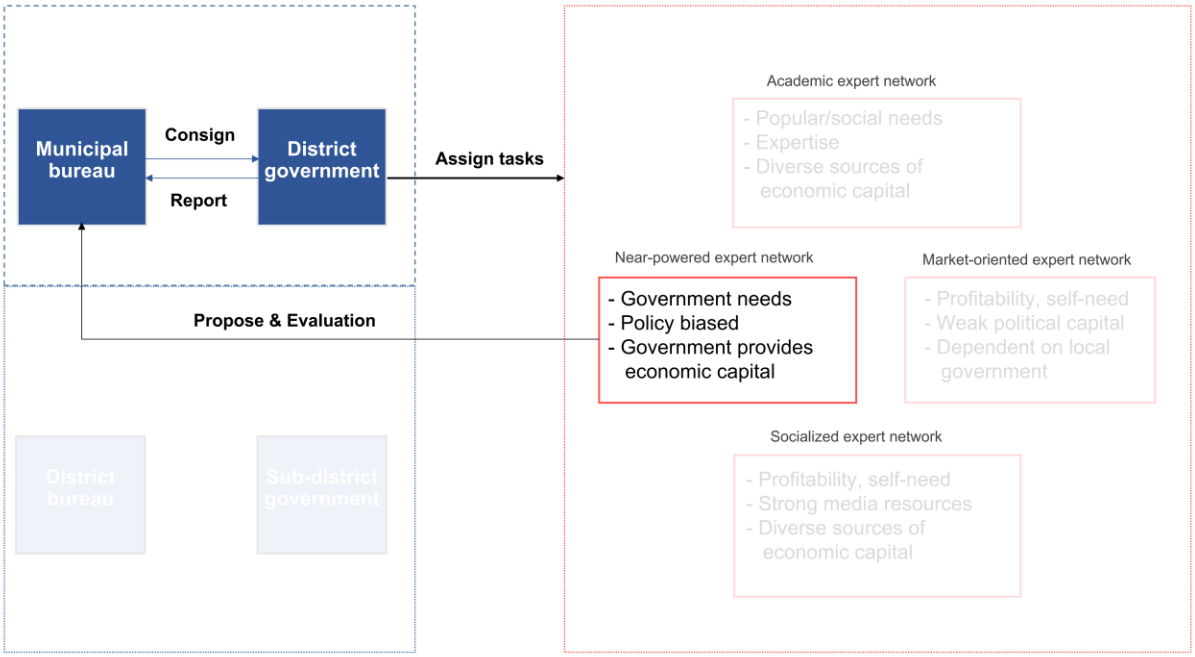


Figure 3. Near-powered expert network resources and generated strategies

5.1.1 Government Agents

The near-powered expert network is familiar with decision-makers' difficulty and expresses them in concrete terms, in a way, to advocate for decision-makers and close the distance with the municipal government and enhance trust. Expert EN3 said in a meeting, "Each system has its own requirements. Do you think the top (government) will agree completely? Do not agree, how do I go to guard the project?" Subsequently, municipal leaders said this expert did raise a dilemma of current government departments, namely, it is difficult to mobilize certain horizontal resources (Participatory Observation M5).

5.1.2 Strong Administrative Ties.

A common strategy used by near-powered experts is to demonstrate their strong ties to municipal decision-makers and thus increase their influence. As one design expert expressed, "Everyone here is familiar with each other. If we didn't take the lead and wangle the government, no one else could, right? Our design plan is also difficult, so many plans have been made... I have already tried my best" (Participatory Observation M6). Strong ties are also reflected in that positions can be exchanged between government leaders and near-powered experts. In this case study, the district chief was originally the dean of a relevant municipal design group, which is similar to the "revolving door" phenomenon of American think tanks.

It is important that “showing connection with decision-makers’ superior to decision-makers” is a strategy that is common to all types of expert networks, however, decision-makers have different perceptions of the connection between different expert networks and superior decision-makers. Although experts attempt to elaborate the link with higher authorities in the same way, trust placed by the street offices is differed from the “near-powered experts’ link with district government” to the “market-oriented experts’ link with district government”.

As demonstrated in Table 2, same demonstration may achieve different results. We infer that such strong connections in near-powered expert network can enhance influence. Moreover, we cross-checked this with interviews. A designer mentioned that “if there is someone inside planning bureau, a lot of materials will be obtained first, then our plan will start earlier than others, and naturally it will be done well (Interview EN2).”

Table 2. Different effects in near-powered and market-oriented network

	The near-powered	The market-oriented
Discourse	"Today a district governor brought us here, these people below us have done it with him in other cities, we are familiar with it, and then I come to lead them and and they are still obedient. If you change something (design group), the design will fail."	"In the past two days, the secretary of the municipal party committee has convened a group of design experts for a meeting... I think this sentence is excellent, it needs to be visible and reachable"
Source of discourse	Participatory Observation M5	Participatory Observation M1
Strategies	Joining the project is directly introduced by the higher-level decision-makers	Quotes from higher-level decision-makers
Level of trust of decision makers	High	Low

Note. Respondent information is kept confidential for IRB purposes to protect the identity of the sources. However, for the interests of data transparency, the type name is used so that conclusions can be drawn by comparing the effects of different strategies used by different types of experts. When possible, we mark the source of the interview, and the source will be presented in coded form, such as M5.

5.2 Academic Expert Network: Authority From Complex Knowledge

They are academically focused, and thus are authoritative in decision-making processes that require complex knowledge. Typical representatives are university researchers, such as University J and B.

These scholars conduct policy research as researchers and are more accountable for knowledge than power (Misztal and Barbara, 2012). They mainly favour research, such as publishing in journals, holding academic seminars, and delivering lectures. Such organisations usually involve universities and research institutes, where the organisational characteristic is research-oriented, serving the needs of knowledge, society and public. Their research is knowledge-oriented. Experts in such organisations usually have high academic capital, and their sources of economic capital are diverse, such as topics, funds, and projects. Their intellectual capital comes from professional knowledge, and their outputs are mostly papers, monographs, conference discussions, and curriculum design. However, their political capital and media capital are relatively weak. The significant difference between academic experts and others is whose interests they serve.

As demonstrated in Figure 4, decision-makers need experts to provide professional knowledge owing to the complexity of policy issues, and experts thus find their own market. As one university teacher expressed, “If there is a huge controversy and uncertainty, this is the time when he sincerely needs professional intervention. Therefore, you must be high enough to not be crushed (by the power). This is the time when professionalism is really a kind of power. This is the most basic meaning of the existence of our profession” (Interview EA1). “This (between governments and planning experts) is a relationship of dialogue. Clearly, it is not an absolutely equal relationship. Governments have resources, the designer has the expertise to influence the way the resources may be used” (Interview EA2).

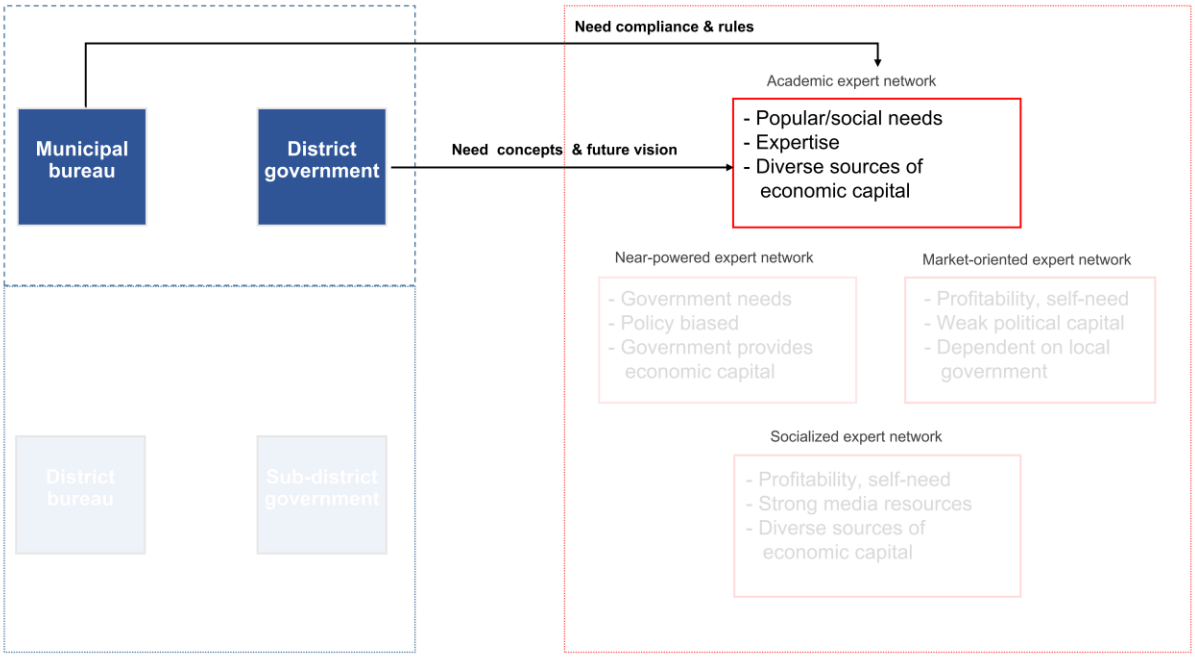


Figure 4. Academic expert network resources and generated strategies

However, being “too scholarly” is a fatal flaw, and the measure of a good policy report is not academic rigor, but functionality in the policy making process. Academic expert network is often criticized for their inability to find a balance between academic rigor and policy functionality. “Different decision-makers have different concerns. I'll give you an example. Planning bureau leader and district secretary are concerned about different things.” The planning bureau leader is more concerned about compliance, and the secretary is more inclined to development concepts and future planning. A design director said, “and these teachers in universities still want to talk about design concepts to try to impress them” (Interview EN4). It is important to successfully balance academic rigor and functionality in decision-making process. “So, it's about finding the difference between different decision-makers” (Interview EN4).

In addition to the authority brought by complex knowledge, academic experts have more human resource advantages. Human capital is the professional analysts generated by intellectual organisations (Stone, 2007). As one college faculty member said, “The biggest help (as a college teacher) is that there are many students, and social capital is very useful” (Interview EA3).

5.3 Market-oriented Expert Network: Economic Capital Is Used To Collaborate With Local Governments

This type of organisation is established for profit-making purposes and operates organisations with market-oriented techniques. They focus on economic capital, and typical representatives are large design companies that concretely implement program design, such as design teams T, P, W and so on. As shown in Figure 5, such experts mainly accomplish specific design tasks assigned by decision-makers and collaborate with other design teams. Compared with former types, design groups are established for profit-making purposes, and main logic of its research is freedom and independence. The economic capital is a more singular contract, and political and media capital are weaker. Their intellectual capital mainly comes from professional knowledge, and outputs are dominated by specific proposals and drawings.

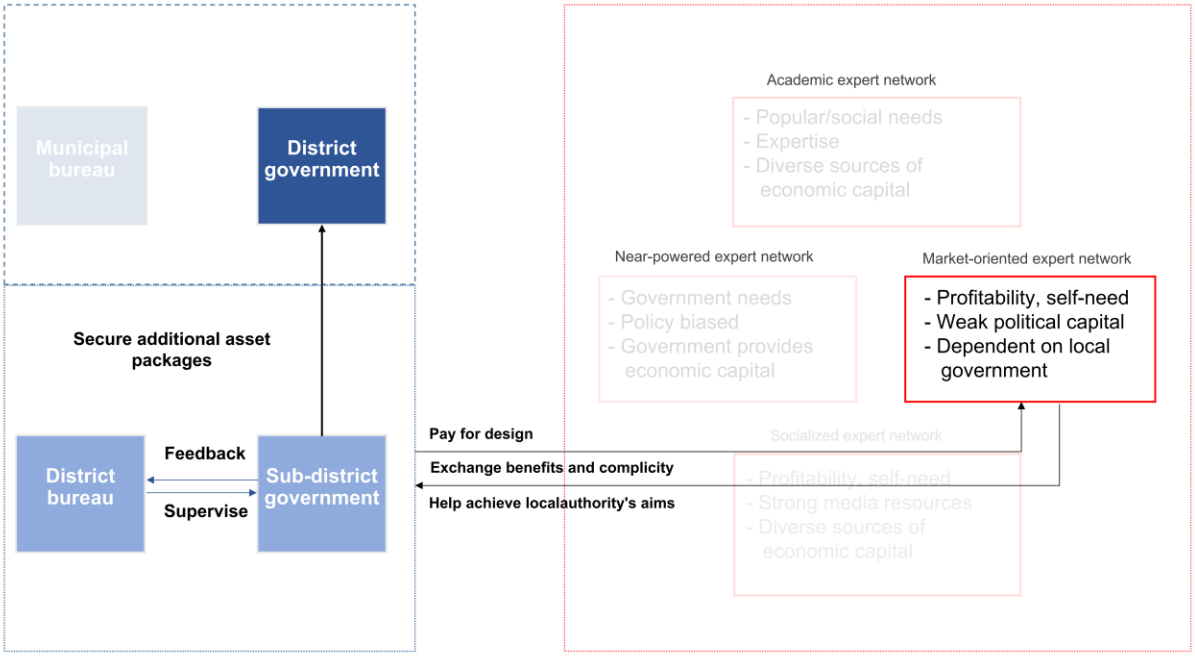


Figure 5. Market-oriented expert network resources and generated strategies

Near-powered and market-oriented experts have certain similarities, for example, they both pay attention to the concerns of decision-makers. However, the most obvious difference between them is political capital. Taking design company W, as an example, in the mid-term evaluation, there is a possibility that “near-powered experts will be invited to modify the scheme for academic reasons, but in fact, near-powered experts will intervene in market-oriented experts' whole design process (Interview EM1)”.

The market-oriented tends to use economic capital as a tool to exchange benefits with the government. During the project meeting, decision-makers exposed funding problems, which is the focus of the market-oriented. The market-oriented saw the uncertainty within decision-makers about funding implementation. To achieve their "concerns about funds implementation" and "reducing workload", expert EM3 used "Party birthday" of governments as the tacit knowledge to get more benefits for themselves: "I do feel that with the power of our big team, we have done so much work in two weeks with your order, but I feel that you do not even implement the money. You still have to ask us if you want this or that... This is not nonsense. If we won't be able to finish it before July 1st, we all work for nothing! You might as well say how much money you can ask for, and where to focus, and we will concentrate on it! (Participatory Observation M2)".

In addition to utilizing economic capital, the market-oriented also collaborates with local governments by helping to achieve their goals. In a project meeting, the sub-district government wanted to remove many articles from the site, however, was afraid that the public would not agree, "The advertisements on the side like this should not be located here, this can be removed. This wall will be completely demolished, this is also not allowed" (Participatory Observation M9). Simultaneously, he mentioned that "when the deputy secretary of municipal government came here to look at this place, it looks messy" (Participatory Observation M9), in order to further achieve their own demolition goals through the conversations of senior leaders.

5.4 Socialized Expert Network: Improving Centrality By Exchanging Resources With The Media

Socialized experts maintain close ties with media and the masses, and engage in events related to social activities. In addition, they may be employed by actors in market-oriented network to complete specific projects. Typical representatives are design studios that concretely project implementation, such as design studio L, social organisation F, and office JU. Moreover, these design offices are established for profit, however, their research logic is freer and more independent than that of the market-oriented. Experts in these organisations usually have low political and academic capital. Their economic capital is also derived from clients. However, their media capital is more diverse and richer. Their intellectual capital comes from popular knowledge and is more closely linked to the masses. The research topics and outputs are similar to the market-oriented. These experts have relatively low academic capital, so they prefer to use popular knowledge more often to counterbalance their lack of professional knowledge. A district government leader mentioned, "The media are less professional generally and like to arouse general interest. Take Design Studio L as an example. It is engaged in community creation (small area

design). Including RDP, we will not seek them as the main design group. Because RDP involves too many things, he can't figure it out... Since we are not willing to bring him to do projects, then he has to take strengths to complement weaknesses, and use the pressure of social media to solve some problems (Interview DC1)."

Socialized expert network generates and disseminates knowledge primarily through the media capital, rather than implementing specific design solutions. The non-governmental status of socialized experts is the main structural constraint on their influence, and they need to draw on peripheral resources to achieve influence. One socialized expert mentioned, "The director of a famous media contacted me several times, and he wanted to promote the history and spirit of this site (Participatory Observation M4)."

Socialized experts are an important source of information for the media, and media coverage, in turn, promotes the visibility of such experts as "media intellectuals" (Schlesinger, 2009). Therefore, they have an increasingly high profile in governments and the media as an important source of information and advice. This self-promotional role allows them to market themselves as research and analysis-oriented institutions in the minds of the government and public (Abelson, 2002). Thus, when socialized experts are connected to the media, this entire network adds to the credibility of the entire expert network. As one designer said, "Government asked Team T to take the lead in the design, they are our party A, and our designers were invited to do the design... We searched for some media to promote it, and when we became famous, governments felt like, hey! Team T has done a good job in this area. The overall evaluation of implementation is high. Who actually did it? We did! But governments don't care, they see you all as a whole. After media coverage, the government or the developers feel very happy, because they all need publicity and to be informed of what they are doing locally, whether it is for achievements or performance, they all need it (Interview ES1)."

Actors in socialized expert network often have a background in social organisations and use resources such as "non-profit legal and financial independence, dispassionate scientific endeavours, and service to democracy or non-state actors" (Sending and Neumann, 2006) to build their credibility and increase their influence and that of the entire expert network. However, after the reputation has been established, that is, after socialized expert network enters the network with media capital, as illustrated in Figure 6, they use "close contact with media and public" as their advantageous resource. A designer mentioned, "In cooperation with governments, I now think that our team is doing a good job in linking resources... In fact, we are cooperating with many parties to enhance our influence. For example, their professional skills in different majors must be able to support us... If we can find a partner, we will try our best to cooperate with them, so as to ensure the position of a node. Then use this comprehensive force to promote yourself (Interview ES2)."

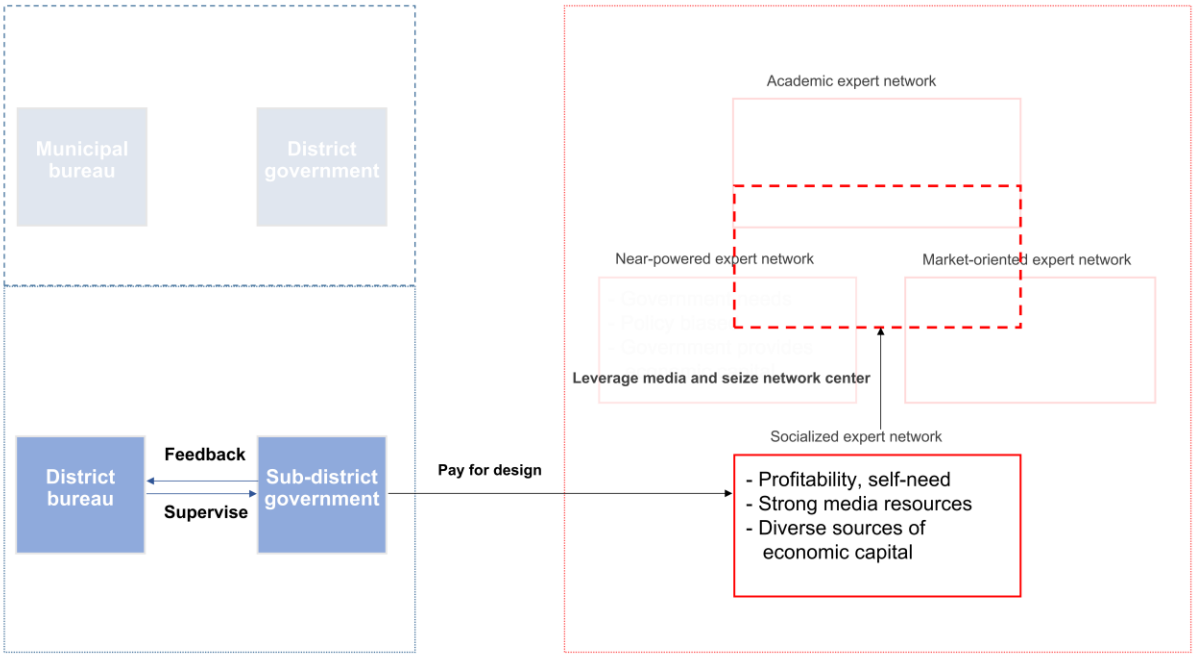


Figure 6. Socialized expert network resources and generated strategies

In efforts to increase their network centrality, the socialized attempts to seize the central position of the overall expert network. When it reaches the centre, as illustrated in Figure 6, it has a competitive advantage over the market-oriented and the academic, and it can make use of media publicity to gain a close relationship with decision-makers at multiple levels. This trend of "cooperating with government" reveals that the socialized has a tendency to transition to the near-powered. In case of need, the socialized can "act as a mechanism to connect knowledge production and policy" (Krizsán and Zentai, 2005), bridging the gap between science and politics.

In short, the socialized generates influence by linking to peripheral resources such as the media. Thereafter, they increase the influence of the entire expert network based on improving their own influence, and thus create a link between science and politics.

6. Resource Empowerment: logic Of Resource Flow In Expert Network

How can expert network have more far-reaching influence? Our close observation of interaction between the Chinese urban planning experts and officials reveals that experts increase their "voice" by optimizing node, flowing relationship, and clustering advantage.

6.1 Node Optimization: Expert Optimal Capital Overlay

First, actors in expert network have "multiple identities". When an expert joins a decision-

making process, huge structural tension is formed, which can easily cause internal consumption. However, when an expert has “multiple identities”, most obstacles can be eliminated. Thus, when a specific actor in expert network has multiple identities, it may bring about a stronger power, thereby consolidating political foundation and increasing the overall network influence where he is located. In addition, the more fluidly experts switch identity between different expert networks, the more effective influences they have. This actor is analogous to a policy entrepreneur, acting as a pivotal node in the network, even more with the concomitant effect of expanding expert community influence. “I think the factor that [XX] has a college background is a very important point for us to be more influential in RDP and to receive more and more projects. He combines his teaching with career completely. So, this kind of research and practice will support and complement each other in the future, the boundaries between them will become more and more blurred... Furthermore, you know, the chairman of this team, who a cadre is working in government for many years, so a person with government background has advantage in promoting something. This means he knows how to achieve a win-win situation in administrative discourse (Interview EM4).”

Research institutions with government backgrounds and experts who maintain personal relationships with key government decision-makers easily stand out as key advisers. It is noteworthy that good decision-making relationships are extremely scarce resource, and the vast majority of experts do not have effective access to maintain it. Therefore, they should try to cultivate more people to participate in decision-making process and increase sustainable impact of expert network. “So, I also often tell [XX] teacher that if those leaders do not force you to participate in, you just allocate someone else to do jobs. Then I believe this is also an essential point to develop the team (Interview EM5).”

Second, expert networks become multifaceted. Expert networks make a difference in constructing their self-image and actual influence: they are able to present themselves to the public as participants who remain as neutral as possible and only provide evidence (Westermeier, 2018). Alternatively, they demonstrate their familiarity with policy and support for bureaucratic views to decision-makers. This increases comprehensive impacts of the expert network. Staff in Municipal Planning Bureau explain that “Experts also have different orientations. For instance, common people, market, the power, the media. The media generally with less professional target the common people who are more likely pleasure-seekers. While some other groups pursue government departments' security and have high quality on the professionalism. As a result, there is a big contradiction between popular knowledge and professional knowledge. We generally know that they have tendencies, but it is more likely that many experts can only match one identity (Interview DC1).” Expert network is multifaceted when facing different subjects and are able to increase their combined impact. “Some experts may say specific things to specific

people, and they can solve problems that ordinary people can't solve or can't solve easily, and those are more wonderful (Interview DC1)."

Third, superior resources are superimposed. As mentioned earlier, the endogenous factors influencing experts' choice of network lie in different positions and resources held by actors, and each has different resource advantage. Thereafter, various types of experts select the capital advantages they hold and combine them to increase the overall expert network influence. Building and maintaining a decisive network enables the expert network not only to keep flexibility but also control over valuable resources, as opposed to constructing a complete organisation to organize other actors.

6.2 Relationship Flow: Conspiring With Like-minded Decision-makers And Competing And Cooperating With Other Knowledge Providers

6.2.1 Conspiring

It has been argued that the emergence of other knowledge providers has contributed to a competitive situation within expert network, which is a crisis for think tanks (Galushko and Djordjevic, 2018). However, this sort of competition and connection with other knowledge providers is also an opportunity that will increase overall network influence. When discussing whether to hold a bridge design proposal, expert EM3 opposed, saying, "I think if we are really talking about how many bridges completed during the art season, maybe not at this time..." While expert EM4 thought it was possible to hold part of the call for proposals, "I think it is possible to use the call for proposals as a phase, and then the call for proposals is selected to see how the proposal will be implemented (Participatory Observation M10)."

6.2.2 Competing

In a follow-up interview with the head of the sub-district government, he answered, "It's not really (to distrust them). We usually don't listen to one side of the story when making decisions, but if they argue, it makes people believe in professional power. Normally we always overrule expert, but here we have different opinions, which gives people a sense of trust. Having multiple voices opens up our minds to a more integrated approach (Interview DS1)." Moreover, it means that the preceding dispute over "bridge design proposal" has provided government trust in expertise. If experts realize that they lack critical resources and capabilities when attempting to impose an impact on the policy, they may turn to collaborate with other experts who have those resources (Xue et al., 2013). Based on this view, it may be further concluded that an appropriate competitive relationship increases the entire expert network influence.

6.2.3 Cooperating

Burt's Structural Holes theory suggests that the more network one has, the more efficient one can be without duplicating sources of information. Social network theory also states that network centrality reflects the degree of centrality of network position occupied by an expert (Freeman, 1978). The higher the network centrality of an expert is and the stronger the connection to external resources is, the greater that expert's influence becomes. In Figure 6, market-oriented experts often attempt to establish connections with other types of experts to improve their social reputation and credibility. In project meetings, market-oriented experts used several panels to present design content such as "slow-living", cultures and so on, and gather experts from various backgrounds to enhance their status as market-oriented experts by presenting linkable resources. Specifically, they propose "suitable for living" to link up with "departments" (administrative power) and "Suitable for sightseeing and slow life" to link up all kinds of living facilities and compete with other market-oriented experts to demonstrate their influence. In cultural section, aesthetic education uses the expertise of their own team. They contacted "Suitable for learning" with academic experts and "intelligent platform" with socialized experts. The text segments "suitable for [XX]" are requirements in government policy. Market-oriented experts are prone to seize these requirements in the policy text, that can be used to corporation and compete with other experts.

6.3 Cluster Advantage: Building A Knowledge Community

As shown in Figure 7, expert network constructed a new "knowledge community" by strengthening the integration of its optimal capital. A more closely related and well-resourced expert network is reconstructed with individual experts as nodes, and the overall power of expert community is expanded through continuous actions. This process can be divided into three phases.

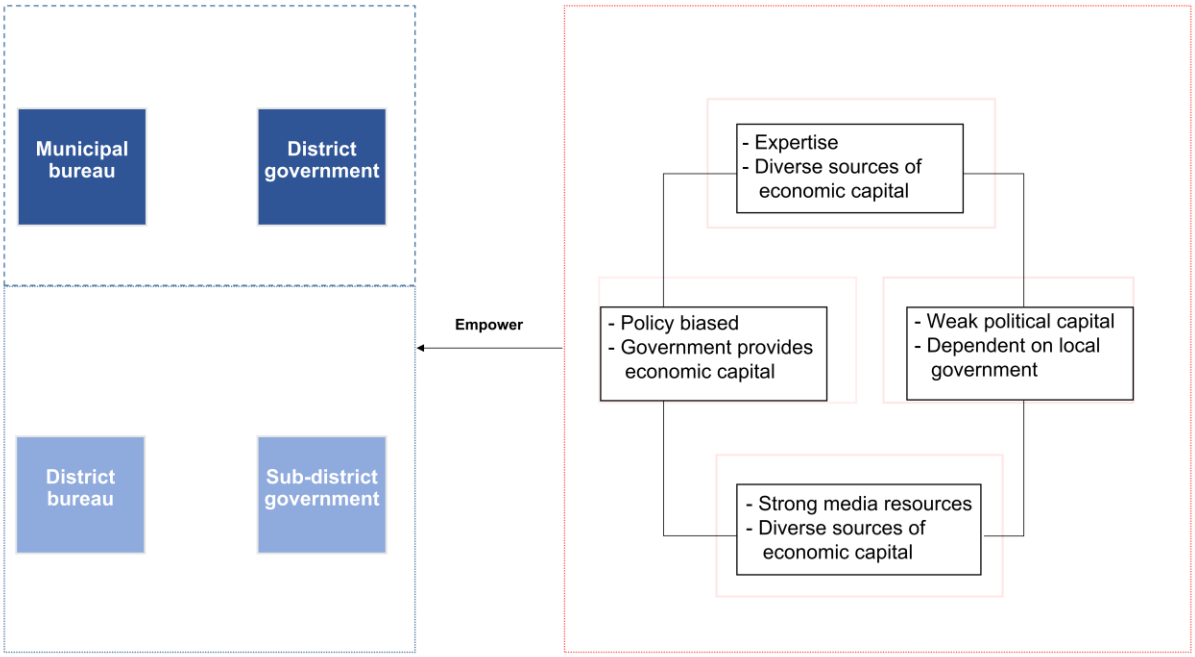


Figure 7. Cluster advantage- Building a knowledge community

6.3.1 Phase 1

The educational role of academic experts is combined with the promotional role of socialized experts, creating an "event forum" to increase impact. With the help of the media, academic expert network forms an expert network with a forum that can increase influence through the formation of a "partially organized" rather than a "fully organized" network by communication. This influence in turn can increase the individual actors' influence in network. A municipal leader said, "It was a good initiative to launch lectures. One billion readings can be a good way to spread the idea of RDP (Participatory Observation M11)."

6.3.2 Phase 2

High professionalism brings a stable reputation to an expert team. Experts and decision-makers know that "involvement in several organisations" or "involvement in an authoritative expert network" is a signal that "the expert is credible" and it can increase influence. Therefore, experts who are able to mention something about their organisation's resources or become a member of that organisation when confronted by a decision-maker are well-positioned to increase their authority and that of their network. When asked, "If an individual goes out with the aura of an organisation, does it make the project more powerful in front of decision-makers?" One of the leaders agreed. "It is

necessary for an identity to make people believe. You can hardly rely on a single person to build a strong trust all of a sudden... At least the organisation's engineering strength and comprehensive strength management system are stable (Interview EM6)." "Like us, we are actually a creative centre with very strong design capabilities, but when you deal with government departments, the identity of 'Chinese' is more credible than a creative centre, even if the centre has higher design capabilities (Interview EM7)."

6.3.3 Phase 3

The leadership of experts is highly concentrated in network centre and increases overall expert network influence. The role of such non-physical "forums" for academic expert network is that they expand academic networking building through communications, in addition to producing books and papers. The richer and more appropriate the communication is, the greater impact it can have, and thus the more chance that intellectual output will be used by decision-makers. This can give academic experts an opportunity to set up contact scenarios that allow them to exercise their autonomy and flexibility. Networking builds on the basics of communication and exchange, which reversely facilitates the setting of relevant agendas. "So, a lot of conferences we are invited to may give opportunities for our team growth (Interview EA4)."

An additional benefit of such event-based forums is the ability to respond more flexibly to demands of accountability. Complete organisations demand more accountability and operational transparency (Ahrne and Brunsson, 2011), and this "loose" forum model can reduce the likelihood and degree of accountability. A leader of team T said, "We only write these two parts.... Part of it is about the situation of the planning process; another is the planning of the fifteen-minute living circle. This is the content of previous academic meeting output and the figures are reported by various design groups, not only our individual things. You have to make a choice, for we have no idea what can be reported, what cannot be reported (Participatory Observation M13)."

It is noteworthy that the logic of resource empowerment described above is not a simple linear relationship between each part. Experts could be key players in policy process by adapting their action strategies according to different decision-makers they face and at different policy stages.

7. Discussion And Conclusion

This study addresses the core issue of internal discrepancy in expert networks based on a review of the relevant literature on expert involvement. Based on network research, this study summarizes a theoretical model and traces the expert involvement in urban planning decision-making process in China, to understand how expert network generates

policy influence. By analysing range of expert actions, we emphasized the concrete influence of resources and structural differences within the expert network in the decision-making process.

First, expert involvement differs in action logic according to network features. Owing to the differences in government choices, organisational characteristics, capital and other features, we find that individual experts and their organisations form different expert networks. We observe that although the four types of expert networks attempt to play a key role in the decision-making process, their action strategies differ. As the “government agent”, near-powered expert network can contain other actors by its strong connection with government and improve its network influence. Academic expert network focuses on academic research and tends to use their complex knowledge to provide advice for decision-makers who have a weak professional knowledge background, or play to this advantage in the scenario requiring high professional degree. By utilizing their economic capital, market-oriented expert network exchanges the interests with the grass-roots government to reach cooperation, and strives for resources from the superior government. Socialized expert network exchanges resources with the media to improve its influence, and thereafter attempts to occupy expert network centre.

Second, “Nodal” experts or organisations can play a bridging role. The “centre” position of socialized expert network is clearly visible, and it has more proactive action strategies than other types of expert network. Decision-makers and academics should focus on bridging instruments that can bring their world closer together (Newman et al., 2016). The socialized with extensive media resources and social organisation resources, such as designer studio L, is more likely to become advocates of public opinion, and their voices are more likely to be noticed by decision-makers. Pivotal professional organisations play a bridging role in decision-making like policy entrepreneurs (Guo and Yuan, 2022), and can continuously enhance the effectiveness of professional knowledge penetration. We suggest that the role of the socialized expert network as a bridge tool should be further exploited, and thereafter developing a more efficient and proactive approach to policy making.

Third, the differential resource overlay of different types of expert networks can create an impact-enhancing effect of “resource empowerment”. This is similar to existing research that suggests that “the functional mix of experts reduces policy ambiguity” (Piggin and Hart, 2017). Experts with “multiple identities” or “consensus authority” in the expert network are “matchmakers”, and their optimal resources are superimposed to achieve node optimization. Thereafter, certain experts look for decision-makers with views similar to its own, and carry out appropriate competition and cooperation with other expert networks to improve the overall influence of expert group in decision-making process. On the basis of increasing advantageous resources, a knowledge community is formed with

expert network to reconstruct an expert network with more superior resources and higher influence. It is important to emphasize that influence through network structure is not a simple linear logic. After a closer network is formed, the superior resources of experts will be further strengthened and stronger expert network will be woven to improve expert influence.

Our study provides several contributions to the existing literature. Firstly, it goes beyond the oft-repeated argument in work on expert involvement and finds different types of expert networks adopt action strategies to exert their influence in the decision-making process. Secondly, it also shows using network to study expert involvement can not only reflect the complex interaction among experts but also help form an organic combination of the network structure and knowledge strategy. Thirdly, we provide a specific measurement tool for the expert influence which was considered to be difficult to quantify before. Therefore, expert involvement can be improved more specifically. Finally, the way to quantify the influence of experts is to generate an analytical framework and provide explanations for the framework. This framework has undergone case studies and can also be used for large N sample testing in the future.

Despite the insights provided, this study has certain limitations. First, the findings are based on a single case study. However, it is worth mentioning that scholars believe that it is beneficial to achieve the theoretical goal of the study with a particular case. Since we highlight the important value at the micro level, which has been surprisingly neglected in existing studies, this may reveal new theoretical and empirical insights (Yin, 2018). Second, the expert network we discussed is within the urban planning, however, considering that it attempts to elucidate the relationship within the expert network and the process of exerting influence by using resources with other actors such as bureaucrats, we believe that it has the same promotion value in other policy fields. Third, it mainly conducts research in the context of Chinese policies, therefore, its applicability in those of other countries and regions remains to be verified. In many other countries, political and administrative decision-makers need to be analysed separately because of their fundamentally different roles and knowledge requirements. Furthermore, this study does not clearly distinguish “different level government” and “authorities and bureaus” as different forms of government subject. In fact, when we conduct theoretical review and empirical research, it is found that there are certain differences between the two or several of them in their attitudes toward professional knowledge. Owing to the limitation of length, it is regrettable that we cannot discuss this in depth. Future studies can attempt to expand the mechanism proposed in this study to relevant policy areas in other countries, and further distinguish the practical scenarios of interaction between officials of different departments and planning experts. In addition, since the influence of network structure formation is not linear, the question of how to optimize the structure in the

actual situation so as to make experts obtain the best allocation of resources is also worth exploring.

Acknowledgment. This research was made possible through funding from the National Social Science Fund of China (Grant No. 22CZZ019).

References

Abelson, D. E. (2002). Do think tanks matter: Assessing the impact of public policy institutes. *Montreal: McGill-Queens University Press*.

Abelson, D. E. (2018). Do think tanks matter: Assessing the impact of public policy institutes. *McGill-Queen's Press-MQUP*.

Abelson, D. E., and Carberry, C. M. (1997). Policy experts in presidential campaigns: a model of think tank recruitment. *Presidential Studies Quarterly*, 27(4), pp.679-697.

Ahmad, M. (2008). US think tanks and the politics of expertise: role, value and impact. *The Political Quarterly*, 79(4), pp.529-555.

Ahrne, G., and Brunsson, N. (2011). Organization outside organizations: The significance of partial organization. *Organization*, 18(1), pp.83-104.

Akerlof, K. L., Allegra, A., Nelson, S., Gonnella, C., Washbourne, C., and Tyler, C. (2022). Global perspectives on scientists' roles in legislative policymaking. *Policy Sciences*, pp.1-17.

Bakir, C., Akgunay, S., and Coban, K. (2021). Why does the combination of policy entrepreneur and institutional entrepreneur roles matter for the institutionalization of policy ideas. *Policy Sciences*, 54(2), pp.397-422.

Boswell, C. (2008). The political functions of expert knowledge: Knowledge and legitimation in European Union immigration policy. *Journal of European public policy*, 15(4), pp.471-488.

Boswell, J. (2018). What makes evidence-based policy making such a useful myth? *The case of NICE guidance on bariatric surgery in the United*.

Bourdieu P. (1986). The forms of capital. *Cultural theory: An anthology*, 1, pp.81-93.

Brennan, N., and Connell, B. (2000). Intellectual capital: current issues and policy implications. *Journal of Intellectual capital.*

Busch A. (2009). Politikwissenschaft und Politikberatung: Reflektionen Anlässlich der Aktuellen Krise. *Zeitschrift für Politikberatung*, 2(3), pp.467-484.

Caplan N. (1979). The Two-communities Theory and Knowledge Utilization. *American Behavioral Scientist*, 22(3), pp.459-470.

Christensen, J. (2021). Expert knowledge and policymaking: a multi-disciplinary research agenda. *Policy and Politics*, 49(3), pp.455-471.

Duina, F. (2021). Is academic research useful to EU officials? The logic of institutional

openness in the Commission. *Journal of European Public Policy*, pp.1-19.
Dumay, J. C. (2009). Intellectual capital measurement: a critical approach. *Journal of intellectual capital*.
Eyal, G. (2013). For a sociology of expertise: The social origins of the autism epidemic. *American Journal of Sociology*, 118(4), pp.863-907.
Fischer M, and Leifeld P. (2015). Policy Forums: Why Do They Exist and What Are They Used for. *Policy Sciences*, 48(3), pp.363-382.
Fleming J, and Rhodes R. Can Experience Be Evidence? Craft Knowledge and Evidence-based Policing. *Policy and Politics*, 46(1), pp.3-26.
Freeman, L. C. (1978). Centrality in social networks conceptual clarification. *Social networks*, 1(3), pp.215-239.
Funke, N., Huitema, D., Petersen, A., and Nienaber, S. (2021). The Roles of Experts and Expert-Based Information in the Advocacy Coalition Framework: Conceptual and Empirical Considerations Based on the Acid Mine Drainage Case Study in Gauteng, South Africa. *Policy Studies Journal*, 49(3), pp.785-810.
Galushko, V., and Djordjevic, M. (2018). Think tanks and 'policy hybrids' in the Western Balkans and post-soviet space. *Policy and Society*, 37(2), pp.206-221.
Grossmann, M. (2013). The variable politics of the policy process: Issue-area differences and comparative networks. *Journal of Politics*, 75(1), pp.65–79.
Guo Y, and Yuan Y. (2022). Assessing the Energy Resources Policy Agenda: Evidence from China's Green Express Policy. *Resources Policy*, 79.
Haas, P. (2004). When does power listen to truth? A constructivist approach to the policy process. *Journal of European public policy*, 11(4), pp.569-592.
Haas, P. M. (1992). Introduction: epistemic communities and international policy coordination. *International organization*, 46(1), pp.1-35.
Hirschman, D., and Berman, E. P. (2014). Do economists make policies? On the political effects of economics. *Socio-Economic Review*, 12(4), pp.779-811.
Krizsán, A. and Zentai,V. (2005) 'From civil society to policy research: the case of the Soros Network and its roma policies', in D. Stone and S. Maxwell (ed) Global knowledge networks and international development: Bridges across boundaries, London: Routledge.
Laage-Thomsen, J. (2021). Professional expertise in policy advisory systems: How administrators and consultants built behavioral insights in Danish public agencies. *Public Administration*, 100(3).
Lundin, M., and Öberg, P. (2014). Expert knowledge use and deliberation in local policy making. *Policy Sciences*, 47(1), pp.25-49.
Jasanoff S. (1990). The Fifth Branch. Science Advisers as Policymakers. *Cambridge: Harvard University Press*.
Maasen, S., and P. Weingart (eds). (2005). Democratization of Expertise? Exploring Novel

Forms of Scientific Advice in Political Decision-Making. *Dordrecht: Springer*.
Marsh, D. (Ed.). (1998). Comparing policy networks. *Open University Press*.
McGann, J. G., and Sabatini, R. (2011). Global Think Tanks: Policy Networks and Governance. Routledge.
McGann, J. G., and Weaver, R. K. (Eds.). (2000). Think tanks and civil society. Catalysts for ideas and action. *New Brunswick: Transaction*.
Medvetz, T. (2006). Hybrid intellectuals: Toward a social praxeology of US think tank experts.
Meijer, A., Boon, W., and Moors, E. (2013). Stakeholder engagement in pharmaceutical regulation: Connecting technical expertise and lay knowledge in risk monitoring. *Public Administration*, 91(3), pp.696-711.
Metz, J. (2013). Expert groups in the European Union: A sui generis phenomenon. *Policy and Society*, 32(3), pp.267-278.
Misztal, B. A. (2012). Public intellectuals and think tanks: A free market in ideas. *International journal of politics, culture, and society*, 25(4), pp.127-141.
Montpetit, É. (2008). Policy design for legitimacy: Expert knowledge, citizens, time and inclusion in the United Kingdom's biotechnology sector. *Public Administration*, 86(1), pp.259-277.
Montpetit, É., and Lachapelle, E. (2016). Information, values and expert decision-making: the case of soil decontamination. *Policy Sciences*, 49(2), pp.155-171.
Newman, J., and Head, B. (2015). Beyond the two communities: a reply to Mead's "why government often ignores research". *Policy Sciences*, 48(3), pp.383-393.
Newman, J., Cherney, A., and Head, B. W. (2016). Do policy makers use academic research? Reexamining the "two communities" theory of research utilization. *Public Administration Review*, 76(1), pp.24-32.
Nichols, T. (2017). The death of expertise: The campaign against established knowledge and why it matters. *Oxford University Press*.
Papadopoulos, Y. (2018). How does knowledge circulate in a regulatory network? Observing a European Platform of Regulatory Authorities meeting. *Regulation and Governance*, 12(4), pp.431-450.
Pielke Jr, R. A. (2007). The honest broker: making sense of science in policy and politics. *Cambridge University Press*.
Piggin J, and Hart L. (2017). Physical Activity Advocacy in the UK: a Multiple Streams Analysis of a Hybrid Policy Issue. *Leisure Studies*, 36(5), pp.708-720
Plehwe, D., Neujeffski, M., and Krämer, W. (2018). Saving the dangerous idea: austerity think tank networks in the European Union. *Policy and Society*, 37(2), pp.188-205.
Reagans, R., and Zuckerman, E. W. (2001). Networks, diversity, and productivity: The social capital of corporate RandD teams. *Organization science*, 12(4), pp.502-517.
Reed, M. I. (1996). Expert power and control in late modernity: An empirical review and

theoretical synthesis. *Organization studies*, 17(4), pp.573-597.
Rethemeyer, R. K., and Hatmaker, D. M. (2008). Network management reconsidered: An inquiry into management of network structures in public sector service provision. *Journal of public administration research and theory*, 18(4), pp.617-646.
Richards G W. (2019). The Science–policy Relationship Hierarchy (SPRHi) Model of Co-production: How Climate Science Organizations Have Influenced the Policy Process in Canadian Case Studies. *Policy Sciences*, 52(1), pp.67-95.
Rock P. (1979). Participant observation. *The making of symbolic interactionism*, pp.178-216.
Roberts, J. J., Lightbody, R., Low, R., and Elstub, S. (2020). Experts and evidence in deliberation: scrutinising the role of witnesses and evidence in mini-publics, a case study. *Policy Sciences*, 53(1), pp.3-32.
Sandström, A., and Carlsson, L. (2008). The performance of policy networks: the relation between network structure and network performance. *Policy Studies Journal*, 36(4), pp.497-524.
Schlesinger, P. (2009). Creativity and the experts: New Labour, think tanks, and the policy process. *The international journal of press/politics*, 14(1), pp.3-20.
Schrefler, L. (2010). The usage of scientific knowledge by independent regulatory agencies. *Governance*, 23(2), pp.309-330.
Sending, O. J., and Neumann, I. B. (2006). Governance to governmentality: Analyzing NGOs, states, and power. *International studies quarterly*, 50(3), pp.651-672.
Seo, B. K. (2022). Co-creation of knowledge in the urban planning context: The case of participatory planning for transitional social housing in Hong Kong. *Cities*, 122.
Shen, Y., Ieong, M. U., and Zhu, Z. (2021). The function of expert involvement in China's local policy making. *Politics and Policy*.
Stephens, N., and Stephens, P. (2021). Interdisciplinary projects as an expert-network: analysing team work across biological and physical sciences. *Science and Technology Studies*.
Stone, D. (2007). Recycling bins, garbage cans or think tanks? Three myths regarding policy analysis institutes. *Public administration*, 85(2), pp.259-278.
Tchilingirian, J. S. (2018). Producing knowledge, producing credibility: British think-tank researchers and the construction of policy reports. *International Journal of Politics, Culture, and Society*, 31(2), pp.161-178.
Teets, J. (2018). The power of policy networks in authoritarian regimes: Changing environmental policy in China. *Governance*, 31(1), pp.125-141.
Turner, K., Alabi, O., and Race, J. (2020). Nudging policymakers: a case study of the role and influence of academic policy analysis. *Journal of European Public Policy*, 27(8), pp.1270-1286.
Westermeier, C. (2018). The Bank of International Settlements as a think tank for financial

policy-making. *Policy and Society*, 37(2), pp.170-187.
Williams, K. (2021). Credibility in policy expertise: The function of boundaries between research and policy. *Policy Studies Journal*, 49(1), pp.37-66.
Wynne, B. (1992). Risk and social learning: reification to engagement.
Xue, L., Zhu, X., and Han, W. (2018). Embracing scientific decision making: The rise of think-tank policies in China. *Pacific Affairs*, 91(1), pp.49-71.
Yang, L. (2019). Knowledge-Driven Governance: The Role of Experts and Scholars in Combating Desertification and Other Dilemmas of Collective Action. *Springer Singapore*.
Yin, R. K. (2009). Case study research: Design and methods (Vol. 5). *sage*.
Zhu, X. (2009). 'The Influence of Think Tanks in the Chinese Policy Process: Different Ways and Mechanisms', *Asian Survey*, 49(2), pp.333-357.
Zhu, X., and Zhang, P. (2016). Intrinsic Motivation and Expert Behavior: Roles of Individual Experts in Wenling Participatory Budgeting Reform in China. *Administration and Society*, 48(7), pp.851-882.

OVERTOURISM AND SPATIAL PLANNING IN GREECE: CHALLENGES (1077)

Eleni Komninou[1]

Department of Planning and Regional Development, University of Thessaly, Volos, Greece; lenakomnin@gmail.com

Abstract. The recovery of tourism following the pandemic resurfaced the challenges of the tourism sector. There is a worldwide dispute about whether overtourism exists or is the result of inadequate tourism planning and management. The most common consequences are the exhaustion of resources, (over)crowding of tourists, popular discontent, displacement of residents, the transformation of the neighborhoods' character, changing land uses to satisfy tourism demand, land, and public space exploitation, sharing economies, overloaded infrastructure, etc. The purpose of this paper is to shed light on the issue of overtourism via a spatial planning approach. Specifically, the spatial planning tools and policies applied in Greece if any as a response to tourism over-crowding will be presented and analyzed. The upper aim is to finally answer if the symptoms are due to overtourism or tourism mismanagement.

Keywords: planning, tourism, overtourism, policies, management.

1. Introduction

Rapid urbanisation during the last decades brought a steep rise of the urban population and an abrupt transformation of the cities. Meanwhile, tourist flows towards urban destinations have recorded an upward trend. Thus, challenges arise in conjunction with half of the world's population being in urban areas. As a result, resources are being depleted, tourists are swarming into masses, residents feel discontented, the real estate market is unstable, land uses change, and cities being transformed to meet tourist needs.

The positive contribution of tourism to host communities and destination growth is widely accepted. However, negative aspects, such as overtourism, are not to be overlooked.

Overtourism is listed among the current mega-trends[1] - determinants of the worldwide tourism market, affecting destinations all over the world. The origin of the phenomenon is traced to the negative sides of mass tourism.

[1] Digital transformation, sustainability, sharing economies, social and demographic changes, rising and secondary destinations and worldwide crises (health, recession).

By planning approach, tourism has prevailed over the (urban) landscape and now has a powerful role in shaping the wider urban agenda. Under those circumstances, any tourism-related issue should be investigated also under the lens of spatial planning as a means of management.

Considering tourism as a motivating force of (urban) changes, it is quite easy to imagine what is overtourism capable of, turning destinations' popularity into a disadvantage.

What is more, take for the negative consequences of the excessive tourism growth: some of them are occasional and more visible during the high tourist season (discomfort of residents and/or tourists, the congregation in facilities and infrastructure, etc,) markedly in Greece throughout summer. At the same time, they may be of permanent character (environmental degradation, change of land uses, the transformation of the landscape, etc), crucial for the viability of the destination, putting at risk its future attractiveness. Given that, researchers and stakeholders are becoming interested in finding tools to manage the issues deriving from the massive tourism development.

Tourism congregation attracts again scientific and academic interest after the tourism rebound following the recession period due to the pandemic. To be more precise, 2022 was a year of congregated tourist traffic with international arrivals reaching 917 million (UNWTO, 2023). Data from the World Tourism Barometer (UNWTO, 2023) show a rise in international tourism values for every European and non-European region, which are predicted to grow further. Europe alone had a share of 585 million tourist arrivals, whose market marked the fastest rebound (United Nations, 2023). Nevertheless, the tourism flows are not distributed equally in space. Thus, the geography of tourism is formed by patterns characterised by concentrations in specific destinations, some of which cannot correspond to the great volumes of tourists, suffering from the consequences of overtourism. The need for urgent action is recognised by lately published reports in the field such as European Tourism – Trends & Prospects (European Travel Commission, 2022, p.4) and OECD Tourism Trends and Policies (2022).

This paper examines the spatial tools, if any, being used to manage and address overtourism having in mind that tourism is an urban phenomenon that cannot be studied individually from urban activities.

To achieve the study's goal, the following research questions are being set:

- Does Greece suffer from overtourism or is it just a matter of inadequate management policies?
- Are any spatial tools to counter overtourism and which are they?
- Are these tools considered appropriate and adequate to address the phenomenon in Greece?

2. Conceptual background

The summer of 2017 was a key date for the travel industry. Suddenly, the negative side of mass tourism expressed as overtourism, and the consequent implications became a hot topic for the media. Protests across famous destinations declaring widespread discontent among residents over too many tourists and the depletion of physical and social resources, made the issue public. Sooner or later, a boom of references to *overtourism* took over a large part of the news and relevant literature by 2018. Markedly, overtourism became the World of the Year by the Oxford Dictionary.

During the past five years, overtourism attracts great interest, being noticed in destinations with high tourist densities and serious overcrowding, although the phenomenon is not new.

Over time, attempts were made to define overtourism. Searching across the relevant literature, many definitions, and related concepts such as *tourismophobia,* emerge. This term for example was coined by the Spanish media to underestimate the severity of the overcrowding issues that many Spanish cities were dealing with as a result of too many tourists. It would implicate the locals' aversion to excessive tourism growth to diminish the actual problem.

Milano (2017, p.05) associated tourismophobia and overtourism as direct results of promoting and practicing unsustainable forms of tourism such as mass tourism. Before that, Ali Rafat, founder of the travel website Skift, produced the term overtourism in June 2016, triggered by the announcement of the World Tourism Organisation, that international arrivals had exceeded 1 billion, reaching precisely 1.3 billion. Ali introduced overtourism as a new construct to look at potential hazards to popular destinations worldwide, as the dynamic forces that power tourism often inflict unavoidable negative consequences if not managed well. In some countries, this can lead to a decline in tourism as a sustainable framework is never put into place for coping with the economic, environmental, and sociocultural effects of tourism. The impact on local residents cannot be understated either.

Ali aimed to initiate interest and alert on the massive tourism flows and their management. He coined the term as an expression of the intersection between the global growth of tourism and the tourism industry's duty to manage it (Ali, 2018).

Likewise, Goodwin (2017, p.01) describes overtourism as a localised situation, where hosts or guests, locals or visitors, feel that there are too many visitors and that the quality of life in the area, or the quality of the experience has deteriorated unacceptably. It is the opposite of responsible tourism which is about using tourism to make better places to live

in and better places to visit. Often both visitors and guests experience the deterioration concurrently and rebel against it.

More recently, Milano et al (2019) identify overtourism as the excessive growth of visitors leading to over-crowding in areas where residents suffer the consequences of temporary and seasonal tourism peaks, which have caused permanent changes to their lifestyles, denied access to amenities, and damaged their general well-being.

According to Collins Dictionary (2018) overtourism is 'the phenomenon of a popular destination or sight becoming overrun with tourists in an unsustainable way.'

In 2018, UNWTO (2018, p.03) defined overtourism as 'the impact of tourism on a destination, or parts thereof, that excessively influences perceived quality of life of citizens and/or quality of visitors experiences in a negative way.'

This definition is set as a reference point for this paper and implies that the limit over which tourism activities stop being beneficial for the host community, rather than being a cause of problems has been exceeded. Problems such as residents' eviction, housing crisis, environmental degradation, overcrowding in infrastructure and services, land use changes, city transformation, and gentrification, are practical indications of overtourism.

Pressure derived from overtourism is not expressed everywhere in the same way, depending on the tourists' volume and the enablers of tourism development (Weber et al, 2017). In any event, overcrowding can be observed under different conditions and places. As Weber et al (2017) point out that the unrestrained tourism growth and a combination of factors (sharing economies, changes in tourist behavior and patterns, social media, competitive markets) have led to the intensification of overcrowding phenomena. To sum up, overtourism indicates limitless tourism growth and the absence of control.

At this point, it should be clarified that the concept of overtourism is more complex than the one of overcrowding. Peeters et al (2018) relate overtourism to the number of tourists, the type and period of visit, and the carrying capacity of the destination. In particular, accounts for the number of tourists in correlation with the carrying capacity of the tourist system (Weber et al, 2017). In that case, negative effects arise when the limit of the carrying capacity is exceeded.

As an illustration, residents feel discomfort, bad governance, environmental overuse and degradation, regional inequalities, the diminished standard of living, carrying capacity issues, resources and infrastructure over-exploitation, traffic and means of transport congestion, and inadequate enforcement of policies and strategies are recognised as negative consequences of overtourism while some of them may also correspond to enablers of the phenomenon.

Tourism activity also includes a spatial dimension (land uses, development provisions, real estate) which is often overlooked on the economic and social ones. Above all overtourism causes the following outcomes in space: neighborhoods' character alteration (residential to tourist), expansion of tourism activities to residential zones, overcrowding and sovereignty in public space, land uses change, and space takeover to meet tourist demand, privatisation of public space (Milano et al, 2019), residencies alter to short-term rental accommodation (Airbnb, etc), the crisis in the real estate market (rise of rent prices, eviction of residents, availability of housing), infrastructure and facilities bottlenecks, et al. Referring to the local economy, it is quite common for tourism to dominate as a monoculture against other economic activities. In general, tourism is considered a social phenomenon. Although this may be true, tourism entails serious environmental and spatial consequences being also an urban- derived phenomenon.

To close this chapter, tourism is an extremely complicated phenomenon interrelated with other activities, subject to the conditions of the supply and demand markets and world events. Granted that Buhalis (2021 in Pantziou, 2021) argues that long-term policies and strategies are needed for the diversification and sustainable growth of the tourist product. Overall, overtourism reflects the absence of appropriate planning and management of the tourist flows and unrestrained tourism growth.

3. An insight into overtourism in Europe

Overtourism is a global phenomenon. As was mentioned in the introduction (see Chapter 1), a wave of protests has erupted in several destinations, Barcelona, San Sebastian, Venice, and Berlin officially suffering from overtourism. Formerly, tolerance to the excessive tourist numbers and depletion of resources have reached the breaking point in which residents resent and demonstrations outburst (Goodwin, 2017). In this chapter, a review of the phenomenon and how it is expressed across famous European destinations will be presented.

To start with, Denmark, a country with 5.83 million permanent population (2020), accepts the triple number of tourists annually (15.6 million in 2020) (statista.com, 2022a; worldometer, 2022). Copenhagen, the capital of Denmark counting 1.15 million residents, is named the 73rd most popular urban destination worldwide. Redistribution of the tourist flows within the city and in the peri-urban zone was chosen as an appropriate strategy to counter overtourism (Goodwin, 2017). Additionally, a supportive measure in the effort to avoid further tourism congregation in the city centre was to ban the opening of new restaurants and bars in this area together with designing cycling routes dedicated to tourists.

Moving on, Barcelona is a renowned destination on European scale. According to official

data, the city held over the half share of international tourist arrivals, to be precise 67 percent, for 2020, translated into 7 million visitors (statista.com, 2022b). Before, 2018, 18 million visitors, tenfold the number of residents (1.6 million) spend the night in the city designating Barcelona as the seventh most popular European destination (Weston et al, 2019). Coupled with the inability to manage these flows, tourism has acted as a force of successive changes in the city. To name a few, loss of the city's identity, territorial decentralization, overcrowding, and social unrest.

Barcelona's municipality introduced a new tourist model as an answer to overtourism including measures to control and tax short-term rental accommodations such as Airbnb and the voice of local communities. As an illustration, the Emergency Inspection against Illegal Tourist Flats plan in 2016 targeted the elimination of illegal tourist accommodation, the rise of which has caused a housing crisis meaning high rental prices and consequent residents' evictions and residential turning into tourist land uses (Goodwin, 2017). Like the Danish approach, *Barcelona is much more* program aimed at spreading tourists out of the urban tissue (Weston et al, 2019). What is more, a turnaround of the tourism policies has been attempted by redistributing the tourism budget from promoting to controlling tourism. Goodwin (2017) characterises it as a wider regulation of the tourism sector by returning to traditional spatial planning prioritising locals' needs over tourists' and avoiding an attack on tourism.

Other famous destinations in the same country, Mallorca and the Balearic Islands, voted for new tourism laws in the battle against overtourism. In the pursuit of quality, it was decided the number of tourist beds in the hotels and other forms of tourist accommodation (rooms to rent) to remain the same. Secondly, a social plan agreed with the specific provision of turning abandoned hotels (1 and 2 stars) into social housing by 50 percent as well as office spaces or retirement homes, but no tourist uses (money tourism, 2022).

To continue with Venice, one of the most visited and discussed destinations around the globe. UNESCO has repeatedly expressed concerns about overtourism threatening Venice being a World Heritage Site since 1987. Tourism has been established as a commercial monoculture and dominant economic activity. As a result, the permanent population has decreased to 57,000 residents in 2012 in comparison to 174,000 in 1951. In other words, residents have been overrun by tourists presenting a notable decrease of 2/3 of the initial population (Goodwin, 2017). Notably, Venice ranks second as the Italian province with the highest number of tourist stays (3.6 million in 2020) and arrivals (domestic and international) (1.3 million in 2020) (Citta di Venezia, 2022). Of these, 30,000 originate from cruise ships (Citta di Venezia, 2022). Regards to accommodation, 1,187 hotel facilities are located solely in the municipality of Venice offering a 421,000 total beds (statista, 2021). Therefore, numbers speak up for themselves.

Tourism overcrowding has become so intense affecting negatively the living standards and the viability of Venice both as a destination and city. Locals or Venecians as how they are being called, have started to express feelings of discomfort and rebel against the massive tourism flows. The most representative example is the *No Grandi Navi* movement, expressions of which can be spotted anywhere in the city. What is more, Venice constitutes the third biggest port for cruise ships in Europe accepting 500-600 of them annually (International Transport Forum, 2016). Complaints about cruise tourism concern the congregation being caused by tourists landing for a short period and on specific timetables daily but not adding to the tourism revenues. Also, the ecosystem endangers by cruise ships at anchor which over exceed its carrying capacity, being a cause of environmental degradation.

Accumulated pressure has evoked efforts of banning or setting a limit on the large-scale cruise ships arriving in Venice to lessen the negative effects. In the meantime, authorities enforced the prohibition of new tourist accommodation in the city centre. Since 2017, a counting system of visitors has been implemented in major tourist locations within Venice where tourism bottlenecks are being noticed (Piazza San Marco, Rialto). Under discussion lie the follow-up measures of specifying the number of visitors entering San Marco Piazza and imposing a tourist tax (2,5-10 euros), revenues of which will be allocated to the conservation of the city (Tjolle, 2022).

As can be seen from the European case studies, the strategies to control overtourism are focused on shifting the priorities regarding tourism. That is to say, management of destination over promotion. In any event, these procedures are long-term and require the commitment of the local authorities and communities. Hence, the results are not tangible yet and suspect to evaluation.

4. Greek reality

Traditionally, tourism development in Greece has been shaped by small and medium - scale, mostly family-owned businesses, which were entering the tourism industry taking full advantage of the land ownership policies but lacking the appropriate knowledge and background. Presently, the new tourist model requires big-scale, integrated, high standards tourist units, meaning large land properties in contrast to the past land ownership fragmentation. Both tourism types have a profound impact on space, environment, and landscape. First one, is synonymous with the construction sprawl outside urban zone areas, a crucial spatial issue that Greece deals with for many decades causing a fragmented landscape. Whilst the latter one demands great untouched areas that are being attributed to tourist land uses even in an integrated construction scheme (Βουρεκάς, 2018). Public authorities play the most significant role in how tourism is being

treated, which has a direct effect on carrying capacity and hence on the resilience of the tourist system to challenges such as overtourism (Goodwin, 2017). This is why Buhalis (2021 in Pantziou, 2021) indicates that insufficient tourism policies as the main issue and not overtourism.

What is of great interest in the Greek tourism scape, is the dispersion of the destinations (accumulation in coastal areas and islands) across the country. Evidence that proves the accumulation of tourism activities is the almost double increase of rented rooms (10,6%) in comparison to the hotels (5,7%) during the last decade (2010-2020) (Νταλακογεώργιο, 2018). A rise in the five-star hotels, mostly big-scale resorts, manifests also tourist concentration (Νταλακογεώργιο, 2018). Λιάλιος (2023) estimates that in many cases the number of tourist beds[2] is triple or even quadruple the number of residents.

To demonstrate, the imbalance between residents and visitors, the five islands with the highest ratio of tourist beds per resident are: Mykonos 3.7, Santorini 3.42, Folegandros 3.16, Ios 3.07 and Antiparos 3.03 (Λιάλιος, 2023). Meaning that during the peak tourist season the visitors' population[3] exceeds four times the residents'. This variable is not exclusively representative of the pressure that an island is subject to. The degree of tourism development, the infrastructure, and the area of the island should be taken also in consideration. Even so, these data denote the trend that dominates the Greek tourist space in the last years: an increase in tourist beds and hotels in the already developed and saturated islands (Cyclades and Dodecanese) while other destinations such as the North Aegean are behind. This is part of the wider mindset in Greece which relates the success of the tourism sector to the number of tourist accommodations and visitors. The more the better.

As shown in the McKinsey and World Travel and Tourism Council report, Greece ranks 15th in tourist overcrowding worldwide presenting a 3 million international arrivals rise in a four-year period (from 2016-2020) (WTTC, 2017). The intensity of the phenomenon is imprinted in Figure 1 Tourists per resident, where Greece is listed as 10th (2.53 tourists per resident[4]). Zooming in, Santorini is illustrated in red color with a ratio of 128.62 tourists per resident.

[2] Excluding short-term accommodation such as AirBnb, which count for thousands.

[3] Referring only to visitors and not counting the employees or the ones staying on the island without being tourists or locals.

[4] Price is calculated by the tourist arrivals in the past 12 months.

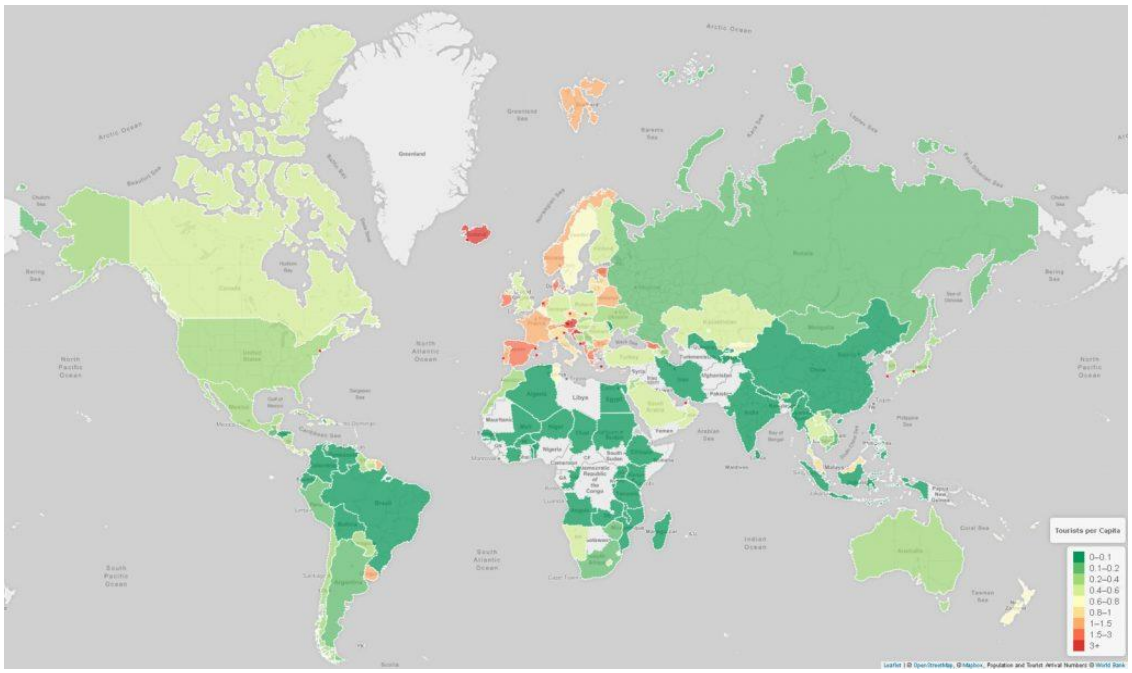


Figure 1. Tourists per resident

Source:https://vividmaps.com/the-over-tourism-map/

Another case of unrestricted tourism development and absence of control is Cavos in Corfu. The issue of unmanageable tourism flows dates back to 1970 reaching a peak point of 4,500 tourist beds and insufficiency of water resources (Goodwin, 2017). Moreover, the Ionian Islands and Peloponnese are pointed by the Research for TRAN Committee - Overtourism: impact and possible policy responses report as European areas with a high risk of overtourism (Peeters, et al, 2018).

To continue with, the Greek most known islands Mykonos and Santorini are officially destinations hit by overtourism. Whilst authorities in Crete, another famous island destination, forbade the entrance of 10,000 British tourists aged 18-30 years old due to reasons related to inappropriate behavior. These destinations are characterised by the seasonality of the tourist product. Practically, this means that the pressure put on their ecosystems derived from the tremendous tourism flows culminates during the summer months, threatening their viability. Because of this invisible burden, as recently being called, a re-direction of tourism from mass to more sustainable forms is necessitated with the upper aim of the destinations' resilience to internal and external shocks. For this purpose, the Ministry of Tourism assigned the preparation of two reports dedicated to Mykonos and Santorini aiming at elaborating customised policies per the Special Urban Plans by the Ministry of Environment and Energy.

The first thing to notice is the absence of a former integrated report for Mykonos, one of the most well-known Greek destinations. Someone can remember the discussion regarding the establishment of Zones of Urban Control (ZOE) via presidential decree (Δήμος Θήρας, 2021). Given the mass tourism model adopted on the island, the high numbers of visitors, and the specific characteristics due to the insularity, recording, and evaluation of the data constitutes an impressive need.

The case of Santorini is referred to in the relevant literature as a typical example of a Greek destination suffering from overtourism. Tourism development on the island is traced back to 1970 and is based solely on the 3S[5] model. Nowadays, tourist arrivals reach 2 million (2017), of which 620,000[6] are cruise passengers, while residents account for 15,457 (census 2021) according to official data provided by the Hellenic Statistical Authority (ΕΛΣΤΑΤ, 2021).

Based on these numbers, the relevant indices occur TPR at 107.8[7] tourists per 100 residents daily (cruise passengers included) and TDR[8] at 220.6 tourists/m^2 daily (Peeters et al., 2018). These values demonstrate the scale of the phenomenon.

Under those circumstances, the given space can't correspond to the increased tourism needs resulting in tourists sprawling in residential zones, unplanned and uncontrolled building, environmental degradation, waste disposal, overuse and insufficiency of resources, congestion in infrastructure, facilities, and public transportation, overcrowding in public spaces, and overexploitation, residents and visitors feeling discomfort, inappropriate behaviors, cultural shift, landscape transformation, housing crises, etc. Pressure intensifies during the summer period but few of the consequences are permanent (landscape transformation) threatening the destination's future attractiveness.

The absence of an integrated spatial planning framework for tourism is mirrored in overtourism and its aftereffects, both short and long-term, from which the island suffers. Santorini is at the top of the list of the most popular destinations worldwide due to its unique characteristics. However, the island has surrendered to the power of tourism and its negative impact which prevails over the benefits due to the lack of appropriate policies and planning.

On the positive side, the study for the calculation of the carrying capacity of Thera Municipality includes spatial planning provisions (control of urban sprawl, etc) and

[5] Sun, Sea and Sand.

[6] Slightly decreased number to previous years due to the restriction that the authorities set for the number of cruise passengers embarking on the island daily.

[7] TPR Tourism Penetration Rate: average rate for the islands: 279.4 tourists per 100 residents/daily (Peeters et al., 2018).

[8] TDR Tourism Density Rate: average rate for the islands: 306.3 tourists/m2 daily (Peeters et al., 2018).

predictions for the land uses (ban of nuisance ones in certain congested areas). Surprisingly, indices[9] are also being specified for the first time and their accepted value range is based on urban–regional and environmental criteria and legislation, European directives and local authorities, and community viewpoints (Δήμος Θήρας, 2021, p.21). Equally important is the establishment of a monitoring mechanism for the indices.

Finally, not to be ignored the local measure of setting a maximum limit on the number of cruise passengers visiting the island daily (8,000 passenger/day). This is considered a successful strategy that has contributed to the decrease of the relevant prices aiming at the dispersion of visitors on a weekly basis (Peeters et al., 2018).

The problem of overtourism in Greece has two sides. The first one regards the carrying capacity, if the resources are enough and not scarce. The second one concerns locals' perception of it. It is not coincidental that the permanent population in many islands has shown a decrease in the last census (2021) despite the tourism development. Long-termly, this could lead to the devaluation of the coastal zone and many island destinations.

5. Legislative framework and policies

The multifaceted nature of tourism means its interrelation and dependence on different policies. In this fact lies the difficulty of the policymaking process from the local to national level. The establishment and implementation of a common policy line for tourism including a broadband of areas requires the cooperation of the different governmental levels, stakeholders, and public and private sector partnerships.

Greek tourism spatial planning has a bitter history. In detail, the current legislative framework will be analysed. Starting from top to bottom, the newly introduced law 4759/2020 constitutes the National Spatial Policy including planning implementation mechanisms at the different governmental levels, national, regional, and local.

In general, the legislative instruments for the spatial organisation and sustainable development of tourism nationally are provided via the Special Planning Framework for Tourism. In 2009, the first SPF (1138/11.6.2009) introduced *Approval of the Special Framework of Spatial Planning and Sustainable Development for Tourism and Strategic environmental impact assessment* named as an initial attempt to set a legal reference for tourism. Later, it was replaced by its amendment (3155/12.12.2013 Approval of the Amendment of the Special Framework of Spatial Planning and Sustainable Development for Tourism and Strategic environmental impact assessment). However, the latter one was declared invalid by the Council of State under the 519/2017 judgement (Πανεπιστήμιο

[9] Building rate built area per resident (Δήμος Θήρας, 2021:203).

Θεσσαλίας, 2020). At the moment, none of the aforementioned frameworks are enacted. The spatial development of tourism is not in conformity with an in-force national policy but rather in the Regional Planning Frameworks and their underlying legislation until the adoption of the new framework.

Up until then, tourism development will be bestowed on the national policy for unplanned construction. Now this condition will cause more harm than good and surely will not contribute to the resolution of the chronic pathogenies of the Greek planning system. As can be seen, the planning treatment of tourism is not equal to its significance and magnitude.

A step forward is the elaboration of Local Town Planning Schemes for 150 municipalities (including 36 destinations and clusters of destinations). Priority will be given to the ones facing challenges such as overtourism.

Ministry of Tourism passed into a new law *DMMOs, Greek Thermal Springs, Zante Shipwreck, provisions for the tourist bureaus, tourism operators,, and tourist accommodation and other regulations for tourism development* which promises to solve key issues of Greek tourism. Indirect reference to overtourism is illustrated in the section concerning the foundation of *Destination Management and Marketing Organisations - DMMOs* and the Greek *International Tourism Destinations Organisation*. Besides the identification of the world and nationwide destinations will ensure their protection by

a) monitoring the carrying capacity indexes
b) creation of developmental strategies for every destination and
c) construction coordination of the necessary infrastructure to support the destination (Υπουργείο Τουρισμού, 2020).

To explain, DMMOs' role will be the identification and resolution of tourism concerning issues in each destination through the private–public sector partnership. These organisations will function as means for managing challenges such as overtourism in suffering destinations and promotion in those lacking.

Overtourism was the starting point of the discussion regarding DMMOs. Βασιλείου and Τοάνογλου (2020) recognise DMMOs as a valuable tool proven successful in other countries but are criticised for the history of mismanagement in Greece. In reality, it is an institution that wasn't widely accepted except for limited cases (Tourism Organisation of Chalkidiki). Not to mention the spatial and thematic conflict of responsibilities between DMMOs and International Tourism Destinations Organisation since their aim is the bottom-up operation and not top-down control. Practically, they represent the participation of the local society in the destination's management process with the upper aim of the enforcement of Integrated Management Schemes. Another point that raises concern is the definition and operating responsibilities which differ noticeably from the

respective ones given in European Union and the United States. Hence, experts imply a centre – focused, designed model (Βασιλείου and Τοάνογλου, 2020). Given these points, even though it is considered a promising initiative, several mistakes and inaccuracies are being observed which need further clarification for the successful function of these institutions.

In the same bill, another institution, *Sustainable Tourism Development Observatories* (Article 3), is being promoted as a responsibility of the DMMOs on a local/regional scale. The Observatories will oversee the monitoring of the sustainability chain – economy – society – environment and deliver the relevant annual reports. Moreover, they shall propose enhancement actions based on the values of the indices.

Now, DMMOs are not an innovative tool. Many European destinations placed their tourism development on the DMMOs years ago. Their belated adoption in Greece is considered a major step towards the treatment of tourism chronic issues but as it was revealed, confusion may arise. For one thing, the establishment of new structures and institutions does not always lead to the desired results, especially when their functions are unclear. On the other hand, the concept of carrying capacity is being introduced as an indicator of sustainable tourism development without the necessary quantitative criteria as it is a variable (ΣΕΤΕ, 2021). Ultimately, the overall approach is being questioned as a fragmented one due to the absence of a specified indices and actions framework.

In the middle of the overtourism debate, lies the long-discussed concept of carrying capacity. Focusing on Greek reality, the concept has been introduced to the common law by the Council of State over nearly two decades. Nevertheless, its use is usually encountered when it comes to island destinations. According to the law, omission from its incorporation into the tourism strategy counts as a serious reason to cancel the administrative act (Δήμος Θήρας, 2021, p.26). Βουλέλης (2009 in Δήμος Θήρας, 2021, p.26) interprets carrying capacity as the drafting of tourism planning for a tourist destination with a view to sustainability and key priorities for the protection of the sensitive areas from the excessive tourism development and the prevention of the overexploitation of the physical resources of the area. That is to say, the Council of State succeeded to set as a responsibility to the administration the inclusion of carrying capacity in tourism planning.

In the foreground, a recent example of bad policymaking became the spotlight. The omnibus bill and specifically Article 72 *Designation and other land use regulations of settlements* introduced by the Ministry of Interior which was into public consultation (March 2022) favors specific interests. Through the town planning provisions is given the option for *segmented land use regulations* in *areas of interest*. This means the expansion of already designated residential areas which are under a protection regime for

architectonical, environmental, and historical reasons leading to their turistification (Λιάλιος, 2022).

Last to report are the actions taken by the Ministry of Tourism introduced via the development laws for the support of the tourism sector in the context of development European programs and funding. Notably, incentives are provided for the construction of new tourist accommodation which is being promoted more than the rehabilitation of the existing ones, perpetuating the typical Greek mentality which correlates the success of tourism to the number of tourist beds. Λιάλιος (2023) disputes the overloading of certain areas/destinations (Mykonos, Santorini) and calls it a strategic mistake based on the raising problematic. On the contrary, he advocates for the funding of upgrading the existing accommodation. The dispute lies on the sustainable character of these interventions, raising also the question if there is adequate space in tourism-saturated areas meant exclusively for tourist uses and under which standards.

In the final analysis, the burden lies on the legislation and the spatial planning framework, which are considered inflexible, inadequate, and outdated and require enhancement, simplification, and alignment on the current trends and challenges. The discussion should be directed into a society-centreed approach.

6. Conclusions

The analysis revealed that Greece has also been hit by overtourism. The phenomenon has been a result of a combination of factors: the inadequate management of the tourism flows, the absence of integrated spatial planning, and the national tourism policy being focused solely on the 3S model, promoting and attracting mass tourism. Furthermore, the deficient support of the tourism sector by the governments, the outdated planning system, and the inability to draft and establish integrated management policies fostered the conditions for overtourism in many destinations. The established mindset that tourism is an instrument to resolve national economic issues has led to short-term, opportunistic policies lacking provisions for the long-term consequences. Thus, we should be aware of tourism's results in real-time monitoring the consequences except the numbers.

In terms of the policies and the spatial tools, progress is being recognised although they continue to be inadequate overall. The *invisible burden* upon the built and physical environment is caused by the regulations: the resource–surplus tourist product is affected and endangered.

Overtourism occupies mostly the public space, which is under central governance. Goodwin (2017) outlines that the management of infrastructure, which are capable of attracting mass tourism, is the liability of the state, where the tax return but not the

negative effects. In the case of Greece, the administration is criticised as inadequate given the outcomes: insufficient support of the tourism sector by means of developing and enforcing policies focused on tourism traffic control.

The future of the destinations lies on the local authorities and communities efforts, which show initiatives to mitigate the negative consequences of the excessive tourism development with a representative example Santorini (daily limit to cruise passengers see Chapter 4). However, local initiatives are not sufficient to address challenges of that magnitude without the support of the central governments. As was observed by the study of the phenomenon, even these efforts are spatially located in the island destinations with references to the urban ones being totally absent. In addition, the inability of cooperation between the different governmental levels does not contribute to the solution of the issue rather than being harmful to the destinations. Given these points, the establishment of a spatial toolbox through the SPF for Tourism would allow for the resolution of these chronic illnesses.

Regards to the tourism flows management strategies, the review of the international experience revealed a shift in the policies from the promotion to the control and management of the destinations. The dispersion of the tourism traffic outside of the city centres and the urban tissue is prominent to address overtourism coupled with the promotion of more sustainable tourism forms and experiences and the enforcement of maximum limits of visitors. Hence, the answer could be the spatial and time dispersion (seasonality) targeting the equal distribution of the tourism flows to the Greek destinations.

Equally important are the upgrading of the infrastructure and the cooperation of the different governmental levels and stakeholders. Also, the need is urgent for legislation amendment and adaptation to the current trends for tourism to be resilient towards internal and external shocks. The necessary spatial tools, measures, and indicators should be included along with prevention and management policies, where a noticeable lack is being noticed (absence of an indicators framework, monitoring mechanisms, and official data at the national level).

Because of the complexity of tourism, mirrored in policy and planning, the assurance of its benefits for the host societies demands an integrated management and governance system, a map of actions for every destination. Tourism should be for society and not society for tourism. A unified solution cannot be discussed due to the unique characteristics of each destination and the driving factors. The only thing that must be in common is the participation of the local community. The upper aim is for tourism to be sustainable for all the destinations and to prevent spreading the problem along with safeguarding destinations' viability. Thus, the planning approach should be integrated:

environment, society, culture, and space.

In conclusion, tourism is beneficial for the local communities – stakeholders – tourists under the condition of the existence and enforcement of an integrated (spatial) planning framework, the absence of which enables phenomena such as overtourism.

References

Ali, Rafat (2018) The Genesis of Overtourism: Why We Came Up With the Term and What's Happened Since [Online] Available from: https://skift.com/2018/08/14/the-genesis-of-overtourism-why-we-came-up-with-the-term-and-whats-happened-since/ Accessed [10/03/2023]

Citta di Venezia (2022) Annuario del Turismo dati 2020. Città di Venezia: Assessorato al Turismo

Collins English Dictionary (2018) Overtourism [Online] Available from: https://www.collinsdictionary.com/submission/19794/Overtourism#:~:text=The%20phenomenon%20of%20a%20popular,tourists%20in%20an%20unsustainable%20way. Accessed [10/03/2023]

European Travel Commission (2022) European Tourism – Trends & Prospects (Q3/2022). Brussels: (Tourism Economics November 2022)

Goodwin, Harold (2017) The Challenge of Overtourism, *Responsible Tourism Partnership Working Paper 4.* October 2017

International Transport Forum (2016) Cruise Shipping and Urban Development. The Case of Venice. Paris: OECD

Milano, Claudio (2017). Over-tourism and Tourism-phobia: Global trends and local contexts. Barcelona.

Milano, Claudio, Novelli, Marina and Cheer, Joseph. M. (2019) Overtourism and tourismphobia: a journey through four decades of tourism development, planning and local concerns. Tourism Planning and Development, 6, pp. 353-357.

MoneyTourism (2022) Προχωρούν οι αλλαγές με το νέο τουριστικό νόμο στη Μαγιόρκα: Τι ισχύει για ανακαινίσεις, μειώσεις κλινών, συνθήκες εργασίας | Συμφωνία κυβέρνησης, αντιπολίτευση και ξενοδόχων [Online] Available from: Προχωρούν οι αλλαγές με το νέο τουριστικό νόμο στη Μαγιόρκα: Τι ισχύει για ανακαινίσεις, μειώσεις κλινών, συνθήκες εργασίας | Συμφωνία κυβέρνησης, αντιπολίτευση και ξενοδόχων - ΧΡΗΜΑ & ΤΟΥΡΙΣΜΟΣ money-tourism.gr Accessed [11/03/2023]

OECD (2022) OECD Tourism Trends and Policies 2022, Paris: OECD Publishing

Pantziou, Eleftheria (2021) Greece: Overtourism or Poor Management? What is the Real Problem of Popular Destinations? [Online]. Available from: https://news.gtp.gr/2021/10/25/greeceovertourismorpoormanagementwhatistherea

lproblemofpopulardestinations/?fbclid=IwAR02WJDafKvPQ3ZX7uJLZHswGBXb04QRkQAg7Qu-9v7DzM-gFvDnHN1PmAc Accessed [11/03/2023]

Peeters, Paul, Gössling, Stefan, Klijs, Jeroen, Milano, Claudio, Novelli, Marina, Dijkmans, Corné, Eijgelaar, Eke, Hartman, Stefan, Heslinga, Jasper, Isaac, Rami, Mitas, Ondrej, Moretti, Simone, Nawijn, Jeroen, Papp, Bernadett and Postma, Albert (2018). Research for TRAN Committee - Overtourism: impact and possible policy responses. Brussels: European Parliament, Policy Department for Structural and Cohesion Policies.

Statista.com (2021) Tourism in Venice - Statistics & Facts [Online] Available from: https://www.statista.com/topics/5979/tourism-in-venice/#topicHeader__wrapper Accessed [12/03/2023]

Statista.com (2022a) Travel, Tourism & Hospitality - Number of international tourist arrivals in Denmark from 2010 to 2020 [Online] Available from: https://www.statista.com/statistics/1059485/international-tourism-volume-denmark/ Accessed [12/03/2023]

Statista.com (2022b) Tourism in Barcelona - statistics & facts [Online] Available from: https://www.statista.com/topics/4156/tourism-in-barcelona/#dossierKeyfigures Accessed [12/03/2023]

Tjolle, Valere (2022) Overtourism crisis spreads [Online] Available from: https://www.travelmole.com/news/overtourism-crisis-spreads/?region=uk Accessed [14/03/2023]

United Nations (2023). World Economic Situation and Prospects 2023. New York

UNWTO (2023) Tourism set to return to pre-pandemic levels in some regions in 2023. World Tourism Barometer 21(1). Madrid: World Tourism Organization (17 January 2023)

Weber, Fabian, Stettler, Juerg, Julianna Priskin, J., Rosenberg-Taufer, Barbara, Ponnapureddy, Sindhuri, Fux, Sarah, Camp, Marc-Antoine, Barth, Martin, (2017) Tourism destinations under pressure. Challenges and innovative solutions. Switzerland: Lucerne University of Applied Sciences and Arts, Institute of Tourism

Weston, Richard, Guia, Jaume, Mihalic, Tanja, Prats, Lluís, Blasco, Dani, Ferrer-Roca, Natàlia, Lawler, Mary and Jarratt, David (2019), Research for Tran Committee – European tourism: recent developments and future challenges. Brussels: European Parliament, Policy Department for Structural and Cohesion Policies.

World Tourism Organization (UNWTO); Centre of Expertise Leisure, Tourism & Hospitality; NHTV Breda University of Applied Sciences; and NHL Stenden University of Applied Sciences (eds., 2018), 'Overtourism'? – Understanding and Managing Urban Tourism Growth beyond Perceptions, Volume 2: Case Studies, UNWTO, Madrid, DOI: https://doi.org/10.18111/9789284420629.

World Travel and Tourism Council (2017) Coping with success. Managing overcrowding in tourism destinations. McKinsey and Company

Worldometer (2022) World Population – Denmark Population [Online] Available from: https://www.worldometers.info/world-population/denmark-population/ Accessed [14/03/2023]

Βασιλείου, Δημήτρης and Τοάνογλου, Μιχάλης (2020) Οργανισμοί Διαχείρισης Προορισμών: Μια πρόκληση και η ελληνική πραγματικότητα [Online] Available from: https://money-tourism.gr/organismoi-diacheirisis-proorismon-mia-proklisi-elliniki-pragmatikotita/ Accessed [16/03/2023]

Βουρεκάς, Κώστας (2018) Τουρισμός, ιδού το «νέο» μοντέλο ανάπτυξης [Online] Available from: https://prin.gr/2018/07/%CF%84%CE%BF%CF%85%CF%81%CE%B9%CF%83%CE%BC%CF%8C%CF%82%CE%B9%CE%B4%CE%BF%CF%8D%CF%84%CE%BF%CE%BD%CE%AD%CE%BF%CE%BC%CE%BF%CE%BD%CF%84%CE%AD%CE%BB%CE%BF%CE%B1%CE%BD%CE%AC%CF%80%CF%84/ Accessed [16/03/2023]

Δήμος Θήρας (2021) Καταγραφή κοινωνικών, οικονομικών και περιβαλλοντικών δεδομένων για τον Υπολογισμό της Φέρουσας Ικανότητας του Δ. Θήρας. Αθήνα: ΕΛΛΕΤ / ΣΠΕ ΕΜΠ.

ΕΛΣΤΑΤ (2011) Απογραφή 2011 – Στοιχεία Μόνιμου Πληθυσμού Θήρας. Αθήνα

Λιάλιος, Γιώργος (2022) Παράθυρο» στην οριοθέτηση των οικισμών [Online] Available from: https://www.kathimerini.gr/society/561743638/parathyro-stin-oriothetisi-ton-oikismon/ Accessed [17/03/2023]

Λιάλιος, Γιώργος (2023) Αρχιπέλαγος κλινών με λίγους κατοίκους [Online] Available from: https://www.kathimerini.gr/society/562405756/archipelagos-klinon-me-ligoys-katoikoys/ Accessed [17/03/2023]

Νταλακογεώργος, Αντώνης (2018) Οι μεγαλοξενοδόχοι, οι πολυεθνικές της κρουαζιέρας, οι tour operators και της Γης οι κολασμένοι [Online] Available from: https://thepressproject.gr/oi-megaloksenodoxoi-oi-poluethnikes-tis-krouazieras-oi-tour-operators-kai-tis-gis-oi-kolasmenoi/#.W2_xtHeA8nc.facebook Accessed [17/03/2023]

Πανεπιστήμιο Θεσσαλίας (2020) ΧΩΡΙΚΟΣ ΣΧΕΔΙΑΣΜΟΣ ΚΑΙ ΤΟΥΡΙΣΤΙΚΗ ΑΝΑΠΤΥΞΗ. ΔΙΕΡΕΥΝΗΣΗ ΚΑΙ ΑΝΑΛΥΣΗ ΣΧΕΤΙΚΩΝ ΖΗΤΗΜΑΤΩΝ, Volos: DPRD

ΣΕΤΕ (2021) Σχολιασμός και προτάσεις ΣΕΤΕ επί του Σχεδίου Νόμου του Υπουργείου Τουρισμού «Οργανισμοί Διαχείρισης και Προώθησης Προορισμού, Ιαματικές Πηγές Ελλάδας, Ναυάγιο Ζακύνθου, διατάξεις για τα τουριστικά γραφεία, τις τουριστικές επιχειρήσεις και τα τουριστικά καταλύματα και άλλες ρυθμίσεις για την τουριστική ανάπτυξη». Athens: Association of Greek Tourism Enterprises

Υπουργείο Τουρισμού (2020) Ο Υπουργός Τουρισμού, κ. Χάρης Θεοχάρης, παρουσίασε το νέο Νομοσχέδιο του Υπουργείου Τουρισμού που περιλαμβάνει μεταξύ άλλων τη θέσπιση «Οργανισμών Διαχείρισης και Ανάπτυξης Τουρισμού (DMMO)» και «Οργανισμού για την Αξιοποίηση Ιαματικών Πόρων». Athens

WHAT DOES 'AUTHENTICITY' MEAN IN JAPANESE CITIES? A CASE STUDY OF KANAZAWA CITY (1105)

Keisuke Sugano[1*], Kei Sakamura[2], Naomi Uchida[3]

[1] Institute of Art and Design, University of Tsukuba, Tsukuba-shi, Ibaraki, Japan; [*]sugano.keisuke.gu@u.tsukuba.ac.jp

[2] School of Environment and Society, Tokyo Institute of Technology, Ookayama, Meguro-ku, Tokyo, Japan

[3] Graduate School of Humanities and Social Sciences, Saitama University, Saitama, Japan

Abstract. This study examines the concept of urban authenticity in Japan, specifically focusing on Kanazawa City as a case study. Through analysing three urban development projects in Kanazawa, this study hypothetically visualises how the perceived urban authenticity among citizens fluctuates with urban development and is adapted as a new authenticity. The study identifies three influential factors affecting authenticity fluctuations: reference points to define authenticity, public input, and external factors. It highlights the importance of recognising that urban authenticity in Japan encompasses a variety of reference points, to comprehend the fluctuations in relation to these reference points and to consider how authenticity can be adapted through incorporating public inputs and external evaluations. These actions contribute to the adaptation process to newly emerging authenticity in Japanese cities.

Keywords: Authenticity, Local identity, Japanese city, Urban development.

1. Introduction

Japan has a unique form of urban authenticity. It has been maintained by preserving the historically formed urban space with wooden structures as well as by actively creating modern urban space during the post-war economic growth period. The authenticity continues to be established under dynamic equilibrium, while constantly being exposed to changes in people's perceptions and the potential for urban development. This is due to the interaction of the three authenticities discussed in previous studies which are 'objective authenticity', 'constructive authenticity' and 'existential authenticity' (Boorstin,1962; Bruner,1994; Cohen,1988; MacCanell,1973; Ning, 2017), whereby the perceived authenticity at a certain point in time is newly established as 'emergent authenticity' (Cohen,1988). This shift does not happen easily, because citizens prefer to preserve traditional authenticity and oppose new authenticity. Consequently, the layered

authenticity is formed despite initial rejection, as perceptions fluctuate and adapt with the public over time.

This study focuses on the processes of fluctuation and adaptation of authenticity, particularly in Japan, where such shifts have occurred rapidly and frequently in the post-war period. The concept of authenticity in Japan has been discussed in relation to local identity within three contexts.

Firstly, in the development of legislative plans for preserving historic urban spaces, each city government identifies its unique historical features and describes them as part of its local identity. For example, a previous study examined how the discourse on urban authenticity is defined in administrative documents related to landscape, tourism, urban planning, and historic preservation (Uchida, Sakamura & Sugano, 2022).

Secondly, local identity has been promoted to revitalise declining cities, differentiating them from others and attracting industry and tourism. The 'Act on Maintenance and Improvement of Traditional Scenery in Certain Districts,' enacted in 2008, provides support measures for the maintenance and improvement of historic environments and local revitalisation projects. Local governments are required to interpret the unique historical environment in their planning, leading to a widespread search for local identity throughout the country.

Thirdly, developers have cited local identity to gain public approval and administrative assistance for urban redevelopment. The 'Act on Special Measures concerning Urban Regeneration,' which took effect in 2002, deregulates redevelopment based on developers' proposed public contributions. Developers increasingly emphasise local identity as a justification for their public contributions, resulting in landscape-friendly spatial design and the preservation and utilisation of historic buildings. The 'Landscape Design Review' includes prior consultation to guide individual redevelopment projects in aligning with the landscape policies of each municipality. Through these consultations, the unique landscape of the city is discussed by developers.

In the Japanese context, the intersection of the aforementioned arguments has given rise to a unique discussion surrounding the concept of urban authenticity.

2. Methodology

This study refers to the three aspects of authenticity that were previously classified as 'objective', 'constructive', and 'personal' by Boorstin (1962), Bruner (1994), Cohen (1988), MacCanell (1973), Jamal and Hill (2004), and Ning (2017). 'Objective authenticity' refers to what is perceived based on objective, scientific evidence, such as chronology and historical facts. 'Constructive authenticity' refers to what is perceived based on societal

norms, which may vary across different societies and times. 'Personal authenticity' refers to what is perceived based on individual impressions and experiences.

Objective authenticity is narrowly interpreted and relies on scientific and historical evidence. On the other hand, constructive authenticity is influenced by social background and can be interpreted differently in various societies and eras. Personal authenticity allows for the broadest range of interpretation, as it is subjective and dependent on the individual interpreting it. In urban settings, these different interpretations of authenticity coexist within the same space. (Boorstin,1962; Bruner,1994; Cohen,1988; MacCanell,1973; Jamal and Hill, 2004; Ning, 2017) Therefore, when new spaces are created through urban development, diverse interpretations of authenticity emerge, leading to fluctuations in previously established notions of authenticity.

As Uchida (2020) also suggests, there is a process of 'familiarity' wherein newly created spaces are gradually accepted as part of the authentic urban experience over time. Building upon this notion, urban authenticity is defined as follows.

Allowing different categories of authenticity - objective, constructive and personal - to be interpreted in the same space, while mixing the roles of host and guest in the 'eye' to that interpretation, having a sense of 'familiarity' beyond true or false in the long time of involvement in the city, and always containing opportunities and crises of 're-interpretation' (Uchida, 2020, p.135).

Based on previous studies, this research posits that the perception of urban authenticity by citizens at a particular point in time fluctuates with urban development and gradually becomes accepted and adapted as a new form of authenticity over time. This phenomenon has been particularly prevalent and rapid in post-war Japan. Consequently, this study aims to hypothetically visualise the fluctuation and adaptation process of authenticity within Japanese-style urban spaces characterised by wooden structures, limited area for preservation, and development since the post-war period. This visualisation will be conducted through a case study in Kanazawa.

Kanazawa City, located in Ishikawa Prefecture within the Hokuriku region, has advocated for the 'harmony between preservation and development' of its urban spaces since the late 1960s. The city government and citizens have actively engaged in discussions on local identity (Yamade, 2013; Yamade, 2015).

This study focuses on analysing three urban development projects in Kanazawa that involved public discussions on authenticity within a complex context. The projects are as follows: the development of Kanazawa Castle Park, the redevelopment of Omicho Market, and the design of the 21st Century Museum of Contemporary Art, Kanazawa (hereinafter 21st Century Museum) (Figure 1).

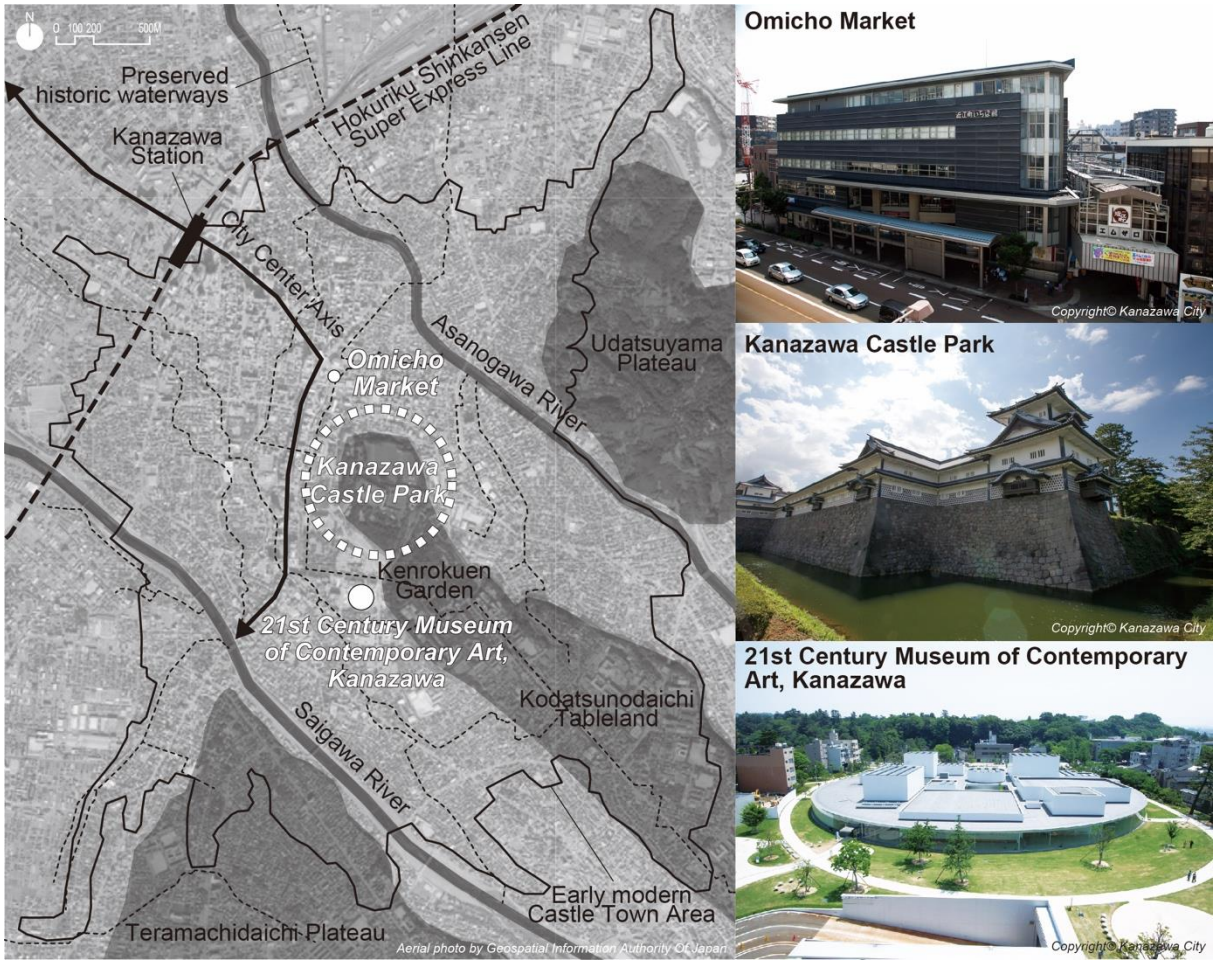


Figure 1. Location of the three subject sites

These three cases were selected because they are considered to have undergone different processes of authenticity fluctuation and adaptation, primarily due to the different 'reference points' used in urban development to define authenticity.

Kanazawa Castle Park referred to the land use approximately 150 years ago, creating a significant disconnect from the present situation. On the other hand, the redevelopment of Omicho Market was based on the existing land use at the time. As for the 21st Century Museum, it represents a completely new space and concept that had never existed in the city before, lacking any specific reference point.

The analysis in this study focuses on three perspectives in terms of ‘fluctuation’ and ‘adaptation’ of authenticity:

1) What triggered the fluctuations in perceptions of authenticity?

2) What was valued and what changes in authenticity were accepted?

3) How was the new authenticity accepted and adapted with citizens?

To achieve these objectives, this study organises the processes of fluctuation and adaptation in each of the three cases based on a literature review and previous studies. Subsequently, the differences between these processes are analysed and discussed, and a hypothetical method for visualising the processes is presented.

Figures 2 to 4 in chapter 3 depict a hypothetical visualisation of the fluctuation and adaptation processes in the three cases, with the horizontal axis representing time. Note that the line fluctuations expressed herein are relative to the three cases being compared.

The multiple curved lines correspond to different line types, contingent upon the stakeholders engaged in formation of authenticity. While the specific stakeholders may differ across projects, three cases commonly include the planners, responsible for designing the plans, and the citizens, who receive and interact with these plans. In the case of the Omicho Market, the property owners are additionally considered, as they contribute to the formation of authenticity through the content provided by the business.

The line representing the planner indicates the degree of understanding of authenticity by planners, while the line representing the citizen reflects the citizens' perception of authenticity. Similarly, the line representing the property owner signifies the property owners' perception of authenticity.

The range between each line illustrates a mutual discrepancy. The narrowing of the vertical axis signifies a decrease in the discrepancy, leading to the establishment of a certain evaluation. This phenomenon is referred to as adaptation in this study. Conversely, the expansion of the vertical axis indicates an increasing discrepancy, signifying a state of heightened fluctuation in the interpretation of authenticity.

This can be understood as a dynamic process in which planners' understanding of authenticity, citizens' and property owners' perceptions of authenticity interact and fluctuate, subsequently adapting over time or undergoing further fluctuations triggered by various factors.

3. Case study

3.1. Kanazawa Castle Park

Kanazawa Castle Park is an urban park located in the centre of Kanazawa City, and is now one of the city's most popular tourist destinations. It was originally the site where

Kanazawa Castle was built (from 1583-1869), followed by a dramatic change in land use from Army base (from 1871-1945), to Kanazawa University (from 1949-1996), to the current park (after 2001). This paper focuses particularly on the period of change from the university to the park.

1) What triggered the fluctuations in perceptions of authenticity?

During the process of changing the land use from Kanazawa University to Kanazawa Castle Park, the authenticity of the site was challenged and fluctuated at two significant moments.

The first fluctuation occurred when Kanazawa University was considering relocating. The university operated in a unique environment where some of Kanazawa Castle's historical sites were preserved, allowing only about 30 percent of the site to be used for the university campus. Moreover, the weak ground of the site was unsuitable for high-rise buildings, making it difficult to expand the university facilities. As a result, when additional university facilities were needed, relocation was considered as an option in 1976 (Kanazawa University, 1993). However, the Faculty of Liberal Arts strongly opposed the idea of moving the university outside the castle site. The Dean of the Faculty at the time stated that 'Kanazawa University is more suited to being inside the castle' and presented the 'Forest of Liberal Arts' plan in 1979, which envisioned only the Faculty of Liberal Arts remaining inside the castle site and maintaining connections with the local community (Kanazawa University, 1993).

Some citizens also opposed the university's relocation. For instance, author Osamu Takahashi criticised it as 'a typical example of losing the cultural centre and turning the town into a ghost town' in a newspaper article (Asahi Shimbun, 1993). Despite these oppositions, in 1981, the university council voted 23 in favour and 7 against or undecided, and the relocation was officially decided (Kanazawa University, 1993). As above, the authenticity of the site was recognised by the unique presence of the university within the castle site and the connection with the local community, and when it was threatened to be lost, a heated debate arose.

The second fluctuation occurred during the deliberation of the site's subsequent use. Following Kanazawa University's decision to relocate, discussions regarding how to utilise the site were repeated among the city council, prefectural assembly, and citizens (Asahi Shimbun, 1992; Kanazawa City, 1989). Various proposals were suggested, including a music hall, art museum, conference centre, and more. Many of these proposals were based solely on the site's location characteristics, such as its large size in the city centre, and had little consideration for its historical background or other relevant factors.

Amidst these intense discussions, Ishikawa Prefecture decided that the utilisation and development of the castle ruins and valuable space in the city centre should be

determined based on opinions from various sectors of society. In 1991, the 'Committee for the Discussion of Kanazawa University's Vacant Site Utilisation' was established for this purpose (Committee, 1993). While the prefectural government handled the committee's administration, the 49 committee members included not only representatives from the local business and political sectors, but also university professors, architects, historians, and representatives from local community organisations and citizen groups.

The committee continued its activities, and in 1993, it released a set of proposals on the utilisation of Kanazawa University's vacant site. Subsequently, the number of discussions regarding the site's utilisation decreased, and the fluctuations in authenticity gradually subsided.

2) What was valued and what changes in authenticity were accepted?

In the committee's proposal, the basic concept for the site's use was to create a park-like cultural space that would preserve the natural environment and cultural heritage, and make it accessible to the public, utilising greenery and open space (Committee, 1993). The committee determined that the appropriate reference point for the restoration of cultural heritage was the late Edo period[1], as it provided the most abundant resources and existing buildings available for restoration. In this way, although there were many changes in land use over time, the project referred to one particular era with abundant objective historical records to clearly highlight its authenticity.

In the actual development of the park, buildings from the late Edo period were faithfully restored based on pictures and written materials (this is the preservation of 'genuineness' that Cohen (1988) refers to). The original stone walls that were preserved from that time are also utilised as they were (this is the preservation of 'originality' that Cohen (1988) refers to). On the other hand, most of the university-related facilities that conveyed the history after the late Edo period were removed (Committee, 1993). In addition, the route of the park path was changed, not replicating the castle's original paths, in order to create a more suitable space for public park use.

3) How was the new authenticity accepted and adapted with citizens?

In the context of the significant changes in land use and development that Kanazawa Castle Park underwent, three main efforts were made to accommodate the fluctuations in the authenticity.

First, as mentioned above, the committee was established with diverse stakeholders, including citizens, to make discussions on the use of the site. This approach ensured citizen participation and may have reduced opposition to the plan.

Second, a development plan was proposed that allowed for future changes in land use by dividing the implementation period into three phases: immediate action, within 10 years,

and long-term planning (Committee, 1993). This intentional allowance for future changes may have accommodated various opinions regarding the authenticity of the place.

Third, the entire region including the park was characterised as the 'central district' by the government, setting the goal of investigating and preserving cultural heritage sites based on their value (Kanazawa City, 2019). This authorisation by the government ensured the legitimacy of restoring historical ruins in the area.

The case of Kanazawa Castle Park highlights the challenges of achieving authenticity in urban planning when previous land use and authenticity are not inherited. In such cases, even if the legitimacy of the spatial design is supported by historical evidence, citizens who live in the city on a daily basis may feel discomfort. Therefore, involving citizens as participants of discussions and providing authoritative characterisation by the government can promote acceptance of the changes by the citizens. The case of Kanazawa Castle Park serves as an example of how these efforts can be successfully implemented.

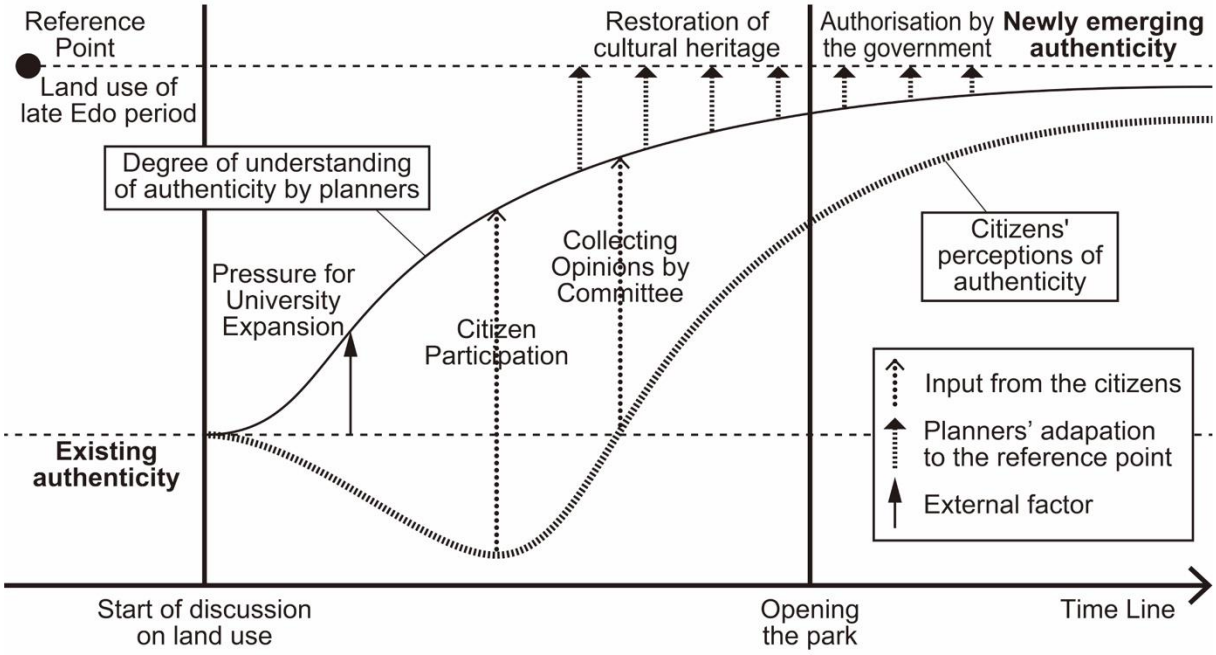


Figure 2. Processes of fluctuations and adaptations of authenticity in Kanazawa Castle Park

3.2. Omicho Market

The Omicho Market opened in 1721 and is located in the centre of Kanazawa City. In 2009,

‘Mino-take (modest scale)’ type of redevelopment project was completed and the arrival of the Shinkansen bullet train has led to a noticeable increase in the number of tourists to the market.

1) What triggered the fluctuations in perceptions of authenticity?

There were two ‘fluctuations’ in perceptions of authenticity in the Omicho Market.

The first is the fluctuation as a role. It was licensed as a public market in the Meiji period[2] (1899) and later specialised in the wholesale of fresh fish. After the post-war black market, it ended its role as a wholesale market in 1966 when a large-scale public market was built in the new downtown area, and subsequently Omicho market became a retail market (Fujishima, 1982). Since the late 1950s, it came to be called as a ‘kitchen for citizens’ (Omicho, 2011, p.211). The image of a kitchen for citizens is the recent authenticity of Omicho Market. However, the openings of modern supermarkets have shaken its position: in 1981, a large national-chained supermarket opened across the street. During this period, some people worked in the Omicho Market felt that the market was ‘relying on tradition and make no effort’ and ‘lacked a modern sense of style,’ but they also wanted to preserve its familiarity and nostalgia for the citizens (Kanazawa City, 1980), and they felt threatened by the fluctuation of its authenticity as a kitchen for citizens.

Secondly, the tourism aspect began to shake its authenticity as a kitchen for citizens. The first was the influx of group tourists triggered by publicity by the prefectural tourism federation in 1978. The tourism aspect was then accelerated by the arrival of the Shinkansen bullet train in 2015. On weekends, the number of visitors has doubled or tripled from before the Shinkansen, and the manner of tourists became a problem, which deterred citizens from visiting the area (Omicho, 2011, pp.256-257, p.308). Thus, there was a fluctuation between the authenticity as a kitchen for citizens and the demand for tourism.

2) What was valued and what changes in authenticity were accepted?

In the midst of these fluctuations in perception of authenticity, Omicho Market started a dramatic spatial change by a redevelopment project. The Omicho Ichibakan redevelopment project, known as the modest-sized type of project, was completed in 2009. A planner who was responsible for the planning of this redevelopment described the market district like the following: ‘Although the Omicho Market has a long history, the number of new visitors, excluding tourists, is declining, and both the number of visitors and sales were declining in proportion to the ageing of regular customers.’ (RIA, 2011 p.28). The report points out the fluctuation of the authenticity as the citizens' kitchen and indicates that ‘the Architectural Institute of Japan requested the preservation of the bank building on the corner of the national roadside intersection, which was constructed in the early Showa period (RIA, 2011). As for the latter, the building was relocated to enhance its

spatial authenticity and incorporated as part of the redevelopment.

The planner also states that he emphasised the following spatial configuration during the redevelopment process:

(1) Maintain the street configurations of the market. (2) Maintain the atmosphere of the market. (3) Preserve the familiar landscape. (4) Retain the function of the market as a kitchen for citizens while adding new functions. (RIA, 2011, p.29)

Based on the then mayor's thought that the idea of a new market should be discussed by local people rather than by consultants from Tokyo (Yamade, 2013), and in part due to the collapse of the bubble economy, the redevelopment of the market was undertaken on a modest scale. The new market was designed carefully with maintaining the traditional scale, width of frontage, and layout of stores, with a 'two-story vaulted arcade-like space' and 'an intricate network of alleyways' (Shinkenchiku-sha, 2013, pp.51-52). Also, with the preservation of historical buildings, the project was able to maintain the integrity of the market. The busy and diversified atmosphere and human scale of the market remained successfully, making it a rare example that redevelopment did not detract from the atmosphere of the market. The planners' interpretation of the authenticity of the space as an important element led citizens to embrace the significant change.

3) How was the new authenticity accepted and adapted with citizens?

While the spaces in the redevelopment project were planned in such a way that citizens could easily embrace the new market, it was the contents that were just as important as the space. Regarding the contents, there was a statement made by a business owner before the redevelopment project, and he mentioned three keywords as Omicho's market character like the following: (1) hustle and bustle (not crowding), (2) seasonal product selection, and (3) frank and honest services. He emphasised the need to maintain the simple appearance of the market, saying that there is no need to spend too much money on equipment and said, 'As long as the products and people selling them do not change, the market's character will be maintained. There is no need to worry.' (Monthly Hokkoku Actus, 2005, p.10) It seems that the redevelopment has preserved the spatial configuration and contents of the market, and that there was not much need to worry about the acceptance by citizens, as the redevelopment considered the business continuity. On the other hand, the increase in the number of tourists is still in the process of acceptance by local people, according to news reports and other information. In response to this, a business owner stated, 'If the locals do not come to the market, the tourists will definitely stop coming,' (Omicho, 2021, p.340), and it is important to strike a balance between locals and tourists. It is expected that this balance will eventually be maintained and that the local people will be more receptive to tourists.

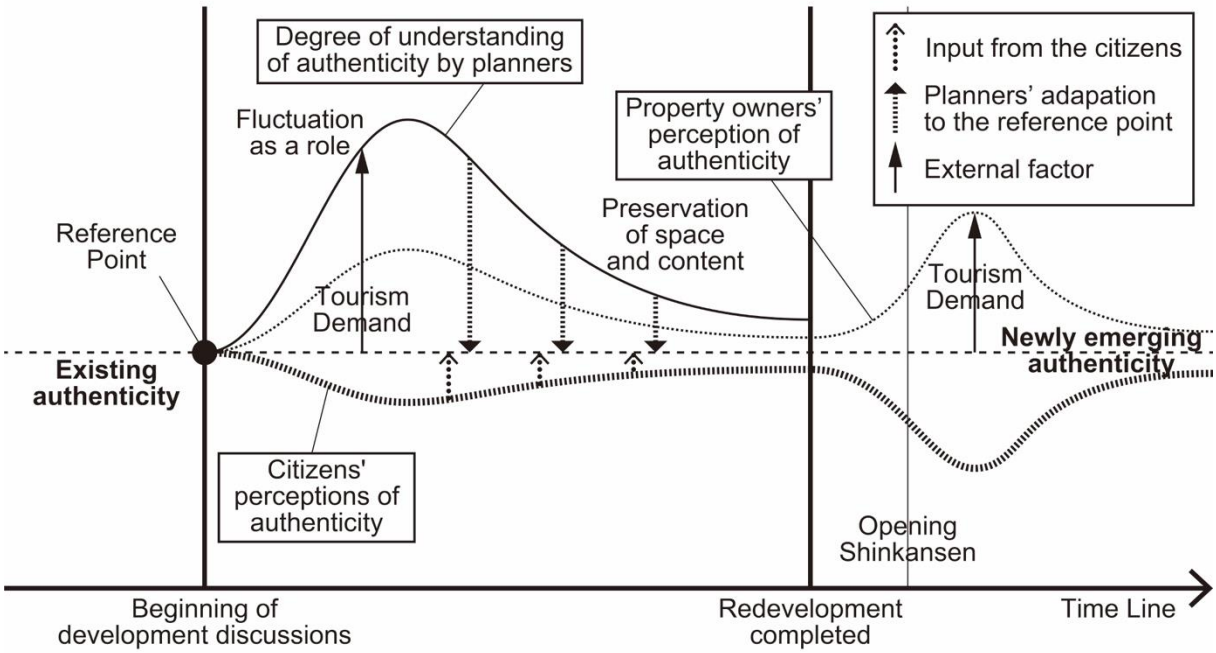


Figure 3. Processes of fluctuations and adaptations of authenticity in Omicho Market

3.3. 21st Century Museum

The 21st Century Museum was established in the historic city centre of Kanazawa in 2004.

1) What triggered the fluctuations in perceptions of authenticity?

The announcement made by the city government regarding the construction of a contemporary art museum in a historically significant city, reflecting the early modern period, served as the catalyst for the fluctuation in authenticity. In 1998, Kanazawa City introduced the 'Hirosaka Art Street' initiative, which aimed to develop a cultural facility. As part of this initiative, the city government expressed its intention to build a contemporary art museum. The artworks in the museum's collection were categorised as 'modern and contemporary' (Hokkoku Shimbun, 1999) from the late Meiji period onwards, aiming to complement the Ishikawa Prefectural Museum of Art, which houses numerous works from the Edo period. The architectural design, presented in 2000, featured a circular plan with fully glazed walls, which had a significant influence on subsequent contemporary architecture. In response, the Hokkoku Shimbun, a leading local newspaper, expressed concerns about the transformation of the entire area into a space dominated by 'modernity' (Hokkoku Shimbun, 2000). Similarly, citizens voiced opposition, believing that a museum of modern art would not align with the historical nature of the city (Yamade, 2018). The announcement of the Museum of Contemporary Art construction

raised concerns among citizens about potential fluctuations in the city's authenticity due to the introduction of contemporary spaces.

2) What was valued and what changes in authenticity were accepted?

During the planning process, the planner proposed a new urban authenticity, which was a city where tradition coexists with contemporary art. This was reflected in the spatial design and the selection of artworks to be included in the museum's collection.

First, in terms of spatial design, the planners integrated the museum into the urban framework based on the early modern period. For example, they designed several parkways that provided multiple access points from different directions, connecting them to the surrounding historical streets. The circular façade, which has no frontality, was designed with four entrances. Additionally, in response to requests from residents of the nearby Kakinokibatake shopping street, an entrance was added to the architectural design near the shopping area. Thus, the relationship between the museum and the city was shaped through citizen input in certain cases. Furthermore, the city of Kanazawa preserved the historical irrigation canal that runs through and around the museum site and relocated the tea house affiliated with the Maeda family, who governed Kanazawa during the Edo period, to the site, creating a space that 'embodies the richness and dignity of the traditions that Kanazawa has accumulated since the Edo period' (Hokkoku Shimbun, 2000).

Secondly, in terms of the artworks collected, the initial plan focused on modern and contemporary works from the late Meiji period onwards. However, in 2001, Kanazawa City revised its policy to include crafts that inherited traditions from the Edo period as an integral part of the collection, without favouring modern and contemporary works exclusively (Hokkoku Shimbun, 2001). The museum's distinct feature was defined as a 'dialogue between crafts and modern and contemporary art' (Hokkoku Shimbun, 2001). This shift ensured that contemporary art was not detached from historical traditions but connected them within a multi-layered historical context.

3) How was the new authenticity accepted and adapted with citizens?

The acceptance of the museum by citizens can be observed from three perspectives.

First, the museum's architecture received international acclaim and became a symbol of the city. The design was highly praised by academic societies, and its architects were awarded the prestigious Pritzker Prize. This external evaluation helped citizens realise the value of the museum and take pride in it as a symbol of their city.

Second, the museum gained recognition as one of Kanazawa's prominent tourist attractions. Since its opening, the museum has attracted an annual average of 1.5 million visitors and has garnered attention as one of Japan's leading museums. Following the

opening of the Shinkansen in 2015, the number of visitors exceeded 2 million for three consecutive years. During this period, volunteer citizen tourist guides began introducing the museum alongside other historical landmarks, allowing citizens to share the museum's value as a tourism resource.

Third, the new urban authenticity advocated by the mayor was successfully established. Tamotsu Yamade, the mayor of Kanazawa at the time, who actively pushed for the museum's construction, provided a rationale for building a contemporary art museum in a historically significant city through various council discussions. As a result, a new urban authenticity emerged, characterised by the coexistence of tradition and contemporary art. In the mayoral election held two years after the museum's opening, Yamade was re-elected with a wide margin over other candidates, signifying the acceptance of the new urban authenticity by the citizens.

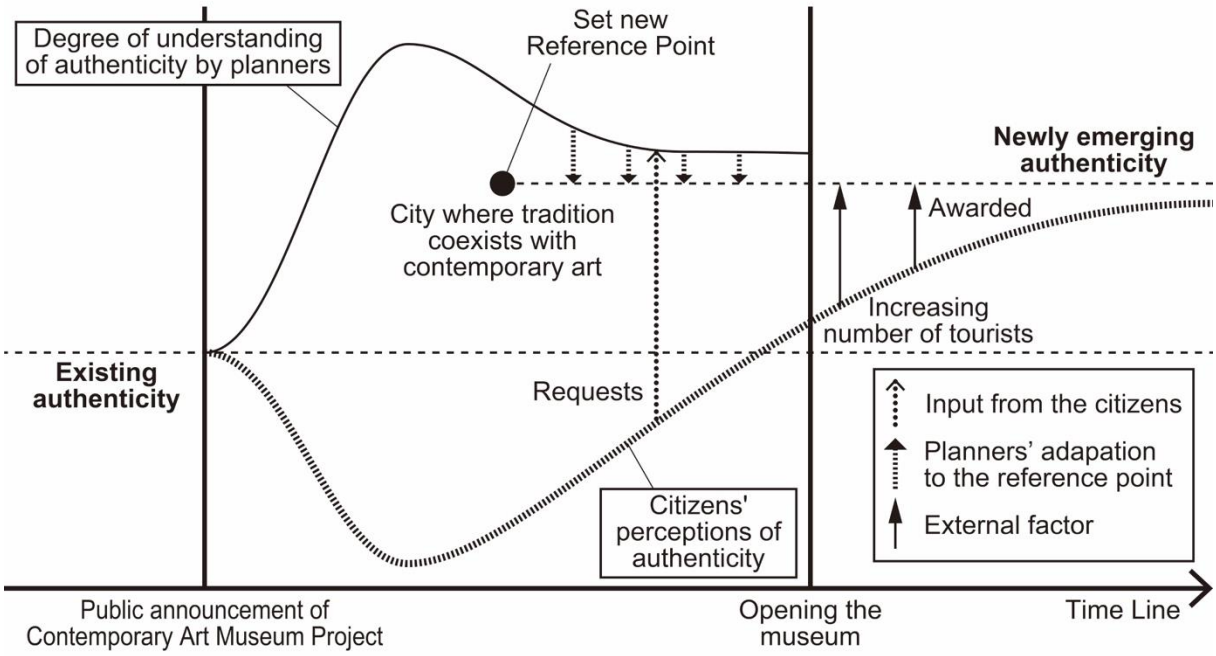


Figure 4. Processes of fluctuations and adaptations of authenticity in 21st Century Museum

4. Discussion

Three distinct characteristics can be interpreted from figures 2 to 4 regarding the fluctuation and adaptation process:

1) Three phases in the fluctuation and adaptation process

The timeline can be divided into three primary phases. The first phase involves the fluctuation of the initially established authenticity, resulting in a discrepancy between the planning and citizens' perception of authenticity. The second phase corresponds to the planning stage, during which various efforts are made to address the discrepancies that arose in the first phase. The third phase encompasses the post-development process, where adaptation often takes place over time; however, external factors can reintroduce discrepancies.

2) Factors influencing the fluctuations

The factors influencing the fluctuations (represented by arrows in the figures) can be categorised into three main types. First is the reference point, i.e. what was referred to as authenticity in urban development. Planning efforts strive to align the planning's content with this reference point. Secondly, input from the public plays a part in reconciling perceptions of authenticity within the planning process. For instance, in Kanazawa Castle Park, fluctuations were managed by incorporating opportunities for citizen participation in the planning process. Thirdly, external factors have an impact. For example, in the case of Omicho Market, the increase in tourists following the opening of the Shinkansen led property owners to cater to the demand, causing a fluctuation in citizens' perception. Conversely, in the case of the 21st Century Museum, the museum's value was shared by the citizens and promoted an adaptation process as a result of awards from academic societies and an increase in tourists. This aligns with Uchida's argument that the roles of host and guest are intertwined in interpreting authenticity (Uchida, 2020). This study demonstrates that guests may contribute to both the emergence of discrepancies in authenticity interpretation and the promotion of adaptation processes.

3) Characteristics of fluctuation and adaptation processes based on different reference points

Among the three factors mentioned in point 2), the different reference points of authenticity during the planning phase characterise the fluctuation and adaptation processes in each case.

Kanazawa Castle Park refers to a past authenticity that significantly diverges from the planning time period. The new authenticity referred to in the planning process relates to land use during the late Edo period, approximately 150 years prior. Referencing land use from the long distant past, which did not exist at the time of planning and whose reference point is open to interpretation, has caused significant fluctuations in planning and citizens' perceptions. Following the park's opening, the government designated the area as one to preserve and enhance its historic character, ensuring the legitimacy of the restoration of historical ruins in the park.

In the case of Omicho Market, existing reference points were preserved as the basis for the applied authenticity in development. The fact that these reference points exist as physical spaces and content limits individual interpretations of authenticity. It is considered that planners incorporated citizens' perceived authenticity into the planning process, contributing to an adaptation process without significant fluctuations.

The 21st Century Museum had no pre-existing reference point during the planning phase. Instead, a new urban authenticity was proposed, creating a reference point during the process. This was a process of giving a new site-scale authenticity to the contemporary art museum, which diverged from the authenticity on an urban scale at the time of planning as a historic city. In addition to a substantial shift in authenticity, the fluctuations in both planning and citizens' perceptions were the most pronounced among the three cases due to the absence of a reference point during the planning phase.

5. Conclusions

This study presents a hypothetical visualisation of the fluctuation and adaptation processes of authenticity, aiming to explore its significance in Japan through three urban developments in Kanazawa. This perspective is crucial for understanding how urban renewal, particularly in wooden cities, can contribute to the creation of a new sense of authenticity in the city.

To achieve the adaptation of authenticity, a series of processes from the planning stage of urban development to post-development becomes essential. However, it is particularly critical to concretely comprehend the fluctuations during the planning phase and be mindful of how to adjust them by involving citizens' input.

Furthermore, the visual representation and communication of external evaluations play a major role in regulating the fluctuations in authenticity. By making these external evaluations visible, it becomes possible to assess and adjust the perception of authenticity in urban development projects.

In addition, the concept of authenticity in urban development can encompass various reference points. It is necessary to consider how to adapt authenticity according to the distance from these reference points. This perspective is particularly significant in the context of Japanese-style authenticity, as it exhibits diverse reference points due to their structural characteristics caused by the rapid pace of urban renewal.

Drawing upon the case study of Kanazawa City, this study presents a hypothetical methodology for visualising the fluctuation and adaptation of authenticity over time. The interpretation of authenticity in Japan is fluid, characterised by frequent updates, dialogues, planning, and reference points with the stakeholders involved in fluctuation

and adaptation. The definition of vertical axis indicators in hypothetical visualisations is a task that remains to be addressed in the future.

It is important to note that while this study does not extensively address the matter, there exist various perceptions of ‘personal’ authenticity among citizens. By expressing the fluctuations and discrepancies in these perceptions across multiple stakeholders, it could serve as a planning indicator in future endeavours, particularly in shaping post-planning adaptations.

Acknowledgement. This research was funded by Grant-in-Aid for Scientific Research (C) (20K04828) 'Development of interpretation methods for multi-layered authenticity that encompasses ‘fluctuation’ in urban space' (Principal Investigator: Naomi Uchida).

Notes

[1] The Edo period in Japan, which spans from 1600 to 1868, is commonly referred to as the early modern period in Japanese history.

[2] The Meiji period in Japan encompasses the years from 1868 to 1912 and marks the beginning of modernization in the country.

References

Asahi Shimbun (newspaper). (1992, May 20, morning edition). Opinions on the use of the site continue to flow in, Kanazawa University to move to the suburbs. p.3.

Asahi Shimbun (newspaper). (1993, June 2, evening edition). Osamu Takahashi who runs Hakusan Backcountry Village private school in Ishikawa. p.1.

Boorstin, D. J. (1992). The Image: A Guide to Pseudo-Events in America. New York: Vintage.

Bruner, E. M. (1994). Abraham Lincoln as authentic reproduction: A critique of postmodernism. American anthropologist, 96(2), pp.397-415.

Cohen, E. (1988). Authenticity and commoditization in tourism. Annals of tourism research, 15(3), pp.371-386.

Committee for the Discussion of Kanazawa University's Vacant Site Utilisation. (1993). Kanazawa Daigaku Atochinado no Riyou ni kansuru Teigen (Proposal on the utilisation of Kanazawa University's vacant site). Kanazawa: Committee for the Discussion of Kanazawa University's Vacant Site Utilisation, p.49.

Fujishima, H. (1982). Kanazawa Omicho Ichiba no Seiritsu (The establishment of Kanazawa City Omicho Market). Kanazawa Institute of Technology Research Bulletin B, (No. 6), pp.13-25.

Hokkoku Shimbun (newspaper). (1999, November 26). Gendai Bijutsukan No Sakuhin Syusyu Meiji Kouki Ikou No 'Kin Gendai' (Collection of works in the Museum of Contemporary Art 'Modern and Contemporary' since the late Meiji period), p.1.

Hokkoku Shimbun (newspaper). (2000, December 31). Dento Bi De Uruoi To Omomi (Richness and dignity in traditional beauty), p.29.

Hokkoku Shimbun (newspaper). (2001, May 9). Meisyo Ha 'Kanazawa 21 Seiki Bijutu Kan' (The Name is '21st Century Museum of Contemporary Art, Kanazawa'), p.20.

Jamal, T., & Hill, S. (2004). Developing a framework for indicators of authenticity: the place and space for cultural and heritage tourism. Asia Pacific Journal of Tourism Research, 9(4), pp.353-372.

Kanazawa City. (1989). Kanazawa City March 1989 Regular Meeting (1st) March 10, Vol.4. Retrieved from Kanazawa City Meeting Minutes Search System: https://ssp.kaigiroku.net/tenant/kanazawa/SpTop.html (Accessed May 10, 2023).

Kanazawa City. (2019). Kanazawa City Master Plan 2019. Retrieved from https://www4.city.kanazawa.lg.jp/shiseijoho/seisaku_keikaku/koso_keikaku/8/12351.html (Accessed May 10, 2023).

Kanazawa City Omicho Market History Compilation Committee. (1980). Kanazawa History of Omicho Market, Omicho Market Shopping Street Promotion Association, pp.149-155.

Kanazawa University Inspection and Evaluation Committee. (1993). Kanazawa Daigaku Genjo to Kadai 1993 (Current Status and Issues of Kanazawa University 1993), General Affairs Division General Affairs Department Kanazawa University, p.345

MacCannell, D. (1973). Staged authenticity: Arrangements of social space in tourist settings. American journal of Sociology, 79(3), pp.589-603.

Monthly Hokkoku Actus Editorial Office. (2005). 'What Will Happen to Omicho Ichiba?' Actus, 17(2), No.187, p.10.

Ning, W. (2017). Rethinking authenticity in tourism experience, in The political nature of cultural heritage and tourism: Critical essays, Routledge, pp.469-490.

Omicho Ichiba Shotengai Shinko Kumiai. (2021). Omicho Ichiba San Hyakunen Shi. Kanazawa: Hokkoku Shimbunsha.

RIA Kanazawa Branch, Inc. Kazunobu Kijima. (2011). Kanazawa City, Ishikawa Prefecture, Musashigatsuji District 4: A Case Study of Market Redevelopment on a modest scale. Shigaichi-saikaihatsu, (No. 493), pp.28-31.

Shinkenchiku-sha. (2013). Machi wo Tsukuru Process RIA no Jikken, pp.51-52.

Uchida, N. (2020). Learning from the Discussion of Authenticity in Tourism: What is Urban Authenticity? Tourism Studies Review, 8(2), pp.123-137.

Uchida, N., Sakamura, K., & Sugano, K. (2022). A framework for deciphering authenticity. Summaries of technical papers of annual meeting Architectural Institute of Japan, pp.975-978.

Yamade, T. (2013). Kanazawa no Kikotsu (Spirit of Kanazawa). Kanazawa: Hokkoku Shimbun Publisher.
Yamade, T. (2015). Kanazawa rashisa to ha nani ka (What is the uniqueness of Kanazawa?). Kanazawa: Hokkoku Shimbun Publisher.
Yamade, T. (2018). Machizukuri Toshi Kanazawa (Machizukuri City Kanazawa). Tokyo: Iwanami Shinsho, p.92.
Zukin, S. (2009). Naked city: The death and life of authentic urban places. Oxford University Press.

RESEARCH ON THE WORKER COMMUNITY GOVERNANCE TRANSFORMATION AND RESIDENTS' SELF-ORGANIZATION: A CASE STUDY OF PINGDINGSHAN CITY, CHINA (1132)

Guangyu Li [1]*, Yi Huang [1]

[1] College of Architecture and Urban Planning, Tongji University, Shanghai, China; *957855653@qq.com

Abstract. In China, state-owned enterprises used to responsible for building workers' houses and providing public services such as education and medical treatment for their employees. However, in recent years, the governance of worker community has been transformed from "unitary management" (managed by the enterprise), to "multi-governance" (managed by the government, property company and residents' organizations). State-owned enterprises are not responsible for community management anymore. Instead, residents' self-organization is seen as an important governance force. This research takes a traditional coal resource-based city as an example, through methods of data review, field survey and semi-structured interview, analyzing the main types of residents' self-organization and the challenges during the autonomy process. Furthermore, this paper indicates that social capital and official supervision should be strengthen in autonomic practice.

Keywords: state-owned enterprise; worker community; governance transformation; residents' self-organization.

1. Introduction

China has an economic and political system that is different from Western countries. In China, state-owned enterprises were responsible for building employee houses and providing education, medical care, cultural, entertainment, and property services for employees. From the establishment of the Chinese government in 1949, especially in twentieth Century, almost each state-owned enterprise in China build kindergarten, middle school, hospital, retail store, and even funeral parlor within or around the worker community for workers and their families, supplying all the services workers need.

However, in the past two decades, in order to promote a rapid growth of economic and reduce the burden on enterprises, China has undergone a continuous and complete economic reform and social transformation. Chinese government decided that it is not

appropriate anymore for state-owned enterprises to continue their management on the worker communities, and the phenomenon of "enterprises are managing the whole community" has been gradually withdrawn from the historical stage. In 2016, the Chinese central government issued a policy to separate and transfer the responsibilities of providing water, electricity, heating, and property services for worker communities from state-owned enterprises to local government and related organizations. The governance of worker community is undergoing a transformation from "unitary management" by enterprises to "multi-governance" by the local government, market-oriented property company, and social organization.

As one of the most important mining city being constructed in 1950's, Pingdingshan City now is facing a series of difficulties and challenges in governance transformation. At the same time, it has also accumulated valuable practical experiences of community self-organization. This article will take worker communities in Pingdingshan City as examples, introducing their practical experiences, summarizing these examples into different types of self-organization practice, and analyzing their specific characteristics. Besides, this article aims to deeply understand the existed challenges and problems within autonomy process and propose effective suggestions for the local government to promote governance transformation smoothly.

2. Literature Review

Worker community has a different spatial and social type compared with ordinary residential communities. Research in China focusing on the transformation of worker community governance began gradually from 1990s. From the perspective of local social governance system, Chen Weidong (2017) took a community in Wuhan as an example to introduce the possibility of transforming the enterprise management mode into the social governance mode. Chai Yanwei (2013), Guo Fengying (2007) and other researchers took communities in Beijing, Hubei, Changchun and other places as examples, analyzed the difficulties encountered in the governance transformation process, and showed the diversification trend of governance subjects during this process. Researchers in China also emphasized the importance of government intervention, reorganization of social capital, and joint administration in the transformation process (Du et al., 2021; Lu et al., 2015; Li et al., 2017).

Except the researches about governance transformation, analysis focusing on the community self-organization also has been emphasized by sociologists and urban planners in China. Because of its regional and social attribute, community's self-organization is based on the residents' common concern for public interests and their urgent aspiration to participate in public affairs within their own community (Wei, 2003).

Since the late 1980s, the process of economic and social transformation has occurred in China. During this process, in response to the problems caused by the "lose efficiency" of the omnipotent government and the "out of order" of the market, residents self-organization has been evaluated as a possible way by many experts and scholars (Xu, 2001; Fei, 2002). Researchers such as Yang Guihua (2007) analyzed the construction path, subject cultivation, and development trajectory of community self-organization. They believes that self-organization is an effective method to optimize social governance structure and strengthen the coordination of multi-governance (Yang, 2007; Xu et al., 2014; Xie, 2002). Yuan Qing (2020), Tao Chuanjin (2021), and others elaborated on the important role of platforms such as homeowners' committees, and believed that the support, guidance, and supervision from local governments are important for the establishment of the self-organization system.

Currently, researchers in China have different opinions on the concept of community self-governance. In this article, community's self-organization refers to the process in which residents are driven by their own attentions, utilizing community resources, choosing appropriate approaches, independently managing public affairs through equal consultation, and finally achieving public interests (Liu, 2016). Except the property management committee registered to local government, other social organizations are also important platforms for community self-organization (Xie, 2021).

Although there have been a series of discussions on community self-organization in the field of urban issues research, there is still a lack of relevant exploration focusing on worker communities in the current background of governance transformation. This article will take worker communities in Pingdingshan City, Henan Province as examples to analyze the practical cases of community self-organization, elaborating on the problems and challenges that worker community need to deal with following the process of self-organization. Besides, it also explores the necessary methods for local government to meet with these challenges.

3. **Methodology**

This research is mainly conducted through qualitative research methods, including data review, field survey, and semi-structured interview. Researcher visited more than 20 coal-based mining communities in Pingdingshan City in 2022. The communities investigated include five worker communities invested and constructed by the enterprise group headquarter (known as Pingdingshan Coal Mine Group, hereinafter referred to as "Ping-coal Group") and other worker communities independently constructed by different enterprises under the group headquarter, such as The First Coal Mine Company and so on (Figure 1, 2). This study obtained 74 interview recordings from different kinds of people, mainly community residents, others including government officers, social organization staff, and people work in property management company. Related records have been encoded, translated, and analyzed. About 30% of the interviewees were recommended by acquaintances, while the majority in-depth interviews were conducted randomly with community residents.

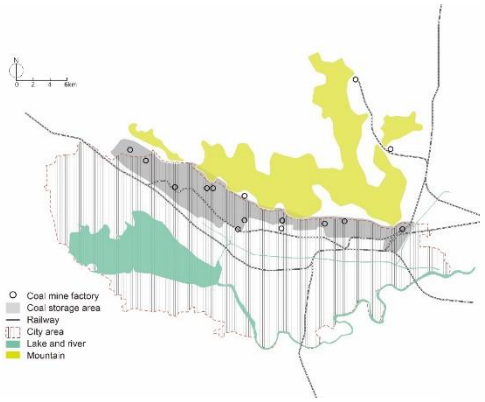


Figure 1. Map of Pingdingshan City

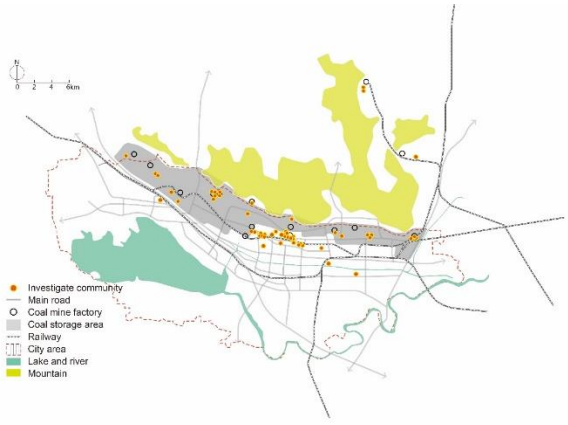


Figure 2. Map of Investigation Worker Communities

4. Background Of Community Governance Transformation

4.1 Pingdingshan City And Worker Community

Pingdingshan City is located in the central region of China, and its development originated from the coal mining industry. According to the " Master Plan of Pingdingshan City (2011-2020)", the central urban area of Pingdingshan city was planned to have a population of 1.1 million people and a total construction land of 106 square kilometers in 2020. The Pingdingshan mining area was the first large-scale coal base that China independently explored, designed, developed, and constructed after 1949. At the same time, it is also one of the thirteen most important national coal bases in China. As a state-owned enterprise, Ping-coal Group dominates the coal mining industry in this city, with nearly

twenty coal mining companies under the headquarters. Mainly of the mining area are in the northern part of the city. The coal mining industry remaining has the highest economic contribution rate in Pingdingshan city.

According to relevant data, the population related to Ping-coal Group was approximately 350 thousand, including employees and their families (as of 2019, there were 88000 employees), accounting for about one-third of the urban permanent population. The coal workers' community occupies an undeniable proportion in the total number of residential community in Pingdingshan city.

4.2 Policy about Governance Transformation

In order to enhance the market competitiveness of state-owned enterprises as well as reduce their financial burden, the construction and management responsibilities of worker community have gradually been separated from the duty of enterprises. In June 2016, the General Office of the State Council issued the document of "Guiding Opinions on the Separation and Handover of the ‘Three Supplies and One management (which means the supplement of water, electricity, heating, and management of property services)’ in the worker community belonging to State-owned Enterprise ". Following this document, a series of guiding policies were introduced by the central and local government. The relevant policies required that the governance transformation of worker communities should be basically completed by the end of 2018, and from 2019 onwards, state-owned enterprises would no longer bear any fees for community management work and services such as the works mentioned within this paragraph before. State-owned enterprises are no longer responsible for the daily management of worker communities, their financial funds and human resources used to be invested in the communities were stopped. Worker communities are implemented to multi-governance instead of be managed by only the enterprise.

These policies have brought about huge changes in community governance. Before the separation and handover of the "three supplies and one management", the logistics department of the enterprise was responsible for the management work, including daily cleaning, greening maintenance, safety guard, and so on. Residents only need to pay a small portion of management fees (less than one fifth of the whole fees) to get a complete property management service. However, after the promoted of governance transformation, the daily management works of the worker community were changed from "unitary management" by enterprises to " multi-governance" by the local government, market-oriented property company, and social organizations.

Different types of management work have different path to be taken over. The management of municipal facilities such as water, electricity supplement are taken over by different department of local government. While, the property management is supposed to be taken over by market-oriented property companies. According to government documents, there are three choices of property management for worker communities. Firstly, it could be taken over by a strong state-owned property company; secondly, a professional market-oriented property management company could be appointed to take over; thirdly, for those communities which cannot import property management companies through market channels, they can apply to residents' self-organization.

In the process of worker community governance transformation, there is a problem that it is difficult for market-oriented property companies to join in the management work within a short period of time, which leading to a large number of worker communities "out of order". Lack of reliance make community residents cannot quickly adapt market-oriented property services, believing that property companies only collect money and do not work well. Residents also believing that the property company do not align with residents. The conflict between residents and property management companies ultimately led to the withdrawal of marketable property services, which also make it possible for the emergence of community residents' self-organization.

5. Different Types Of Self-organization In Worker Community

The worker communities investigated in this research are mainly divided into two types: communities constructed by Ping-coal Group (which residents come from different subsidiary mining companies belonging to Ping-coal Group) and worker communities independently constructed by each single subsidiary mining company (which residents come from the same subsidiary enterprise). Due to different social background and population composition, worker community in Pingdingshan city have different types of residents' self-organization mode. The following analysis relies on practical experiences in Pingdingshan city in China.

5.1 Type 1: Organization Fight against Property Management Company

In order to combat issues such as rising property management costs and inadequate property service quality, some worker community residents have organized preliminary residential committee organization to fight for their own rights. Community residents select representatives to communicate and coordinate with relevant stakeholders such as

property management companies, enterprises, and local government departments, and to express their own opinions through complaints, petitions, non-violence resistance and other forms.

Taking GaoYang Community (hereinafter referred to as GY community) in Pingdingshan City as an example. The community was built in 2013, covering an area of 31.5 hectares, with over 4800 households and a permanent population of over 10000. GY community is home to employees and family members of multiple subordinate enterprises under Ping-coal Group. The majority of residents are low income families, and more than half of them are elderly population aged 50 and above. The annual income of a family is around 4500€, which need to be used to maintain the daily consumption of 2-3 family members, including the education and nutrition expenses for their grandson (nearly 1500€ per year).

After the governance transformation, enterprises no longer pay the fees for community property management service, and newly takeover property company doubled the charging fees for management service. Previously, the enterprise only charged 0.03€ per square meter per month for community management. After the governance transformation, the marketable property company charged 0.06€ per square meter per month (based on the charging standard of the "Guiding Price Standard for Residential Property Service Fees in Pingdingshan Urban Area"). At the same time, the property management company wish to charge the parking space rental fee of 90€ per year (have not been charged previously), which is a considerable large fixed expense for each employee family.

The rise in property service costs has caused strong dissatisfaction among residents. They formed a protest organization to express their opinions. Community residents use online social media to establish residential committee (with over 2000 members) and elect representatives to express their demands to the enterprises and local government departments. At the same time, in order to delay payment time, residents' organizations and property management companies engaged in a "battle of wits and courage". More than eighty percent of homeowners did not pay property service and parking fees during the past 1-2 years. It is very difficult for the property management company to continue management work without financial support. Although the struggle and rights protection of residents' organizations have achieved many results, the residents' self-organization practice in GY community is still in its infancy stage and has not yet formed a comprehensive autonomous system. Community organizations have only undertaken the work of reflecting problems and fighting for rights, and have not yet established a platform to manage the work of community daily service.

5.2 Type 2: Self-organization In Preliminary Status

The preliminary status of residents' self-organization can undertake part of community

management work, but it is still incomplete. Following the evacuation of market-oriented property management company, the preliminary mode of residents' self-organization was emerged in some small-scale (less than 1000 households) communities which have relatively simple population composition (such as all residents come from a same enterprise).

In those worker communities, residents elect enthusiastic, responsible, prestigious, and capable homeowners as representatives to jointly solve basic daily management issues through regular meetings and consultations. In addition to the leader team of the self-organization, residents also selected the "unit-building leader" for each residential building to responsible for the coordination of the specific unit. This kind of residents' self-organization has formed a preliminary system of manager structure, and it has a clear leadership collective and task division. It also can maintain the basic daily work of the community management.

Taking five worker communities on both sides of Sanqi Street in Pingdingshan City as examples. After community governance was separated from state-owned enterprises, there have two property management companies taken over the management work of these five worker communities in 2019, but both of them withdrew within a year. In the second year after governance transformation, the communities maintained a state of residents' self-organization.

"We have selected the unit-building manager for each building to collect a sanitation fee (0.6€ per household per month). This money is used to invite municipal workers to carry off the garbage from the trash cans every day, and there is no need to spend money on other places. The sanitation of public areas is cleaned by the elderly residents who have free time, most of the time, they are retired elderly people. This kind of management can maintain the basic operation of the community with a lower quality. " (Interview with residents)

For the immature residents' self-organization, only the basic services such as garbage

Figure 4, 5. The Entrance Without A Safe Guard

cleaning are carried out. There are still some other services need to be done according to the community management. Although the cost is very low, services such as sanitation maintenance and daily cleaning, greening maintenance, and security guard in public spaces are all in a state of scarcity. For examples, public spaces such as roads, squares, and staircases within the community usually are not cleaned by anyone. Also, the public green space is covered with weeds. Many residents plant vegetables in the open space in front of their own buildings, and privately set up fences to divide the public green space (Figure 4). Landscape trees are not regularly treated and watered, and even pulled out and discarded by residents on the grounds of attracting mosquitoes. Residents privately occupy parking spaces and park indiscriminately. Furthermore, there are no security guards at the entrance of the community. Outsiders and vehicles can enter in the community and exit at will, lacking necessary supervision (Figure 4,5). These issues have had a negative impact on the quality of life of residents.

The residents' self-organization in this mode is still in an incomplete status and cannot implement comprehensive and effective community management. Residents in worker communities have varying attitudes towards this situation. Due to different levels of education and life experiences, elderly people hope to maintain this low-cost management mode, and the concept of *"there is no need to pay a penny to go through the daily life, cleaning by ourselves is complete enough"* is deeply rooted within their mind. However, younger people generally says that the poor environment, chaos, and lack of safety guard have effected their life quality negatively, and it is better to have a professional property management company to governance the community.

5.3 Type3: Self-organization With Well Established Services

In worker communities with relatively small population size and relatively simple population composition, residents' self-organizations are more likely to operate stably and continuously improve themselves. The following will take Pingdingshan worker community as an example to introduce and analyze the practical experiences of two types of comprehensive community autonomous organizations.

5.3.1 Self-organization in Acquaintance Community

In the worker communities with acquaintance social background, a more comprehensive autonomous organizational system has been formed by residents themselves. These self-organizations can undertake a diverse range of community service, improving the quality of property management service, and meeting the daily requirements of community residents. At the same time, these organizations are relatively stable and can be operated sustainably for a long term.

Taking the worker community of a power plant as an example. The community was built in 1999 and consists of four multi-story residential buildings. More than 80% of

community residents are retired employees of the power plant. After the withdrawal of the property management company in 2020, residents in this community began to develop self-organization and gradually established a relatively mature organization system. Community residents elect residents representatives to form a leadership team to responsible for formulating various management rules, and to arrange financial personnel to keep expenditure records. Residents also select the unit manager to be responsible for fee collection and information transmission in each building. The community pays a fixed monthly salary and hires around 10 people (most of whom are employees' family members) to undertake works including security, public area cleaning, greening maintenance, and facility maintenance. Community residents pay management fees every six months. The fees are collected by financial personnel and regularly disclosed as expenditure details every month. The residents' self-organization in this community were operated smoothly. Residents only need to pay a very minimal expenses (about one-third of the normal property fee standard) to enjoy a high quality property service. This mode has received unanimous recognition from community residents.

The ability of this worker community to form a stable and comprehensive autonomous system is closely related to its limited population size and simple population composition. Firstly, the community is relatively small in scale, with only 4 multi-story residential buildings and a total of 150 households. A small population size makes it easier for residents to reach consensus. Secondly, the community was built in the 1990s, and the vast majority of residents are employees and colleagues of a same enterprise (the power plant), making it a typical acquaintance society. Community residents have lived together for many decades, getting to know each other and trust each other. Therefore, the social cohesion of the community is much more stronger than other worker communities. When encountering problems, residents are more likely to closely united together and tolerate differences, thereby achieving effective self-management.

5.3.2 Self-organization under the Leadership of a Capable Man

Under the leadership of someone with strong social capital and organizational abilities may help worker communities to achieve autonomy effectively. Taking Beiyuan community in Pingdingshan City as an example, it was built in 2015 including three twelve-story residential building. It has about 200 permanent households, all of whom are employees of the same enterprise. According to local government staff, the residential committee of this community was established in April 2020 and took over the community's management work from May 2020. It is "the community with the best effect of self-organization work in nearby areas". There are five main members in the leadership group. They organize discussions with residential representatives regularly to negotiate and solve problems faced by the community. The leadership decided how to collect management fees. In addition, it is also responsible for hiring people for cleaning and security protection, negotiating elevator maintenance matters, and ensuring that the community could be governed in a healthy and stable state (Figure 6, 7).

Figure 6. Management Policies Made By The Residential Committee

Figure 6, 7. Details Of Financial Expenditures Posted On The Wall Of The Community

In this example, the leader of the autonomous organization is also a leader in the enterprise. He is forty years old, currently in the golden period of personal career. Due to his better ability in organization work, he is required by the superior leadership of the enterprise to be responsible for the organizing management work of the community in order to help the community avoid disorder after the property company run away. Since the community was built for workers of the enterprise, the leader of the self-organization and majority of community residents work in the same unit. His leadership position in the enterprise has extended to community management affairs. Therefore, residents are also more inclined to accept the opinions and suggestions of the responsible person. This relationship between the leader and residents has laid the foundation for the community management work.

From the practice of this community, it can be seen that one or more capable managers are one of the most important factors for residents' self-organizations. The leader in this case not only possesses good communication and coordination skills, but also has considered social resources. Taking over community autonomy work is not only his basic living needs, but also a task assigned by his superiors, which make it has special significance. The results of community governance work are related to his personal image in front of his enterprise leaders, which largely urges him to complete the governance tasks better. At the same time, this case also reflects that in the process of governance transformation, although the enterprise is no longer responsible for community management on the surface, it still exerts tremendous potential effects in various forms. In other words, with the assistance of enterprise, community organizations have more financial and material resources to carry out their self-organization work more effectively.

5.4 Type 4: From Autonomy Organization to Property Company

In Pingdingshan City, a phenomenon that community residents independently establish professional property management companies to take over property services has occurred. This mode is expected to improve the quality of property services, and at the same time, to achieve residents' satisfaction with a charging standard lower than the market value. Limited by financial and social resources, this phenomenon only occurs in a very small number of worker communities.

For example, in the "Nantuan Community", in order to take over community management work, a property management company was established by a retired employee of the state-owned enterprise. Before establishing the property company, he has been responsible for community governance work as the unit leader of one building for nearly a year. He organized and carried out work such as collecting fees and recording accounts, and was enthusiastic about helping the neighbors to solve daily problems. This experience gave him a better understanding of community issues and residents' needs. He maintains a good interactive relationship with community residents, which to some extent eliminates residents' resistance and lays the foundation for the subsequent development of property management work.

The advantages of this mode are as follows. First of all, the newly established property management company consists of more than 20 people, with priority given to hiring local community residents, including retired employees and their families, to undertake tasks such as cleaning and security. This mode reduces the operating costs while providing jobs for residents. Secondly, the company charges only half of the market fee standard, which has increased the acceptance and recognition of community residents. At the same time, this mode has also been recognized and encouraged by local government. Although the low-cost operation strategy still faces the problem of low service quality, it is undoubtedly

one of the optional paths for the governance of property services in the worker community during the transformation period.

6. Problems within the Process of Self-organization

6.1 Restriction of Population Scale and Composition

It is difficult for worker community to implement self-organization beyond a population size. The autonomy of residents in worker communities is influenced by differences in population scale and population composition. According to research data, communities with a large population scale (usually over 1000 households) or a complex population composition (mixed residence from multiple enterprise) are difficult to smoothly implement residents' self-organization.

Taking "Xinxin Community" as an example. The community was built in 2014, with employees from four companies under the head of Ping-coal Group. It has twelve high-rise residential buildings with a population of about 1400 households. After the evacuation of the original property management company, the community was unable to establish an effective resident autonomy organization by itself. Residents in this community come from different companies, and they are not familiar with each other. It is difficult for them to achieve mutual trust. It has been also difficult for autonomous organization gain recognition from all residents. Many residents believe that the current residential representatives were not personally elected by themselves, and the autonomy plan proposed by the representative meeting did not obtain their consent.

Due to a lack of trust in autonomous organization, although there are a system of managers such as the committee leader and unit manager, the autonomous working group still faces difficulties in collecting fees from residents. “We are not familiar with the unit managers and do not want to listen to them”. (Here the managers were elected by the leaders of the enterprise who were originally responsible for community management work. When the enterprise withdrew from community management, they designated specific person to be responsible for community management work). Excessive population size or complex population composition greatly increase the difficulty of residents' self-organization. Lack of trust among residents and lack of community cohesion make it difficult to implement residents' autonomy.

6.2 Monopoly of Opinion Expression

In the process of promoting resident autonomy, some residents' opinions are coerced. When the opinions of the residents are inconsistent and unable to reach a consensus, problems occurred that some residents' opinions cannot be expressed and are then coerced by the opinions of a few residents. This issue arises in some community self-

organization practices, especially in communities that have not yet formed a complete autonomic system and lack of comprehensive governance process.

Taking GY community as an example. This worker community has formed a residents' organization for the purpose of confrontation and rights protection, attracting more than two thousand people joined in. However, compared to the permanent population of over ten thousand people in the community, the proportion of people participating in resident organization is only twenty percent. Residential organization can only represent the opinions of part of residents, which means the representatives elected by the organization are cannot represent the opinions of all residents, even can only represent the opinions of some special radical residents. The autonomous organization hopes to drive out the current property management company and introduce a new one to manage daily work. However, their governance advocacy lacks the supervision of all homeowners, making it difficult for the community to recognize and accept it. Furthermore, part of residents in this community believe that

"there are several leaders in autonomous organization may privately contact with some property management companies, and it is possible for them to involve in corruption cases. There might be an exchange of interests in the process of rights protection activities. Leaders of residential organization are more concerned with seeking for their own welfare rather than fairly handling community affairs." (Interview with a resident)

This type of community self-organization practice indicates that irregular resident organizations are likely to become tools for some individuals to profit from, leading to the infringement of their own interests.

6.3 Lack of Supervision

The safety hazards and fund management issues caused by the lack of supervision have appeared in some cases of community self-organization practices. Compared to multi-story communities, the property services in communities with high-rise buildings are more complex due to the involvement of elevator maintenance, fire control and other contents. Besides, the management costs rise considerably. Therefore, the negative impact of lack of supervision in high-rise communities is more serious.

Because of the lack of supervision, it is difficult for the residents' self-organization to meet the requirements of professional standards. Taking a worker community as an example. There are three high-rise residential buildings in this community, each of them has approximately 120 households. According to the agreement of community autonomic organization, each household needs to pay a fee of 4€ per month to cover the fees of public area cleaning, garbage removal, elevator maintenance and other contents. This price is far below the charging standard of market-oriented property companies (about 10.5€ per household per month). However, there are many safety hazards in the process

of autonomy, such as the lack of professional guidance for elevator maintenance and fire protection facility maintenance, which is not conducive to timely resolution of problems and have negative impact on ensuring the safety of residents.

At the same time, there is a lack of necessary regulatory procedures for fund management in the residents' self-organization. In this community, all of the homeowners are required to pay a management fee, and the total amount of money is approximately eighteen thousand euro per year, which is about five times the amount of multi-story community. Currently, this large amount of financial funds are concentrated in the hands of an enthusiastic resident. There is no complete supervision mechanism to monitor the expenditure and usage of these money. Although this enthusiastic resident is required to regularly disclose expenditure accounts, lack of supervision can easily lead to corruption.

7. Suggestions For Local Government

7.1 Develop Community Cohesion

Community cohesion is an important foundation for improving community autonomy. Worker community has a different social background and population composition from ordinary urban community. In communities in which most residents are employees of a same enterprise, a relatively simple population composition occurs and similar work experiences and lifestyle habits happened to every resident. Residents are familiar with each other and trust each other, having close social relationships making it easier for them to maintain consistent opinions. Strong community cohesion can help the community reach consensus. When conflicts arise, residents can quickly unite together to fight for their rights and protect their own interests.

Therefore, in the process of community governance transformation, it is important to guide the inheritance and develop community cohesion, realizing the effective use of social capital and making up for the absence of managers caused by the withdrawal of enterprises. These suggestions could help community access a healthy transition of community governance from "unitary management" by enterprises to "multi-governance" by different stakeholders.

7.2 Regulate The Process Of Self-organization

In China, the law stipulates that community residential committee should be established through voting by all residents and be registered in the local government. Unregistered residential autonomous organizations probably lack supervision from both local government departments and community residents. Lack of supervision may lead to problems such as opinion monopoly and opaque financial transactions. According to the latest version of the Henan Provincial Property Management Regulations (2013),

community residents need to hold a general meeting of all homeowners under the guidance of local government, voting formally to elect residential representatives, establishing the residential committee, and then comprehensively presiding over the management work of the community. Usually the management work includes the invitation of a suitable property company. Within the community management, important decisions made by the committee require the consent of more than half of all residents. The whole process should strict adherence to legal process regulations. Although relevant policies have been formulated, it is temporarily difficult to implement them in practice, which has led to a series of problems.

Therefore, in the process of governance transformation, strengthening supervision can help community self-organization form a complete and standardized workflow, and prevent the occurrence of related problems. In the follow-up practice of community autonomy, it is necessary to enhance the guidance and supervision of local government departments, ensuring that autonomous organizations carry out community governance within the scope of the law, and making it possible that problems in the work of self-organization could be found and solved at the first time.

8. Conclusion

In general, worker community residents' self-organization in China at this stage is mostly to make up for the lack of governance caused by the withdrawal of state-owned enterprises. Due to the low acceptance of marketable property company and the difficulty in collecting property fees, it is difficult for market-oriented property companies to take over the management work in a short period of time. Residents' self-organizations effectively make up for this defect, assuming the main responsibility for community governance and helping community avoid disorder.

This article takes coal mine worker communities in Pingdingshan City, Henan Province as examples, summarizing the practical experiences of different types of community residents' self-organization and analyzing the existing problems. This research believes that the current community autonomy practices in Pingdingshan City can be divided into four types based on their main characteristics, including the type of rights protection organization, organization with initial status, organization with a comprehensive system and the professional property company. The comprehensive autonomy type includes two categories, acquaintance social autonomy and autonomy with competent people. In addition, this article indicates that population size restrictions, opinion monopolies and lack of supervision are common issues in the current process of residents' self-organization. Local government departments should make reasonable use of community social capital to encourage residential autonomy, and strengthen supervision to guide autonomous organizations being further improved and legalized.

References

Chen Weidong, Chen Ai (2017) Cultivation of residents' subjectivity: the direction and path of community governance. Research on Socialism, 234 (4), pp. 88-95.

Du Shi, Chen Jie (2021) State led and worker community governance transformation - take the automobile factory community in the old industrial city of Northeast China as an example. Journal of Harbin Institute of Technology (Social Sciences Edition), 2021 (2), pp. 57-64.

Fei Xiaotong (2002) Resident Autonomy: A new goal of urban community construction in China. Jianghai Academic Journal, 2002 (3), pp.15-18, 206.

Guo Fengying (2007) The end of unit community and the transformation of community governance -- Taking three communities of L Group in X City, Hubei Province as cases. Hubei Social Sciences, 251 (11), pp. 59-62.

Li Yan, Fan Yongzhong (2017) Courtyard community governance: community evolution model and governance typology - a comparative case study based on three types of courtyard communities in Beijing. Journal of Beijing Institute of Administration, 109 (3), pp. 108-115.

Liu Jianjun (ed.) (2016) Typological analysis of resident autonomy and community co governance in urban grassroots governance. Shanghai: Gezhi Publishing House.

Lu Heng, Cai Chongyang (2015) Reorganization of "Unit People": Governance innovation in urban community reconstruction: A case study of C community in Changchun city. New Horizons, 192 (6), pp. 39-45.

Mao Zidan, Chai Yanwei (2013) The transformation path and future trend of China's urban unit community governance model -- take Beijing Maofangnan Community as an example. Urban Development Research, 20 (3), pp. 17-22.

Tao Chuanjin, Xu Xinyu (2021) The support of resources within the system and the development of grassroots society - Taking the topic of the industry commission as an example. Journal of Social Sciences of Jilin University, 61 (2), pp.106-115, 237.

Wei Na (2003) Urban community construction and the development of community autonomous organizations. Journal of Beijing Institute of Administration, 2003 (1), pp. 69-74.

Xie Biao (2021) Research on the forms of community residents' autonomy in the new era. Yangtze River Forum, 166 (1), pp.80-83.

Xie Lizhong (2002) Urban residents' autonomy: Actual meaning, analysis model, and historical trajectory. Journal of Jiangsu University of Administration, 2002 (3), pp.65-72.

Xu Yong (2001) Research on community residents' autonomy in urban community construction. Journal of Central China Normal University (Humanities and Social Sciences Edition), 2001 (3), pp. 5-13.

Xu Yong, He Lei (2014) Cultivating autonomy: Exploring the effective forms of resident autonomy. Southeast Academic, 243 (5), pp.33-39, 246.

Yang Guihua (2007) Self organization and the mechanism of community communities. Southeast Academic, 200 (5), pp.117-122.

Yuan Qing (2020) Breaking the dilemma of autonomy: Practical logic and optimization of homeowner autonomy in residential communities. Journal of Hunan University of Administration, 126 (6), pp.22-31.

TRACK 07: PLANNING FOR RESILIENCE: TERRITORIES, COMMUNITIES AND ENVIRONMENT

ENHANCING RAIN-FLOOD RESILIENCE IN URBAN PLANNING: A PARAMETERIZED DESIGN APPROACH INTEGRATING SCS-CN METHOD AND GRASSHOPPER (1032)

Xin Zhao[1], ZuoBin Wu[2]

[1 2] Department of Urban and Rural Planning, School of Architecture, Xi'an University of Architecture and Technology, China

Abstract. Urban flooding has become an increasing issue due to climate change and urbanization. To address this, urban resilience and parameterized design frameworks for flood-resilient urban planning are crucial. This study presents a framework that integrates the SCS-CN method and Grasshopper software. The SCS-CN method estimates urban runoff and infiltration, while Grasshopper creates adaptable planning workflows. A custom Grasshopper component automates SCS-CN calculations, generating design parameters for optimal flood resilience. The component considers land use, topography, and drainage infrastructure to evaluate design alternatives. This framework is valuable for examining trade-offs and identifying suitable design solutions, incorporating a multi-objective optimization approach for land-use configurations. Ultimately, this parameterized design framework aids urban planners in creating resilient and sustainable cities.

Keywords: urban flooding, climate change, flood resilience strategies, parameterized design framework

1. Introduction

Urban flooding has become a prominent issue worldwide due to the rapid urbanization and climate change(Li et al., 2023), which not only leads to significant economic losses but also threatens human life and ecosystem health. As cities continue to expand, impervious surfaces, such as concrete pavements and buildings, are replacing natural land cover, altering the hydrological cycle and reducing the infiltration capacity of urban areas. Consequently, urban areas are more prone to flooding, especially during heavy rainfall

events(Tingsanchali et al., 2010). Therefore, it is essential to develop effective strategies to enhance flood resilience in urban planning, ensuring the sustainability and resilience of cities in the face of increasing flood risks.

One approach to tackle this issue is to integrate hydrological modeling methods into urban planning processes to simulate and analyze the impacts of different land use patterns and urban design interventions on stormwater runoff and flood risk. The Soil Conservation Service Curve Number (SCS-CN) method(Cai et al., 2022) is a widely recognized and applied hydrological model for estimating direct runoff volume and peak flow rates in response to rainfall events. The SCS-CN method has been extensively used in various hydrological studies and applications due to its simplicity, flexibility, and robustness. In recent years, parametric design has emerged as a promising approach to urban planning and design, enabling the exploration of complex relationships between design variables and the generation of multiple design alternatives. The utilization of parametric design tools, such as Grasshopper, a visual programming plugin for Rhino, allows urban planners and designers to create flexible, data-driven, and performance-oriented design solutions. By incorporating hydrological models like the SCS-CN method into parametric design workflows, it is possible to develop a more comprehensive and integrated approach to urban flood resilience.

This paper presents a novel parameterized design approach to enhance urban flood resilience by integrating the SCS-CN method into the Grasshopper parametric design environment. The primary motivation behind this research is to leverage the advantages of Grasshopper, such as its flexibility, adaptability, and interactivity, in combination with the SCS-CN method to assess and optimize urban design interventions concerning flood risk reduction. The integration is achieved through C# programming, allowing the development of custom components to implement the SCS-CN method within the Grasshopper computational workflow. The proposed approach aims to achieve a multi-objective optimization process by considering economic, ecological, and precipitation-related indicators, ensuring a balance between ecological and economic sustainability while improving urban flood resilience. By conducting case studies in selected urban areas, this research demonstrates the effectiveness and applicability of the proposed approach in addressing urban flooding challenges. By presenting a novel and integrated approach to urban flood resilience, this research contributes to the growing body of literature on the intersection of hydrological modeling, parametric design, and urban planning. The proposed method offers urban planners and designers a valuable tool for understanding and managing urban flood risks, ultimately fostering more resilient and sustainable urban environments.

2. Methodology

2.1 Integrated Parameterized Urban Planning Design Framework with SCS-CN

This section introduces the overall framework for the integrated parameterized urban planning design process incorporating the SCS-CN method, as illustrated in Figure 1.

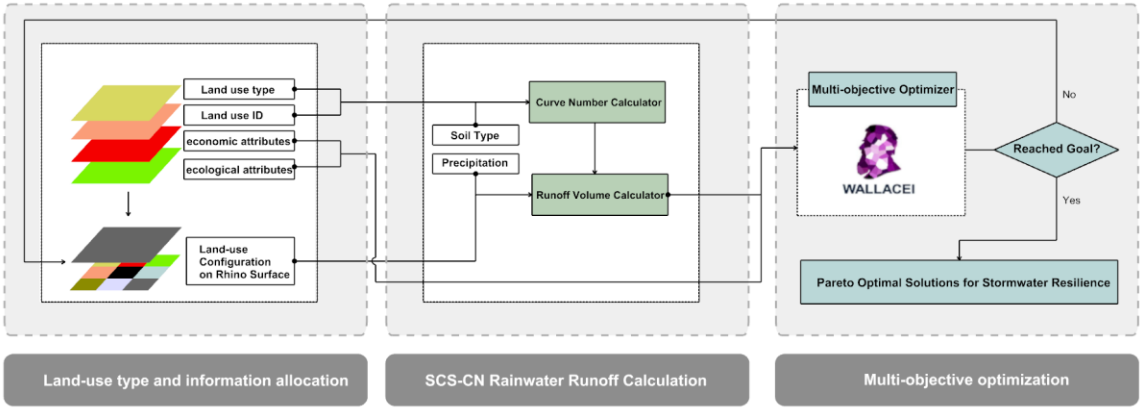


Figure 1. Integrated Parameterized Urban Planning Design Framework with SCS-CN

As shown in Figure 1, the first component, Land-use type and information allocation, focuses on assigning land-use types, IDs, and relevant indicators, such as economic and ecological metrics, to planar elements within Rhino, a 3D modeling software. This process is carried out using Grasshopper, a visual programming plugin for Rhino, which enables the efficient and flexible manipulation of urban planning data. Once the land-use information is assigned, the framework can proceed with land allocation planning, taking into account the designated land-use types and associated indicators. The second component of the framework, SCS-CN Rainwater Runoff Calculation, integrates the SCS-CN method into Grasshopper using two custom components: Curve Number Calculator and Runoff Volume Calculator. The Curve Number Calculator estimates the curve number (CN) values for different land-use types based on their hydrological properties, while the Runoff Volume Calculator computes the runoff volume generated during rainfall events. These components enable the quantification of rainwater runoff associated with various land-use configurations and facilitate the incorporation of hydrological considerations into the parameterized urban planning design process. The third component of the framework, Multi-objective optimization, employs the Wallacei plugin for Grasshopper to optimize flood resilience, economic, and ecological objectives simultaneously. This optimization process generates a set of Pareto-optimal solutions that represent a balance

between the competing objectives. If the optimization results meet the desired performance criteria, the framework produces a range of optimal design alternatives. If the performance criteria are not met, the framework iteratively adjusts the land-use configuration to further optimize the design.

The integrated parameterized urban planning design framework presented in this paper offers a systematic approach to incorporating hydrological considerations into the urban planning process. By leveraging the flexibility and adaptability of Grasshopper and Rhino, this framework provides urban planners and designers with a powerful tool for managing flood risks and enhancing urban flood resilience through the exploration of various land-use configurations and design interventions.

2.2 Incorporating the SCS-CN Method into Grasshopper

The Soil Conservation Service Curve Number (SCS-CN) method is a widely used empirical model developed by the USDA Natural Resources Conservation Service (NRCS) for estimating direct runoff volume and peak flow rates in response to rainfall events(Mishra et al., 2003). The method has gained popularity due to its simplicity, effectiveness, and relatively low data requirements. In this section, we will provide a comprehensive overview of the SCS-CN method, including its underlying principles, key equations, and limitations, before describing the process of integrating it into the Grasshopper environment using custom C# components.

The SCS-CN method is based on the concept of a curve number (CN), which is a dimensionless parameter that represents the combined effects of land cover, soil properties, and antecedent moisture conditions on runoff generation. The CN values range from 0 to 100, with higher values indicating greater runoff potential. These values are determined using a predefined table that accounts for various land-use types and soil hydrologic groups, ranging from A (highly permeable) to D (least permeable).The primary equation of the SCS-CN method estimates runoff depth (Q) as follows(Hawkins et al., 2008):

$$Q = (P - Ia)^2 / (P - Ia + S)$$

P represents the rainfall depth, Ia denotes the initial abstraction (i.e., the portion of rainfall that is lost due to interception, infiltration, and surface storage before runoff begins), and S signifies the potential maximum retention after runoff begins. The initial abstraction is generally approximated as 0.2 * S, and S is related to the CN value through the equation:

$$S = (1000 / CN) - 10$$

Despite its simplicity, the SCS-CN method has been widely applied in various hydrological studies and engineering projects, including flood forecasting, stormwater management,

and watershed modeling. However, it should be noted that the method has certain limitations, such as its empirical nature, reliance on static CN values, and lack of consideration for spatial variability in rainfall and other hydrological factors. To incorporate the SCS-CN method into the Grasshopper environment and enable its seamless integration with the parameterized urban planning design process, two custom C# components were developed: CurveNumber Calculator and RunoffVolume Calculator (Figure 2).

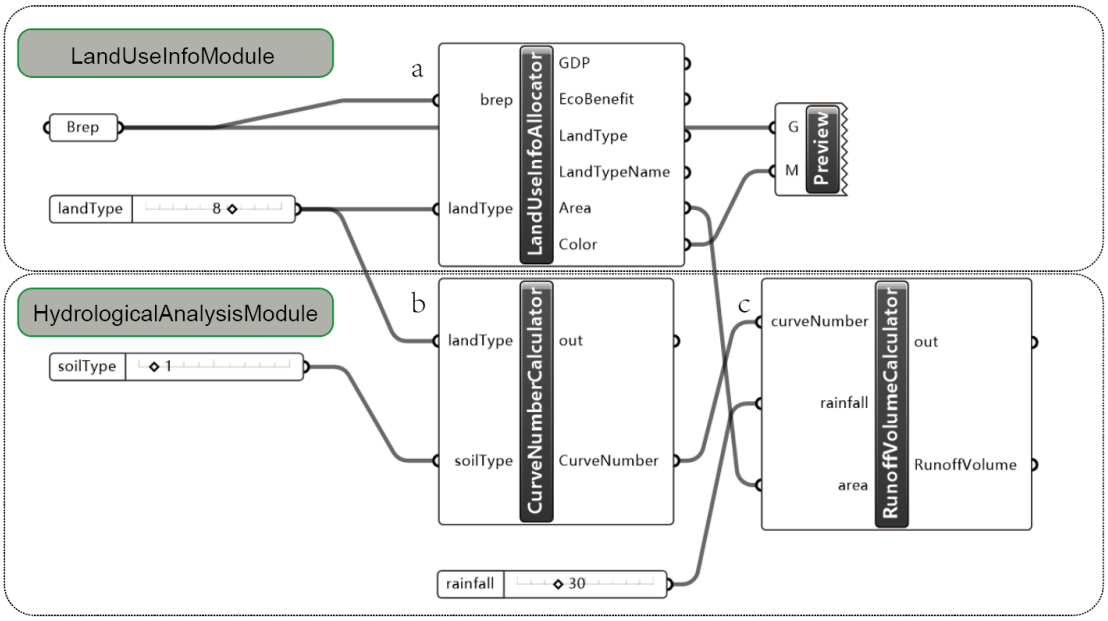


Figure 2. Custom SCS-CN components in Grasshopper: (a) LandUseInfoAllocator, (b) CurveNumberCalculator, and (c) RunoffVolumeCalculator

The CurveNumber Calculator component (Figure 2b) calculates the CN value based on the input land-use type and soil group. The C# code for this component defines a class named SCS_CN, which includes properties for land-use type, soil group, and CN value. The class constructor initializes the properties and computes the CN value using a predefined lookup table containing CN values for different land-use and soil group combinations. This table is implemented as a two-dimensional array of integers, with rows representing land-use types and columns representing soil groups. The component also includes error handling to ensure that the input values for land-use type and soil group are within the valid range. If the input values are outside the valid range, the component returns an error message and sets the CN value to -1, indicating invalid input. The RunoffVolume Calculator component (Figure 2c) computes the runoff volume generated during a rainfall event based on the input CN value, rainfall depth, and catchment area. The C# code for this component defines a class named RunoffCalculation, which includes properties for CN value, rainfall depth, catchment area, and runoff volume. The class constructor

initializes the properties and calls the CalculateRunoffVolume method, which computes the runoff depth using the SCS-CN equation.

3. Multi-Objective Optimization

To achieve urban flood resilience, a careful balance between multiple objectives is essential, including the minimization of stormwater runoff, the maximization of ecological sustainability, and the promotion of economic development. In this research, we employ the Grasshopper plugin Wallacei(Navarro-Mateu et al., 2018) to deploy the Non-dominated Sorting Genetic Algorithm II (NSGA-II)(Back et al., 1997), thereby simultaneously optimizing these objectives. Wallacei which is an extensive optimization platform, empowers designers and planners to navigate and comprehend complex solution spaces by offering a diverse set of analytical tools and visualizations. It utilizes NSGA-II, a widely-used and efficient multi-objective genetic algorithm (MOGA), to balance multiple conflicting objectives. The algorithm achieves this by generating and scrutinizing a varied set of design alternatives. MOGAs, like NSGA-II, are especially beneficial for urban planning issues, given their capacity to effectively balance trade-offs amongst competing objectives, while pinpointing optimal solutions that satisfy multiple criteria. We incorporate the SCS-CN method within the parametric design process to quantify stormwater runoff volume resulting from varying land-use configurations. The reduction of stormwater runoff is a critical facet of urban flood resilience. Hence, the objective is to minimize this volume, consequently diminishing the potential for urban flooding and its associated damage. Ecological sustainability is of paramount importance for the long-term wellbeing and resilience of urban environments. Our goal is to optimize green space provision, biodiversity, and ecosystem services, while mitigating habitat fragmentation and other adverse environmental impacts. This goal can be quantified using a range of ecological indicators, like the total area of green spaces, habitat connectivity, and species diversity. In the context of successful urban planning, promoting economic development and maintaining a vibrant urban economy is a must. This goal can be assessed through indicators such as job creation, property values, and the overall economic performance of the urban area. We have referenced the ecological and economic indicators of relevant parcels of land to establish a foundation for multi-objective optimization(Pan et al., 2023). By optimizing these indicators with NSGA-II, a balance between flood resilience, ecological sustainability, and economic growth can be realized. In Figure 3, we illustrate the site in Yulin that requires optimization, alongside various scenarios derived from the multi-objective optimization process.

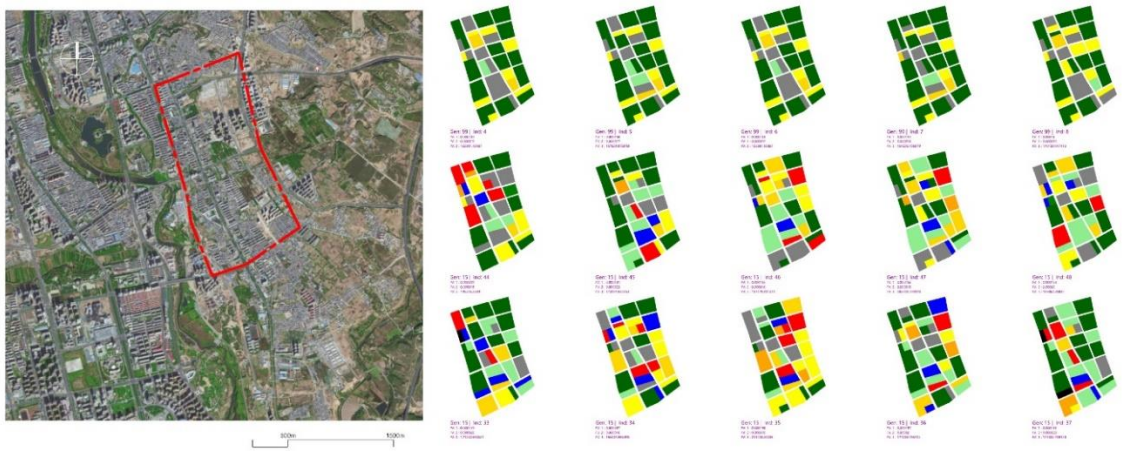


Figure 3. The left panel displays the site in Yulin earmarked for optimization. The right panel shows different scenarios arising from the multi-objective optimization process, depicting distinct solutions derived from different objective weightings.

Employing Wallacei, we organize the multi-objective optimization process with NSGA-II, to find solutions that simultaneously optimize the three defined objectives. We establish fitness functions for each objective, grounded in the indicators described above. To ensure an equal contribution from each objective to the overall optimization process, the fitness functions should be normalized. Subsequently, we set up the Wallacei plugin within the Grasshopper environment, linking the custom SCS-CN components and other relevant design parameters to the plugin. The NSGA-II settings, such as population size, mutation rate, and crossover rate, should be chosen based on the problem's specific characteristics and adjusted as necessary to achieve satisfactory results. Upon initiation of the optimization process, Wallacei generates and evaluates a diverse set of design alternatives. The NSGA-II iteratively refines the solutions and identifies optimal trade-offs between the competing objectives. The resulting Pareto front represents a set of non-dominated solutions - optimal in the sense that no single solution outperforms the others across all objectives. The final step in the multi-objective optimization process is to analyze and select the most suitable solutions for implementation. Wallacei offers various visualization and analytical tools to assist decision-makers in understanding the trade-offs between objectives and in selecting the most appropriate design alternatives to enhance urban flood resilience. Figure 4 showcases the optimized process.

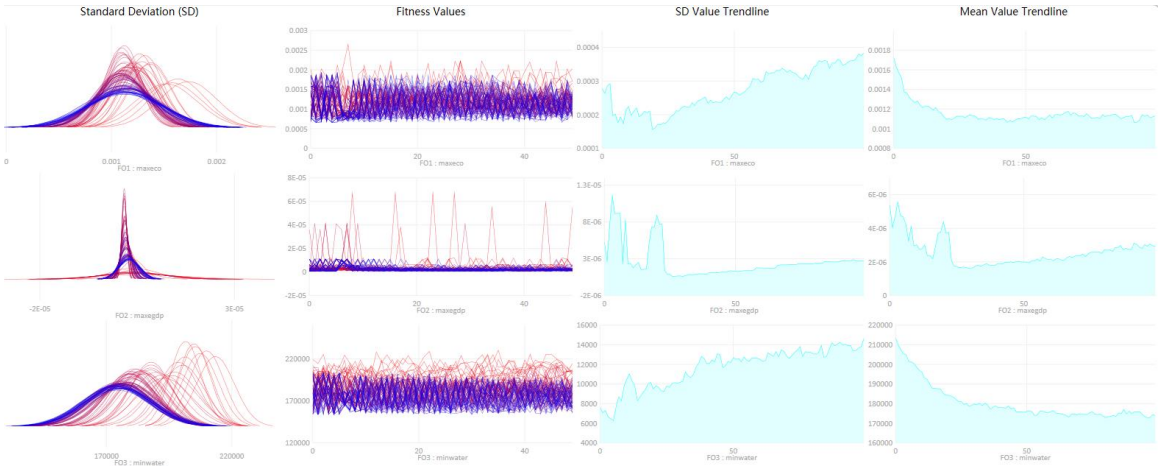


Figure 4. This visual representation depicts the results of the optimization process. It demonstrates the performance of each solution in relation to the set objectives, highlighting the trade-offs involved in selecting an optimal strategy.

The multi-objective optimization process provided by Wallacei and NSGA-II demonstrates a powerful approach to urban planning and design. By considering multiple objectives simultaneously and exploring a wide range of design alternatives, it allows planners and designers to make informed decisions that balance competing objectives and foster urban flood resilience, ecological sustainability, and economic growth.

4. Conclusion

In conclusion, this study has presented an innovative approach to urban planning and design by integrating parameterized design, hydrological modeling, and multi-objective optimization. Through the application of Grasshopper plugins, including Rhino and Wallacei, and the development of custom components for implementing the SCS-CN method, we have demonstrated the potential of computational design tools in promoting resilient and sustainable urban development. The proposed method offers a comprehensive solution for evaluating and optimizing the hydrological impacts of different land-use configurations. Incorporating the SCS-CN method into the Grasshopper environment allows for seamless integration of hydrological considerations into the parameterized urban planning design process, enhancing the accuracy and reliability of urban design decisions. The multi-objective optimization process, implemented using the Wallacei plugin and the NSGA-2 algorithm, facilitates simultaneous consideration of multiple objectives, such as minimizing runoff volume, maximizing economic benefits, and enhancing ecological value. This process enables the identification of optimal solutions that balance these competing objectives. The case study of Yulin City showcases

the applicability and effectiveness of the proposed method in real-world urban planning contexts. The optimized land-use configuration resulting from the multi-objective optimization process provides a blueprint for enhancing urban resilience and reducing flood risks in Yulin City, considering its unique ecological constraints.

Overall, the proposed method holds significant potential for advancing urban planning and design, offering a powerful tool for navigating the complexities and uncertainties of urban development, especially in the face of environmental challenges such as climate change and urban flooding. We hope this study will encourage further exploration and adoption of computational design tools and multi-objective optimization techniques in urban planning and design practice and research.

References

Back, T., Hammel, U. and Schwefel, H.-P. (1997), Evolutionary Computation: Comments on the History and Current State. *IEEE Transactions on Evolutionary Computation*, 1(1): 3–17.

Cai, Xinhong and Xu, Dawei (2022), Simulation and Optimization Strategy of Storm Flood Safety Pattern Based on SCS-CN Model. *International Journal of Environmental Research and Public Health*, 19(2): 698.

Hawkins, Richard H., Ward, Timothy J., Woodward, Donald E. and Van Mullem, Joseph A. (2008), *Curve Number Hydrology*. American Society of Civil Engineers. available at https://ascelibrary.org/doi/book/10.1061/9780784410042 [10 May 2023].

Li, Yao, Osei, Frank Badu, Hu, Tangao and Stein, Alfred (2023), Urban Flood Susceptibility Mapping Based on Social Media Data in Chengdu City, China. *Sustainable Cities and Society*, 88: 104307.

Mishra, S. K. and Singh, Vijay (2003), *Soil Conservation Service Curve Number (SCS-CN) Methodology*. Springer Science & Business Media.

Navarro-Mateu, Diego, Makki, Mohammed and Cocho-Bermejo, Ana (2018), Urban-Tissue Optimization through Evolutionary Computation. *Mathematics*, 6(10): 189.

Pan, Tingting, Su, Fenzhen, Yan, Fengqin, Lyne, Vincent, Wang, Zhihua and Xu, Liang (2023), Optimization of Multi-Objective Multi-Functional Landuse Zoning Using a Vector-Based Genetic Algorithm. *Cities*, 137: 104256.

Tingsanchali, Tawatchai and Karim, Fazlul (2010), Flood-Hazard Assessment and Risk-Based Zoning of a Tropical Flood Plain: Case Study of the Yom River, Thailand. *Hydrological Sciences Journal–Journal des Sciences Hydrologiques*, 55(2): 145–161.

RESILIENCE AND RISK MULTIADAPTATION: A METHOD AND A CASE STUDY (1058)

Marichela Sepe

DICEA-Sapienza Università di Roma, ISMed-National Research Council, Rome (Italy); marichela.sepe@uniroma1.it, sepe@ismed.cnr.it

Abstract. The term resilience is used in many disciplines due to its adaptability to theories of complexity, including economics, ecology, political science, cognitive science, new technologies and land-use planning. Consequently, Zolli and Healey's (2012) definition of resilience understood as "the ability of a system, company or person to maintain its fundamental purpose and integrity in the face of radically changed circumstances" integrates ecology and sociology and offers an overview of the multidisciplinary nature of the issue.

It is also true that resilient spaces are spaces capable of adapting to change by contributing to their balance. This must be appropriately planned and managed also with the use of indicators capable of measuring the performance of cities. Therefore, the purpose of this study - carried out within the research project PRIN 2020 SUMMA is to define multiresilience and multiadaptation starting from the concept of resilience and adaptation and present the synthesis of a case study carried out with an *ad hoc* method.

Keywords: multiresilience, multiadaptation, multirisk, sustainable urban design

1. Introduction: Complexity of contemporary territories and multiresilience

The complexity of the current territories is due to the increasing circumstance that several crises occur simultaneously causing great difficulties to suitably respond to them.

In fact, resilience often considers the events that cause a crisis in a system to be equal despite having different characteristics. Among these, for example, since there is no definition of how to pursue it, the degree of resilience of communities after a sudden event may not be the same and even within the same community different behaviors may occur.

Considering an evolutionary approach (Bohland, et Al., 2019; Davoudi et Al. 2012), there is no single equilibrium in ecology but there are multiple equilibriums; however, the question to focus on is the type of balance to refer to rather than the causes that could alter it.

A social or cultural crisis must be faced with different approaches than that due to an

environmental catastrophe and, moreover, even the same type of crisis can have different durations of effects with as many variable response times. The multidimensional characteristic of resilience makes the concept of resilience flexible on the one hand and elusive in its entirety and complexity on the other, requiring continuous updates and insights. Current studies are focusing on environmental risks and, more recently, on those due to epidemics such as in the case of Covid-19, allowing the inherent problems to be highlighted more clearly (Vale, Campanella, 2005).

Applying the concept of resilience to socio-environmental systems such as cities means anticipating crises and strengthening cities with proactive solutions that can enhance both public and private places at the same time.

However, preventive resilience requires choices that involve expenditure, investments and also decisions about which people and places are at risk and which should be protected, whether the hazards are man-made, natural or a combination of them. A holistic view of preventive resilience should include consideration of the needs of all stakeholders and the different types of potentially affected locations.

Certain factors and their components are important in determining resilience, including: vulnerability analysis, which has as components uncertainty, informality, demographics and urban distribution of vulnerability; uncertainty-oriented planning, which has adaptation, planning and sustainable form as components; urban governance, which has equity, integration and ecological economy as components; and prevention, which has mitigation, refurbishment and the application of alternative energies as components.

Uncertainty is another important component in the study of resilience because the lack of knowledge about future environmental and other crises makes people and places particularly vulnerable. To mitigate the impacts due to the uncertainty of future events, planning and management of urban and political risks must be taken into account in advance.

Integrating uncertainties within the planning process and improving collaboration between different institutions and organizations, both public and private at all levels, are key components of resilience. Similarly, social diversity must be considered in order to reduce it through a more balanced distribution of resilience resources.

Prevention is assuming an increasingly important role in urban resilience especially if thought of in terms of risk mitigation - which can translate into not only a reduction of greenhouse gas emissions, but also of inequalities and social imbalances in terms of urban decay - and flexibility to concretely face ecological, cultural and economic challenges with specific strategies and policies for the transformation of cities.

Resilient planning should therefore be oriented towards uncertainty and go beyond

traditional approaches, preparing cities for possible changes. Adaptation in this sense is essential to limit the damage of climate change and, more generally, of economic, social and health crises. Planning should include a wider range of conditions and, in particular, develop ex ante and ex post analyzes to adequately adapt to sudden situations.

Another component of uncertainty is the sustainable urban form, which concerns many aspects of resilience: livability, urban health, change, climate, multiculturalism are just some of the elements that influence contemporary public policies and must be taken into consideration for a good form of the city (Lynch, 1984). Urban compactness and contiguity, high-density planning, sustainable transport and equitable access, mixed land uses, diversity of housing and built form, passive solar design, greening in particular cities and the renewal and use with the rehabilitation and re-functionalization of brownfield sites constitute the key evaluation criteria of the sustainability of the urban form (Jabareen, 2013).

In this regard, as Desouza and Flanery (2013) observe, the social sphere is composed of three types of elements, namely people, institutions understood as the set of individuals who converge towards common goals, and activities, understood as functions that people and institutions have in relation to designing, building and using. In this framework, people play the most important role because the other two components are built around them. Furthermore, the physical and social spheres often overlap and many activities within a city arise from the meeting of these two spheres. In public spaces, for example, it is possible to observe interactions between different people, activities (walking), institutions (services), processes (permits of various kinds) and resources (works of art and artifacts of various kinds). Each of these components interacts in intentional and unintentional ways that it is important to identify for the creation of resilient and adaptive places (Desouza, Flanery, 2013).

Accordingly, it may therefore be useful to define the term *multiresilience*, i.e. the ability of a system to react to a situation of simultaneous presence of multiple risks and, taking into account the peculiarities of the place, the characteristics of the individual risks, the participation of the various subjects in a perspective of inclusion, and return to the initial situation.

Starting from this premises, aim of this work - carried out in the framework of the research project PRIN 2020 SUMMA "Sustainable modelling of materials, structures and Urban spaces including econoMic-legal iMplicAtions" – within the ISMed-CNR Unit (with the author's responsibility) and the relative agreement between Sapienza Università di Roma and ISMed-CNR - is to define multiresilience and multiadaptation starting from the concept of resilience and adaptation and present the synthesis of a the Cittaducale case study carried out with an *ad hoc* method.

2. Planning the complexity of the unexpected

Spaces that have a good degree of resilience are spaces capable of adapting to change. It is also true that adaptation, like resilience, is a term that lacks a univocal interpretation (De Roo, Porter, 2007).

To clarify its limits in the design field, it is possible to bring this field back (De Roo et A. 2020) to the material dimension and to the organizational and institutional dimensions. The material dimension concerns people, the environment and the territory, while the organizational and institutional dimensions concern the domains in which planning and activities act to link institutions with the material dimension. Adaptive planning can therefore lead to: that the people, places or situation being planned have a dynamic behavior and may exhibit such behavior in the future; o that the processes for designing and implementing interventions are likely to be adaptive.

The uncertainty and unpredictability of an event and its subsequent, often unknown, development are difficult elements to manage. In fact, the system as a whole cannot be understood only by observing the parts that compose it, which must instead be analyzed together with their context, noting the reciprocal relationships and the ways in which the system reaches the best possible configuration.

Traditional approaches to spatial planning often do not take adaptive behavior as a starting point, believing that interventions can be decided on the basis of facts and estimates available at the time of the decision-making process.

This static perspective is also used in contemporary planning, where deliberate actions will lead to the results of the intended decision. However, assuming a static world can lead to strategies that may be outdated by the time of the decision, leading to a large divergence between the expected and actual effects.

Resilience and adaptation are to be considered fundamental in dynamic planning, where the uncertain and the sudden become components of the planning process with the same weight as the others, and where urban planning tools are renewed or modified to help manage any crises in a adequate way.

In line with the concepts set out above, just as for *multiresilience*, it may also be useful to define the concept of *multiadaptation*, i.e. the ability of a system to react to a multi-risk and unexpected situation by creating a new balance capable of taking into account the specificities of the territories, types of risks, actors involved and new needs of people.

Multiadaptive planning - due to its complexity - to be suitably designed needs the support of an *ad hoc* methodology, as illustrated below.

2.1 The protocol of investigations

The proposed original method has the purpose of identifying which are the present or possible risks, both single and above all multiple, that may affect public spaces, the factors that determine them, the perception that users have of these risks and project interventions for a multiadaptation that aims at the same time to enhance the quality of the places. The final product is represented by two maps, one that systematises and integrates all the data collected separately in the previous phases in order to obtain a mosaic of risks, factors, user perceptions, and the other that presents the identified multiadaptation and enhancement project interventions.

The first phase concerns the analysis of the place with the identification of the single present or presumed urban risks. This is carried out by detecting these risks with the use of a specific database: the risk is detected through the observation of the places and it is quantified with respect to its presence in slight, medium and significant.

The present risks that can be detected from the observation include: the risk of degradation, the environmental risk, the social risk, the cultural risk, the anthropic risk, the seismic risk, the health risk, the risk of low liveability, the risk of insecurity, the risk of loss of place identity.

This survey is connected to the subsequent one concerning the factors that can determine the risk, since the risk is detected through the identification of these factors. It is therefore a mainly qualitative survey as it is based on the observation of the place.

The second phase is carried out by observing which elements and factors influence or can influence the present or possible risk or risks. This observation is carried out with a database which indicates the type of risk identified and the factor or factors that determine it.

Factors that can determine risk include: lack of shelters or shelters in open spaces with extreme temperatures; presence of mass tourism in historic places; poor state of conservation of public places and spaces including floors, furnishings and equipment; presence of buildings without maintenance; presence of fast food, street vendors and shops selling poor quality products with use of the street for display in historic places; presence of environmental events such as floods or seismic phenomena, albeit periodic; presence of architectural barriers; presence of furnishings, equipment, maintenance with little attention to the identity of the places. For example: the anthropic risk can be determined by factors such as mass tourism, territorial marketing actions; pedestrianization of a single road within the tourist route; the environmental risk can be

determined by earthquakes or floods; the urban unliveability can be determined by low quality design of spaces and scarce maintenance of furnishings and equipment.

The result is a mosaic of factors that influence or can influence the emergence of risks of various kinds.

The third phase concerns the observation and analysis of the effects that may occur if several risks analysed in the first phase occur or may occur simultaneously.

The data collected concern the type of risk, the effect or effects and the relative quantity of the effect detected, indicated as slight, medium or significant. For example, if the public space concerns a city affected by seismic risk or flood risk and at the same time the space has been created or rebuilt with a design that pays little attention to the identity of the places, the place will not fulfil its function as a place for socialization, as the lack of security could be joined by that of the perception of space not linked to tangible and intangible cultural aspects.

The result will be a mosaic of the risks present with their effects and quantities detected.

The fourth phase concerns the risk perception questionnaires. In this phase, two types of surveys will be carried out: the first relating to the perception of the risk by the people who use the place, through the administration of a questionnaire; the second related to the perception of the place present on social networks - including Facebook, Tripadvisor, Instagram, Twitter - from where to extrapolate useful information for the study being carried out.

Questions that will be asked include:

1. What general perception do you have of this place?
2. Do you think this place is affected by one or more types of risk?
3. What perception do you have of the risk or the risks to which it refers?
4. Do you think that these are permanent or transitory risks?
5. How do you think citizens can contribute to the resolution of the risk/s?
6. What are the quality of this place?

This aspect of the analysis is very important as from the answers it will be possible to understand how much and if people perceive each risk and if they think they can contribute to their resolution.

The fifth phase concerns the identification of the plans, programs and policies that are active in the place under analysis. An overview of the area will be carried out and research on the actions, if any, aimed at mitigating the different types of present or possible risk will be carried out. These can be on different scales and of different types, of a general nature or very specific and sectoral.

The product will be a sort of mosaic of plans, projects, programs and policies that may be present in the territory in question which will make it clear whether the risks under analysis are already object of attention and what actions, if any, have been undertaken.

The sixth phase is the identification of the quality factors and elements of the place.

The identification of the quality of the place is understood here as the presence of historical monuments of interest, historical buildings, public spaces with good quality design, easy accessibility, greenery, historical urban fabric, perspective views. The identification of the presence is also linked to the current use. This information is important to understand what resources that place possess and if the uses of it can be flexible.

The result is a mosaic of the quality elements of the place with their relative uses. The seventh phase concerns the multiple risks analysis, i.e. the creation of a map that presents all the risks which are present. The map will contain: all the risks present in relation to public spaces; the factors that contribute to the perception of present or possible risk; the results of the questionnaire on risk perception by people and those identified on social networks; and the quality elements of the place with its use.

The eighth phase consists in identifying the dynamic potential of the area. In this phase, by observing the multi-risk map, the most flexible spaces for resilience and improvement/enhancement project are identified. The result will be a sort of mosaic where areas of greatest risk are indicated where an action of adaptation and improvement/enhancement is most necessary.

Finally, the ninth phase will be the identification of the multiadaptation project interventions, located in the areas already surveyed in the previous phase. These project interventions concern the possible actions to be carried out to *multiadapt* to the risks and at the same time enhance the places. The result will be a map that will identify flexible interventions to be implemented both in the case of risks that are already present and of possible risks.

3. The case study

By way of example, the case of Cittaducale in the province of Rieti - Lazio Region in Italy -, which was affected by an earthquake in 2016, will be summarized in the following. Despite it was not having suffered major damage as several other nearby centres, the place is subject, also for effect of the earthquake, at risk of depopulation and isolation.

I will summarize the example, reporting the results of the phases of design, namely, phase 7,8,9. The seventh phase concerns the construction of a mosaic map where risks, user

perception and quality of the place are identified. The risks identified in this city are the seismic risk, depopulation risk, isolation risk and the identity risk. From the interviews carried out, the most perceived risk is the seismic one, probably due to the enormous damage of neighbouring countries, while the least perceived is the pandemic one detected by only 30% of the interviewees. The risk of depopulation and that of isolation are mentioned, as they are closely linked to each other, and in some way the consequence of the other.

Regarding the quality, the regular layout of Cittaducale allows even the occasional visitor to be able to orientate easily, its small size and a liveable atmosphere favours the slow and pleasant walkability of the town. The network of narrow streets surprises in the sudden glimpses of the green of the mountains or the valley. In some places the roads open towards small open spaces used mostly for parking. There are numerous historic buildings that arouse interest along the route such as the Dragonetti-De Torres, in Baroque style located in the middle of the upper course, or the buildings that house the pupil's school and the former forestry dormitory, an important and historical presence for Cittaducale since 1905.

The eighth phase concerns the identification of flexible areas, or the parts of Cittaducale where it is possible to think of a multiadaptive project capable of accommodating different types of activities also with a view to enhancement.

The identified areas concern in particular the squares and open spaces of the historic centre that are little used, buildings and churches of interest and routes.

The first spaces identified are those used for parking that can be allocated to initial reception areas in the event of earthquakes but also for socialization and participation.

Then the numerous squares and open spaces to be connected to the central Piazza del Popolo in the redesign of the urban path to rebalance the attractiveness of the square and at the same time improve its liveability in periods such as the summer when it is little used. Other flexible areas concern the streets on the edge of the historic buildings, creating both a cycle-pedestrian path that connects these places of identity value, promoting sustainable mobility, and a connection between the railway stations and the already existing cultural tourist train.

Finally, the naturalistic-archaeological-religious itineraries, where small orientation and rest areas can be created, also inserting areas to be used for outdoor sports activities.

In the last phase, mutiadaptation project interventions are identified to enhance the qualities of Cittaducale by mitigating the various risks identified, enhancing its cultural resources and powering the already existent liveability atmosphere. To this end, four paths have been identified including architectural, landscape/naturalistic, religious, and

arts and crafts.

In the architectural path it is possible to cross the squares of the historic centre - without architectural barriers - which will be used for initial reception areas in case of earthquakes, socialization, and enhancement of prestigious buildings of various eras in all other periods. The traces of the arcades incorporated into the building, the stone portals, the towers and bell towers become references for orientation. The route then opens towards the ancient city walls extending towards the archaeological area and the Church of S.M. di Sesto which reciprocally become the beginning and end of the path.

In the landscape/naturalistic path Cittaducale can be connected to other hiking trails and paths, including the European route E1 (from North Cape in Norway to Capo Passero in Sicily, South of Italy), reshaping the place with its wider context. From this, which becomes of main interest, other paths and trails branch off that touch naturalistic areas where various outdoor activities can bed carried out, also useful in periods of physical distancing (e.g. 1-2 meters among people) due to Covid-19 pandemic restrictions.

In the religious path it is possible to visit the churches through an itinerary of sacred architecture that also includes a stop at the episcopal museum and the library museum of Santa Caterina up to the Capuchins as a place of meditation and contemplation. This path is linked to two interwoven paths incorporating that of San Francesco da Greccio, Rieti, Poggio Bustone up to Borgo San Pietro on Lake Salto and that of San Felice da Cantalice from the Sanctuary of San Felice all'Acqua to the house where he lived located in Corso Mazzini.

Finally, in the path of the arts and crafts, abandoned and disused production areas could be recovered for the transformation of local products and the creation of workshops / accommodation, in underused buildings, for new skills by strengthening native crops to be recovered and enhancing the Terme di Vespasiano with its healing waters. This path is in particular designed to involve in different ways locals and fragile people.

Suitable info points, Qr Codes and a web portal with apps to be downloaded by place users will report paths and show their characteristics and information concerning areas for first recover in case of seism or physical distance in case of pandemic and all useful information in period of crisis.

In this way, the various identified risks - seismic, depopulation, isolation, identity, pandemic - could find resilience, transforming them into opportunities for enhancing Cittaducale in sustainable way.

4. Observations

The proposed method was experimented in areas characterized by different types of risks.

This is a method which follows a holistic approach and that was created by the author to analyse and design complex urban situations where the presence of multiple risks makes the place in question particularly subject to degradation, disuse, unliveability or depopulation.

A method that can identify at the same time factors, risks and people's perceptions can support a sustainable project that is more attentive to urban situations where the coexistence of several overlapping crises makes resolution difficult. In addition, users' perceptions are of great importance to understand their awareness with respect to important issues affecting the space in question.

During the experiments, some observations came up, which will be reported below.

The main problems include: the survey of the risks, the indication of the risk in quantitative terms; the users' perceptions and flexible area identification. Indeed, risks cannot always be predicted, as it is easier to understand the vulnerabilities than the risks; the coexistence of several risks has different effects according to the risks that are added together, the places where they occur, the percentages in which each risk occurs.

The presence of a poor state of preservation of public space and little accessibility can predict a situation of disuse or degradation; but the presence of seismic risk and little accessibility, does not necessarily lead to degradation, as the seismic event may not occur for many years. Similarly, the presence of mass tourism together with a low quality of design of the places can predict a cultural risk and a loss of identity of the places. The presence of mass tourism together with the risk due to climate change could also result in a decrease of tourism due to difficult climatic conditions and therefore paradoxically to a better maintenance of the place.

Another aspect concerns the indication of the risk in quantitative terms, that is light, medium and considerable. Indeed, the presence of a risk is due to changing factors and therefore defining mass tourism as a risk for the identity of that place probably means approximating the quantity detected to a specific period of time (e.g. spring or summer). Furthermore, indicating the due effects of multiple risks in quantitative terms requires averaging as each effect will present different quantities of risks.

Furthermore, every mitigation and enhancement must be planned on the single site.

As regards the users of the places, they perceive the risks only if these occurred recently or if these persist over time, therefore the answers to the questionnaires must be adequately integrated with the information collected in the inspections.

Again, the collection of information on social networks requires a survey with parameters

that can change from time to time depending on the type of risk to be detected, and, in any case, a complex interpretation of the data for the purpose of the case study.

And, finally, the flexible areas that are identified can be such even only in certain periods and for this reason the project interventions can refer to more or less long periods of the year.

The potentials include in particular the method itself and the detection of quality factors for enhancement of the resources which are identified. As a matter of fact, the flexibility of the method makes it applicable to areas of different types and for different types of risk and the repeatability of the method, thanks to a survey protocol organized by phases and products, can be applied by everyone.

Accordingly, the other important potentialities include: the possibility of identifying enhancement and risk resilience interventions that derive directly from the results of an analysis; and the detection of risks from a qualitative point of view, that is linked to the intangible characteristics of a place and its cultural heritage. Furthermore, the qualities of a place must also be noted with respect to the potential of the surrounding areas.

There are many users to whom the method is addressed: to citizens in order to share vulnerabilities and risks and participate in their resolution; administrators to understand, also from a qualitative point of view, the various risks of the territory and how to transform them into an opportunity to enhance cultural resources; to technicians, to identify flexible project areas for different uses; to tour operators, local product companies, businesses in general, in order to offer their products in an integrated manner.

Finally, the general idea is that the risk can be an opportunity to review aspects of the territory that can be improved and enhanced and therefore multiresilience and multiadaptation can be interpreted as a component of sustainable regeneration (Sepe, 2021-2023).

5. Conclusions

Resilience often considers the events that cause a crisis in a system to be equal even if they have different characteristics and does not distinguish sudden events from unwanted ones, leading to some ambiguities. Among these, for example, since there is no definition of how to pursue it, the degree of resilience of communities after a sudden event may not be the same and even within the same community different behaviours may occur.

It is also true that adaptation, like resilience, is a term without a univocal interpretation.

Consequently, I have proposed the terms of multiresilience and multiadaptation to frame the behaviours of a place in situations of multiple risks that are increasingly occurring in

contemporary territories. *Multiresilience* is defined as the ability of a system to react to a situation of simultaneous presence of multiple risks and, taking into account the peculiarities of the place, the characteristics of the individual risks, the participation of the various subjects in a perspective of inclusion, and return to the initial situation.

Multiadaptation is meant as the ability of a system to react to a multirisk and unforeseen situation by creating a new balance, capable of taking into account the specific features of the territories, types of risks, actors involved and new needs of people.

The various case studies that have been carried out have led to the identification of guidelines, always following the idea that the risk can be an opportunity to review aspects of the territory that can be improved and enhanced and therefore resilience can be interpreted as a component of sustainable regeneration. The case studies include: Cittaducale and Leonessa in Lazio Region, Siena, Naples, Paris, Madrid and Rotterdam. The case studies have been chosen for the presence of one or more present or probable risks: Cittaducale and Leonessa are interested by seismic risk and depopulation; the historic centre of Siena, Naples and Madrid by mass tourism and globalization; Rotterdam and Paris by flood and possible lack of place identity as regard the first and mass tourism as regards the second.

According with the concept of flexibility and multiadaptation, the following guidelines are meant as an output that can be continuously updated depending on possible new kind of risks or combinations of them which could be detected in further case studies.

The identification of the dangers related to a place must take place in a preventive manner, through analyses involving material and immaterial factors.

1. The multi-resilience/adaptation project should be meant with a holistic approach.

2. The identification of risks and possible damages must take place with reference to more potential events that can occur simultaneously.

3. The perception that the population or, more generally, the user of a place has, is a fundamental element in the study of dangers and risks and must be detected through ad hoc questionnaires.

4. Fragile individuals must be taken into particular consideration both for the survey of their perception of risk and for the project of adaptation to them.

5. The survey of the urban qualities of the place - cultural heritage, materials, equipment - are elements to be considered in multirisk multiadaptation projects/policies, in order to transform them into opportunities to improve its liveability.

6. The multi-resilience/adaptation project must be constantly monitored in order to be able to foresee sudden events and to be able to react in a sustainable manner.

7. Flexibility is one of the essential characteristics of the multiadaptation project and must be understood in an inter-scalar (from the building to the city) and interfactorial way, integrating urban, socio-economic, cultural and environmental aspects.

8. A multi-resilience/adaptation project cannot be used in any place even if characterized by the same risks, but must be carried out respecting the different characteristics, as each site (historic centre, suburbs, regeneration area) has its own peculiarities to take into consideration.

9. The communication of dangers and risks as well as of projects, plans and policies for multi-resilience/ adaptation must be carried out in an appropriate manner for all age groups and abilities.

10. New technologies must be used to support both the communication of risks and dangers. And the disclosure of all the measures adopted or to be adopted in the case of a crisis of various types, should be clearly and widely illustrated through ad hoc web portals, apps, social networks, sensors, interactive maps.

These principles are the results of the different case studies carried until now; because uncertainty is at the base of multiadaptive planning, new guidelines can be added if an update will be necessary.

At the same time, the experiments carried out so far have verified the validity of the method and its protocol of investigations, but because of its flexibility, as for the principles, also the method can be updated if different types of risks peculiar to other places will be detected.

Acknowledgments. Financial support from the Italian Ministry of University and Research (MUR) in the framework of the Project PRIN2020 #20209F3A37 is gratefully acknowledged.

References

Badland Hannah., Whitzman Carolyn, Lowe Melanie, Davern Melanie, Aye Lu, Butterworth Iain, Hes, Dominique and Giles-Corti Billie, (2014) Urban liveability: Emerging lessons from Australia for exploring the potential for indicators to measure the social determinants of health, *Social Science and Medicine*, 111, pp. 64–73.

Bohland, Jim, Davoudi, Simin, Lawrence, Jennifer, (eds) (2019) *The resilience machine*. New York: Routledge

Boyko, Christofer T., Gaterell, Mark R., Barber, Austin R. G., Brown, Julie, Bryson, John R., Butler, David, Rogers, Christofer D. F. (2012) Benchmarking sustainability in cities: The role of indicators and future scenarios. *Global Environmental Change-Human and*

Policy Dimensions, 22(1), pp. 245-254
Davoudi, Simin et Al. (2012) Resilience: A Bridging Concept or a Dead End?, *Planning Theory and Practice*, 13 (2), pp. 299-333
De Roo, Gert, Yamu, Claudia, Zuidema, Christian (2020) *Handbook on Planning and Complexity*. Cheltenham Glos UK: Edward Elgar Publishing
De Roo, Gert, Porter, Geoff (eds) (2007) *Fuzzy Planning – The Role of Actors in a Fuzzy Governance. Environment.* Ashgate, Aldershot and Routledge: London
Desouza, Kevin C., Flanery, Trevor H. (2013) Designing, planning, and managing resilient cities: A conceptual framework, *Cities*, 35, pp. 89-99
EIU (2021) The Global Liveability Index 2021, https://www.eiu.com/topic/liveability
Lawrence Roderick J. (2008) Urban environmental health indicators: appraisal and policy directives, *Rev Environ Health*, 23, pp. 299–325.
Lowe Melanie, Whitzman Carolyn, Badland Hannah, et Al. (2015) Planning healthy, liveable and sustainable cities: how can indicators inform policy? *Urban Policy Res*, 33, pp. 131–44
Lynch, Kevin (1984) *Good City Form*. Boston: Mit Press
Rockefeller Foundation, Arup (2019) *City Resilience Index. Understanding and Measuring City Resilience*, https://www.cityresilienceindex.org
Sepe, Marichela (2023) *Designing Healty and Liveable Cities. Creating Sustainable urban regeneration*. London-NewYork: Routledge
Sepe, Marichela (2022) Adaptive places: achieving resilience, by facing risks, *WIT Transactions on Ecology and the Environment*, Vol. 285. Southampton: Wit Press
Sepe, Marichela (2021) 'Covid-19 pandemic and public spaces: improving quality and flexibility for healthier places', *Urban Design International* 26(2), pp. 159–173
Vale, Lawrence J., Campanella, Thomas J. (2005) *The resilient city: how modern cities recover from disaster.* Oxford Scholarship Online
Vale, Lawrence J. (2014) The politics of resilience cities: whose resilience and whose city', *Building Research and Information*, 42 (2), pp. 191-201
Wong, Cecilia (2006) Indicators for urban and regional planning: the interplay of policy and methods. Abingdon: Routledge
Zolli, Andrew, Healey, Anne Marie (2012) *Resilience. Why things bounce back*. New York: The Free Press

PLANNING METHOD OF CORRIDOR NETWORK IN MULTI-RESIDENTIAL PUBLIC SPACE (1059)

Qian Zhao

College of Architecture and Urban Planning, Tongji University, Shanghai, China; 594081886@qq.com

Abstract. In recent years, the planning concept of creating a pleasant environment for residential areas has been applied to improve the quality of new residential areas, but it has not improved the living environment of old residential areas, nor the fragmentation of public space in urban residential areas. Under this background, the research first analyzes characteristics of several public space of residential area, connected corridor network, build a distinctive and identification, is advantageous for the promotion of public space connected corridor network planning method, and probes into the public space connected corridor network application in the actual program. The planning method improves the continuity of the public space system in urban residential areas and provides a feasible method for design practitioners to practice in multiple fields.

Keywords: Connecting corridor; Network planning; Public space; Planning method

China's urbanisation is at a critical stage of changing from speed to quality. People's requirements for urban and rural living environment and community living quality are increasing day by day. In accordance with the Opinions of the CPC Central Committee and The State Council on Promoting Ecological Civilisation Construction issued in 2015 and Several Opinions of the CPC Central Committee and The State Council on Further Strengthening the Administration of Urban Planning and Construction issued in 2016, the CPC Central Committee and The State Council issued the Opinions on Strengthening Ecological restoration and urban repair on 6 March, 2017. "Strengthen urban design in key areas for urban repair, organise public space and coordinate landscape features," the guideline said (Ministry of Housing and Urban-Rural Development, 2017). Thus, it can be seen that improving the overall quality of life and vitality of urban settlements and communities has become an important issue. As the most dynamic place in the residential community and neighborhood, public space not only accepts the daily activities of residents, but also serves as an important medium and bond for the communication and interaction between the residential community, neighborhood and the city. Only by constructing a continuous and orderly public space system can we create a benign and dynamic urban living environment.

In recent years, under the background of "urban repair and ecological restoration", the

planning concept of "small neighborhood and dense road network" has been widely applied to the planning and construction of residential areas, which has effectively improved the living quality of some newly built residential areas, but the living environment of the vast majority of old residential areas has not been improved. In the development of urban residential areas, real estate enterprises pay more attention to the construction of inner space of residential areas and neighborhoods, and pay less attention to the connection between multiple residential areas and public space of neighborhoods. The internalisation of public space of multiple residential districts and neighborhoods leads to discontinuous walking paths in urban residential areas, low density of walking paths, and incomplete structure of urban slow walking space. At present, China has not yet formed a set of perfect planning methods to connect residential quarters and neighborhood public Spaces to deal with the above problems. Therefore, this study explores a characteristic, recognizable and easy to promote public space connecting corridor network planning method, in order to improve the continuity of urban residential public space system.

1. Characteristics Of Public Space Of Residential District And Neighborhood

Urban public space refers to the urban space that is open and accessible to the public. Roads, squares, parks and beaches are typical urban public Spaces (Li, 2014). The residential public space is different from the concept of urban public space. As an important part of urban public space, it is the main place for residents' daily life. This paper studies the public space within multiple residential districts and neighborhoods, namely the public space of residential areas, and defines the public space of residential areas as community parks, neighborhood parks, residential parks, linear parks along the riverfront green belt and civic squares that carry residents' leisure, fitness, sports and communication activities.

1.1. Functions And Levels Of Public Space

From the perspective of function, the main body of public space in residential areas can be divided into rest type public space, traffic type public space and service type public space (Li, 2014). Rest type public space refers to the space that meets the activity functions of residents of different ages such as communication, rest and recreation. This kind of rest space includes green space, square, walking path, playing field, rest seat and other elements. It usually takes green space as the main body and lays out soft and natural space environment. The transportation public space usually takes the street space as the carrier. It is composed of the form skeleton of the residential area, such as the vehicle lane, walking path, traffic square and bus station, etc., and undertakes the functions of the residential area, such as the traffic, viewing, leisure walking and neighborhood

communication. Service-oriented public space refers to the public service facilities in residential areas, such as commercial centre, community cultural centre, etc. The place is mainly a hard square space, combined with seats, plants and other activity facilities, carrying commercial shopping, cultural entertainment and social activities and other functions, such places have strong public attributes, can accommodate a large number of people gathering public activities. From the perspective of spatial hierarchy, public space can be divided into semi-public and semi-private residential areas. Semi-public residential areas have a large radiation range, strong openness, shallow communication level, and can organise large-scale and group activities, accommodating a variety of activity types. Semi-private residential areas have small radiation range, strong sense of privacy and belonging, and close neighborhood interaction activities. The residents' communication activities are usually based on fitness and chatting, and the groups involved are relatively fixed (Hu, 2007).

1.2. Scale And Service Radius Of Public Space

The literature review found that there is currently no quantitative index control of public space in China, and some developed countries in Europe and the United States have formed a relatively mature index control system tested by practice in the field of public space. Draw lessons from European and American case experiences of public space index control（Table1）(Yang, Si and Hong, 2008), Corresponding to China's current residential green space design standards(Table2), Determine quantitative indicators of public space in residential areas(Code for design of residential green space, 2003). The scale of community level public space is greater than 1 hectare, and the service radius is controlled within 300-500 meters. The scale of district-level public space is greater than 4 hectares, and the service radius is controlled within 800-1000 meters. The scale of municipal public space is greater than 40 hectares, and the service radius is controlled within 2000-3000 meters.

Table 1. Indicators of public space in Europe and America

Standard	Landscape and Public Space Planning in London (2000)		San Francisco Public Space Plan (1997)		Vancouver Public Space Plan (2002)	
Level	Spatial scale（ha）	Service radius（m）	Spatial scale（ha）	Service radius（m）	Spatial scale（ha）	Service radius（m）
City	60	3200	400	800	-	-

District	20	1200	4	600	40	1600-4800
Community	2	400	4	400	1.2-2	500-800

Table 2. Design standards of residential green space in China

Standard	Design standard of residential green space in China	
Level	Spatial scale （ha）	Service radius （m）
Residential district	1	800-1000
community	0.4	300-500

2. Construction Of Connected Network In Public Space

At present, the development scale of urban residential areas is increasing day by day, and multi-level and large-scale people gather inside residential areas. In terms of openness and publicity, the public space of residential districts and neighborhoods shoulder more and more responsibilities of sharing urban resources. Planning and design can no longer simply talk about the community, we should control and guide the planning, construction and development of residential areas from the regional level. With the improvement of the quality and demand for public space, residents pay more attention to the accessibility and connection of public space. In the future, the construction of public space corridor network will become one of the important means to improve the public space environment in residential areas. To construct an overall public space corridor network suitable for multiple residential districts and neighborhoods, firstly, we should add complete dotted public Spaces of different levels in multiple residential districts and neighborhoods, connect urban attraction resources, connect various types of corridor networks, optimise the environment connecting potential public Spaces on the corridors, and refine the connecting nodes between the connected corridors and public Spaces. Form a region-oriented public space connectivity network.

2.1. Add Public Space

Add public space inside each residential district and neighborhood to improve the utilisation rate of public space. Two levels of community level public space and internal small public space are arranged. The scale of community level public space is larger than 1 hectare, with a spacing of 900-1500 meters, and the scale of internal small public space is larger than 0.4 hectare, with a spacing of 450-750 meters. The types of public space include central green space, pocket park and micro square (Figure 1).

Corner space renovation. In view of the increasing demand of residents for fitness, culture, communication and other activities, and the shortage of public space in existing residential areas, extensive public opinion surveys and scientific traffic flow analysis are adopted according to the actual needs to add public space with appropriate size and function, and the added public space should maintain integrity (Peng, 2018).

Entrance space renovation. The entrance space of most of the built residential areas is mixed with people and vehicles, and the flow of people is interwoven with the flow of vehicles, and there is a lack of identifying landscape facilities. In the process of urban renewal, the entrance space should be appropriately transformed and divided into motor vehicle area, pedestrian area and entrance landscape identification area. It can not only effectively increase the safety of the entrance space, but also highlight the community culture (Figure 2).

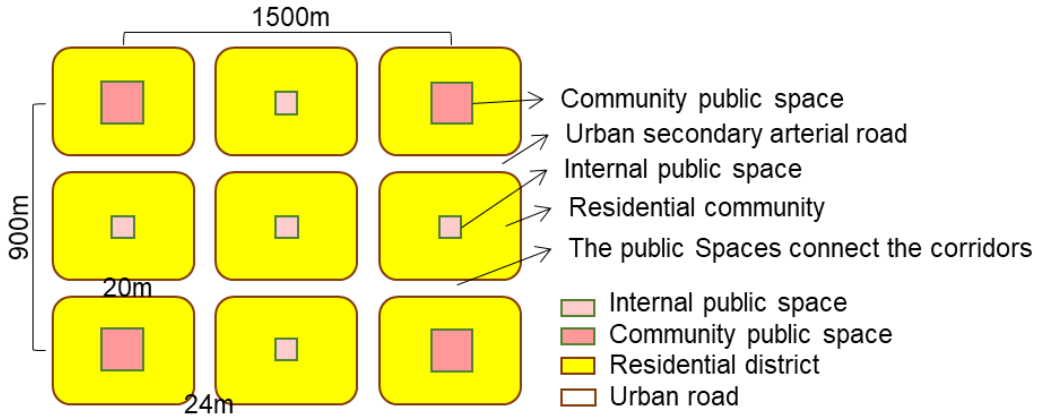


Figure 1. Public space of residential district and neighborhood
source: author.

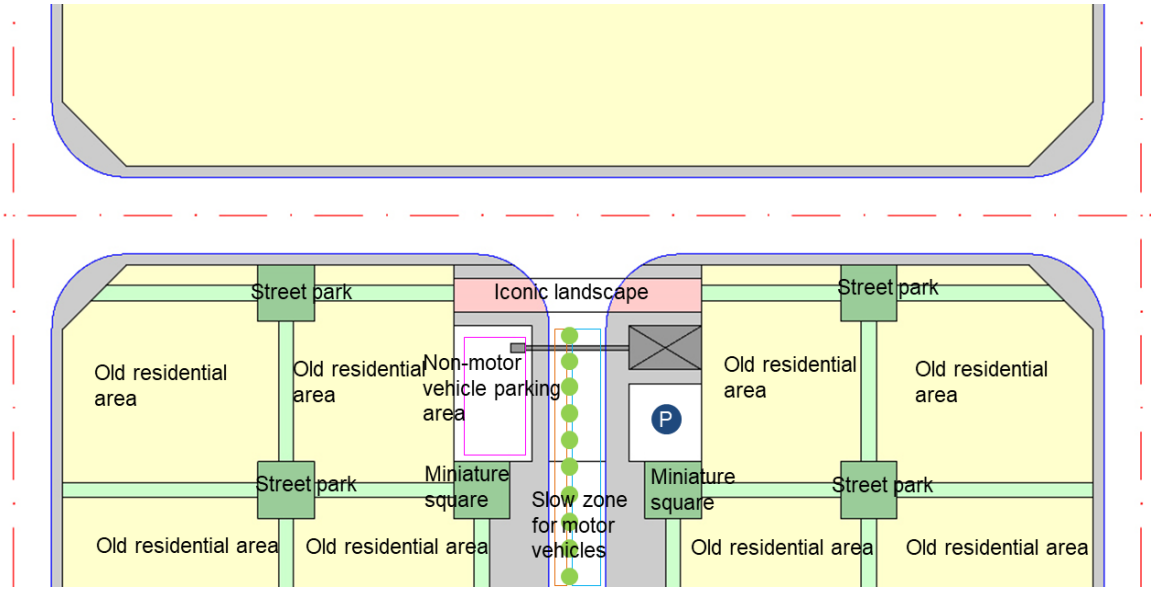


Figure 2. Space division of entrance
Source: author.

Microspace re-embedding. Open the original barrier walls and fences, innovative liberation of street green space. The optimisation and improvement of green open space at street corners will provide more places for residents to communicate and help improve the quality of ecological environment in residential areas.

2.2 Connecting The Corridor Network

2.2.1 Connection Corridor Type

According to their spatial positions, connecting corridors can be divided into three types: aerial connecting corridors, ground connecting corridors and underground connecting corridors. Among them, the air connecting corridor includes slow landscape bridge and building platform connecting corridor; The ground connecting corridor includes the pedestrian system on both sides of the slow street and the motorway. The underground connecting corridor includes the building underground walkway and the continuous walkway through the bridge.

The air connecting corridor is divided into two types: independent flyover and building connecting corridor. The freestanded bridge can carry a large number of people and has strong recreational and landscape functions. This mode mainly crosses intersections, rivers and urban roads. Under the bridge, vehicles can be used for parking, afforestation, square and commercial market space, etc. It is suitable for crossing the lot with large flow of people, which affects the original function in the vertical direction (Figure 3) (Chen,

2018). The building corridor is connected by the second floor of shops and buildings, and its connection mode has no impact on the ground road traffic and pedestrian traffic, ensuring the continuity of walking space. Combined with the layout of the street buildings, it is necessary to deal with the public management problems between the street landscape and buildings. This model is suitable for areas with dense commercial facilities in residential areas and areas around subway stations in the TOD development model (Peng, 2011).

Figure 3. Aerial building corridor
Source: author.

Figure 4. Ground connection gallery
Source: author.

Ground connecting corridor is residential greenway. The residential area provides a green open space with good natural landscape and leisure functions for pedestrians and cyclists to enter, providing residents with a continuous field suitable for jogging, walking, cycling and other outdoor activities. The corridor integrates sidewalk, slow track and bicycle path, pays attention to the creation of a green environment, and is a channel network for people to exercise, relax, get close to nature and travel easily (Figure 4). The public space of green

space and public square in residential blocks added above is seamlessly connected with the ground connecting corridor, providing places and opportunities for residential residents to integrate and communicate, providing safe and exclusive sports space for jogging and cycling enthusiasts, and enabling residents to realise their dream of running anywhere and anytime. The residential greenway is connected to the slow track of the community park, and the ground connecting corridor is combined with the urban walking system, which not only satisfies the functions of recreation and sports, but also shares part of the functions of the slow traffic system, which helps to realise the separation of people and vehicles and reduce the pressure of urban traffic.

Underground connecting corridors are less used because of their high cost. The connection form of the corridor is only applicable to the underpass node of the vehicle-traffic arterial road bridge and the surrounding area of the subway station (Zhang, 2016).

2.2.2 Connect Urban Attraction Resources

Urban attraction resources are divided into three categories: basic attraction resources, supporting attraction resources and image attraction resources. Basic attraction resources include urban landmark buildings, urban recreation areas, exhibition and event venues, etc. Supporting attraction resources include exhibition facilities, sports venues, entertainment venues, shopping centres and various forms of transportation, etc. Image attraction resource is the diversified city characteristic landscape image. Urban attraction resource points are easy to exist in the intersection space of urban road and public space corridor in residential neighborhood (He and Yang, 2020).

In the process of community planning and construction, when connecting the public space inside the community and the public space outside the community, the existing attraction resources of the city should be incorporated into the network system of connecting corridors of the public space as far as possible (Figure 5). When there is no established urban attraction resource in the residential neighborhood, the subjective initiative of the neighborhood should be given proper play to create "unique" urban attraction resources. For example, organizing community cultural festival activities, expanding community activity venues, increasing leisure landscape facilities such as seats, plants, flower beds, promenades, sculptures and children's amusement facilities, etc., improving the node vitality of corridor crossing zones, helping to enhance the charm of residential districts and neighborhoods.

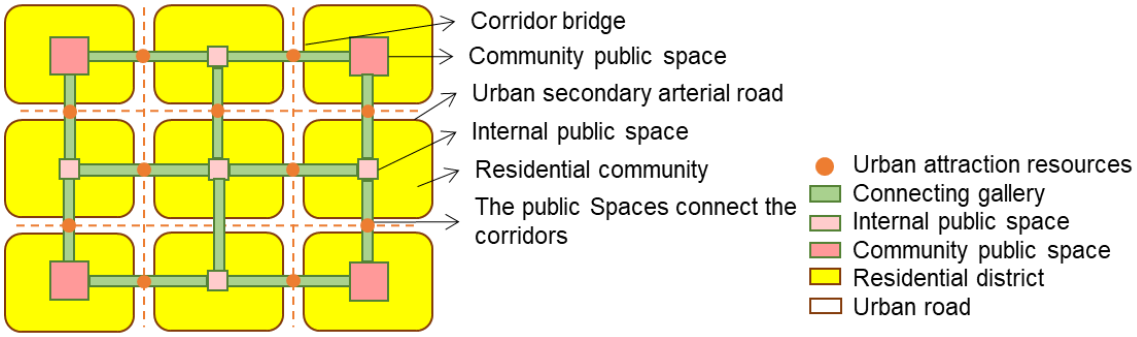


Figure 5. The corridor network between the inner space of residential neighborhood and urban attraction resources is shown
Source: author.

2.3. Improve The Connecting Nodes Of The Corridor

The ground connecting corridor is a continuous network system, and no special connecting nodes are needed. When the air connecting gallery and the underground connecting gallery connect with the ground, it is necessary to improve the vertical traffic elements to guide the people evacuation and ensure the smoothness of the connection. Interesting urban furniture is designed to enhance the vitality of the joint space.

2.3.1. Facilitation Of Node Traffic

Vertical means of transportation is the most basic element of the connection node connecting the corridor. The commonly used vertical means of transportation include stairs, ramps, escalators and elevators. The main vertical traffic nodes should be arranged on the broad nodes of the main stream line, which is a necessary tool for traffic evacuation to facilitate the flow of people to the upper and lower levels (Zhang, 2016). At present, the main functions of traffic evacuation are mostly undertaken by escalators or elevators, and stairs, as an auxiliary vertical connection element, are mainly used for fire evacuation. The stairs are rich in forms, mainly using straight or folded lines. The design of the stairs combines with the natural landscape to form different walking landscape experience, which not only satisfies the traffic function, but also increases the spatial attraction of connecting nodes. Vertical elevator is a kind of tool with the fastest transportation speed and the smallest floor area among various vertical transportation tools. It is convenient to cross multi-layer vertical space and can be used to solve barrier-free transportation. However, the carrying capacity of elevator is small, and it is not suitable for the spatial connection area with large human flow. Escalators are usually set in the vertical space transformation area, landmark node space or square area with large flow of people. In the space area of the two floors connected by escalators, locally open space is required for people to gather and disperse. Escalators are usually no longer built when there are

elevators for accessible traffic. The ramp is a continuous barrier-free channel with a certain incline Angle, and the gradient is mostly controlled at 1:12. The ramps that can gently connect the upper and lower Spaces usually occupy a large area of outdoor space, which can effectively reduce the fatigue of people crossing the vertical distance. The unconscious ascending experience brings surprises and freshness to people, enriching the fun of space transformation.

2.3.2. Interesting Node Facilities

A conventional connection node connecting the air corridor and the ground corridor is designed. The node is composed of a slow air corridor, a barrier-free elevator, a walking staircase, a cylindrical children's slide and a circular spiral ramp. The slow air corridor is 4.14m high and 6.5m wide, and its sections are divided into 1.5m slow runway, 2m slow corridor and 3m recreational lawn. The size of barrier-free elevator is 2.6m*3m; The walking stairs are divided into three sections with a width of 4m and a total of 28 steps. The cylindrical children's slide, with a diameter of 1m, slides from the slow-moving aerial corridor to the children's play sand pit on the ground floor; The circular spiral staircase has a radius of 7.5m and a circumference of 50m. The ramp is 2.8 meters wide and has a gradient of 1:12, providing continuity for cyclists and pedestrians jogging(Figure 6).

The cylindrical children's slide, children's play sand pit, slow track and recreational lawn are set up to increase the interest of connecting nodes. The construction of children's facilities and recreation space has increased the opportunities and frequency of children's contact with nature, and created a colorful and good environment for children with outdoor activities, so that children can exercise in activities and get happy communication with other children. With the arrival of children, parents can also gather in the node facility space, making the bridge deck a small communication space between communities.

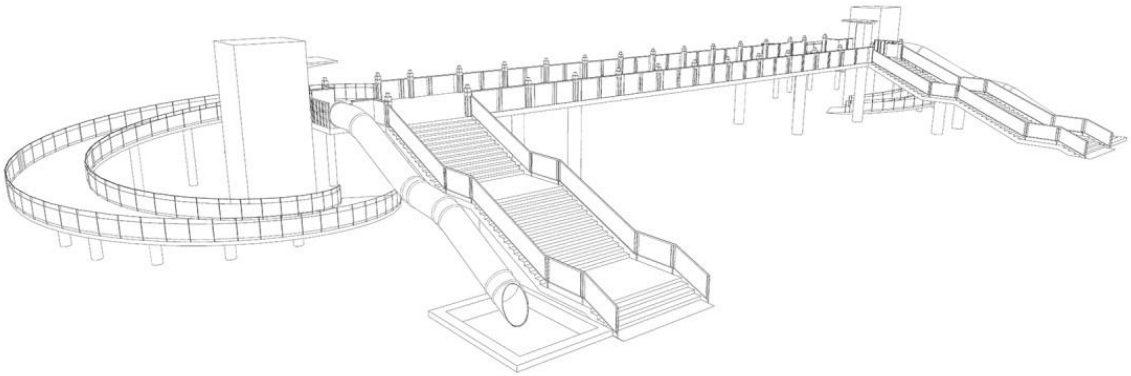


Figure 6. Stereogram of node facilities
Source: author.

2.3.3. Vitality Of Node Space

Combined with the cultural characteristics of adjacent communities, integrate community public resources, make full use of the bridge floor seats, square under the bridge and other leisure Spaces, hold community cultural exchange activities, hold festival activities on the Children's Day, Labor Day, National Day, Mid-Autumn Festival, Spring Festival and other holidays, create a "big community" cultural brand. If conditions permit, the neighborhood can start the night view lighting project of the corridor bridge, design different lighting effects on the bridge, perfect integration of lighting technology and the bridge, the bridge at night flowing brightly, giving people a dreamlike feeling, not only brings a sense of belonging to the residents, but also provides residents with leisure and communication space.

3. Application Of Connected Corridor Network In Public Space

3.1 Communication Between Public Space And Urban Attraction Resources

In 2017, the Ministry of Housing and Urban-Rural Development issued the "Guidance on Strengthening Urban repair Work of Ecological Restoration" (hereinafter referred to as the "Guideline"), which proposed to restore urban ecology and improve ecological functions; Repair urban function, improve environmental quality; Fill the debt of urban facilities, increase public space, improve travel conditions, renovate old residential areas and other requirements(Ministry of Housing and Urban-Rural Development, 2017).

In this context, Langfang organised a special plan of "urban repair" to optimise the space of multiple residential communities and neighborhoods on both sides of the Bagan Canal, an important river system in the city, actively add waterfront public space and continuous slow space, and ensure the continuity of the connecting gallery through the main road under the pedestrian path. Urban attraction resources such as green veins on the riverfront permeate into the neighborhoods on both sides. Form the public space connecting corridor network system of the whole waterfront residential area(Figure 7).

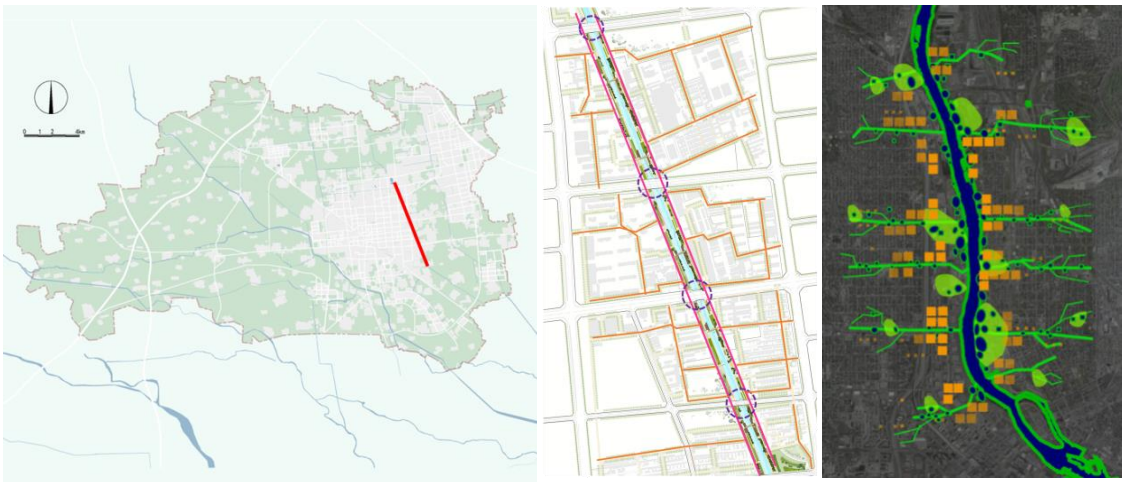


Figure 7. The location of Eight canals in Langfang city space and the network of connecting corridors
Source: author.

3.2 Design Of Connecting Node Of Connecting Gallery

In the planning and design of the Three Rivers and Six Banks project in Lanxi City, Zhejiang Province, the strategy of "green heart ring" was put forward to construct the connecting slow greenway and reshape the open waterfront space, so as to solve the problems of fracture and obstruction of the three rivers and six banks. The components of "green heart ring" include: green island, green bridge, green bank, green core and green veins. Among them, three green Bridges, namely Lanjiang Bridge, Nanmen Bridge and Hengshan Bridge, straddle the water surface of the three rivers and become the key elements of building a "green heart ring" and shaping urban attraction resources. Take Lanjiang Bridge as an example. Built in 1975, Lanjiang Bridge was the largest highway bridge in China in the mid-1970s. It was awarded as one of the top Ten Buildings in China that year by the National Science Congress and was inscribed by Guo Moruo, president of the Chinese Academy of Sciences. In September, 2000, the widening project was implemented. After the widening, the total length of the bridge is 1,080 meters. The main bridge is 820 meters long and 24 meters wide. The vehicle traffic is four lanes in two directions, including three lanes in the new bridge and one lane in the old bridge, which can fully meet the traffic demand, but the current situation of the bridge deck carries a limited amount of pedestrian traffic. There is a height difference of about 5 meters between the east and west ends of Lanjiang Bridge and the bank. At present, there is a double-run staircase with a width of about 1.5 meters connecting the new bridge and the bank, and there is a lack of barrier-free access facilities. It is planned to transform the old part of Lanjiang Bridge into a slow passage, set up bicycle lanes and pedestrian recreation gardens, and set ramps on the east and west

sides to connect the urban greenway. The bridge deck and ground connection zone becomes one of the important nodes of the green ring of Three rivers and six banks.

Reconstruction of the west end bridge: the bridge deck elevation is 37.90m, the north sidewalk width is 2.2m, and the south greenway width is 7.8m. The ground level of the north side of the bridge is 31.11m, and there are 2-4 storey concrete buildings. The pedestrian greenway on the north side of the bridge is partially widened to form a wooden viewing platform, which is connected with the second floor of the building on the north side by a bridge and a pavilion. The ground part is used as a recreation garden. The ground elevation of the south side is 30.36m. The existing building with poor quality is demolished, and the original site is transformed into a street green park. The red light steel is used as a ring bridge to connect the bridge deck with the ground(Figure 8). The width of the ring bridge is 2.5m, the total length is 75.6m, and the average slope is about 10%. The other curved bridge is connected to the top of the dike, the top elevation is 34.29m, the length of the bridge is 28.5m, and the average slope is about 12%.

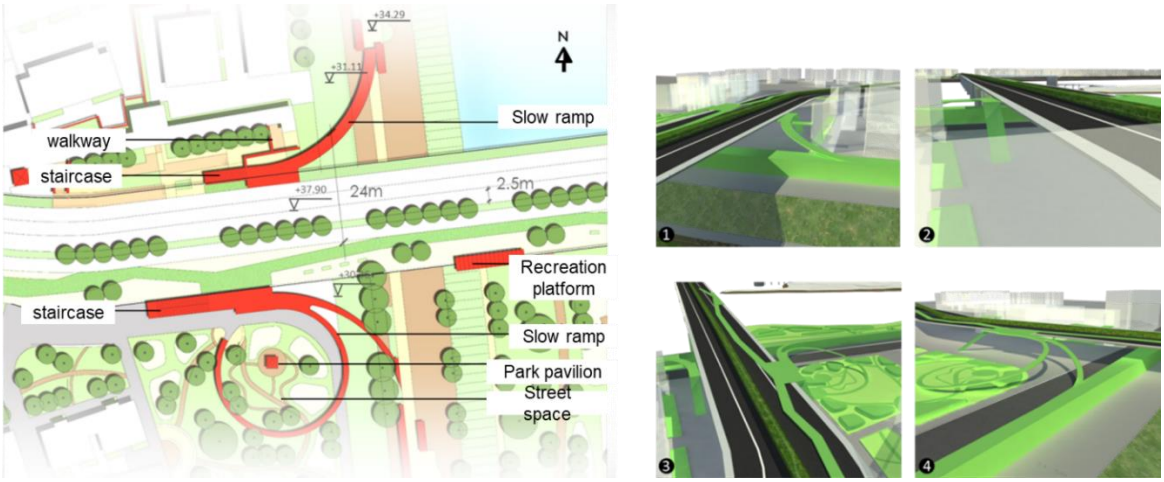


Figure 8. Reconstruction of the west end of Lanjiang Bridge

Source: author.

4. Conclusion

This paper innovatively proposes a "three-dimensional" public space connected corridor network system which is easy to popularise, easy to implement, identifiable and suitable for residential quarters and neighborhoods. The establishment of a series of "chain" corridors including various water systems, streets and landscape roads helps the public space environment of residential areas move from closed to urban integration, introduces urban life into residential areas, and realise a multi-level open public space system, which provides a theoretical basis for the upgrading of the renewal level of urban residential areas in China and the improvement of livable living environment. In view of the different environments of various public Spaces in residential areas, multiple "three-dimensional"

public space connecting corridor network is organised. Public Spaces of different levels connect corridor and connect public Spaces of different levels in residential areas. The research on the connected corridor network of public space has a wide range of application, and it involves the guidance of control regulations in the planning and design(Zheng, Liu and Jiang, 2013), In urban design, the opening and corridor reservation of newly built residential areas, and the renovation of old residential areas in the reconstruction of old cities are an innovation of the current urban planning and design methods. Can also be directly applied to the field of architectural design, reconstruction, expansion of buildings have a certain guiding role, with a wide range of practical value. It provides feasible methods for planning and design practitioners in the fields of controlling detailed planning, urban renewal, urban design, old district reconstruction and so on.

References

Chen, Xiaoyu. (2018). Study on landscape oriented open space integration Strategy of compact urban centre. Guangzhou: South China University of Technology,(6）:74-79.

DB11/T 214——2003. (2003). Code for design of residential green space. Beijing: Beijing Institute of Landscape Science.

Hu, Wen. (2007). Principles and design methods of residential area planning. Beijing: China Architecture and Building Press,7-23.

He, Xuehui, Yang F R. (2020). Quantitative analysis of Visual Attraction of urban waterfront Greenway: A case study of Dongfengqu Riverfront Greenway in Zhengzhou City. Hubei Agricultural Sciences,59(6):112-116.

Li, Qing. (2014). Study on the Characteristics of Residential Public Space with Social cohesion-Oriented -- A Case study of Chuangzhi Fang and Caoyang Village in Shanghai. Urban Planning Journal，(4):88-89.

Ministry of Housing and Urban-Rural Development.(2017). Guidelines on Strengthening the urban repair work of ecological Restoration,03.

Peng, Hao. (2018). Research on the reconstruction of old residential streets Open Space based on the concept of "urban repair". Beijing: Beijing University of Civil Engineering and Architecture,(6):45-59.

Peng, Qingyan. (2011). Construction mode and applicability of elevated pedestrian walkway. Urban traffic,9（6）:38-40.

Yang, Xiaochun, Si, Maxiao and Hong, Tao. (2008). Preliminary study on urban public open space system planning method: A case study of Shenzhen. Planner, 24(6):24-27.

Zhang, Tingwei. (2016). Study on Walking space System in the core area of Zhujiang New Town. Guangzhou: South China University of Technology,(3）:48-56.

Zheng, Jianxia, Liu Huijun and Jiang Weiming. (2013). Research on the compilation of detailed planning of residential area based on public open space construction. Planner,29(5):90-92.

CITIZEN SOCIAL SCIENCE IN SPATIAL PLANNING – POTENTIALS FOR RESILIENCE IN A COMPLEX UNPREDICTABLE WORLD (1064)

Tom Goosse

Centre for Mobility and Spatial planning (UGent), Ghent, Belgium; Department of Spatial Planning (RUG), Groningen, The Netherlands; Tom.Goosse@ugent.be, t.p.goosse@rug.nl

Abstract. This paper reflects on the potential of citizen science in spatial planning when facing complex issues. It presents a framework that builds upon existing typologies and methods of citizen science and how it can be conceptualised as an adaptive tool in spatial planning to ensure active participatory engagement in the face of uncertainty and promote evolutionary resilience. Planners struggle to integrate citizens in their quest for certainty and evidence-based planning centred around technical expertise. Many studies have recently explored the plurality of citizen science and identified multiple benefits for policy-making such as engagement of citizens, its possibility to be initiated by any societal actor, as well as information flow and comprehension between involved actors. This paper investigates the potential benefits of citizen science in spatial planning for the input of new dynamic and situational perspectives on complex issues.

Keywords: citizen science, participatory planning, complex adaptive systems, evolutionary resilience

1. Introduction

Since a couple of decades, citizen science gained attention for its potentialities within policy-making and public management (Freitag, 2016). While there are different interpretations and typologies of citizen science, its main concept implies the participation of citizens in scientific inquiry by taking an active role (Strasser et al., 2018). In most cases, this active role solely entails data collection. However, experiments and pilot cases are on the rise to broaden the role of citizens and to use citizen science for addressing societal challenges (Kythreotis et al., 2019). Scholars identified numerous academic, civic and policy-making advantages through these experiments. For instance, citizen science allows enhanced research capacity and social relevance for academic research, increased awareness amongst citizens and a positive community impact, and public support as well as improved democratic and scientific legitimacy to policy decisions (Freitag, 2016; von Gönner et al., 2023). Since the initial conception of citizen science in the 1990s, academics have discussed the role assignments within citizen science projects

and its recognition as valuable scientific approach. On the one hand, practitioners underline the importance of a central management by recognized academics to ensure the scientific validity of the results. Others have highlighted the potential of citizen science to create new forms of citizen-centred knowledge and bring about a new recognized role for citizens as scientific actors in society (Strasser et al., 2018). Building upon the idea that citizen science might offer the opportunity to include citizen-centred knowledge in the scientific process as well as the ensuing policy-making, some academics presented the concept of citizen social science to study societal issues from the perspective of citizens (Albert et al., 2021; Amirrudin et al., 2021; Campos et al., 2021; Perelló, 2021; Pykett et al., 2020; Thomas et al., 2021). Such practice offers the possibility to tailor research and policy-making to the social and cultural norms of citizens (Albert et al., 2021; Kythreotis et al., 2019). Based on the identified academic, civic and policy-making advantages, this paper explores the potential of citizen social science to address spatial planning issues.

Comparably, citizen's participation is a central topic in spatial planning since much longer. Spatial planning aims initially at controlling space and its future evolution to prevent society from becoming chaotic and ineffective (Boelens, 2020a). It addresses a plurality of societal issues and tends to answer these issues through spatially oriented policies and practices. Influenced by its original conception, spatial planning traditionally tends to address these issues through a centralized technocratic lens. Criticism to this technical paradigm of spatial planning arose in the 1960's arguing that it did not take sufficiently into account the multitude of private and civic actors outside of the government. Spatial planning consequently made a communicative turn, in theory if not in practice, emphasizing the importance of an exchange of ideas and perceptions to address multi-faceted planning issues (Healey, 2003; Innes, 1998). Several participatory approaches emerged since the 1990s proposing shared partnerships and actor-network based processes for closing the gap between the government and society (Boelens, 2020a; de Roo, 2020). Currently however, spatial planning practices tend to prevail in a technocratic logic of control and supervision towards a predictable future (Boonstra and Boelens, 2011). The public institutional settings still continue to differentiate lay citizens from scientific and governmental experts, which makes it difficult to legitimise citizen engagement (Rose and Miller, 2010).

Another issue that spatial planning is facing relates to the unpredictability of today's societies which very notion is deeply contradictory with the initial planning paradigm of control and guidance (de Roo, 2020). The dynamism of the contemporary world has led political theorists and planners to view societies as part of a global network in an interconnected complex world (Murdoch, 1998). Societies cannot be understood anymore by analysing its different parts, but as complex dynamic world where multiple realities influence each other at different space and time scales (Boelens and de Roo,

2016). It inspired scholars to analyse and understand societies as interacting complex adaptive systems with multiple components and actors have self-organising capacities and continuously co-evolve (Sengupta et al., 2016; Teisman and Klijn, 2008). This systemic look not only sheds light on the multitude of interacting components in a spatial system but also on their continuous dynamism in time. While complex system theories contribute in a better understanding of contemporary socio-spatial systems, they generally lack in presenting pro-active or effective instruments (Boonstra and Boelens, 2011).

Spatial planners also sought inspiration from other concepts such as the adaptive or resilient capacity of systems in the face of uncertainty (Bertolini, 2010; Davoudi et al., 2012). Such reflective viewpoint focuses not only on understanding the systems but also on means and measures to cope with unexpected events. While stability and resisting capacity influence the level of a system's resilience, its ability to adapt and subsequently transform plays a key-role (Folke, 2006). In spatial planning, enhancing the resilience of a defined spatial system requires a better understanding of the infrastructural and ecological capacity as well as the evolution of the behavioural characteristics and social norms of its population. This understanding widens the possibilities to develop situational solutions when dealing with complex issues in spatial planning (Bertolini, 2010; Davoudi et al., 2012). As mentioned however, public institutions are still traditionally inclined to rely on technocratic approaches that do not take into account the concrete life-world of citizens.

Three main issues are presented here that represent challenges for spatial planning: 1) the recognition of citizen's role for active participatory planning, 2) the search for instruments or approaches in the face of unpredictable complexity and 3) the translation of spatial policies coherent in the concrete life-world of citizens. Based on the potentialities of citizen social science in policy-making, this paper explores how citizen social science could be serve in tackling these contemporary issues of spatial planning is facing. The paper links the different understandings of citizen social science with three theoretical considerations in spatial planning: communicative rationality, complex adaptive systems and resilience. The main guiding question of the paper is: "How can the societal benefits of citizen social science result in better planning policies and provide solutions to the complex issues spatial planners are facing". In current instances, citizen social science remains a wide concept. Its different interpretations yet distinctly encourage higher active participation of citizens in every step of policy-making, imply that it can be initiated by any societal actor and entail improved policy-making more relevant to the concrete lifeworld of citizens. The paper first presents existing theoretical considerations and understandings of citizen science and the subsequent introduction of citizen social science concepts. Following this, the paper draws significant potentialities in spatial planning from a communicative, complexity and resilience perspective.

2. Delineation of Citizen Science

2.1. Definitions

The term citizen science emerged in the mid-90s to designate diverse scientific activities in which citizens have either an active or a passive role (Strasser et al., 2018). The interpretation of citizen science largely depends on the scientific discipline, the societal context, the objectives of the activity and the involved stakeholders (Haklay et al., 2021). The exhaustive list of current definitions encompasses a wide set of purposes and approaches applied in different contexts.

Citizen science already had different interpretations since its first use in the 90s. Alan Irwin (1995) and Richard Bonney (1996), who are often credited as the first to use the term, each presented their own concept. As a science policy analyst, Irwin's original idea is set in a policy and social context, and sees it as science performed by citizens to serve the interest of citizens. His approach focuses on sustainable development, on a democratisation of science and on types of knowledge production that could not be produced by scientific institutions. Irwin sought the creation of a new role for citizens as legitimate scientific actors in society through citizen science (Irwin, 1995). As an ornithologist, Bonney's approach much more strongly stressed the input of observational data for scientists from citizens. He still considered the coordination of recognized academics as mandatory for a citizen science activity to be successful and receive the necessary recognition. He subsequently oriented his research on the scientific methodologies of citizen science and their added value for participants such as knowledge gain and increased awareness of scientific processes (Bonney et al., 2016, 2009).

More recently, Haklay et al. (2021) wrote an exhaustive review and evaluation of 34 definitions of citizen science from public agencies, universities, NGO's or multi-national organisations. They identified three main contexts with common characteristics in which citizen science is defined: a scientific, a societal and a political context. In the scientific context, citizen science is defined as citizen's participation in research academic knowledge production and enlargement of the scientific community. In a societal context, citizen science is applied to address community challenges, raise awareness, enhance knowledge amongst the population and create new networks. In the political context, the definitions of citizen science seek to enhance awareness and knowledge of policy -makers, build consensus and serve democratic legitimacy. Compared to the dichotomy of its original definitions of the mid-90s, the scientific characteristics echo with Bonney's (1996) conceptualisation. On the other hand, the societal and political characteristics pursue Irwin's (1995) thoughts on the potential of citizen science in a larger frame of society.

Citizen science has increasingly received recognition since its original conceptualisations, both for the production of scientific knowledge as for its added value to society (Voigt-Heucke and Riemenschneider, 2022). In this paper, citizen science is delineated as the participation of citizens in one or several steps of scientific inquiry, which consequently enhances the outreach and societal relevance of the scientific inquiry.

2.2. Typologies

The diversity of definitions indicate that the concept of citizen science is situational in time and space. Several academics reflected on ways of categorization and proposed a number of typologies. These typologies indicate a wide diversity of citizen science practices, which sheds light in the potential relevance in the context of spatial planning.

The recurrent typology for citizen science arguably is based on the level or degree of participation. This level of participation is generally situated in the frame of the different steps of scientific process (Wiggins and Crowston, 2011). These typologies commonly categorize citizen science projects based on the amount of steps where citizens play a role. This approach show similarities with dated Arnstein's ladder of participation (1969), which highlights the power and enforcement in spatial planning of citizens. Comparably, the typologies of Wiggins and Crowston also emphasize the power relationships in scientific research between citizen and academics. Perhaps the most referenced typology of citizen science is the one presented by Haklay (2013), which is based on the cognitive engagement of citizens:

Crowdsourcing, where participation is limited to the provision of resources and the cognitive engagement. Citizens can act as sensors to collect data or volunteer in shared computing.

Distributed intelligence, in which citizens act as basic interpreters of the collected data after some basic training.

Participatory science, in which the problem definition and collection method is set by the participants. Academics or experts subsequently perform the detailed analysis.

Extreme citizen science or collaborative science, in which citizens' activities are considered as a completely integrated where professional and non-professional scientists are involved in each step of the scientific process.

Figure 1. The four modes of citizen science based on the level of cognitive engagement
Source: Haklay, 2022.

Other typologies tend to encompass the variety of the citizen science concepts in their scientific and social contexts (Dillon et al., 2016; Wals, 2022). They distinguish the adaptive nature of the citizen science projects by identifying whether the goal is closed and pre-determined or open and co-determined. Next to these characteristics, they either analyse the level of participation (Dillon et al., 2016) or the drivers being more oriented to knowledge expansion or to social engagement (Wals, 2022). These typologies are featured in figure 2, which discerns science-, policy- and transition/concern- driven citizen science. In both models, science-driven citizen science very much coincides with Bonney's (1996) conception that underlines the importance of academic supervision in the scientific process and which implies specific, pre-determined scientific goals. This form of citizen science is often initiated by academics with a lower involvement of citizens. The policy- and transition/concern-driven citizen science approximate Irwin's (1995) idea where knowledge is produced to answer societal issues. These categories include academics as a group of stakeholders amongst many in a joint learning process leading towards fully engaged policies. As Wals (2022) points out, concern-driven citizen science is often initiated by citizens based on a common concern regarding their quality of life. Noticeably, both models regard "science-driven" citizen science as having pre-determined goals, coordinated by recognized researchers. They thus tend to maintain the notion of "science" and "scientist" within a recognized academic institutional realm.

From the perspective of spatial planning, citizen science cannot be regarded independently from its potential social and political impact. As spatial planning aims at shaping and governing space to achieve economic, social and environmental goals (Van Assche et al. 2013), the concept of citizen science in spatial planning has to be placed in the frame of those goals. In this paper, citizen science is therefore delineated as the active participation of citizens in one or several steps of scientific inquiry that subsequently serves in the development of spatial plans or policies. Such active participation implies a cognitive engagement and understanding of citizens in the economic, social and environmental goals addressed by the scientific inquiry.

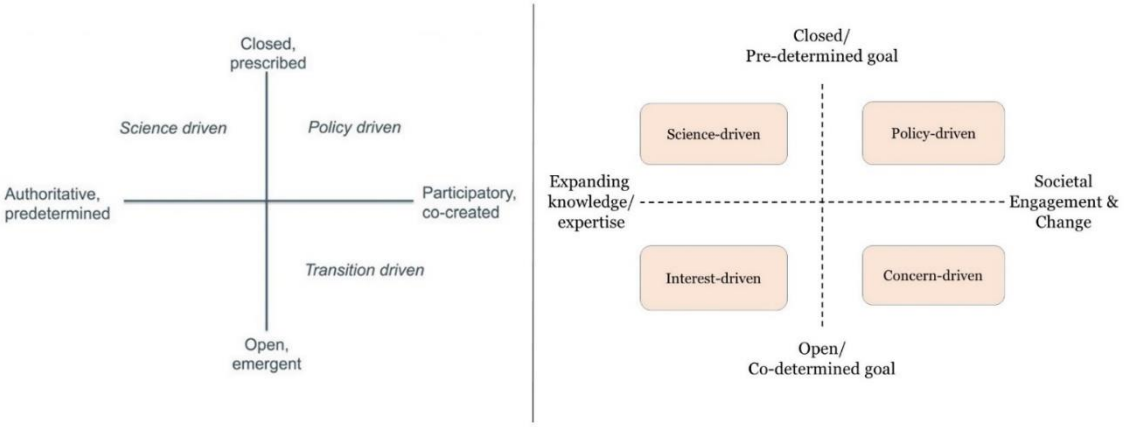


Figure 2.42 The citizen science typology developed by Dillon, Stevenson and Wals (2016) based on closed versus open goals and the level of participation (left) compared to the typology of Wals (2022) distinguishing closed versus open goals and scientific versus societal drivers (right).

2.3. Citizen *Social* Science

The growing interest amongst academics for the potential impact of citizen science on policy-making led to a further conceptualisation towards citizen social science. This concept of citizen social science centres around an involvement of citizens in the ensuing policy-making, based on the citizen scientific inquiries (Kythreotis et al., 2019). On a different note, citizen science has predominantly addressed environmental issues (Schade et al., 2021). Hence, several academics from social disciplines started exploring the potential of citizen science to address social or sociological issues.

Table 1. The concept of citizen social science proposed by Kythreotis et al. (2019) based on the typology of Haklay (2013)

Increasing levels of citizen participation and engagement ↑			
	(Level 5)	"Citizen Social Science"	• Citizens as key agents of research, action AND policy change at ALL levels of engagement and scales of the decision-making process
	Level 4	"Extreme Citizen Science"	• Collaborative science–problem definition, data collection and analysis
	Level 3	"Participatory Science"	• Participation in problem definition and data collection
	Level 2	"Distributed Intelligence"	• Citizens as basic interpreters • Volunteered thinking
	Level 1	"Crowdsourcing"	• Citizens as sensors • Volunteered computing

The first form of citizen social science, proposed by Kythreotis et al. (2019), is a continuation of the typology proposed by Haklay (2013), based on a vertical notion of participation, proposing a step beyond extreme citizen science (Kythreotis et al., 2019; see table 1). This concept builds upon the argument that citizen science, to date, merely uses citizens as policy passive objects for research. Kythreotis et al. (2019) propose to involve citizens not only in the different steps of scientific inquiry, but also in the ensuing policy-making. Citizens as key-agents would ensure the input of heterogeneous forms of social knowing, values and cultures both in the knowledge production and policy-making. This citizen social science framework sees all participating stakeholders as co-learners within a research process by actively exploring the possibility of transforming institutionalised research methods and policy systems towards more socially grounded policy decisions. It implies the effective integration of different forms of knowledge via the recognition of multiple social practices and experiences (Campos et al., 2021).The second form of citizen social science evolved from exploring the practicality of citizen science in social sciences. This concept of citizen social science does not necessarily imply the involvement of citizens at every step of the research process (Heiss et al., 2021; Pykett et al., 2020) A significant part of the studies discussing that form of citizen social science emphasize on the empowerment of citizens in the scientific process through the input of citizen-based knowledge and collective actions (Amirrudin et al., 2021; Campos et al., 2021; Perelló, 2021). Such objective could therefore only be attained through the engagement of citizens in all steps of the research process (Albert et al., 2021).

These two forms of citizen social science take fundamentally different starting points. The first form initially aims at addressing issues by empowering citizens at every step of scientific research to make policy-making more relevant in the social lifeworld of citizens. The second form can be seen as the active participation of citizens in social scientific research (Thomas et al., 2021). While there are differences, these forms share a significant amount of attributes and can sometimes be confused with one another. For instance,

addressing environmental issues through the input of citizen's knowledge based on their social lifeworld inherently brings a social dimension to the topic, which transforms the environmental issue into a social issue. Both interpretations entail an empowerment of citizen, the recognition of citizen-based knowledge and research based on multiple forms of knowledge. Both interpretations also imply an enduring on policy-making by increasing its social relevance. In this paper, citizen social science is defined as a form of citizen science that addresses social issues to enhance the relevance of policies in the social life-world of citizens.

3. Citizen Social Science and Spatial Planning

3.1. Introduction

The description in the previous section about the different definitions and typologies of citizen science shed light to its potential practicalities in the context of policy-making and enhanced participation. Consequently, this paper explores its links with conceptual spatial planning thoughts. The paper centres around three attention points that relate to complexity thinking: the technical versus communicative rationalities dichotomy, complex adaptive planning and evolutionary resilience. These three perspectives regard the spatial planning practice from different angles. The first focuses on how spatial planning reality is perceived, analysed and how the consequent course of actions is defined. The second tends to broaden the understanding of societies' complexity through a system-based analysis. The third centres its attention on The combination of those three perspectives allow to identify different notions and challenges spatial planning is facing and how it could benefit from citizen social science.

3.2. Rationalities

One approach is to regard planning practice from the perspective of the adopted rationality. Rationality can here be defined as the logical frame of intentional behaviour adopted by planners to define a course of action in a given situation, based on existing knowledge, information and experience (de Roo and Perrone, 2020). A dominant categorization of rationalities in spatial planning distinguishes technical from communicative rationality. The prior relies on objective reasoning and technical expertise to analyse the world, predict its potential future and act upon it rationally. Contrarily, the latter builds upon Habermas' communicative paradigm underlining the existence of multiple perceptions to this world. Communicative planning tends towards an agreed reality and subsequent course of action based on intersubjective reasoning (Boelens and Devos, 2022; de Roo and Perrone, 2020). While technical rationality can be useful in

situations with a limited number of influential actors and thus few planning objectives, communicative rationality seems more reasonable in complex situations with a high number of influential actors and several planning objectives to take into considerations (de Roo et al., 2020). Technical rationality is based on the assumption that issues can be understood and solutions can be developed through rational technical or strategic expertises from an objective approach. It traditionally implies top-down perspective of decision-making based on a central guiding position. Communicative rationality in spatial planning focuses on often called bottom-up approaches, which tends to develop decisions based on multiple perspectives from key-stakeholders and citizens or communities. Such rationality emphasizes intersubjectivity and horizontality in decision-making (de Roo and Perrone, 2020).

A similar dichotomy can be noticed in the initial definitions and interpretations of citizen science (see figure 3). Bonney's (1996) interpretation believed in the necessity of central guidance and a methodology-making by recognized academic actors to build research processes and produce scientific knowledge. In such design of citizen science, citizens tend to maintain a limited role in their participation along the scientific process. This role generally includes data collection and sometimes basic analysis of the data. The other steps of the scientific process are designed and performed by recognized academic actors (Haklay, 2013). In that sense, the knowledge that is produced is strongly academic-based. Much contrarily, Irwin's (1995) concept of citizen science underlined the importance and added-value of considering new forms of knowledge (Campos et al., 2021; Perelló, 2021). His concept is based upon the notion that academic knowledge is produced to serve the interests of recognized academics who act and work within their specific institutional settings. He therefore advocates for the acknowledgement of citizen-based knowledge, which would serve the interests of citizens, and an empowerment of citizens in the scientific process. The models adopted by Haklay (2013) and Kythreotis et al. (2019) speculates that this empowerment could entail an increase of citizen's participation in several steps of the scientific process. An increase of citizen's participation and cognitive engagement could thus go along with an increasing acknowledgement of their role in integrated knowledge and policy-making (Kythreotis et al., 2019).

Much like Arnstein's ladder (1969), this hierarchical approach does not reflect the diversity of contemporary practices. Several citizen science cases have shown that the reality is more nuanced in practice (Dillon et al., 2016; Strasser et al., 2018; Wiggins and Crowston, 2011). Citizen's participation often presents a dynamic and diverse character and consequently cannot be categorized based on a static form of citizen's participation in distinct steps of the scientific inquiry. For instance, citizens can sometimes initiate a citizen science project based on their societal concerns, thus formulating the problem statement, but rely on an academic team to collect the data and conduct the analysis. The initiating

citizens then use the academic-based results to outline policy recommendations to serve their interest or answer their concerns (Shirk et al., 2012). In that example, while citizens have a limited participation in the scientific inquiry, their cognitive engagement and empowerment in its societal and political relevance is nevertheless significantly high. Yet, one could question the relevance of these policy recommendations in the social life-world of these citizens as this life-world was not fully integrated in scientific inquiry.

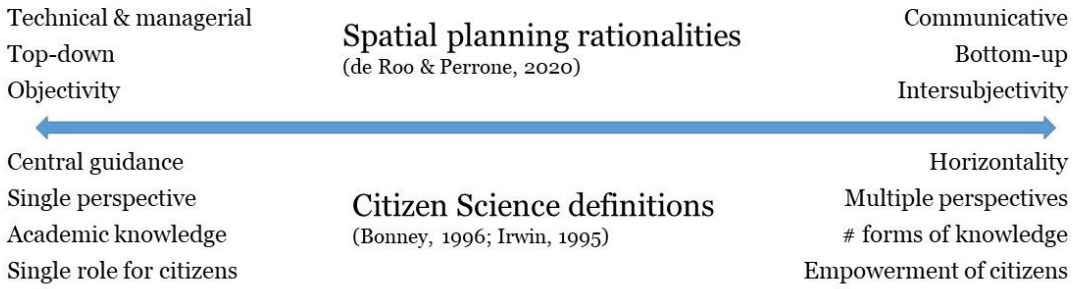


Figure 3. The similarities between the spatial planning rationalities as described by de Roo & Perrone (2020), the original interpretations of citizen science
Source: Bonney, 1996; Irwin, 1995.

Such framework coincides with Arnstein's hierarchical approach (1969) to participation which co-relates higher levels of participation to a greater empowerment. However, several citizen science cases indicate that the reality is more nuanced in practice (Dillon et al., 2016; Strasser et al., 2018; Wiggins and Crowston, 2011). Citizen's participation often presents a dynamic and diverse character and consequently cannot be categorized based on a static form of citizen's participation in distinct steps of the scientific inquiry. For instance, citizens can sometimes initiate a citizen science project based on their societal concerns, thus formulating the problem statement, but rely on an academic team to collect the data and conduct the analysis. The initiating citizens then use the academic-based results to outline policy recommendations to serve their interest or answer their concerns (Shirk et al., 2012). In that example, while citizens have a limited participation in the scientific inquiry, their cognitive engagement and empowerment in its societal and political relevance is nevertheless significantly high.

3.3. Complex Adaptive Planning

The emphasis towards the integration of multiple perspectives and intersubjectivity in citizen social science is consistent with the advocacy of highly communicative approaches

in spatial planning when facing significantly complex issues. In his earlier works in environmental planning, de Roo (2003) presented a framework depicting the level of complexity in function of the number of planning objectives and the number of actors related to these objectives (figure 4). This framework first describes the number of objectives and actors as being directly correlated. In other words, the more goals are included in spatial plans the higher the amount of actors are related and will interact with these goals. Secondly, the level of complexity of the issues are directly proportionate with the amount of objectives and interacting actors (de Roo, 2003). In such depiction, where complexity is defined by the amount of actors and objectives influencing the spatial plans, the appropriate rationality can be adopted depending on the level of complexity of the issue. In case of simple and relatively static situations with few actors involved, a technical rationality could be the most appropriate. The best rationality becomes progressively communicative with increasing complexity, which implies an acknowledgement of multiple perspectives and forms of knowledge to address those issues.

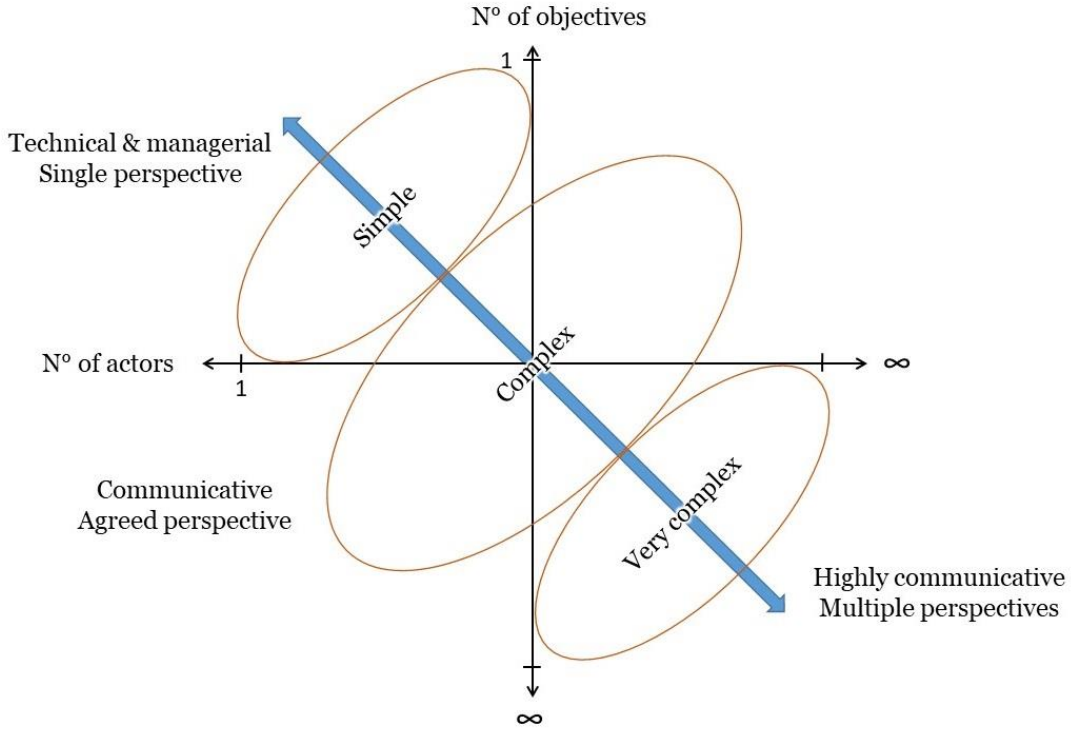


Figure 4.43 Transposing the citizen science dichotomy on the framework proposed by de Roo (2003) depicting the relationship between number of planning goals and interactions based on level of complexity.

However, more recent planning reflections brought the concept of co-evolution to consider, which adds a layer of complexity to such analysis. Co-evolution concretely implies a dynamic feature of the number of actors and objectives in such model. Actors and factors of importance in a certain situation co-evolve continuously in time bringing new circumstances, for better or worse (Boelens, 2020a). This dynamism in time has led to the development of the complex adaptive planning concept. The concept still implies the possibility of addressing issues from a traditional technical and single perspective if the situation allows it. However, circumstances can change requiring a highly adaptive capacity from the planner and the participating actors. When a certain level of complexity and unpredictability is reached, spatial planning practices then change from a position of leadership and control to a position of observation and adaptation. In these situations, the level of complexity and unknown necessitates an adaptive learning behaviour to grasp the new situation (de Roo et al., 2020; Rauws et al., 2019). The dynamic complexity explained above would also imply an adaptive capacity when conducting a particular form of citizen social science in spatial planning. In case of new circumstances a new form of citizen social science might be adopted entailing an adaptive learning behaviour from the actors involved in citizen science.

3.4. Evolutionary Resilience

The challenge of dealing with unexpected change also introduced the concept of resilience in spatial planning. The resilience thinking originally emerged from the 1970s to study how ecological systems deal with stresses and shocks by external factors. Resilience was thus primarily used in relation to environmental hazards and risk mitigation for environmental management. Gradually, spatial planners started exploring its application in the context of complexity and in the face of important demographic, economic and social change (Bertolini, 2010; Davoudi et al., 2012). The initial conception of resilience defined as the persistence and ability of a system to resist or absorb disturbances and maintain the relationships between its population or its state variables. The resilience concept thus identified two different ways to deal with change: stability, resist and return to equilibrium after the shock or absorb the change and get to a new equilibrium (Folke, 2006). The application of resilience thinking in social systems however, led to the conceptualisation of a third form: socio-ecological resilience. The socio-ecological resilience is regarded as the capacity to adapt through behavioural change and ecological transformation (Tempels, 2016). In the context of spatial planning, some commentators highlight its similarities with the co-evolutionary perspective and thus prefer to call it evolutionary resilience (Davoudi et al., 2012). The concept of evolutionary resilience relates more directly with complexity and co-evolutionary thinking where systems are identified as being complex, uncertain, non-linear and self-organising (Davoudi et al.,

2012).

This latter concept of co-evolutionary resilience in spatial planning instigates a continuous search for robust measures and options that should be left open. It requires an ongoing societal dialogue covering different views on the means and goals of planning and experimental attitude towards policies and the appropriate interventions (Bertolini, 2010). While the resilient concept encourages a continuous dialogue between key actors to consider technical, ecological and social measures to address change, public institutional and administrative structures still tend to manage societal issues from a fragmented expertise-based approach (Boelens, 2020b). Furthermore, public institutions are traditionally inclined to apply engineering-based measures by focusing primarily on infrastructural change (Tempels, 2016). Such assessment instigates the advocacy for nurturing diversity and combining knowledge systems into institutions. It includes logics of conflict resolution, negotiation, and participation to maintain a process of learning and adaptation in the face of uncertainty (Folke, 2017). Citizen social science, by producing knowledge from a citizen's perspective, helps in understanding the co-evolution of behavioural change and communities' perceptions regarding complex spatial issues. The application of citizen social science in the process of spatial policy-making would therefore intrinsically induce spatial policies that do take into account the real-life world of citizens.

4. Discussion

In this paper, three theoretical concepts were used to explore the potential of citizen social science in spatial planning: the technical versus communicative rationality, complex adaptive planning and evolutionary resilience. All three of these theoretical reflections emphasize on the importance of multi-stakeholders' involvement, space for self-organisation, a recognition of multiple perspectives and an open-mindedness for new potential situations. To put it more bluntly, societies need to open-up beyond their institutional realms and learn to observe from different perspectives, learn and adapt.

Originally, learning is the basic objective of any form of scientific research. The ensuing knowledge production is performed to develop a better understanding of this world and the processes that shape it (Cambridge, 2023). The primary conceptions of the scientific method to conduct scientific research takes its grounds in the 17th century, during the so-called Enlightment. The scientific method was regarded as a guarantee of a certain objectivity to study processes and to produce knowledge. Nowadays, the scientific method is predominantly used by recognized actors with a specific academic background and following a specific institutional-related framework. The objectivity of recognized scientifically produced knowledge is therefore subject to an epistemological debate (Irwin, 1995). In that sense, citizen social science proposes alternative models of knowledge

production in accordance with the scientific method and based on dialogue between multiple members of communities and by fostering commitment (Campos et al., 2021). Its approach inherently implies a learning process that goes beyond in the traditional institutional approaches of knowledge production and a subsequent understanding of socio-ecological systems. Citizen social science hence motivates to look beyond traditional engineering approaches to address societal issues. As a form of scientific research, it aims at a greater understanding of societal situations. Traditional actors however cannot apply citizen social science on their own. Citizen social science can be applied both through the collaboration between academic actors and lay-citizens or by a group of self-organising citizens. Ultimately, citizen social science can be thought of as a highly potential planning tool to continuously explore and deal with complex adaptive systems and possible socio-ecological interventions for an enhanced resilience.

Through this paper's literature review, several advantages are identified to apply it in spatial planning. These advantages can be formulated in the frame of the three main issues presented in the introduction: (1) the lack of recognition of citizen's role for active participatory planning, (2) the difficult search for instruments or approaches in the face of unpredictable complexity and (3) the translation of spatial policies coherent in the concrete life-world of citizens. Firstly, citizen social science can theoretically be initiated by any societal actor and subsequently serve "to develop a better understanding of the world (Cambridge, 2023)" from the perspective of the real life-world of citizens. Its conception intrinsically implies an essential active role for citizen to develop this new understanding. Secondly, it offers a wide array of possible modus operandi where any actor can actively participate in any step of the scientific process, as long as citizen's play a key-role. Depending on the level of the citizen's role, citizen social science presents various degrees of divergence to the traditionally recognized knowledge production. The role of each actor can be determined in function of situational factors of importance and different institutional settings. It thus has the potential to take any form and be carry out in function of situational circumstances. In the end, citizen social science can serve as useful socio-political learning tool in spatial planning to understand complex adaptive systems.

These conclusions are based on a comparison of theoretical reflections around citizen science and spatial planning and on an effort of joining them coherently. While this exercise led to the formulation of promising benefits of citizen social science in spatial planning, these potentialities were only theoretically conceptualised and thus remain hypothetical. Further investigation through practical case-studies could shed light to what extent these benefits are achieved and what situational factors influence those benefits.

Acknowledgments. This paper was written under the frame of the joint PhD conducted by Tom Goosse between the Centre of Mobility and Spatial Planning of the UGent (Belgium) and the Department of Spatial Planning of the RUGroningen (The Netherlands). The PhD research is promoted by prof. Luuk Boelens (UGent) and Gert de Roo (RUGroningen) and supervised by Dr. Tim Devos (UGent) and Dr. Christian Lamker (RUGroningen).

References

Albert, A., Balázs, B., Butkevičienė, E., Mayer, K., Perelló, J., 2021. Citizen Social Science: New and Established Approaches to Participation in Social Research, in: Vohland, K., Land-Zandstra, A., Ceccaroni, L., Lemmens, R., Perelló, J., Ponti, M., Samson, R., Wagenknecht, K. (Eds.), The Science of Citizen Science. Springer International Publishing, Cham, pp. 119–138. https://doi.org/10.1007/978-3-030-58278-4_7

Amirrudin, A., Harrigan, N., Naqvi, I., 2021. Scaled, citizen-led, and public qualitative research: A framework for citizen social science. Current Sociology 001139212110560. https://doi.org/10.1177/00113921211056057

Bertolini, L., 2010. 6 Complex Systems, Evolutionary Planning? A planner's encounter with complexity 81–98.

Boelens, L., 2020a. Opening up new Planning Landscapes – An introduction in the actor-relational approach of planning, in: Opening up the Planning Landscape - 15 Years of Actor-Relational Approaches to Spatial Planninf in Flanders, the Netherlands and Beyond. Beitske Boonstra, Peter Davids & Annelies Staessen, Groningen, p. 389.

Boelens, L., 2020b. Struggling with climate change – Dealing with a complex adaptive system, in: Opening up the Planning Landscape - 15 Years of Actor-Relational Approaches to Spatial Planninf in Flanders, the Netherlands and Beyond. Beitske Boonstra, Peter Davids & Annelies Staessen, Groningen, p. 389.

Boelens, L., de Roo, G., 2016. Planning of undefined becoming: First encounters of planners beyond the plan. Planning Theory 15, 42–67. https://doi.org/10.1177/1473095214542631

Boelens, L., Devos, T., 2022. Course Introduction Planning Theory 22-23 - Session 3: Advocacy Planning, Neigbourhood & Participatory planning.

Bonney, R., Cooper, C.B., Dickinson, J., Kelling, S., Phillips, T., Rosenberg, K.V., Shirk, J., 2009. Citizen Science: A Developing Tool for Expanding Science Knowledge and Scientific Literacy. BioScience 59, 977–984. https://doi.org/10.1525/bio.2009.59.11.9

Bonney, R., Phillips, T.B., Ballard, H.L., Enck, J.W., 2016. Can citizen science enhance public understanding of science? Public Underst Sci 25, 2–16.

https://doi.org/10.1177/0963662515607406
Boonstra, B., Boelens, L., 2011. Self-organization in urban development: towards a new perspective on spatial planning. Urban Research & Practice 4, 99–122. https://doi.org/10.1080/17535069.2011.579767
Cambridge, 2023. Research [WWW Document]. Cambridge Dictionary. URL https://dictionary.cambridge.org/dictionary/english/research (accessed 4.25.23).
Campos, R., Monteiro, J., Carvalho, C., 2021. Engaged Citizen Social Science or the public participation in social science research. JCOM 20, A06. https://doi.org/10.22323/2.20060206
Davoudi, S., Shaw, K., Haider, L.J., Quinlan, A.E., Peterson, G.D., Wilkinson, C., Fünfgeld, H., McEvoy, D., Porter, L., Davoudi, S., 2012. Resilience: A Bridging Concept or a Dead End? "Reframing" Resilience: Challenges for Planning Theory and Practice Interacting Traps: Resilience Assessment of a Pasture Management System in Northern Afghanistan Urban Resilience: What Does it Mean in Planning Practice? Resilience as a Useful Concept for Climate Change Adaptation? The Politics of Resilience for Planning: A Cautionary Note: Edited by Simin Davoudi and Libby Porter. Planning Theory & Practice 13, 299–333. https://doi.org/10.1080/14649357.2012.677124
de Roo, G., 2020. Introduction to the Handbook on Planning and Complexity, in: Handbook on Planning and Complexity. Edward Elgar Publishing, Cheltenham, UK ; Northampton, MA, p. 400.
de Roo, G., 2003. Planning-Oriented Action in a Theoretical Perspective, in: Environmental Planning in the Netherlands: Too Good to Be True. pp. 87–156.
de Roo, G., Perrone, C., 2020. A multi-level rationality model for planning behaviour, in: Handbook on Planning and Complexity. Edward Elgar Publishing Limited, Cheltenham, UK ; Northampton, MA, p. 400.
de Roo, G., Rauws, W., Zuidema, C., 2020. Adaptive planning and the capacity to perform in moments of change, in: Handbook on Planning and Complexity. Edward Elgar Publishing Limited, Cheltenham, UK ; Northampton, MA, p. 400.
Dillon, J., Stevenson, R.B., Wals, A.E.J., 2016. Introduction to the special section Moving from Citizen to Civic Science to Address Wicked Conservation Problems. Corrected by erratum 12844: Moving from Citizen to Civic Science. Conservation Biology 30, 450–455. https://doi.org/10.1111/cobi.12689
Folke, C., 2017. Socio-Ecological Resilience and Behavioural Responses, in: Individual and Structural Determinants of Environmental Practice. Bengt Hansson & Anders Biel, London, p. 258.
Folke, C., 2006. Resilience: The emergence of a perspective for social–ecological systems analyses. Global Environmental Change 16, 253–267. https://doi.org/10.1016/j.gloenvcha.2006.04.002
Freitag, A., 2016. A typology for strategies to connect citizen science and management.

Environ Monit Assess 188, 519. https://doi.org/10.1007/s10661-016-5513-y
Haklay, Dörler, D., Heigl, F., Manzoni, M., Hecker, S., Vohland, K., 2021. What Is Citizen Science? The Challenges of Definition, in: Vohland, K., Land-Zandstra, A., Ceccaroni, L., Lemmens, R., Perelló, J., Ponti, M., Samson, R., Wagenknecht, K. (Eds.), The Science of Citizen Science. Springer International Publishing, Cham, pp. 13–33. https://doi.org/10.1007/978-3-030-58278-4_2
Haklay, M., 2013. Citizen Science and Volunteered Geographic Information: Overview and Typology of Participation, in: Sui, D., Elwood, S., Goodchild, M. (Eds.), Crowdsourcing Geographic Knowledge. Springer Netherlands, Dordrecht, pp. 105–122. https://doi.org/10.1007/978-94-007-4587-2_7
Healey, P., 2003. Collaborative Planning in Perspective. Planning Theory 2, 101–123. https://doi.org/10.1177/14730952030022002
Heiss, R., Schmuck, D., Matthes, J., Eicher, C., 2021. Citizen Science in Schools: Predictors and Outcomes of Participating in Voluntary Political Research. SAGE Open 11, 215824402110164. https://doi.org/10.1177/21582440211016428
Innes, J.E., 1998. Information in Communicative Planning. Journal of the American Planning Association 64, 52–63. https://doi.org/10.1080/01944369808975956
Irwin, A., 1995. CITIZEN SCIENCE: A study of people, expertise and sustainable development 213.
Kythreotis, A.P., Mantyka-Pringle, C., Mercer, T.G., Whitmarsh, L.E., Corner, A., Paavola, J., Chambers, C., Miller, B.A., Castree, N., 2019. Citizen Social Science for More Integrative and Effective Climate Action: A Science-Policy Perspective. Frontiers in Environmental Science 7. https://doi.org/10.3389/fenvs.2019.00010
Murdoch, J., 1998. The spaces of actor-network theory. Geoforum 29, 357–374. https://doi.org/10.1016/S0016-7185(98)00011-6
Perelló, J., 2021. Sobre la possibilitat d'una ciència ciutadana social. Mètode. https://doi.org/10.7203/metode.12.18136
Pykett, J., Chrisinger, B., Kyriakou, K., Osborne, T., Resch, B., Stathi, A., Toth, E., Whittaker, A.C., 2020. Developing a Citizen Social Science approach to understand urban stress and promote wellbeing in urban communities. Palgrave Commun 6, 85. https://doi.org/10.1057/s41599-020-0460-1
Rauws, D.W., Zuidema, D.C., de Roo, G., 2019. ADAPTIEVE PLANNING IN PERSPECTIEF 75.
Rose, N., Miller, P., 2010. Political power beyond the State: problematics of government: Political power beyond the State. The British Journal of Sociology 61, 271–303. https://doi.org/10.1111/j.1468-4446.2009.01247.x
Schade, S., Pelacho, M., van Noordwijk, T. (C. G.E.), Vohland, K., Hecker, S., Manzoni, M., 2021. Citizen Science and Policy, in: Vohland, K., Land-Zandstra, A., Ceccaroni, L., Lemmens, R., Perelló, J., Ponti, M., Samson, R., Wagenknecht, K. (Eds.), The Science of Citizen Science. Springer International Publishing, Cham, pp. 351–371.

https://doi.org/10.1007/978-3-030-58278-4_18
Sengupta, U., Rauws, W.S., De Roo, G., 2016. Planning and complexity: Engaging with temporal dynamics, uncertainty and complex adaptive systems. Environ Plann B Plann Des 43, 970–974. https://doi.org/10.1177/0265813516675872
Shirk, J.L., Ballard, H.L., Wilderman, C.C., Phillips, T., Wiggins, A., Jordan, R., McCallie, E., Minarchek, M., Lewenstein, B.V., Krasny, M.E., Bonney, R., 2012. Public Participation in Scientific Research: a Framework for Deliberate Design. E&S 17, art29. https://doi.org/10.5751/ES-04705-170229
Strasser, B.J., Baudry, J., Mahr, D., Sanchez, G., Tancoigne, E., 2018. "Citizen Science"? Rethinking Science and Public Participation. S&TS 52–76. https://doi.org/10.23987/sts.60425
Teisman, G.R., Klijn, E.-H., 2008. Complexity Theory and Public Management: An introduction. Public Management Review 10, 287–297. https://doi.org/10.1080/14719030802002451
Tempels, B., 2016. Veerkracht tegen overstromingen: een co-evolutionaire benadering Bewoners, ruimtelijke ontwikkelingen en overstromingsbeheer in het Denderbekken 212.
Thomas, S., Scheller, D., Schröder, S., 2021. Co-creation in citizen social science: the research forum as a methodological foundation for communication and participation. Humanit Soc Sci Commun 8, 244. https://doi.org/10.1057/s41599-021-00902-x
Van Assche, K., Beunen, R., Duineveld, M., de Jong, H., 2013. Co-evolutions of planning and design: Risks and benefits of design perspectives in planning systems. Planning Theory 12, 177–198. https://doi.org/10.1177/1473095212456771
Voigt-Heucke, S., Riemenschneider, D., 2022. The transformative potential of citizen science. European Research Council.
von Gönner, J., Herrmann, T.M., Bruckermann, T., Eichinger, M., Hecker, S., Klan, F., Lorke, J., Richter, A., Sturm, U., Voigt-Heucke, S., Brink, W., Liedtke, C., Premke-Kraus, M., Altmann, C., Bauhus, W., Bengtsson, L., Büermann, A., Dietrich, P., Dörler, D., Eich-Brod, R., Ferschinger, L., Freyberg, L., Grützner, A., Hammel, G., Heigl, F., Heyen, N.B., Hölker, F., Johannsen, C., Kluß, T., Kluttig, T., Knobloch, J., Munke, M., Mortega, K., Pathe, C., Soßdorf, A., Stämpfli, T., Thiel, C., Tönsmann, S., Valentin, A., Wagenknecht, K., Wegener, R., Woll, S., Bonn, A., 2023. Citizen science's transformative impact on science, citizen empowerment and socio-political processes. Socio Ecol Pract Res 5, 11–33. https://doi.org/10.1007/s42532-022-00136-4
Wals, A.E.J., 2022. Transformative Citizen Science for Sustainability - Four Strands of Citizen Science.
Wiggins, A., Crowston, K., 2011. From Conservation to Crowdsourcing: A Typology of Citizen Science, in: 2011 44th Hawaii International Conference on System Sciences. Presented at the 2011 44th Hawaii International Conference on System Sciences (HICSS

2011), IEEE, Kauai, HI, pp. 1–10. https://doi.org/10.1109/HICSS.2011.207

RESEARCH ON REGENERATION STRATEGIES OF OLD URBAN AREAS FROM THE PERSPECTIVE OF RESILIENCE: TAKE ERQI SQUARE IN DALIAN, CHINA AS AN EXAMPLE (1078)

Jianing SHI1, Gangyu HU1, Jianzhong HUANG 1*, Siyu CHENG2, Jinling ZHAO3

1 Tongji University College of Architecture and Urban Planning, Shanghai, China; huang03213@tongji.edu.cn

2 School of Architecture and Planning, Shenyang Jianzhu University

3 School of Architecyure&Fine Art, Dalian University of Technology

Abstract. The regeneration of old urban areas is faced with various problems such as low spatial and environmental quality, functional decline and inadequate ability to cope with emergencies, and weak resilience, but the existing regeneration strategies lack attention to resilience. This paper aims to explore the regeneration strategy of old urban areas from the perspective of resilience, clarifies the connotation of resilience in the regeneration of old urban areas, and constructs a resilience analysis framework comprising four dimensions, including economic, engineering, environmental and social dimensions. The study proposes a regeneration path that integrates the concept of resilience into the whole process, and proposes a regeneration strategy for the old areas from four aspects, including production, living, ecology and governance, in order to improve the ability of the old areas to cope with risks.

Keywords: urban resilience, old urban areas, risk response, urban regeneration

1. Introduction

In recent years, the frequency of various risks and disturbances is increasing. Cities are not only facing sudden acute shocks such as natural disasters and public health crises, but also facing chronic pressures such as aging infrastructure, low efficiency of public transport, and declining social cohesion. These two kinds of risks have brought great challenges to urban development from different perspectives. As an important part of urban land stock, the old area often weakens with the development of the city, and often faces many problems such as imperfect infrastructure, lack of public services, and imperfect governance system. Therefore, compared with the new area in the city, the old area has a weaker ability to resist risks, and it is difficult to effectively respond to risks when they come. As a result, the operation of the area may be impeded and the daily life of residents in the area may be greatly affected.

In many important development strategies, China has clearly proposed that the functions of existing areas such as old residential areas, old factories and old urban villages should be upgraded. The upgrading of these old areas should not only be limited to the improvement of existing functions within the area, but also be integrated with the concept of resilience, so that they can resist external risks and operate stably when risks come. The study combed the relevant studies on resilience, clarified the connotation of the regeneration of old urban areas from the perspective of resilience, constructed the framework and content of the regeneration of old urban areas from the perspective of resilience, expected to expand the connotation of the resilience perspective from the level of the regeneration of old urban areas, and put forward suggestions for the integration of the concept of resilience into the regeneration.

The first section introduces the background of the study and outlines the significance and purpose of the research. Section 2 provides an overview of the research process of resilience and its development in the field of urban studies and related definitions, introduces the international and Chinese research on old urban areas and defines the connotation of old urban areas regeneration under the resilience perspective studied in this paper. Section 3 presents the overall process of proposing a regeneration strategy for old urban areas from a resilience perspective, the methods of integrating resilience at different stages and the reasons for adopting each specific tool. Section four uses Erqi Square in Dalian as a practical case study to explore the application of the research framework for the regeneration of old urban areas from a resilience perspective in practice, and proposes specific regeneration measures for the problems and underlying conditions of the Erqi Square area in Dalian. Section five provides a further discussion on the integration of resilience into the regeneration of old urban areas. Section six concludes the study.

2.Literature review

2.1 Origin and development of toughness

The word ‘resilience’ is derived from the Latin word ‘resilio’, meaning ‘to return to a pristine state’. Later, it evolved into the modern English word ‘resile’ and is still used today; Holling(1973) and his research put forward the concept of ecosystem resilience, focusing on the balance of ecosystems; with the increase of risks faced by cities and the adaptability of resilience and urban systems gradually emerged, the concept of urban resilience began to be studied The concept of urban resilience has been studied, and different scholars have defined and interpreted the concept from different perspectives, and gradually developed a definition of resilient cities. Related studies such as Sara Meerow et al. (2016)define urban resilience as the ability of an urban system and all its

inter-temporal socio-ecological and socio-technical component networks to maintain or rapidly restore expected functions, adapt to change and rapidly transform systems that limit current or future adaptive capacity when disturbed. Chen et al.(2017) summarise the basic framework of a resilient city into four aspects: economic, engineering, environmental and social. The resilient city includes the ability of the urban system to adjust itself and resist external blows and the ability of the urban system to turn opportunities into advantages. Qiu (2018) classifies urban resilience into three levels: structural resilience, process resilience and system resilience, structural resilience includes technical resilience, economic resilience, social resilience and government resilience, which refer to the ability of infrastructure to cope with urban disasters, economic structure to resist financial drastic changes, social people to face major events, and government departments to maintain stability and stabilize people's hearts. Meng et al.(2022) study from the perspective of urban resilience practices, arguing that the resilient city as a whole consists of three components: resilient production, resilient living and resilient ecology.

In general, although some of the angles and dimensions are different in the analysis, these related studies express the meaning that urban resilience is the ability of cities to react to and adapt to disturbances and restore stability when they are exposed to risks or disturbances (including physical damage, economic disruption, etc.), and split the resilience construct into multiple dimensions. Subsequent researchers have built on the foundational consensus to focus on both resilience building and sustainable development to ensure the stable operation and dynamic optimisation of urban systems.

2.2. Definition of old areas and related studies

Research on old areas has focused on the redevelopment and regeneration of areas. Based on the research of Wang et al.(2022), there is no clear definition of ‘old areas’ in international studies, but the research objects include old down town areas and old residential areas. International research on old areas and related areas is often combined with capital intervention and government management, and a more comprehensive regeneration system has been built through the study of the transformation modes of different types of areas and the regeneration process carried out by various departments and regeneration bodies. Existing Chinese studies on the regeneration and transformation of old areas and areas have focused on transformation models, transformation implementation paths and outcomes, as well as governance for old communities, but the part that has formed a consensus lacks research on the resilience of old areas.

In recent years, Chinese research on old areas and communities from the perspective of resilience has mainly focused on the level of public participation and the resilience of governance capacity. Many articles apply the concept of resilience in the study of area

regeneration, but only superficially describe resilience in the definition of the concept, and do not integrate the definition of resilience with the actual situation and the characteristics and connotations of resilience in the subsequent analysis and strategy recommendation process. Some articles also assess the resilience of old areas, but only propose assessment systems and methods without subsequent case studies.

This paper argues that an old urban area is one that has been built earlier in the urban development process, has a dilapidated physical environment, has a high vacancy rate of shops, and has infrastructure support that cannot meet the current living needs of the area's residents. It often includes one or more of the old residential areas, old factories and old urban villages. In this paper, we consider the old area to include not only residential areas, but also related urban public services and infrastructures.

2.3 The connotations of regeneration in old areas through the lens of resilience

This paper argues that to build a framework for the regeneration of old areas from a resilience perspective, it is necessary to integrate the concept of resilience into the whole process of regeneration, while considering the response to different stages of resilience in the regeneration of different systems. Therefore, in the regeneration of old areas from a resilience perspective, it is necessary to consider old areas as a collection of multiple complex systems, and to integrate the concept of resilience into the regeneration of systems with different dimensions and functions. Old areas should have the ability to resist, absorb and quickly restore stable operation in different dimensions after regeneration. It also should be able to meet the needs for stable operation and continuous optimisation of different systems while resisting different risks and disturbances.

3. Methodology

In order to propose a practical regeneration strategy for old areas, the study proposes a regeneration path based on the concept of resilience. The study also attempts to present detailed methods for incorporating resilience at different stages and the reasons for adopting each specific means.

3.1 Construction of regeneration path covered by the whole process of resilience concept

The regeneration phase of an old area is often divided into an analysis of the current situation of the area, the search for a regenerable site and the proposal of a specific regeneration strategy that combines these two aspects. To build a framework for regeneration of old areas from a resilience perspective, it is necessary to integrate the concept of resilience into the whole process of regeneration, and to consider the response to different stages of resilience in different systems of regeneration. The regeneration

path is summarised into a three-stage process: exploring the problems of old areas - the search for regeneration space - proposal for a regeneration strategy that incorporates the concept of resilience (figure.1).

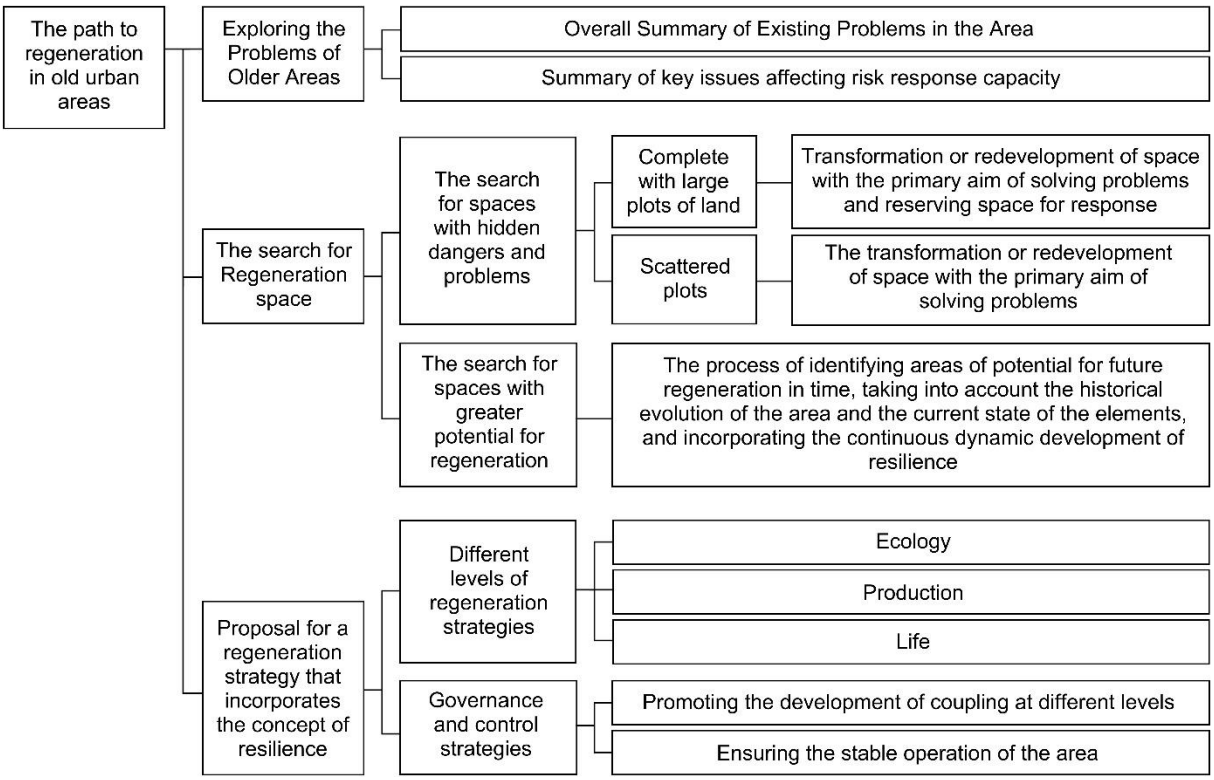


Figure 1. A three-stage regeneration path incorporating the concept of resilience

In the current situation analysis stage, while sorting out the existing problems in the area, we should focus on analyzing the key problems that lead to the poor ability of the area to deal with risks in combination with the needs of the resilience concept. In the process of solving the overall problem, we should focus on analyzing the causes of the key problems, which will support the proposal of the follow-up regenerate strategy.

In the search phase for regenerable plots, it is necessary to find spaces with larger problems and those with greater potential for regeneration. The main reason for this step is the current high density of construction in the city and the lack of space in the old areas of the city. On the one hand, the high density of construction makes it difficult to evacuate people in time in the event of a disaster, and on the other hand, it is difficult to take isolation measures in the event of a public health crisis, either of which is detrimental to the stable operation of the area. Therefore, it is necessary to identify areas that can be regenerated on a large scale or adapted on a small scale for the construction of disaster prevention or evacuation spaces by sorting out the current spatial elements and sites. The

integration of the concept of resilience in this phase of site identification means that, in addition to identifying the physical and spatial elements that are in a state of disrepair and can be demolished or rehabilitated from a qualitative point of view, it is also necessary to consider spaces that are likely to be affected by disasters and those that will be disturbed by other urban influences, such as the possible construction of future large-scale projects. It is in order to provide a comprehensive consideration of the spaces that can be used and are proposed for conversion.

Furthermore, the identification of renewable land in the region cannot only identify renewable land at a certain point in time, but rather focus on possible future areas of regeneration potential when analysing the current situation. The delineation of possible regeneration potential areas should take into account the possibility of regeneration evolution and development over different periods of time, thus delineating time-phased potential areas that will inform the future renewal of the area during the evolutionary process.

The path of regeneration can be constructed after the analysis of current problems and the excavation of regenerable potential land. In general, regeneration tends to focus on the optimisation and improvement of different aspects and dimensions, or on problem solving. Thereafter, possible regeneration strategies are often proposed for multi-level spaces and systems such as ecology, production and living. In addition, incorporating the concept of resilience into the construction of regeneration paths requires integrating different dimensions of resilience thinking into the regeneration systems at different levels. At the same time, consider how to make the system resilient in the regenerate path. In previous studies, the characteristics of toughness generally include robustness, redundancy, rapidity and resourcefulness, as well as the frequently mentioned '4R' characteristics. In addition, it also includes flexibility, prevention and other characteristics. Looking at the regeneration of the old areas from the perspective of resilience, we need to consider responding to these characteristics by means of regeneration in the process of regeneration.

3.2 Regenerated content integrating multi-dimensional resilience thinking

In the process of regeneration, we often propose and build regenerate strategies and regenerate paths for different systems and dimensions contained in the area, and propose corresponding governance suggestions for the future development of the area and the aspects used to support the implementation of regenerate strategies. To regenerate a region from the perspective of resilience, it is necessary to consider how to make the complex system of the region have various characteristics of resilience through regeneration in the process of regeneration different dimensional systems. The research believes that the regeneration content of multi-dimensional resilience thinking needs to

consider four aspects, including production, life, ecology and governance, and incorporate resilience of different functional dimensions in the process, and develop the regeneration goals, as shown in Table 1.

Table.1. Regenerated contents and target framework

Regenerate content	Functional dimension	Regeneration goal - benefit improvement	Corresponding toughness characteristics
ecology	Environmental dimension	Through regeneration creates a zone with the capacity to absorb the effects of natural disasters and maintain the normal functioning of the zone's systems under the impact.	Robustness and adaptability
production	Economic dimension	Through regeneration creates an area capable of resisting external economic turbulence	Robustness and redundancy
life	Engineering dimension	Through regeneration creates a area that can meet the needs of residents in the area to use various infrastructures under different risks and disturbances, and constantly adapt to the needs of residents to develop and improve the service capacity of facilities	Robustness, adaptability, flexibility
governance	Social dimension	Through regeneration creates areas that meet the needs of different groups, can bring new vitality through the interaction of multiple age groups and types of people, and can quickly respond to risks	Resourcefulness and rapidity

4. Result：Regeneration strategy for the Erqi Square area of Dalian

This section takes Erqi Square in Dalian as a case, applies the regeneration framework incorporating the concept of resilience, and proposes the regeneration strategy for this area.

4.1 Overview of the Area

Dalian Erqi Square is located in the core area of the central urban area of Dalian, Liaoning Province, China, close to the core development axis of city's Qingniwa - Donggang core business and trade axis (figure.2). The initial construction of the area can be traced back to around 1890s. The area was built during the Russian occupation period, which is one of the origins of urban development in Dalian. The development of the area is also closely related to the development of the city. The initial construction made the area form a radial road network texture. During the period of Japanese occupation from 1904 to 1945, the area developed and expanded, gradually developing the functions of production, residence and commerce. On the basis of the original radial road network, a grid road network was built, forming a grid block. From 1945 to 1970, the area mainly developed industrial related functions. In the early stage, it was mainly used as a processing and transit base for products such as refined oil and chemicals. The corresponding dynamic area was also concentrated near the factory. In the later stage, it was mainly used as a chemical area of the port to develop a comprehensive industrial zone. After the 1970s, some enterprises in the central urban area moved out to the peripheral industrial zones and economic development zones. The industry of the area gradually moved out, and commerce and trade began to flourish from scratch. In the middle and late 1990s, residential clusters with relatively complete functions were formed, and the land use construction was basically saturated. Today, the commerce and trade industry in the area is no longer prosperous and gradually declining, but with the development of the city and the emergence of the new economy, it tries to introduce new business forms.

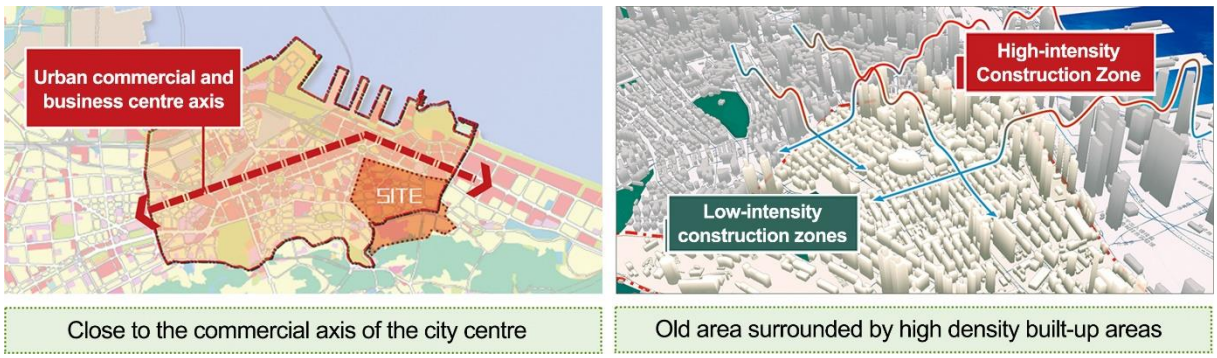


Figure 2. Diagram showing the location and extent of Erqi Square in Dalian

It can be seen that the selected area has a certain development history, and with the continuous development of the city, the area is also constantly changing, and has a certain resilience in industrial development, functional adjustment and other aspects. However, it can also be seen that the development of this area mainly depends on the characteristics of the times. In the early stage of development, it focuses on responding

to the needs of urban economic development. In the later stage, with the massive development and construction of the city, it has been transformed into a residential functional area. High density construction and the continuous decline of physical space have made the ability of the area to resist risks worse and worse, and it is urgent to regenerate.

4.2 Analysis of Area Problems

The development process of the area conforms to the development needs of the city at present, but the lack of strategic and sustainable vision in the early construction planning has left many problems in the Erqi Square area today.

4.2.1 The Physical Space Decays, The Space Is Over Saturated, And The Space Available For Emergency Is Occupied

Since the area was built in an early age, the existing buildings in the area also span many years, and the early buildings are now difficult to meet the needs of residents in terms of thermal insulation, safety, etc. In addition, the construction density of the area is extremely high, and few vacant land can be used as emergency space. The current small amount of vacant land or some public spaces are also often occupied in daily life. For example, due to the limited construction land that can be transformed in the old area, the high demolition cost, the difficulty of social parking lot construction, improper management, and unreasonable configuration of static traffic facilities, there is a large number of illegal parking and illegal occupation of sidewalks. It not only intensifies the contradiction between slow traffic and motor vehicle traffic, causing potential safety hazards, but also crowding out the space available for emergency use.

4.2.2 Serious Waterlogging In Rainy Season, Lack Of Disaster Prevention Space, And Large Potential Safety Hazards

This area is located in a mountainous area, affected by the terrain, and the area has always been facing the risk of flood disaster. Rainstorms caused by seasonal rainfall often lead to serious urban flooding and poor drainage in the rainy season. Although the existing drainage pipeline system operates normally at ordinary times, it still cannot meet the drainage demand in the rainy season. For example, in the summer of 2017, the commercial buildings around Erqi Square were flooded by the rainstorm, and the highest water can reach the waist, which has caused great hidden dangers for the safety of residents. In addition, the area lacks disaster prevention space. Because there are few green spaces, the disaster prevention space cannot penetrate into the city in combination with the green space system, and it is difficult to cope with sudden disasters and risks.

4.2.3 The Area Is Not Well Connected, And The Trunk Road Traffic Is Blocked

The trunk road network in the area is concentrated in the west and north of the area.

Donghai Thermal Power Plant in the northeast of the area and Dalian Naval Ship Academy (both large parcels of land) in the southwest block the east-west connection between the south and the north. The east and south of the area are lack of connection with trunk road network, and the east is especially lack of north-south connection. The disconnection of these roads leads to frequent traffic congestion in the area, especially during the weekday morning and evening rush hours. It is affected by commuting and by the arrival and departure of students from school. Congestion occurs mainly at the five-way intersections in the commercial area and at entrances and intersections near schools, affecting the smooth articulation of the area.

4.2.4 Public Service Facilities Are Not Matched With Crowd Demand

The existing educational service facilities in the area have low quality of spatial resource allocation, lack of street level cultural and sports facilities and social welfare facilities, which do not match the needs of the aging base. In terms of public space, there are only four squares for public activities in the area, and three squares except the Navy Square are traffic squares. The hard ground area is insufficient, and the crowd activity space is seriously lacking. The only large activity space in the area has low crowd concentration during leisure time. The Navy Square has too large green area, and the area available for activities is not large. The facilities are mostly memorial. There is no activity space and facilities for citizens' daily leisure, and most other places have no facilities, so the activity space and facilities do not match the needs of the crowd.

4.2.5 Strong Convergence Of Business Types And Declining Economic Vitality

The existing business types are converging. The financial industry in the area is dominated by banks and insurance companies, and most of them are bank outlets. The level is low, and the homogenization trend is increasingly serious. The trade industry in the area is dominated by food trade and daily general merchandise trade. Most trade companies have low registered capital, small scale and single business type.The Erqi Business Area, where the area is located, is far from the vision of the four business areas in the 14th Five Year Plan of Zhongshan Area. The gap between the Erqi Business Area and the surrounding Qingniwa Bridge Business Area is extremely wide. The concentration of brand stores is low, the business type is low-end, and the crowd attracted is mostly middle-aged and elderly people. The passenger flow is small, the stay time is short, the overall business strength is weak, and it gradually declines with the development of e-codismmerce in recent years.

In addition, the construction density of the area is too high, and the available space is insufficient, which is very unfavorable to the stable development of the area and the absorption and weakening of disturbance. In addition, the current situation of some regions, such as the age structure showing a high level of operation and the high degree of aging, can not be called a problem, but it is also not conducive to the rapid recovery of

various systems in the region when disturbed.

4.3 Researching regenerable space in the area

The basic identification of regenerable spaces is often based on building quality and the renovation of major construction projects to identify regenerable plots. In a resilience perspective it is also necessary to focus on areas that are too poorly equipped to cope with risks in different dimensions, thus complementing the spaces that can and need to be regenerated. Therefore, firstly, through the analysis of building quality, age, construction density, and the type of business carried, the spaces that can be demolished and renovated are identified. Then, the requirements put forward by urban development are sorted out to identify the areas within the area that are affected by large construction projects, and some of these areas are designated as regenerable spaces in the light of the actual situation. Finally, in conjunction with the areas identified during the problem analysis as having greater safety risks, areas with very poor risk resilience and areas with the opportunity to be used as emergency space for disaster prevention, the spaces that must be retrofitted to improve resilience are identified to form an overall regenerable space for the area (figure.3, figure.4).

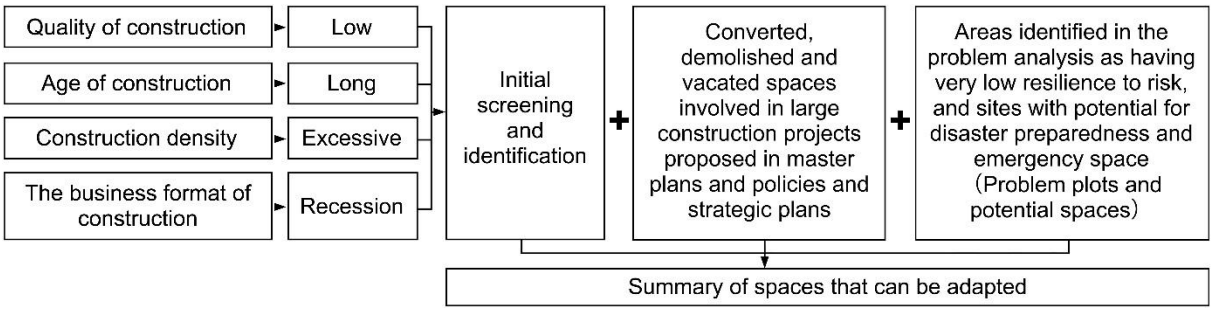


Figure 3. Determination of regenerable space

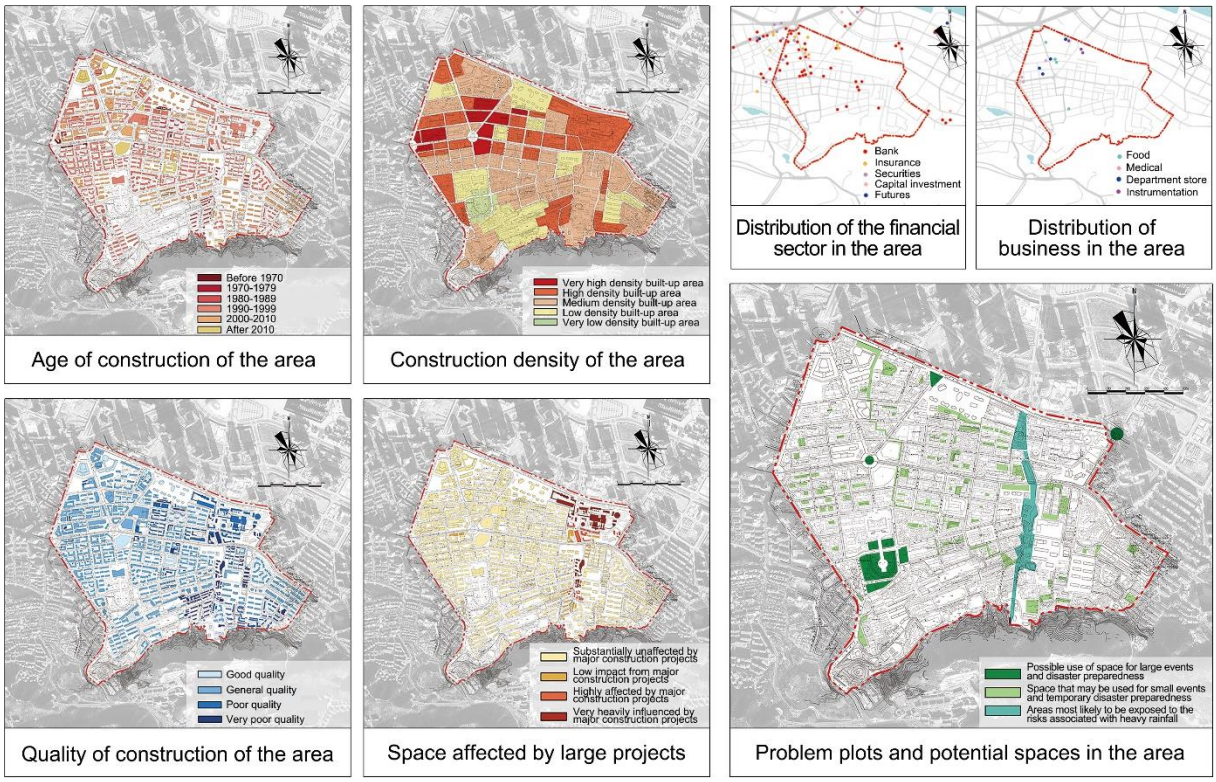


Figure 4. The process of identifying regenerable spaces in the Erqi Square area

4.4 Propose the regeneration strategy incorporating the concept of resilience

4.4.1 Area Regeneration Strategy at The Ecological Level: Resilient Thinking Integrated into The Environmental Dimension

(1) Reconstructing the Ecological Environment with Risk Absorption Capacity: Re-convergence of water systems

A hydrological correlation analysis is carried out using GIS based on the elevation data for the area. Determine the catchment line, and redetermine the approximate location and flow direction of the generated water system in combination with the available space identified in the space evacuation strategy. 'Re-convergence' refers to the overall sorting and updating of the base drainage system in conjunction with the newly created water system and the existing municipal drainage system. The extent and size of the catchment area should be determined by how much water is collected in the area, and the new catchment area should be determined in relation to the height difference in the area. Combine the determined flow direction and catchment area of the water system with the existing rainwater pipeline to determine the starting point of the water system and the operation of the overall system of the combined drainage of the water system and pipeline, so as to build an ecological environment that can cope with rain flood disasters (figure.5).

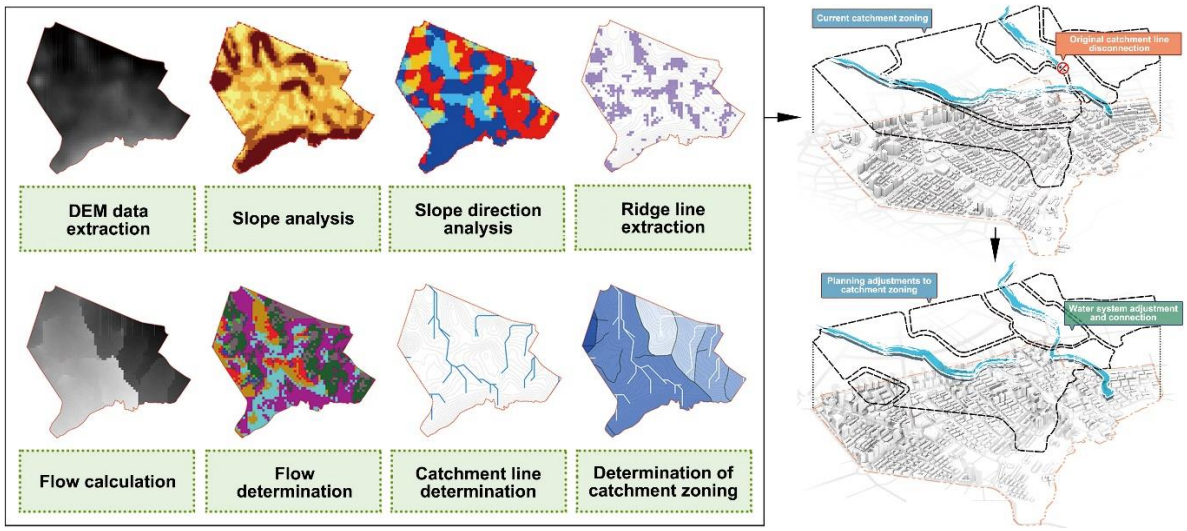


Figure 5. By using GIS analysis, the current catchment area was derived and the alignment of the water system was adjusted to take account of actual construction conditions

(2) Combining different levels of green space to enhance the area's ability to cope with disturbance

Existing ‘crevices’ that can be regenerated as ecological spaces are identified and regenerated. Green corridors, urban green spaces, community hard spaces and road green spaces are defined as ‘large crevices’, ‘small crevices’, ‘micro crevices’ and ‘line crevices' respectively (figure.6). The strategy transforms multiple 'gaps' - areas of the site that can be renewed as eco-spaces - and combines them in a synergistic way. The ‘large crevices’ are identified as the main skeleton, the ‘small crevices’ are identified as the main activity and landscape nodes, the ‘micro crevices’ are identified as the small scattered points that support the quality of life in the community. The ‘line crevices’ is a network that combines roads to connect the large and small crevices, building an ecological spatial network of the area and enhancing the ability to prevent daily climatic disasters.

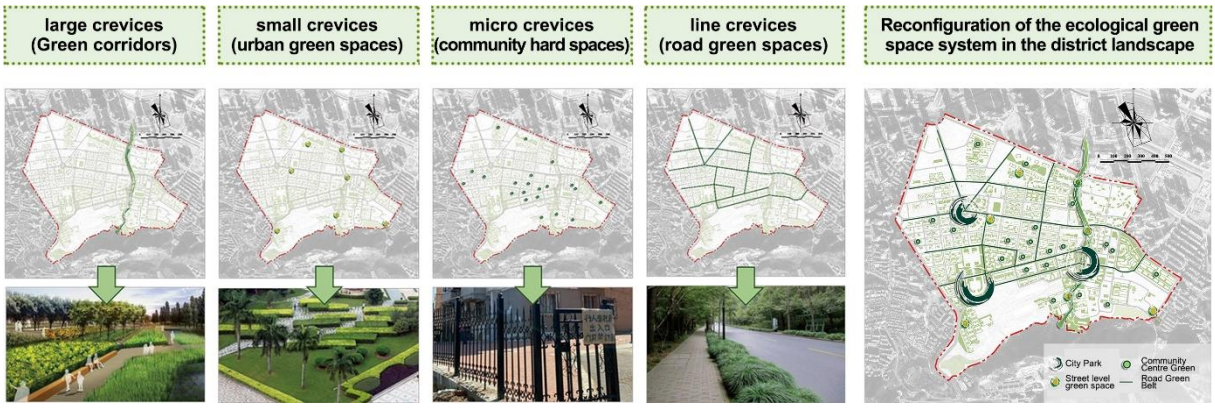


Figure 6. Identification and combination of different levels of green space

(3) Construction of sponge facilities to deal with risk disturbance

The construction of small and micro ecological environment shall be carried out in combination with different types of sponge facilities, including detention and infiltration facilities, transfer facilities, storage facilities and sewage interception and purification facilities. The detention and infiltration facilities include sunken green space, rainwater garden, permeable pavement and ecological tree pool, which can play a better role in rainwater storage and infiltration at the area level and community level. The transfer facilities are mainly grass planting ditches, and the storage facilities are mainly rainwater wetlands, which are arranged and used in combination with the construction of the central water system. The sewage interception and purification facilities are vegetation buffer zones, which combine the unique elevation difference terrain of Dalian to discharge and collect natural water bodies. In addition, to build a system of sponge facilities at both the area level and community level is also important (Figure.7). The construction of sponge facilities is conducive to maintaining the stability of urban ecological environment, urban flood control and waterlogging prevention, increasing landscape greening, and providing better living environment for residents.

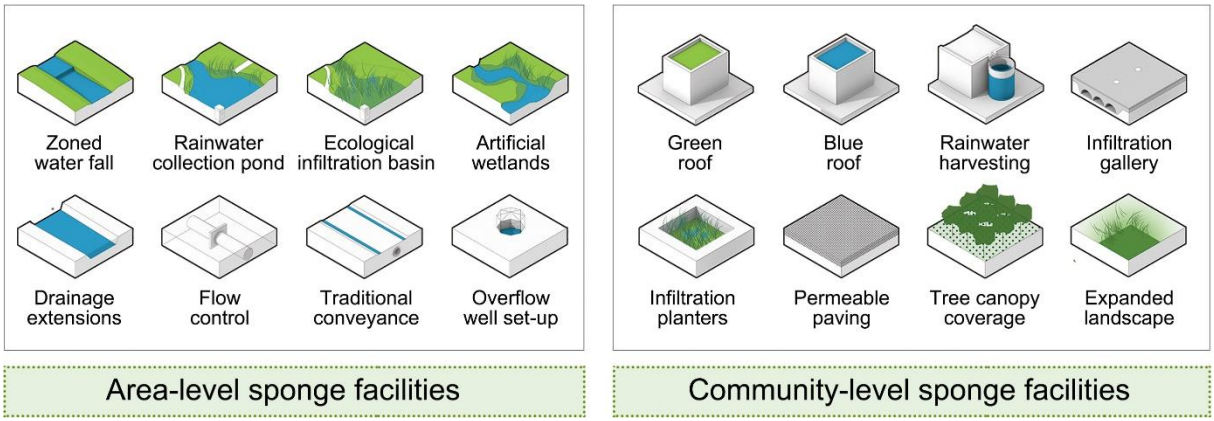


Figure 7. Area-level and community-level sponge facilities (Reprinted from SASAKI,2016)

4.4.2 Area Regeneration Strategy At The Production Level - Resilient Thinking Integrated Into The Economic Dimension

(1) Reconstruction of industrial support system and introduction of diversified economic forms

Sort out the original industries that do not meet the needs of the current situation, and determine the future main development of ancillary industries and attracting industries in combination with the development goals of the area. 'Ancillary industries' mainly refer to the demand of the central business axis and Dalian Port for the surrounding areas, such as financial services, trade services, port and shipping services and other business formats. 'Attractive industries' are based on the location of the area and its historical heritage, mainly include market commerce, speciality catering, tourism and cultural and creative industries. In conjunction with the reconfiguration of the industries, a diversified economic form is introduced, such as the floor stall economy and the creative economy. The area's economic and social diversity will be maintained by bringing in people from all walks of life.

(2) Adjustment of business structure and business model

It is proposed that some industries that are no longer suitable for development in the area, such as Donghai Thermal Power Plant, wholesale markets such as auto repair market, and some enterprises that have closed down should be abandoned. On the basis of upgrading the original reserved industries, such as market commerce, financial services, and commercial services, new industries such as cultural and creative industries, tourism industries, and specialty catering industries should be cultivated and developed. In addition, it is important to establish a business model that combines market and public interest and to avoid a single form of economy dominated by the market. In the regeneration of public service facilities such as sports facilities, elderly facilities and other facilities, a semi-market and semi-community operation model is adopted to meet the needs of the residents in the area while ensuring the possibility of diversified development in the area.

4.4.3 Area Regeneration Strategy At The Life Level - Resilient Thinking Integrated Into The Engineering Dimension

(1) Reconstruction of public open space provides residents with communication space

Combined with the exploration of renewable spaces, the public open space system of the district is reconstructed by reusing spaces with potential for renewal. The original large open spaces in the area will be retained and combined with demolition and redevelopment to create community-level public spaces, and with the transformation of

the hard land between houses to create public spaces between houses, solving the problem of the original open space with little land and a single function. This strategy can increase the interaction of residents and promote social ties by increasing the number of activity spaces.

(2) A series of traffic measures to ease the traffic in the area

Based on the current characteristics of the roads on the base and the preservation, demolition and transformation of the space, sort out the roads that can be and need to be altered. The plan divides the entire road system into current preservation roads, roads with partial adjustments and roads undergoing complete renovation. Different strategies are used to alleviate traffic congestion depending on the different problems that exist on the different roads. The specific strategy can be found in figure 8 and table 2.

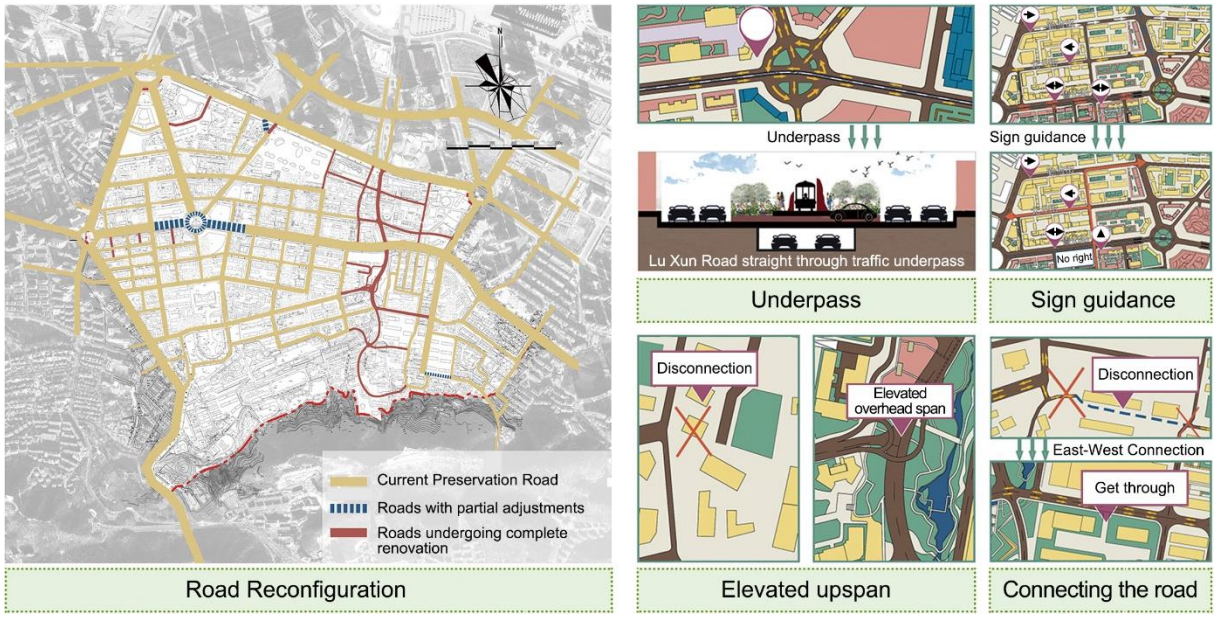


Figure 8. Illustration of the regeneration measures for traffic in the Erqi Square area

Table 2. Diversified measures to relieve traffic in the area

take steps	concrete content	Regenerate results

Elevated upspan	In the gully section in the southeast of the plot, due to its own elevation difference, the road traffic is disconnected from east to west and the connection is not convenient. In combination with the response space vacated by the reconstruction of the ecosystem, the elevated upper span is used to enhance the multi-directional connectivity of the area	It ensures the efficient use of space, improves the connection of north-south trunk roads in the east of the area, and enhances the connectivity of the area
Underpass	In order to ease the traffic in Erqi Square, it is planned to lead the traffic directly through Lu Xun Road through the tunnel to the underground of Erqi Square, and the traffic from Lu Xun Road to Gangwan Street and Dazhong Street will drive around Erqi Square counterclockwise	The traffic operation at the intersection is relieved, and the potential safety hazards are reduced. The underpass provides new traffic path choices, increasing flexibility and redundancy
Sign guidance	The traffic section between March 8th Square and Erqi Square is prone to congestion. It is planned to direct the traffic flow of the open block to the north of Sun Street, set up stop right turn signs at the intersection of Lu Xun Road and Sun Street, and guide the traffic flow to the destination by taking advantage of the characteristics of Beidou Street and Qinjian Street, which are one-way right and one-way left.	Make full use of the existing space, relieve the traffic pressure on the main roads, reduce the potential safety hazards, and enhance the robustness of the operation of the area during peak hours
Time-sharing parking	Integrate road resources, reasonably use redundant roads to set up time-sharing roadside parking, and the parking space planning should follow the principle of 'reducing interference streamline, clear, convenient and moderate space for passengers to drop off'.	Make full use of existing resources, reflecting the resourcefulness of space

Smart management	Through the management means of intelligent parking, the integrated development of finding parking spaces, parking, calculating parking time, paying fees, and driving away will be further strengthened, and the construction and operation of the static traffic system will be further strengthened.	It makes the space utilization of the area more reasonable, and is conducive to forecasting the traffic flow, vehicle ownership, etc., so as to provide reference for the future regenerate of the area

(3) Upgrading public services to meet different needs and situations

In view of the low quality of primary and secondary schools and medical facilities in the planned public service system, based on the management and control standard, plan the expandable space, leave it for aging and upgrading, and transform and improve the existing regenerable land. Areas that do not currently meet the transformation requirements but where there is a need for renewal can be renewed on an ongoing basis as the area develops, and when their quality meets the transformation requirements, or when the impact of a major project provides an opportunity for transformation, then the corresponding facilities can be transformed, but with the potential space left in advance (figure.9).

For the social welfare facilities and cultural, sports and recreational facilities that are currently lacking, there is a need to combine the demolition and renovation of renewable spaces and to implant social welfare facilities and cultural, sports and recreational facilities in the vacant land after the demolition of buildings in a graded manner. At the same time, it is necessary to combine the semi-market and semi-community operation mode of the industrial strategy to improve the quality of the existing public service facilities in the area, to supplement the missing service functions in the area and to enhance the public service capacity within the area.

In addition, the time-sharing of some areas can also ensure the effective use of various urban spaces and the satisfaction of public service space needs. For example, some kindergartens themselves do not have enough space for activities, so the administrators can open the surrounding public green areas on a time-sharing basis, only provide children with access to them at certain times, thus relieving the pressure on the tight public service space (figure.9).

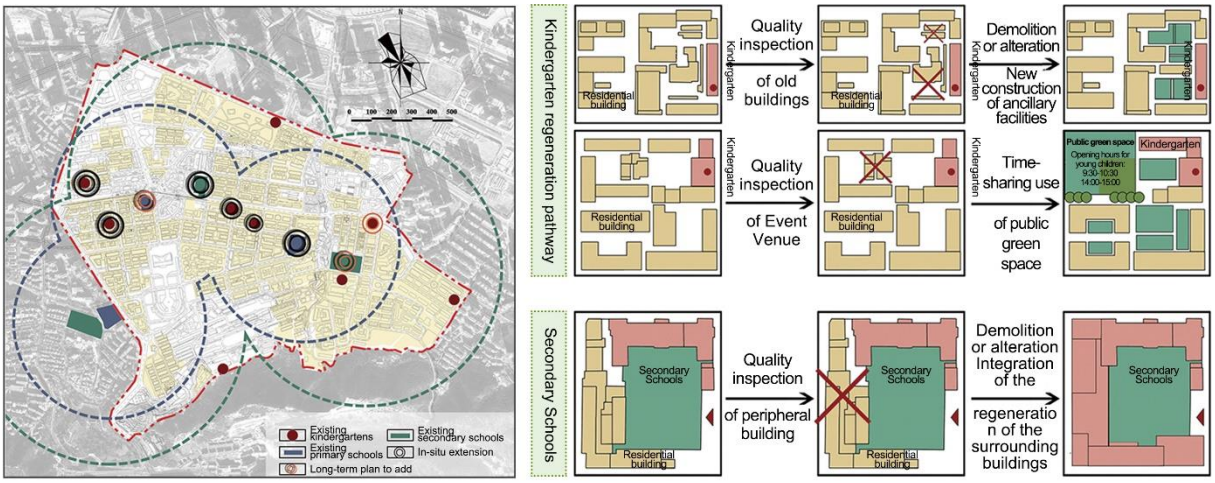


Figure 9. Proposing a model for facility quality improvement using educational facilities as an example

4.4.4 Co Construction And Co Governance Strategy Of The Region - Resilient Thinking Integrated Into The Social Dimension

(1) All interest groups jointly negotiate the planning and construction of the future area

The development of the area requires the entry of capital and the vitality of the residents. In addition, the government's requirements for urban development will also be reflected in the achievements of the area construction, so the future construction and development of the area cannot be separated from these three factors. The lack of any party in the construction of the area will make the future development of the area unbalanced, thus weakening, or losing the ability to operate stably and healthily and resist risks in all aspects. Therefore, the 'co construction' strategy is proposed in the renovation of Erqi Square area to consider costs and benefits, and try to reduce costs and improve benefits. The construction and development of the area needs the joint participation of multiple subjects involved in the area. The participants involved here mainly include three parties, namely the government, developers and indigenous people. The needs, bottom line of interests and restrictions of the three parties are different. It is necessary to balance the needs and interests of the three parties to achieve solutions that meet the requirements of all parties, and avoid the implementation and regenerate risks caused by conflicting opinions (figure.10).

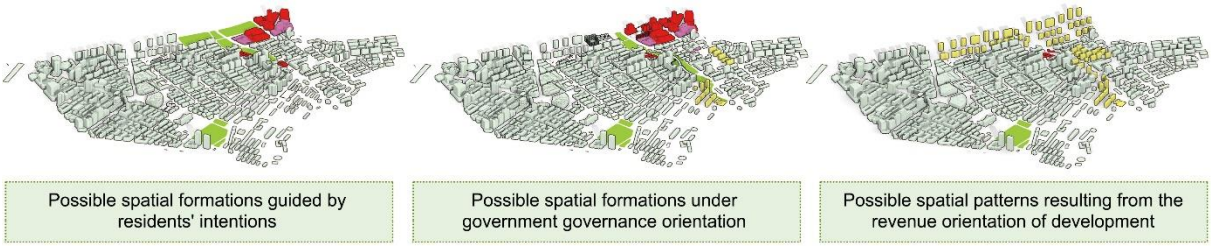


Figure 10. Illustration of the process of multi-stakehold coordination programme

(2) Multi-social actors jointly participate in the governance of the area

The participation of multiple social entities in governance is mainly to respond to the occurrence of special circumstances. For example, during the COVID-19 epidemic period, community governance is difficult to rely on only a few community managers. Therefore, in the process of daily management and governance, the participation of multiple social entities should be considered, such as expanding the owner's committee, allowing people from different professions in the area to participate in governance, and determining volunteers for each building in the community. This management and coordination system is difficult to establish temporarily in the event of a disaster, so it is necessary to build a governance structure with the participation of multiple social subjects on a daily basis. It is proposed to adopt a win-win organization operation mode of multi-party cooperation game, which can enhance the ability of the area to deal with uncertainty by enhancing multi-party group cooperation.

5. Discussion

Integrating the concept of resilience in the regeneration of old areas does not only mean building or enhancing resilience in the outcome of regeneration, but also focusing on the excavation and construction of the changing and transforming capacity of the system in the whole process of regeneration, emphasising the attention to the different stages of risk and the response and correspondence to the characteristics of resilience in different stages. Based on the analysis of the concept of resilience and the case study of the regeneration of Erqi Square, the regeneration of old urban areas from a resilience perspective should integrate the concept of resilience into multiple stages of regeneration, and also consider the construction of resilience of different systems in the detailed path of regeneration.

In terms of the overall objective of regeneration, emphasis needs to be placed on the enhancement of the ability to cope with, adapt to and recover from risks, and the construction of resilience should be incorporated into the overall regeneration objective when it is first defined, so that in addition to solving the existing problems of the old

district, more emphasis should be placed on enhancing the ability of the old district to cope with different types of risks, so that the district finally has the ability to self-regulate and continuously adjust and optimise. In terms of regeneration methods and paths, the systems to be regenerated need to be split up, and the final regeneration outcomes achieved after incorporating the concept of resilience should be considered in different dimensions, reflecting a progressive process of continuous renewal and transformation in the regeneration paths of different systems. The update outcome of the different systems should reflect the improvement of the resilience to disturbances in different dimensions and the increase of the threshold for the risk of a sudden drop in system performance.

6. Conclusion

This paper aims to build a framework and content for the renewal of old urban areas from a resilience perspective. Based on a review of existing literature, it clarifies the meaning of resilience in the renewal of old urban areas and constructs a resilience analysis framework that includes four dimensions: economic, engineering, environmental and social. A three-stage research process is proposed, from the exploring the problems of old areas, the search for regeneration space to the proposal for a regeneration strategy that incorporates the concept of resilience. A regeneration strategy that incorporates the concept of resilience is proposed based on the actual case of the Erqi Square area in Dalian. Thereafter, a discussion based on the case study is presented. The study expects to provide some reference for the application and theoretical perceptions of the concept of resilience in regeneration.

References

C.S.Holling (1973) Resilience and Stability of Ecological Systems. Annual Review of Ecology and Systematics,4,pp.1-23

CHEN L, ZHU X and SUN Jie(2017) The Basic Concept, Mechanism and Planning Ideas of Resilient Cities. Modern Urban Research, (9),pp.18-24.

Meng H, Shen Qingji, Jia Qian and Ci Hai (2022) Inspiration and Experience of International Urban Resilience Practice Based on Interpretation of Report of Resilient Cities Resilient Lives. Huazhong Architecture, 40(3),pp.1-5.

QIU B (2018) Methods and Principles of Designing Resilient CityBased On Complex Adaptive System Theory. Urban Development Studies, 25(10),pp.1-3

Sara Meerow, Joshua P. Newell and Melissa Stults(2016)Defining urban resilience: A review. Landscape and Urban Planning,147,pp.38-49

SASAKI (2016) Jinan Central Business District Landscape Design[Online] Available from:https://www.sasaki.com/zh/projects/jinan-central-business-district-landscape-design/Accessed [15/05/2023]

Wang B and Li M (2022) The Reconstruction of Old Urban Areas from the Perspective of Holistic Governance. Global Cities Research, (3), pp.32-46

RESILIENT SPATIAL PLANNING AND GOVERNANCE STRATEGIES FOR INDUSTRIAL TOWNS FACING SUDDEN EPIDEMIC: BASED ON THE CASES IN CHINA (1097)

Wenqi Li[1*], Lingzhi Zhang[1], Li Zhang[1]

[1] Department of Urban Planning, College of Architecture and Urban Planning, Tongji University, China; * 493700113@qq.com

Abstract. Industrial towns, emerged during the restructuring process from planned economy to market economy, are special products of China's urban-rural dualistic structure, and also are important bases for the civilian production industry. Currently, under the crucial circumstances of epidemic prevention, industrial towns are also faced with multiple risks and challenges. It is necessary to pay full attention to the prevention work and spatial governance strategies in those industrial towns. Based on the observation of some industrial towns in the Yangtze River Delta and the Pearl River Delta, this paper analyzes the ability and shortcomings of those industrial towns in preventing the epidemic, and points out that it is essential to plan and develop those industrial towns with resilience theory. In further, following the concept of resilience, the paper discusses the key points of spatial planning in industrial towns from the perspectives of public space, community unit, public facilities and emergency space redundancy, etc. Finally, several spatial governance strategies have been put forward, including resilient allocation of medical resources, coordinated prevention mechanism, participation of social organizations, refined community governance and so on.

Keywords: sudden epidemic, industrial towns, resilience, spatial planning, governance

1. Introduction

On January 20, 2020, the National Health Commission of the People's Republic of China officially included the COVID-19 pandemic into the B class infectious diseases stipulated in the "Law on the Prevention and Treatment of Infectious Diseases of the People's Republic of China", adopted the prevention and control measures of A class infectious diseases,[1] and issued a unified pneumonia prevention and control plan, marking the launch of the nationwide coronavirus epidemic prevention battle in China. Under the current national epidemic prevention and control plan, except Hubei Province, the focus is on imported infections in megacities and large cities, and strict control measures have been taken across the country. But in fact, there are a large number of industrial towns in China, also known as industrial towns, which have been facing more complex and difficult

problems in the epidemic. Among these industrial towns, the largest town has a total population of nearly one million (Hu Men Town and Chang An Town in Dongguan, Guangdong). There are 72 towns and districts with a population of more than 100,000, but the administrative structure of their governments is the same as that of general towns with less than 10,000 residents. These industrial towns are mostly distributed in the Pearl River Delta, Yangtze River Delta and southern Fujian (Figure 1), and they are also regions with high density of migrant population and severe impact of the epidemic (or will face great pressure of prevention and control soon). In the coming period of the work resumption, those industrial towns may face a greater risk of the epidemic, so how to effectively conduct prevention and control measures is crucial and should be paid attention to.

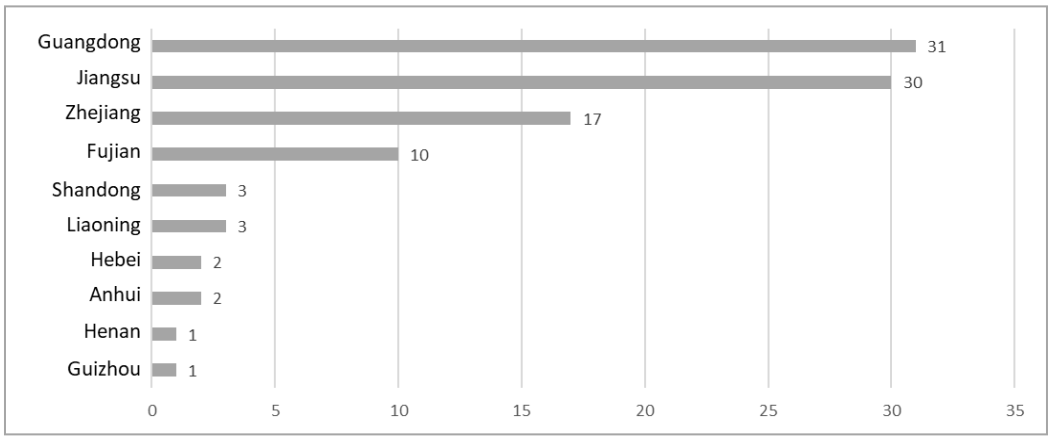


Figure 1. Top 100 industrial towns in China counted by provinces

The outbreak of infectious diseases is a great test of the entire national public health governance system from the central to the local, and to the grass-roots level. In view of this epidemic, how to put forward scientific control and prevention strategies from the perspective of planning has aroused extensive discussions among scholars of urban planning. Perspectives as follows have been mentioned broadly, how to infer the transmission path and impact scale of the virus based on big data technologies such as population flow and Baidu migration data,[2] how to improve the urban management and governance means to cope with emergent infectious diseases,[3] [4] how to optimize the urban prevention and control system, how to improve the community governance,[5] [6] how to make use of the digital platform to dynamically update the prevention and control program,[7] etc. Existing academic studies on the outbreak of infectious diseases have focused more on how to improve the emergency management capacity at the city level, but less at the township level, and have not taken the industrial towns into the consideration of urban and rural emergency management system. On the other hand, the existing academic studies on industrial towns have mostly focused on the reform of

government rights and industrial upgrading, etc., but have not touched on the emergency capacity and measures in response to public health emergencies or emergency disasters.

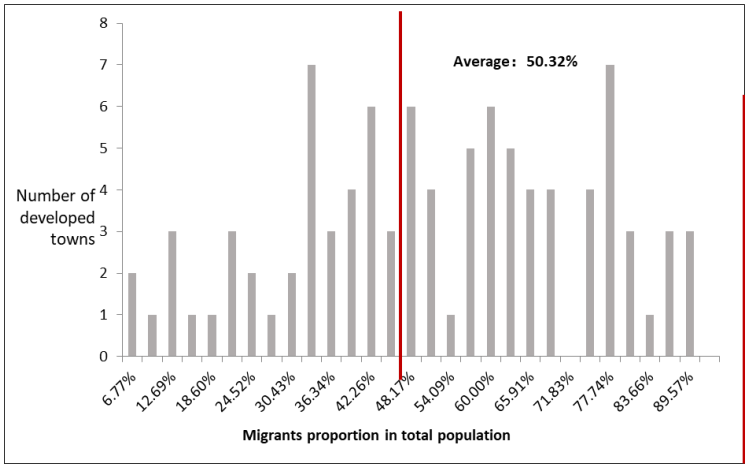
Although the population and economic aggregate of most industrial towns have reached the level of small cities, their infrastructure construction, administrative ability and staff allocation are basically at the township level, resulting in a serious mismatch between their governance capacity and economic level, which also leads to higher risks for industrial towns when dealing with sudden disasters. Based on the current prevention and control work, there are many disadvantages and challenges in the prevention and control of the epidemic in industrial towns. It is not only necessary to take active response but also to plan ahead and provide support for future contingencies.

2. Identification of characteristic risks of industrial towns in the epidemic emergency

Industrial towns are the special product of China's urban-rural dual system and the transition from planned economy to market economy, which have played an important role in China's reform and opening up and rapid economic growth in a certain period. In the current critical period of China's economic transformation and upgrading, industrial towns still play an important role in providing local employment, attracting foreign labor, cultivating new industries and improving industrial chain upgrading, especially in the Yangtze River Delta and Pearl River Delta regions. However, most of these industrial towns have been developed from traditional low, small and scattered industries, which not only have many difficulties in the industrial transformation but also expose the strong risk and serious shortcomings in spatial organization and governance ability when dealing with major public health events such as sudden infectious diseases. Combined with the characteristics of industrial towns, there are the following key risks in the face of the epidemic.

First, the high proportion of migrant population causes great pressure of imported prevention and control. Industrial towns generally grew from township enterprises. A large number of small and medium-sized enterprises gathered together as the downstream supporting parts of the industrial chain, or as the manufacturing and production of people's livelihood necessities with relatively low technical requirements. This kind of labor-intensive industry determines that population structure in industrial towns has a relatively high proportion of migrant people (usually more than the local population). Taking China's top 100 towns as an example, the average proportion of non-native population in their total population is 50.3%, among which the average proportion of non-native population in Guangdong's top 100 towns is as high as 65% (Figure 2). In terms of the sources of migrants, they mainly came from other provinces and cities due to the relatively developed local economy. Therefore, the population of industrial towns

is from a wide source, large in number, and with complex flow situation, which have undoubtedly posed a high risk of disease spread in the period of epidemic, and also caused a high pressure of control and control.



Migrant proportion	Number of Top 100 developed towns	Interval proportion	Cumulative proportion
<20%	11	11.58%	11.58%
20%~50%	36	37.89%	49.47%
50%~80%	40	42.11%	91.58%
>80%	8	8.42%	100.00%

Top 100 developed towns by province	Average migrant proportion
Guangdong	64.69%
Jiangsu	47.16%
Zhejiang	43.50%
Fujian	49.64%
Others	24.14%

Figure 2. The migrants' proportion in total population in Top 100 industrial towns in 2017

Second, the highly dense living environment makes the higher risk of internal infection. The prosperity of township enterprises has also led to a large number of construction of staff dormitories and the emergence of village rental houses, and these collective dormitories and village rental houses generally present a living environment with a high-density, which is easy to induce the internal infection of virus. At the same time, the old town center of industrial towns is still the center of all kinds of economic and social activities in the whole town. Although the construction of new towns has been generally carried out in developed town, the construction quality of the old town remains at a low level (as shown in Figure 3). In terms of space organization, town and village, industry and housing space are highly mixed. However, public places such as traditional markets and street markets have serious environmental problems due to the poor regulation, which undoubtedly contributed to a greater potential danger to public health and safety.

Figure 3. The old town center in an industrial town in Zhejiang Province

Thirdly, cross-border traffic rises the difficulty in conducting closed-off management. The development of industrial towns has benefited a lot from their convenient traffic conditions. As a result, industrial towns are mostly located at the arteries of traffic and closely connected with regional cities (such as Xinqiao Town in Jiangyin City, Jiangsu Province, which is located at the intersection of several national highways and major urban expressways, and adjacent to the urban area of Zhangjiagang city). Convenient transportation is an advantage in daily life, but during the epidemic period, the cross-border traffic system makes have put the industrial towns in the risk of imported infection through multiple channels, which not only greatly increases the probability of being infected by the external epidemic, but also has been a great test to the control level of industrial towns.

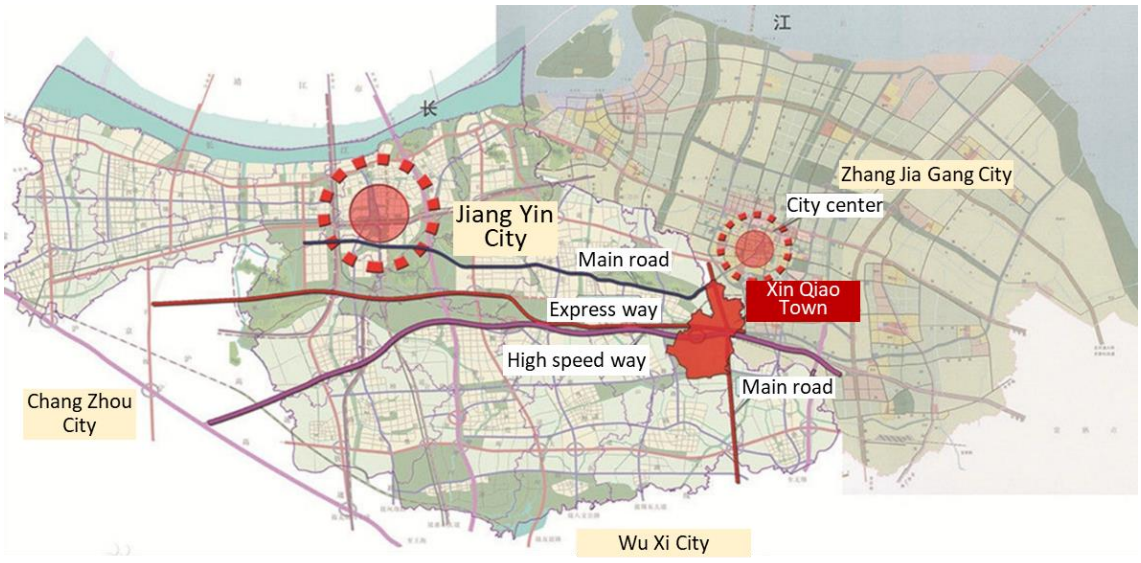


Figure 4. The old town center in an industrial town in Zhejiang Province

Fourthly, the limited administration authority restricts the ability of comprehensive control and prevention. Due to the government administrative structure of China, although the economy of industrial towns is relatively developed, the economic aggregate of some industrial towns is strong enough to be compared with the prefecture-level cities in the central and western regions in China, the administrative authority of the government is still limited to the town level. Except for some pilot towns of power expansion, most industrial towns basically have no administrative approval authority, no independent financial authority, etc. In general, administrative management lags behind economic development, as well as public service level lags behind the level of urbanization, which is a common management system dilemma in industrial towns at present.[8] Especially under the circumstances of current poor prevent system in grassroots towns and villages,[9] these contradictions will result in the lack of manpower and material support, professional talents and medical assistance, which will restrict the efficiency of fighting against the epidemic in industrial towns.

Fifthly, the high mobilities between villages and towns make it difficult to conduct thorough control. As the lowest level of government, industrial towns also take charge of rural governance. In case of an epidemic, industrial towns should not only deal with the town itself, but also have to conduct the epidemic control in rural areas, which increases the burden of management in industrial towns. At that time, less staffing, low management ability, high workload pressure will undoubtedly restrict the ability of local governments to take emergency decisions and the deployment of prevention and control measures.

Sixthly, the urgency of work resumption poses extra difficulty in management. The industrial types of industrial towns are mainly related to the basic livelihood of people (as shown in Table 1), and the product supply often covers the whole country or even the overseas. During the epidemic period, especially in the face of a long period of epidemic, many enterprises in industrial towns are in urgent need of resuming work before the end of the epidemic, so as to provide social necessities to maintain the basic production of the country. In this case, those industrial towns can’t afford being shut down for a long time, which poses extra difficulty in preventing epidemic and organizing work resumption at the same time.

Table 1. The main industry category of Top 100 industrial towns in the Yangtze River Delta Area and the Pearl River Delta

Industrial towns in the Yangtze River Delta	Main industry	Industrial towns in the Pearl River Delta	Main industry
Liushi town, Wenzhou city	High and low voltage industrial electrical equipment	Xintang town, Guangzhou city	Automobile parts
Beibaixiang town, Wenzhou city		Dali town, Foshan city	Aluminum manufacturing
Hongqiao town, Wenzhou city	Electron component	Beijiao town, Foshan city	Machine manufacturing
Puyuan town, Jiaxing city	Woollen sweater, fashion clothes	Shishan town, Foshan city	Automobile parts, medicine and medical apparatus
Shengze town, Suzhou city	Silk crafts	Chang'an Zhen, Dongguan city	Mechanical hardware
Datang town, Zhuji city	Socks	Humen town, Dongguan city	Clothes industry

3. The performance and predicament of industrial towns in preventing COVID-19 Epidemic

It has been nearly two months since the outbreak of the epidemic, and governments across the country have launched multiple prevention and control plans. Based on the observation of some industrial towns in the Yangtze River Delta and Pearl River Delta, we can preliminarily judge the ability and deficiency of industrial towns in emergency prevention and control.

3.1. Industrial towns are the areas with high incidence of the epidemic

For infectious diseases, the degree of infection is closely related to the extroversion of local economic activities and population mobility. The Yangtze River Delta and the Pearl River Delta, the most economically developed regions in China, are home to more than half of the top 100 towns in the country, and are also one of the most severely affected regions except Hubei Province. In Zhejiang province, Wenzhou, which is famous for township enterprises and private economy, has become the most severely affected city

outside Hubei province. Taking Wenzhou City of Zhejiang Province and Foshan City of Guangdong Province as examples, focusing on the township level, it can be clearly found that a small number of industrial towns (there are 11 industrial towns in Wenzhou, accounting for 5.98% of the total number of local administrative units; There are 18 industrial towns in Foshan, accounting for 56.25% of the total number of local administrative units) however, account for a relatively high proportion of actual cases of local diseases (Figure 5).

For example, in Wenzhou, Yueqing is the county-level unit with the most epidemic cases in the whole city, among which, the number of cases in industrial towns (a total of 4 cases) accounted for 44% of all. Liushi Town (ranked 12th in the towns of whole country), the most economically developed town has the most reported cases, followed by Hongqiao Town (ranked 40th in the top 100), Dajing Town (top 1000 towns in the whole country) (Figure 6).

In Foshan, Nanhai District, where Shishan Town, the second largest town in China, and the other five top 100 towns locate, is also the administrative unit with the largest number of confirmed cases in the whole city. In the whole Foshan, the number of cases in the industrial towns accounts for nearly 50%. Therefore, by analyzing these two typical cities with relatively a larger number of industrial towns, it is quite enough to tell that when dealing with the sudden epidemic, industrial towns are in much higher risk than general towns, even higher than that of sub-district. It has further illustrated that in epidemic prevention and control, industrial towns itself must be vigilant, to strengthen early warning, while the higher-level government must attach great importance to the prevention and control deployment of large towns and industrial towns, and the prevention and control plan should be different from that of general towns to appropriately improve the level of epidemic prevention and control in industrial towns.

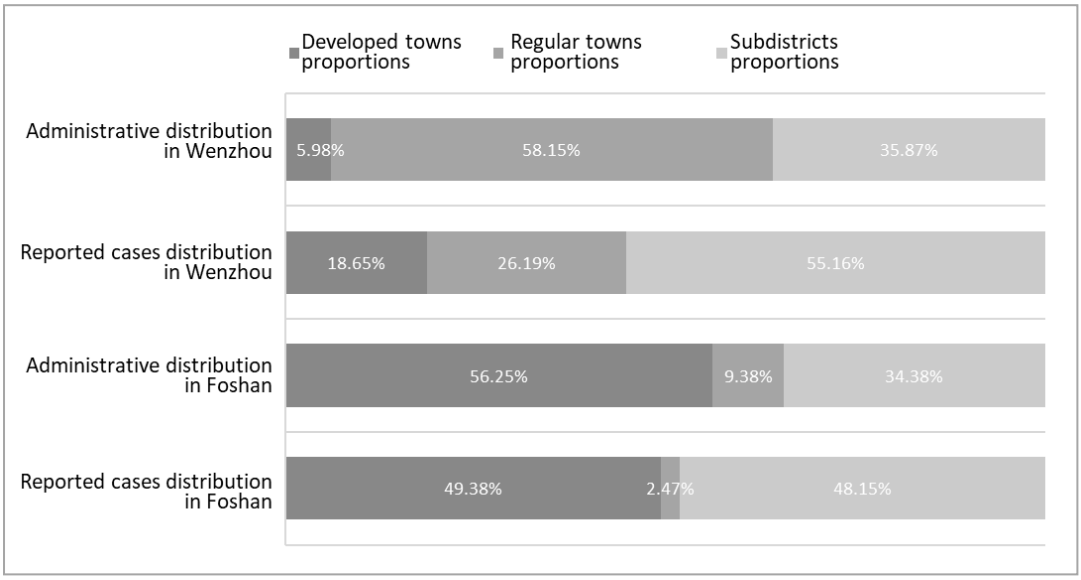


Figure 5. Administrative distribution and reported cases distribution in Wenzhou and Foshan

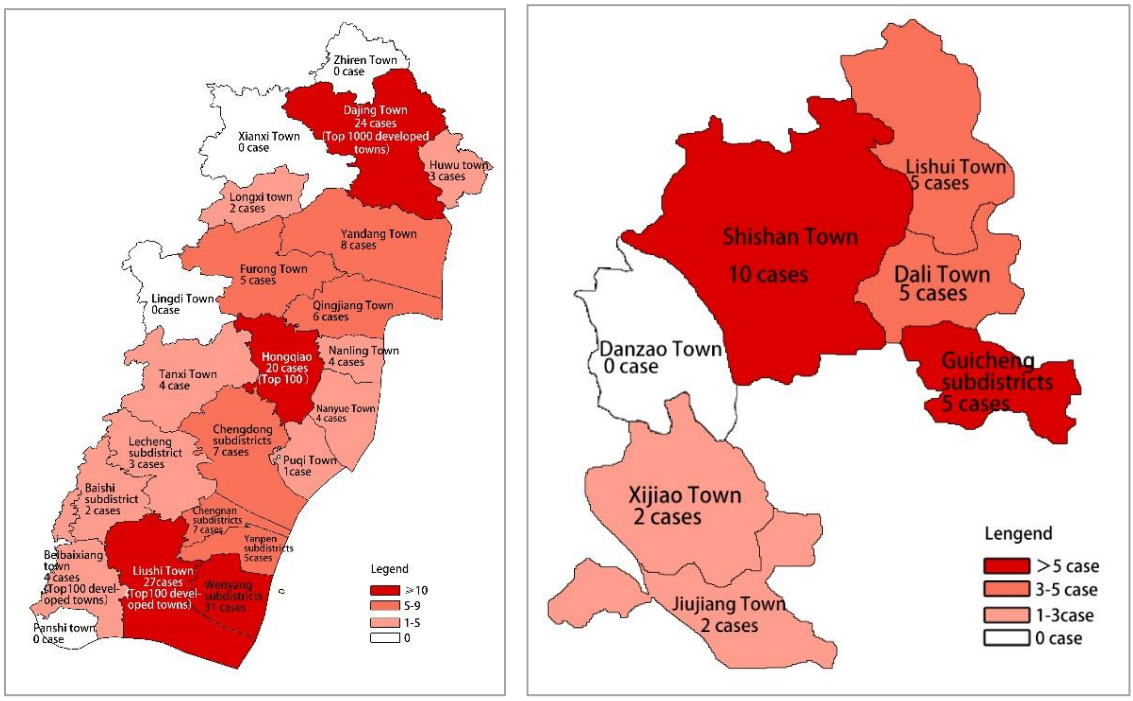


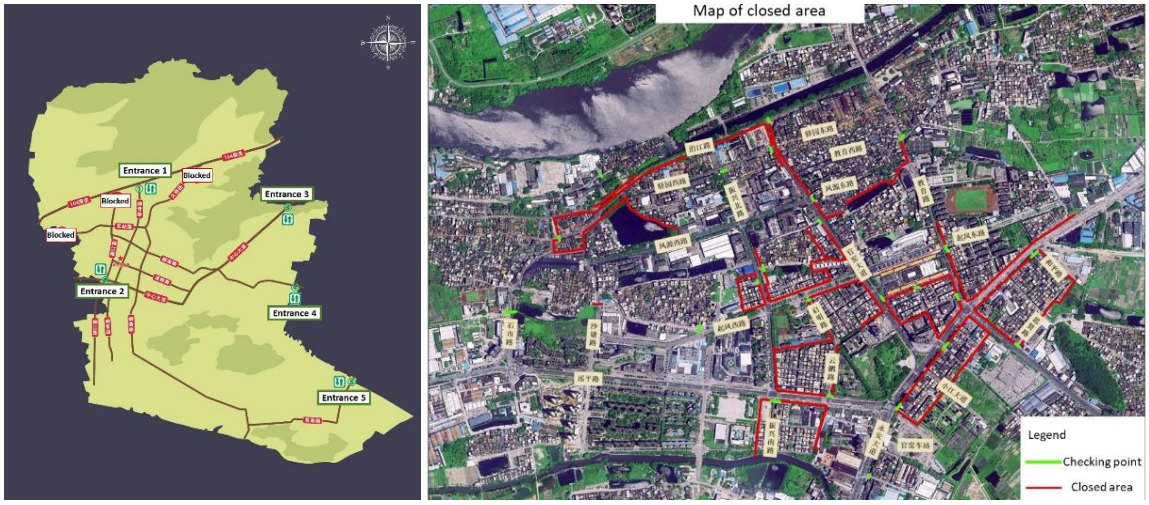
Figure 6. The distribution of reported cases in Yueqing, Wenzhou(left) and Nanhai, Shishan

3.2. Spatial isolation predominates while systematic prevention and control preparation lack

Since the outbreak of the epidemic, 31 provinces have launched a level 1 response to major public health emergencies, and the prevention and control plan has been implemented from top to bottom covering all grass-roots units. According to the available public information, the focus of prevention work in the industrial towns is conducting spatial isolation by adopting regional blockade and artificial control to cut off the transmission path of the virus. The difference among those towns lies in the strict degree of the prevention and control measures due to different risk levels.

Industrial towns in high-risk areas, such as Liushi Town and Hongqiao Town in Yueqing, Wenzhou, implemented strict prevention and control and investigation with rapid response. Liushi Town, known as the "Electric Appliance Capital of China", is home to more than 7,000 small and medium-sized enterprises and about 410,000 permanent residents, including nearly 200,000 migrant population. Great pressure of epidemic prevention and control is self-evident in the case of Wenzhou outbreak. Since January 23, prevention and control measures have been taken in Liushi Town, including investigation of migrant population in urban communities and rural villages, suspension of bus operation, and detection of key traffic intersections. By February 2nd, Wenzhou City and Yueqing City were deployed to upgrade the level of prevention and control. Traffic restrictions and intersection control were carried out in the whole town, and only 5 external entrances and exits were reserved (Figure 7) and strictly controlled. With community units as the basis of the defense line, all communities, village residents were asked to implement two weeks of closed management and only allowed to go out twice a day for necessary supply. As a result, the town was urgently promoted into the "dormant" state.

Industrial towns in relatively high-risk areas, such as Shishan town, Lishui town in Nanhai district, Beijiao town in Shunde district etc., took the adjust measures of partition



enclosure due to their larger jurisdiction territory. In this case, urban space was divided into units by peripheral roads around communities, forming temporary closed units (Figure 8).

Figure 7. Map of traffic control in Liushi town

Figure 8. Map of partition enclosure in Shishan town

However, in terms of the emergency system, the current measures are only limited to emergency prevention and control in disasters, and there is still a lack of adequate preparation for risk warning, allocation of regional emergency resources, and people's livelihood issues after isolation, among which the most prominent shortcoming is still the medical level. The concentration of high-level medical resources in urban areas has limited the local treatment capacity of many industrial towns to the pre-inspection of fever outpatient clinics, or even to the level of general township health centers, which increases the transport cost and diffusion risk in the treatment work.

3.3. Government organizations are dominant, with scattered social participation

In the current grassroots prevention and control work, the town generally adopted the "town social cadres, police, grid personnel, health personnel" equipped with a team to conduct investigation. However, for a strong town with hundreds of thousands of permanent residents and hundreds of communities living in villages, it is indeed too difficult to carry out household investigation of each community in the area with the daily manpower of the town level. In addition to the community survey, of the town of township government work include domain thousands of enterprises to carry out supervision and return to work for the record, no property management community, scattered on the tenant such as "blind Angle", to social prevention and control of material supply, regulation of market environment, etc., to general township level architecture to deal with more complicated control system, the strong town is clearly unsustainable. To this, many cities and counties in an emergency dispatching grass-roots organs at the corresponding level personnel aid a line of work, such as, Shunde district, Foshan city, adopted a level 3 subcontract screening system, led by the district town "package" sinking villages and towns to guide the work, the town leaders "Bao Village" create positions village in line inspection, party members and cadres "package enterprise", "bag community" is a hard upon of illness.

In this outbreak, many local enterprises and public figures in Industrial towns showed positive social responsibility, such as CaiDuoDuo Food Co., Ltd. in Liushi Town, Wenzhou, which provided vegetable distribution service for the village residents in Liushi Town. Most of these spontaneous social forces are concerned with the demands of people's livelihood. If they can be actively integrated into the government-led prevention and control system,

they will not only greatly improve the efficiency of government command and deployment, but also provide useful supplements where government forces cannot reach.

3.4. Prevention as well as work resumption increases the burden of public service supply

With the development of epidemic situation into the second-half, return to work and production and epidemic prevention and control to combine to become a new focus, policy focus all over the country in succession by rein fight to restore the traffic, transportation, withdrawal barrier free point, simplify examination and approval procedures, in order to promote all kinds of enterprises to return to work and production, in particular, increase support for small and medium enterprises such as policy transfer. It is the heavy pressure that falls on the grass-roots work to do a good job of supervision and service for enterprises to return to work at the same time. This for the jurisdiction of thousands of enterprises in the town, not only faced with the huge pressure of public service security, such as corporate dining, car, health protection equipment, transportation and logistics channel management; At the same time, it is also an important test of the governance capacity and the flexibility of the system and mechanism, such as how to set an appropriate threshold for resuming work, how to supervise the prevention and control work of enterprises, how to simplify procedures and speed up the process of resuming work, etc. Under the guidance of the national "game of chess for resuming work", Zhejiang, Jiangsu, Guangdong, Fujian and other labor-heavy provinces were the quickest to respond to the policy, and successively introduced resumption plans and favorable policies for enterprises. From local counties and cities to industrial towns, they were actively exploring and adjusting their local policies. For example, Liushi Town of Wenzhou assisted the leading enterprises Deli Group and Zhengtai Group to carry out the service of "charter" and "meal package" for the resumption of work, and opened up the special passage for trucks for enterprises.

At present, the above all kinds of emergency prevention and control measures for subsequent outbreak control has been showing a certain effect, but temporary physical isolation measures such as sealing city, road in alleviating the shortage of facilities toughness town pressure also had a great social cost, in the long run, there are still many weaknesses and challenges, the need to address. According to the characteristics of Industrial towns and the problems exposed in this epidemic, industrial towns should be sorted out and optimized at the level of spatial planning and governance.

4. Key points of spatial planning in industrial towns based on the concept of resilience planning

Resilience, which has been discussed in the west academy for more than a decade, is a new idea for exploring risk management and sustainable development in urban and rural areas.[10] Urban resilience generally refers to the ability of urban systems and regions to recover normal operation of public security, social order and economy through reasonable preparation, buffering and coping with uncertain disturbances. The study of urban resilience is multi-disciplinary covering infrastructure, system, economy and society.[11] [12]

Compared with emergency system planning and comprehensive disaster prevention planning, the research of resilient urban planning has extended to urban public safety and long-term sustainable development with the overall goal of coping with unforeseen disasters.[13] The planning framework is more complete, including the city's lifeline system, social organization system, emergency management capacity, residents' awareness of disaster prevention and reduction.[14] In terms of planning mechanism, more emphasis is placed on the combination of soft and hard systems and the coordination of various departments to build a multi-level linkage comprehensive governance platform and a multi-participation social co-governance model.[15]

In order to achieve efficient and safe epidemic prevention and control in industrial towns, it needs to be supported in the stage of spatial planning. Guided by the theory of resilience planning, it is important to improve the system resilience and resilience of industrial towns to cope with the sudden epidemic. In general, the current level of construction and facilities in industrial towns is much lower than in cities, and construction funds and resources are also limited. Therefore, spatial resilience planning for industrial towns needs to be adjusted based on the urban resilience theory, in order that the capacity of industrial towns in dealing with emergency disaster can be ensured to the greatest extent with limited resources and space.

4.1. Pay attention to public space design and increase emergency space reservation

It is of great significance to construct urban public space system for disaster prevention and mitigation. Public open space is an important space carrier to maintain urban public health and public health, as well as an important space reserve to alleviate the insufficiency of urban emergency facilities system. At present, in the construction of industrial towns, the quality of living environment is generally poor, especially for the ecological green space, sports and leisure places and other public space history debt is too much. Therefore, in the spatial planning, it is necessary to design enough public space with multi-function as the orientation, so that the public open space of different scales, such as urban parks, squares, community/village fitness sites, can be effectively combined with different levels of emergency shelters; Secondly, the layout of grey infrastructure and public space should be considered simultaneously, and the capacity of public space in

terms of infrastructure such as energy and water should be strengthened, and temporary or permanent facilities for public health monitoring and emergency use should be appropriately increased. In addition, the enhancement of both the maintenance of public space, update and strengthen health supervision and management, refine of Suggestions at all levels of public space can be use to daily, planning department can be combined on public health, public security and other relevant departments to formulate daily with the very period of the public space use guide and management rules, so that more accurate for design and maintenance.

4.2. Strengthen the construction of community units and stabilize the urban security pattern

Community is the basic unit of social governance and the frontier position of urban disaster prevention. The outbreak, the community is the first defense line of the epidemic prevention and control, especially the traditional "door village" in the very period became the important tool of social protection, behind it reflects, in response to sudden disasters (especially in infectious diseases), how to carry out the "closed" on the urban space unit management inner demands, it is also the important manifestations of urban space toughness. From the present situation, the construction of community units in industrial towns is relatively weak. First of all, the size of the community is different, which is not conducive to administrative management and facility layout. Taking Dali Town, one of the top 100 towns in Guangdong Province as an example, the largest community contains 15,000 households and nearly 40,000 permanent residents. The minimum community size is only 300 households; Secondly, the boundary of community space is not clear. Based on the historical causes, strong town above, commercial housing building, dormitory, property and other kinds of mixed crisscross of living space, coupled with the development of all types and at all levels, the industrial layout dispersion "blossoming", lead to different land use properties and management ownership of space interspersed with interweave each other, is not conducive to the disaster period of flexible management of space requirements.

In the study of urban resilience, it is believed that the "network + cluster" spatial structure is a resilient spatial organization form that can quickly adapt to the changes of external environment and disperse risks,[13] which also proposes a reference idea for the spatial governance of industrial towns. From the perspective of practice, "industrial park" and "residential area" may be the main trend of spatial intensification in industrial towns around the country. Combined with the characteristics of industrial towns, we should actively explore the spatial unit models of various "industrial communities", systematically sort out and organize the spatial relations and corresponding management ownership of

industrial space, residential space, basic supporting service space, public open space and other space in each community. On this basis, actively absorb the concept of community life circle, the community public service facilities and space resources actively integrating into the community level of emergency disaster prevention system, to make every industrial community can form the basic protection, guarantee supply system of emergency supplies safety nets, "toughness" to improve the community itself to respond to disasters. Therefore, the ideal layout pattern is to construct an urban security pattern with flexible organization and systematic toughness by several industrial community units with complete production and living functions and relatively independent space aggregation.

4.3. Raise the standard of public facilities construction and make up for weak links in peacetime and wartime

Technological resilience, including the level of urban health care and lifeline infrastructure, is the basic guarantee to achieve spatial resilience. For Industrial towns, the first thing is to improve its public facilities supporting standards, fundamentally improve the ability of Industrial towns disaster resistance. In the current planning and construction of public facilities in most powerful towns, there are not only the quality problems of supporting productive facilities and active services, but also the quantity is usually allocated according to the standard of local registered population, resulting in the level of various facilities lagging seriously behind the actual living needs. For example, in Shishan Town of Foshan City, Guangdong Province, the second largest town in China, there are only two secondary public hospitals for the permanent resident population of 870,000 people. The average number of beds for 1,000 people is 1.5, which only reaches the level of towns and cities but is far lower than the average standard of 4-5 beds per person in small cities. The same situation as well happens in Puyuan Town of Tongxiang City, famous for its woolen sweater production, in Zhejiang Province. With whole registered population of 47,300 people and 170,000 migrating population, there is only one health center in the town, and the number of community medical stations can’t even reach the coverage of each village. Therefore, it is necessary to enhance the overall allocation standard of public facilities in industrial towns, so that the carrying capacity of public service facilities matches the permanent population capacity of towns.

In addition, the planning of public facilities in industrial towns must fully consider the annexation of gun-bombs and the combination of peacetime and wartime, and construct the system of emergency facilities and resource supply and allocation. In addition to the allocation system of health facilities, in terms of transportation facilities, it is necessary to strengthen the efficient connection channels between regions, attach importance to the

construction of logistics channels, meet the needs of rapid mobilization and supplement of resources within the region in the emergency period, and timely fill the gap; At the same time, improve the density of internal road network to support its internal traffic accessibility, increase the proportion of branch roads in the town, improve the construction of rural roads; If conditions permit, independent transit roads should be planned and constructed to facilitate closed control during the epidemic period.

4.4. Appropriately improve spatial redundancy and reserve temporary construction space for emergency facilities

Appropriate redundancy is an important concept in toughness planning. When considering infrastructure construction, a certain degree of functional overlap space should be planned to prevent the overall failure of the system.[16] Urban redundant space refers to the space that can be quickly used for personnel evacuation, refuge, isolation, material storage and other functions in a short period of time under the state of emergency, among which the more important facilities include large-scale sports facilities, exhibition space, large-scale material warehouse, etc.[17] The spatial planning of Industrial towns should also fully show foresight and predictability, and have a certain "redundant consciousness". Combined with the development level of Industrial towns, temporary construction space should be reserved for public health emergencies, and pipeline interface should be reserved for important infrastructure, so as to ensure the available space during emergency. For example, sports facilities of medium capacity are encouraged to be planned in the town. Such facilities have the advantages of high safety and rapid evacuation, and can be used as emergency shelters in disasters and emergency isolation hospitals to treat patients with mild diseases in epidemic times. For the strong town, under the limited land resource constraints, can make full use of redundant space revitalize the inefficient use of land, the inefficient spatial resources into the reserved space security risks, on the other hand, based on redundant public demand space of public use function, to the use of being serviceable at both peacetime and wartime best effect.

5. Spatial governance strategies for industrial towns in response to the sudden epidemic

Research shows that good public governance order is the guarantee for the resilient development of small towns.[18] From the perspective of resilience planning, all kinds of emergencies are only the inducing factors to highlight urban vulnerability, while the lifeline system and public service level enhance spatial resilience. However, the social organization system, emergency management capability and national awareness of disaster prevention and reduction are the keys to resilience and social resilience, which

greatly affect the extent of epidemic spread and the speed of urban recovery. Therefore, it is necessary to strengthen social coordination ability, improve governance ability and emergency management ability when dealing with sudden public crisis events, so as to systematically promote the resilience level of cities and towns, and mitigate the impact and impact caused by public crisis to the greatest extent.

5.1. Link medical resources at the town level with those at the county and city levels, making flexible preplan for general medical facilities

China's current disease prevention and control system mainly includes national, provincial, municipal and county levels of disease prevention and control centers, grassroots community health service centers (township health centers) and rural community health institutions. During the emergency prevention and control period, the strong town must formulate the emergency preplan with the linkage of upper and lower levels. On the other hand, according to the emergency degree of the epidemic, we should dynamically adjust the allocation of resources, treat personnel at a higher level during the emergency period, transfer high-grade treatment equipment to the township level, and improve the capacity of local treatment and isolation, so as to avoid the large-scale spread of the disease which is difficult to control. On the other hand, we should strengthen the level and material allocation of urban and rural community health institutions, strengthen the training of community doctors, fully mobilize and integrate the medical resources of communities at all levels during the epidemic, and build the first line of defense at the community level. On this basis, through the mobile Internet platform, the monitoring and contact channels and first-aid dispatching system among community health service points, local centralized diagnosis and treatment hospitals and superior CDC are established, and a decentralized, centralized, hierarchical and cooperative dynamic disease prevention and control system is constructed.

5.2. Establish a systematic prevention and control mechanism for the linkage of towns, villages and enterprises

The prevention and control work needs to establish the upper and lower linkage working mechanism. The prevention and control work at the township level focuses on formulating the overall emergency plan, clarifying the medical treatment policy, traffic management policy and public goods supply policy during the epidemic period, and systematically deploy and command the prevention and control work of urban communities, rural communities and enterprise units in the area under their control according to the risk assessment in different points and levels. Community village residents are staffed with community workers, community police officers and medical staff to carry out investigation

and epidemic publicity for key personnel in the community, and take prevention and control measures according to local conditions. In accordance with the policy, the enterprise units set up the epidemic command working group, formulated the control and supervision plan for the park and the enterprise, strictly managed the flow of employees, timely reported the epidemic situation to all government departments, and properly arranged the order of returning to work according to the overall deployment of the epidemic prevention and control in the town. The transparency and unobtainability of information at all levels can effectively enhance the flexibility of prevention and control work. In addition, local governments should actively adjust their working boundaries, actively include social forces in the prevention and control work plan, such as cooperating with platforms such as e-commerce and logistics enterprises to provide basic livelihood materials and logistics services, and expanding publicity with the help of public media platforms.

5.3. Promote the development of social organizations and establish a linkage mechanism between government and non-governmental participants

In the epidemic prevention and control of novel coronavirus, civil forces cannot be ignored. Especially for industrial towns, a large number of local private enterprises and local chambers of commerce are also important non-governmental organizations actively engaged in the front line. However, in general, the current voluntary actions of the people are scattered and spontaneous, while the strength of professional prevention and control or relief social organizations is still not sound. International experience shows that giving full play to civil society is an indispensable part of the epidemic prevention and control network. More importantly, when looking into the construction of public health governance system in the future, civil society should play a major role in the prevention and detection of infectious diseases. In the epidemic report, voluntary service, goods and materials donated, publicity education should give full play to the multiple aspects, such as natural advantages of civil society organizations (mobilization rapidly, flexible organization and wide type, laminating the masses, etc.), and expand public participation channels make more professional ability of society to positive advices, multi-level, three-dimensional social support and the government forces with complementary, Thus, an organic, complete and resilient public health security system will be formed. Therefore, it also requires industrial towns to attach importance to the cultivation of social organizations in the system construction of social governance, and to actively explore the management system conducive to the vigorous development of social organizations by giving play to the advantages of local social capital. This is also one of the tasks of modernizing China's governance system and capacity.

5.4. Establish an intelligent data system to achieve fine community governance

The application of intelligent technology in modern governance should be strengthened, and the community partitions should be classified and refined in combination with the intelligent data system. In this epidemic, many townships across the country adopted grid governance. For example, in Dayun Town of Jiashan, Zhejiang Province, the "large grid" of villages, communities and enterprises was subdivided into "micro grids". Party members, as the leader of the micro grids, carried out information screening, policy publicity and psychological counseling. In Zhuzi Town of Wuyi Mountain, Fujian Province, the "three cards and one card" system has been established, with permanent residents holding "green cards", floating residents holding "red cards" and people in the worst-hit areas holding "yellow cards", to implement rapid identification and precise management. Xixiashu Town, Changzhou City, Jiangsu Province, has implemented a "grid + police grid" management system, using intelligent devices such as video surveillance, face recognition and access control identification to track the tracks of quarantined people and confirmed cases. Intelligent tools have played an important role in the epidemic prevention and control, promoting more accurate and refined governance, should be further optimized. In the future, intelligent information system which involves residents' information collection, community access management, security monitoring, daily supplies, information publicity and other functions should be increasingly strengthened.

6. Conclusions

The sudden coronavirus outbreak caused great influence to the national economic and social development, also to local space planning and social governance present a major challenge, at the same time also reveals the strong town in unexpected events occur (public health) facing the high risk and long-term accumulated space planning and social governance issues caused by the vulnerability. In fact, the outbreak of the epidemic happened close to the Chinese Lunar New Year, when a large number of migrants had left the migrant towns, which to a large extent reduced the pressure of epidemic prevention in the towns. Even so, the epidemic prevention risk of industrial towns reflected in the comprehensive prevention and control period has also made clear that the emergency disaster prevention (epidemic) of industrial towns is very important and cannot be ignored.

The pursuit of social development and spatial quality will be more significant when China's per capita GDP has just entered the threshold of 10,000 US dollars. The development of

industrial towns needs to be transformed. It is the future road for industrial towns to change from a traditional town with low, small and scattered industries gathering and production as its main focus to a comprehensive and professional modern town with innovative industries driving and high-quality living environment. From this perspective, improving the resilience of cities and towns is an issue that should be fully paid attention to and considered during the transformation and development of industrial towns across the country, as well as an emergency guarantee when industrial towns deal with sudden (epidemic) disasters.

References

National Health Commission. Notice on the incorporation of novel coronavirus into the management of statutory in-fectious diseases (No.2020 [1]),2020-01-20.

Long Ying. Pan-Smart City Technology to Improve Urban Resilience -- A Handbook Session on 2020COVID-19 Emer-gencies. City Planning Review,2020-02-12.

Zhou Suhong. Safety and health spatial planning and governance: a written discussion on 2020COVID-19 emergencies. City Planning Review,2020-02-19.

Liu Qizhi. It is suggested to increase the special program for prevention and treatment of infectious diseases -- a written discussion meeting for 2020COVID-19 emergencies. City Planning Review,2020-02-13.

Wang L. Building a healthy urban governance system with "public health unit" as the core -- a written discussion on coping with 2020COVID-19 emergencies. City Planning Review,2020-02-18.

Wang Chenghui. Enhancing Community Resilience through Community Participation in Planning: A Written Talk on 2020COVID-19 Emergency. City Planning Review,2020-02-13.

Leng Hong. Promotion of health and safety planning: a written discussion on 2020COVID-19 emergency. City Planning Review,2020-02-17.

Zhang Li, Dong Shuting. Construction of urban system with Chinese characteristics under the trend of modernization of national governance. Urban Planning Forum,2019 (04):32-37.

Chang Haijun. Research on public health emergency management system of grass-roots government. Tongji Uni-versity,2006.

Ahern J. From Fail-Safe to Safe-to-Fail: Sustainability and Resilience in the New Urban World. Landscape and Urban Planning, 2011, 100(4): 341-343.

Jha A K, Miner T W, Stanton-Geddes Z. Building Urban Resilience: Principles, Tools, and Practice. World Bank Publications, 2013.

Shao Yiwen, Xu Jiang. Urban resilience: A conceptual analysis based on international literature review. Urban Planning International,2015,30(02):48-54.

Qiu Baoxing. Resilient urban design methods and principles based on complex adaptive system theory. Urban Development Studies,2018,25(10):1-3.

ZHAO Guohua, ZHANG Ye. The development of China's large urban agglomeration and toughness plague prevention and control of urban construction, based on city emergency thinking. https://mp.weixin.qq.com/s/6BUgWNfu6NgpjEnimECteg, 2020-02-26

Bing Qiliang, Li Xin, Luo Yan. Discussion on urban disaster prevention and mitigation planning guided by resilient city theory [J]. Planners,2017,33(08):12-17.

Wildavsky A B. Searching for Safety (Vol.10)[M]. Transaction Publishers,1988.

LIU Zhimin, XIU Chunliang, SONG Wei. Research progress on urban spatial resilience. Urban Architec-ture,2018(35):16-18.

Guo Wenjuan. Journal of Shanxi Agricultural University (Social Science Edition), 2018,17(09):42-47. (in Chinese)

ACHIEVING ADAPTATION IN MEDIUM-SIZED CITIES: THE CONTRIBUTION OF URBAN CLIMATE TRANSITION STRATEGIES IN INCREASING SOIL PERMEABILITY (1113)

Barbara Caselli[1], Marianna Ceci[1], Ilaria De Noia[1], Emanuele Garda[2*], Giovanni Tedeschi[1], Michele Zazzi[1]

[1] University of Parma, Department of Engineering and Architecture, Parma, Italy
[2] University of Bergamo, Department of Engineering and Applied Sciences, Bergamo, Italy
[*]emanuele.garda@unibg.it

Abstract. Soil sealing and land take have produced negative impacts on urban areas, leading to adverse phenomena such as loss of ecosystem services, the urban heat island effect, and flooding. In this critical context, increasing soil permeability through desealing interventions is considered an effective solution against these problems. Over the past years, desealing has begun to be recognised in the scientific literature and in spatial planning practice to meet various needs. The approaches to desealing considered today are either top-down, as a result of political actions and choices by local and regional governments, or bottom-up, i.e. promoted by local associations.

Within this complex framework, the aim of this contribution is to investigate and compare some specific innovative strategic urban planning instruments in medium-sized cities, specifically the Sustainable Energy and Climate Action Plans (SECAPs), which were examined focusing on how these tools have interpreted and proposed desealing interventions.

Keywords: desealing, soil sealing, climate change, adaptation, urban planning transition plans.

1. Introduction

It has been broadly demonstrated that soil sealing and land take have strongly impacted urban and metropolitan systems, leading to adverse phenomena such as loss of ecosystem services, the urban heat island effect, and flooding. The severe impacts on urban areas caused by increasingly frequent extreme or abnormal weather events can no longer be defined as 'unpredictable', and strongly impact on society social, economical, and environmental dimensions. These urban challenges call for specific mitigation and adaptation actions (i.a. Biesbroek, Swart and Van der Knaap, 2009), given also the growing awareness of a substantial change in approaches to the urban and territorial transformations governance that climate change requires (Zucaro and Morosini, 2018).

The increasing urbanisation and land take that were observed in the last centuries, both in European and Italian cities, contribute to sharpen the effects of climate change (Intergovernmental Panel on Climate Change, 2022; Munafò, 2022). Indeed, in urbanised areas, the effects of water runoff during heavy rainfall are aggravated; this requires adequate infrastructure in order to reduce probable negative impacts (Gibelli *et al.*, 2015). Traditional grey infrastructures are still broadly being implemented, but the potential role played by Nature-based Solutions (NBS) is being increasingly recognized both in literature and in urban planning practices and tools (De Luca *et al.*, 2021; Voskamp *et al.*, 2021; De Noia *et al.* 2022).

In this context, increasing soil permeability is considered an effective intervention against climate change and its effects. By restoring soil permeability, the ecosystem services provided by the soil can be partially restored, with benefits for the environment, human health, and society as well (Bockarjova *et al.*, 2022). This can be achieved through desealing interventions, i.e. restoring part of the soils to their previous state, recovering the main functions inhibited by transformative processes, through the removal of the waterproofed layers, the loosening of underlying soil and the removal of foreign material (European Commission, Directorate-General for Environment, 2013; Tobias *et al.*, 2018).

Over the past 30 years, desealing has begun to be recognized as a possible compensation and mitigation measure in the scientific literature (SOS4LIFE-Save Our Soil For Life, 2017; SOS4LIFE-Save Our Soil For Life, 2018, Ceci, 2023) in European policies (European Commission, Directorate-General for Environment, 2012) and in spatial planning practice, e.g. in the German cities of Berlin, Dresden and Stuttgart (presented as case studies in the European research programme SOS4Life) or in the city of Eindhoven (Augusto *et al.*, 2020). The approaches to desealing known in literature and practice are either top-down, i.e. the result of political actions and choices by local governments (Prokop, Jobstmann and Schönbauer, 2011; SOS4LIFE-Save Our Soil For Life, 2017), or bottom-up, i.e. promoted by associations and volunteers sensitive to the issue[1] (Artmann, 2014; Caselli *et al.*, 2022; Garda, 2020; SOS4LIFE-Save Our Soil For Life, 2017; Stobbelaar, van der Knaap and Spijker, 2021).

Within this framework, the aim of this contribution is to investigate how desealing actions have been adopted and implemented in innovative strategic planning instruments, specifically the Sustainable Energy and Climate Action Plans (SECAPs). The SECAPs are developed within the Covenant of Mayors urban climate network (Global Covenant of Mayors for Climate & Energy, n.d.), a specific European policy aimed at increasing urban

[1] One example is the 'Depave' association founded in Portland (Oregon) in 2007: for more than ten years, it has managed to stimulate the activation of desealing projects for collective space by actively involving thousands of citizen volunteers. https://depave.org/

and regional resilience to the energy emergency and climate change. SECAPs are chosen as a case study as they are new tools that incorporate climate strategies and actions (sometimes with spatial implications) but are still little explored in the scientific literature, especially in their interactions with ordinary urban planning tools.

The proposed analysis focuses on the SECAPs drafted by three medium-sized cities in Northern Italy, investigating the conditions, measures, and processes related to desealing actions. Medium-sized cities show the same environmental, social, and economical issues of bigger urban areas, but have often fewer financial resources to manage urban challenges, in addition to limited technical and administrative structures, including the reduction of climate change effects (Häußler and Haupt, 2021).

The expected results of the comparative analysis are to realise a synthesis of three innovative experiences in the Italian context aimed at increasing the resilience of cities to climate change with a systematic approach, trying to investigate the different interpretations and applications of the desealing concept. The outcomes of the study will be useful to investigate the criteria and processes underlying the choice of priority areas to be de-sealed and the physical interventions on the urban soils. It will also allow the development of a first critical reflection on the opportunities and limits of strategic plans for climate resilience, and their interactions with the ordinary urban plans.

The paper is structured as follows: chapter 2 provides insights into the Covenant of Mayors and the evolution and content of SECAPs; chapter 3 introduces the three SECAPs chosen as case studies and the main geographical, morphological and climatic features of the cities involved; chapter 4 outlines the methodological approach adopted for the comparative analysis; chapter 5 presents and discusses the results of the analysis; and finally, chapter 6 draws some concluding remarks.

2. Insight Into The Covenant Of Mayors And The SECAPs

The Covenant of Mayors (Global Covenant of Mayors for Climate & Energy, n.d.), launched in Europe in 2008 and at a global level in 2015, is an initiative and opportunity for local governments to concretize their efforts towards an increased urban resilience, thus reducing greenhouse gas emissions and alleviating energy poverty. In the Green Deal and Agenda 2030 context, the Covenant of Mayors signatories' commitment is to keep the global temperature rise below 1.5°C, in line with the Paris Agreement.

The Covenant of Mayors for Climate and Energy intends to support local activities and set up a network of cities while raising public awareness about climate adaptation and mitigation. Based on transparency, flexibility, data evaluation, and exchange of experience, the initiative supports a bottom-up approach, a multilevel cooperation, and a context-

driven framework for action. Participating municipalities can, therefore, take a direct and voluntary step for their transition towards resilience by adopting a local action plan.

The 'first generation' action plans, called Sustainable Energy Action Plans (SEAPs), included mainly mitigation actions to achieve at least a 20% reduction in CO_2 emissions by 2020, but since 2015, signatories to the Covenant have the opportunity to adopt the SECAP that includes both mitigation and adaptation strategies to achieve a 40% reduction (at least) in CO_2 emissions by 2030. More specifically SECAPs address the key mitigation sectors of Municipal buildings and equipment/facilities, tertiary buildings and equipment/facilities, residential buildings, and transport. They can also include sectors such as industry, local electricity, or heat/cold production. For what concerns adaptation, the main sectors included are infrastructure, public services, land use planning, environment and biodiversity, agriculture and forestry, and economy.

Since the beginning, the Covenant of Mayors initiative has helped develop climate strategies in European cities, years before climate policies were implemented at a regional and national level. It is debatable if the transformational momentum of the Covenant and SECAPs is still relevant when climate policies and strategies are gaining more importance across different governance levels (Tedeschi, 2023).

3. Presenting The Three Case Studies

In this contribution, we focus on SECAPs implemented by Italian medium-sized cities. Medium-sized and small cities constitute a significant asset both in the European and Italian context (European Commission, Directorate-General for Regional and Urban Policy, 2016). Indeed, European countries, for historical, political, and geographical reasons, register a higher share of population living in medium and small cities compared to the rest of the world. Though their urban densities result lower than in Asian cities, they are much higher than those of the U.S. cities (European Union and United Nations Human Settlements Programme, 2016). This peculiarity has been taken into account for several years by European institutions, with programs such as URBAN II, with the aim of fostering and funding the sustainable development of areas characterised with this specific type of urban distribution (European Commission, Directorate-General for Regional and Urban Policy, 2003). Other research programs seek to better define the specificities and challenges of European medium and small cities, through morphological, functional, and administrative analyses in order to elaborate more defined territorial development policies (European Spatial Planning Observation Network, 2006; Servillo *et al*. 2014). Medium-sized cities also participate in European coordination networks, such as Eurotowns network (Eurotowns, n.d.), as well as in forms of competition that enhance and reward the implementation of sustainable development policies, such as the Green

Leaf Award (European Commission, n.d.).

The Italian situation traces and further highlights the role and importance of medium-sized cities as nodes of development and territorial *praesidium*. About one fifth of Italian citizens reside in medium-sized urban areas, with populations between 200,000 and 500,000, and an additional 19% in small urban areas, with populations between 50,000 and 200,000, 2014 data (Organisation for Economic Co-operation and Development, 2014). The definition of the extension and features of the medium-sized city in Italy has been the subject of several studies (Associazione Nazionale Comuni Italiani, 2013; Associazione Nazionale Comuni Italiani, 2022), with the aim of enhancing the functional and strategic role played by these areas and defining the criteria for allocating resources, in order to implement the necessary development policies. In Italy, SECAPs have been implemented in 3,619 municipalities, from the bigger metropolitan areas with more than 500,000 inhabitants such as Milan and Rome, to the smallest towns with less than 10,000 inhabitants. Among all the urban areas, this contribution focuses on three Italian medium-sized cities - Mantua, Modena, and Parma - which have been selected for their common scattered and polycentric urbanisation which characterises the southern section of the 'Megalopoli Padana' (Figure 1). This term has been used by Turri (2001) to define the urbanised system of the Padana Valley. From the most western point in Piedmont to the Adriatic Sea, this area is characterised by a diffuse urbanisation, where natural and agricultural areas represent the interstices of the built-up areas. The 'Megalopoli Padana' develops within two large 'linear cities' which rise along the feet of the mountains (Muscarà, 1978; Turri, 2001). As shown in Figure 2, the 'Megalopoli Padana' is also the area where the percentage of land consumption is higher than in the rest of the peninsula.

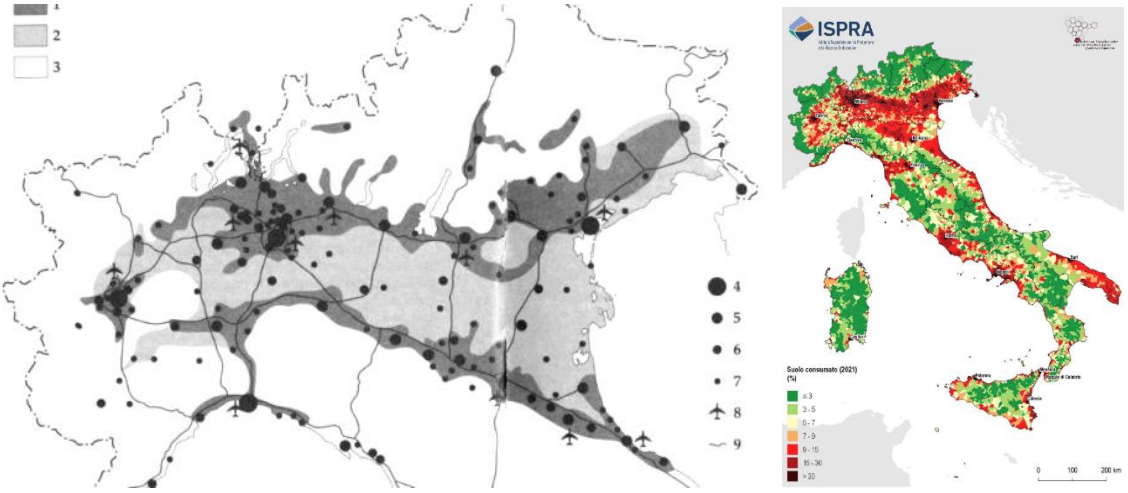


Figure 1 and Figure 2. On the left, the 'Megalopoli Padana' (Source: Turri, 2001); the dark-grey area identifies two 'linear cities', i.e., high-density urbanised areas, while the light-grey areas identify lowland areas where agricultural systems and scattered urbanisation prevail. On the right, land take mapping of the Italian Peninsula
Source: Munafò, 2022.

In the three case study cities an increase in soil consumption has been observed in recent decades, and more than one fifth of their municipal area has been classified as consumed (Table 1). Between 2020 and 2021, Mantua consumed 6.98 more hectares, Modena 11.20 hectares, and Parma 28.04 hectares (Istituto Superiore per la Protezione e la Ricerca Ambientale, n.d.).

Table 1. Soil consumption trends in Mantua, Modena, and Parma (2006-2021). Data retrieved from the Italian Institute for Environmental Protection and Research (Istituto Superiore per la Protezione e la Ricerca Ambientale, n.d.)

City	Consumed soil 2006 [ha]	Consumed soil 2006 [%]	Consumed soil 2021 [ha]	Consumed soil 2021 [%]	Increase 2006-2021 [ha]	Increase 2020-2021 [ha]
Mantua	1493	23.4	1579	24.7	86	6.98
Modena	5048	19.4	5620	21.5	572	11.20
Parma	4422	24.1	4620	25.1	198	28.04

The path towards the approval of the SECAPs for all three cities has seen a constant interest in the issues of containing CO_2 emissions and combating climate change through mitigation and adaptation actions: from the initial adhesion to the Covenant of Mayors to the subsequent approval of the SEAP in each city council (Modena was the first). The table below (Table 2) shows the chronology of events for the three case study cities.

Table 2. Adhesion to the Covenant of Mayors and approval of the local action plans of the Municipalities of Mantua, Modena, and Parma.

Municipality	Year of adhesion to the Covenant of Mayors	Year of SEAP approval	Year of SECAP approval

Mantua	2013	2014	2020
Modena	2010	2011	2021
Parma	2013	2014	2021

3.1 The SECAP Of Mantua

The first case study is the SECAP of Mantua, approved by the local government in 2020 (Comune di Mantova, 2020). An in-depth urban analysis and specific guidelines 'Mantova Resiliente. Verso il Piano di Adattamento Climatico - Linee Guida' (Resilient Mantua. Towards the Climate Adaptation Plan - Guidelines, particularly focused on adaptation) (Musco, 2018) preceded the drafting phase. These guidelines offered suggestions and examples of best practices, mainly focused on NBSs and increasing the soil permeability, on the basis of the vulnerability analysis (Musco, 2018). Then, the SECAP incorporated some of these suggestions. The analysis of the SECAP from a desealing perspective, focuses in particular on the section addressing adaptation actions, but all the other sections have also been examined.

3.1.1 Document Characteristics

The SECAP of Mantua is divided into seven main sections. The first and the second trace the steps of the global fight against climate change, as well as the European 2050 Strategy and the Italian 'Piano Nazionale Integrato per l'Energia e il Clima' (National Integrated Plan for Energy and Climate) 2030; the third chapter presents the vision of the action plan, while chapter 4 presents its strategy and mitigation actions and chapter 5 presents its strategy and adaptation actions; chapter 6 and 7 address dissemination, formative activities, and monitoring of the SECAP.

This contribution approaches the analysis of the SECAP from the desealing perspective, focusing in particular on the adaptation action section, but all the sections have been examined/reviewed.

3.1.2 Characteristics Of The Urban Context

Mantua is an Italian medium-sized city geographically located in the Po Valley, in the southeastern sector of the Lombardy Region (Figure 3). It rises along the course of the Mincio River, in the foredeep between the Apennines and the Alps. The total population consists of about 48,000 inhabitants (ISTAT), has an extension of 63.96 km^2 and a population density of 778.88 people/km^2.

Figure 3. The City of Mantua and its administrative boundaries. Elaboration by the authors based on Google satellite images and ISTAT data (municipal administrative boundaries).

Eight percent of the total surface area of the Municipality of Mantua is occupied by three lakes (Lago Superiore, Lago di Mezzo, and Lago Inferiore), along with a vast marshland area. From a geomorphological perspective, the territory is characterised by sediments with a silty-sandy composition and an average acclivity of around 0.1 percent. The circulation of surface water, also due to a reduced water supply from Lake Garda, is relatively slow, while the impermeable levels of the soil favour the formation of a multilayer aquifer.

Mantua has a strong relationship with the water system. In ancient times, the historic city centre was completely surrounded by water, and the presence of the port ensured the city's economic, architectural and cultural development. Works to reclaim land and regulate the river led over the centuries to the formation of the current three lakes that embrace the historic centre (now UNESCO world heritage) on three sides.

Even today, the territorial economic system is still closely linked to the presence of the river, both in the secondary sector for the presence of one of the main river ports of the Po Valley and a large industrial hub (developed in the twentieth century), and in the

tertiary sector. The river, the lake system and the conterminous areas have been protected since the 1980s within Mincio Park which has become, indeed, an important tourist attraction.

The climate of the Municipality of Mantua is in some respects continental, and it is conditioned mainly by the physical conformation of the Po Valley. Being completely enclosed by the mountains, there is no inflow of cold winds from northern Europe, while the Adriatic Sea does not impact the climate. Winters tend to be long and cold with average temperatures often below the freezing point that, in some periods, fall below -10°C. High humidity causes intense and persistent fog, enhanced by the area's poor ventilation. Summers are muggy, and average temperatures hover around 23-26°C, with the maximums as high as 35°C. Rainfall is not very abundant, but it is evenly distributed across the seasons, although it is at its highest in spring and autumn. In winter, precipitation consists sometimes of snow, while, in summer, thunderstorms are frequent, often accompanied by hailstorms (Musco, 2018).

3.2 The SECAP Of Modena

The second case study is the SECAP of Modena, approved in 2021. Similarly to the case of Mantua, the analysis focuses in particular on the adaptation actions section, even if all the other chapters have also been explored.

3.2.1 Document Characteristics

The SECAP of Modena has seven sections. The first chapter provides a summary of the action plan, while the second introduces the history of the Covenant of Mayors, as well as the work group; the third chapter addresses the criteria and objectives of the inventory of the emissions encompassed by chapter 4; while chapter 5 provides the description of mitigation actions; chapter 6 evaluates the risks and vulnerabilities of the urban area, while the last chapter encompasses the adaptation actions envisioned by the action plan.

3.2.2 Characteristics Of The Urban Context

Modena is a medium-sized city located in the centre of the Emilia-Romagna region, along one of the oldest Italian roads, the Via Emilia in the Po Valley (Figure 4).

Modena has a population of 184.971 inhabitants (Provincia di Modena, n.d.), and an extension of 183,19 km^2 and population density of 1,017.1 inhabitants/km^2, a much higher value than the provincial and regional average. The Province of Modena encompasses one of the most thriving economic areas in Europe, due to the concentration of high-value industries and services.

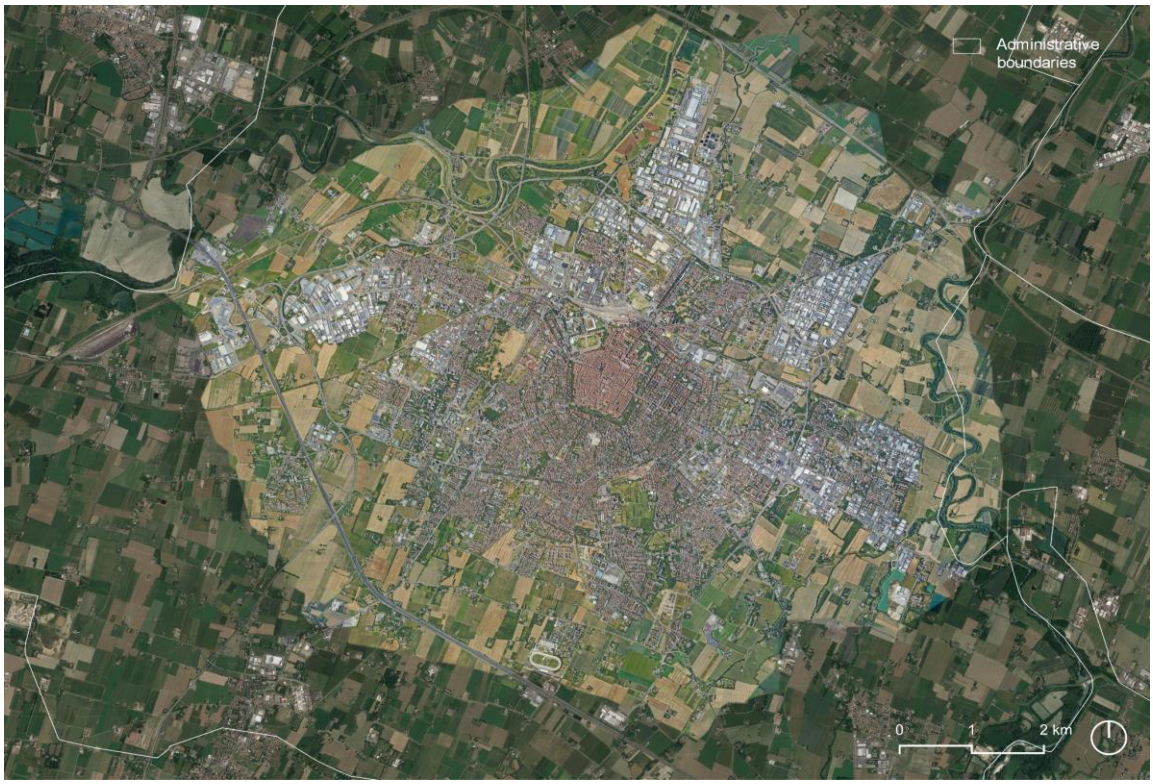


Figure 4. The City of Modena within its administrative boundaries. Elaboration by the authors based on Google satellite images and ISTAT data (municipal administrative boundaries).

The municipal area of Modena is flat throughout its extension. The urban centre and the historical city are located in the central part while the industrial areas extend mainly in the northern part of the municipal area. The municipal boundaries consist of the Secchia river on the north-western side, and the Panaro river on the eastern. Among other geomorphological and hydraulic aspects, the two rivers contribute to the area's particular sensitivity to floods and extreme weather events.

The Climate Atlas 1961-2015 (Antolini, *et al.,* 2017) of the Regional Agency for Prevention, Environment and Energy of Emilia-Romagna ('Agenzia regionale per la prevenzione, l'ambiente e l'energia dell´Emilia-Romagna' - ARPAE) compares the regional climate data of two-time frames: 1961-1990 and 1991-2015. In the first-time frame, the average temperature registered was 11.7°C, while in the second the average value reached 12.8 °C, highlighting a temperature rise of 1.1°C. Precipitation is generally decreasing, except in autumn, where an increase in rainfall has been observed.

The SECAP and its synthesis document (Comune di Modena, 2021) focused on the future climate projections for 2050, in particular, on the foreseen extreme heats, droughts,

intense precipitation events, and flooding. Storms, fires and subsidence are taken into account as well. By 2050, the maximum summer temperature is expected to increase by 2.8°C (from 27.8 °C in the time frame 1961-1990 to 30.6 °C in the time frame 2021-2050) together with the number of tropical nights (that will rise by 45%) and heat wave duration. On the other hand, the annual precipitation will probably decrease from 630 mm (1961-1990) to 590 mm (2021-2050).

3.3 Parma

The SECAP of Parma was approved in 2021. Also in this third case, all document sections have been thoroughly examined, while focusing in particular on chapter four, which encompasses both mitigation and adaptation actions.

3.3.1 Document Characteristics

The document is divided into six main sections. The first introductory chapter highlights the context of the global fight against climate change, the second chapter summarises the elements which were considered for building the SECAP's vision - the pre-existing SEAP and the stakeholders' engagement, while the third chapter encloses energetic, climatic, and risk and vulnerability profiles of the city; chapter 4 encloses the vision of the action plan, highlighting its targets and actions; dissemination, formative activities, and monitoring are addressed in chapter 5 and 6.

3.3.2 Urban Context Characteristics

Similarly to Modena, Parma (Figure 5) is located along the axis of the ancient Via Emilia in the western side of the Emilia-Romagna region, in the Po Valley. Parma has a population of about 200,000 inhabitants. Along with an extension of 260,77 km^2, Parma has a population density of 769,2 people/km^2, which, compared to the other regional capital municipalities, is lower than the average (Comune di Parma, 2021).

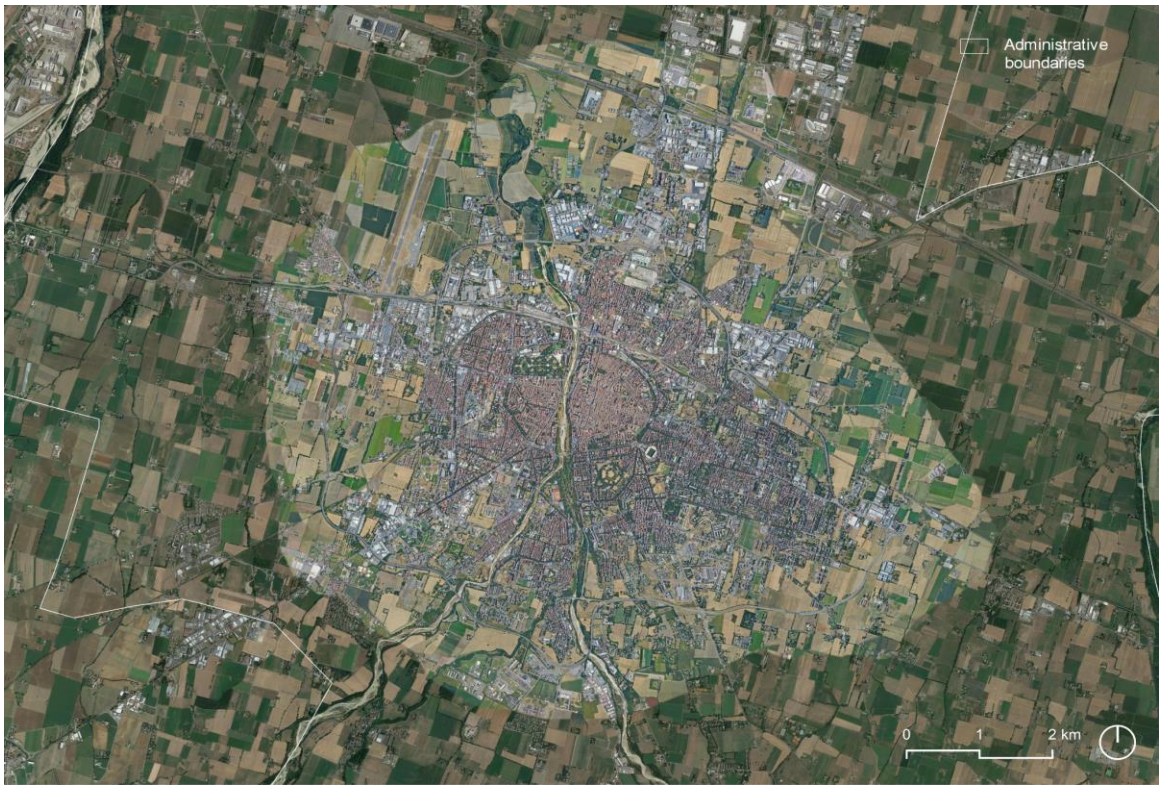


Figure 5. The City of Parma within its administrative boundaries. Elaboration by the authors based on Google satellite images and ISTAT data (municipal administrative boundaries).

Within the regional context, the Province of Parma is characterised by the highest percentage of territory defined as mountainous (43.5%) and the lowest percentage of territory defined as lowland (25%). The municipal territory is entirely flat and two watercourses, the Taro river on the west and the Enza stream on the east, delimit its boundaries. Two other watercourses characterise and divide the city: the Parma and the Baganza streams. The first stream is a tributary of the Po River, which receives the waters of the Baganza stream before crossing the historic centre.

The urban territory of Parma is characterised by a continental temperate climate, a wide annual temperature range corresponding to low winter temperatures and high summer temperatures. Rainfall is mainly concentrated in autumn and spring, while in summer, the lowlands can concentrate heat causing thunderstorms. The area and its surroundings are not generally windy, causing fog during winter and mugginess during summer. This favours the accumulation of pollutants, such as PM10 in winter and ozone in the summer, thus decreasing air quality. The temperature trends highlight climate change in their average values. The maximum and minimum temperatures show increasing trends both in their average and extreme values, especially for what concerns the summer season.

Precipitation data show an increase of years with low precipitation in the last decade, an increase of drought lengths during the summer season and an increase in precipitation in autumn (Comune di Parma, 2021).

4. Method For The Comparative Analysis

The comparative analysis is carried out consulting the technical documentation retrieved from the official websites of the analysed municipalities: specifically the three action plans, any guidelines for the drafting of the SECAP, if present (in this specific case only for the city of Mantua), and the urban planning tools of the analysed cities (e.g. local urban plans). The main aim is to understand how the practice of desealing is approached in the three urban contexts, what are the recurring and common approaches or features, and what are the discrepancies. Furthermore, it is interesting to investigate the relationship with traditional local urban plans which, in the regional and national legislative framework, are the ordinary tools used to guide decisions and interventions in the built and open spaces.

The comparative analysis of the three SECAPs is conducted in three parallel steps, as indicated in the matrix below (Table 3).

Table 3. Matrix for the comparative analysis of the three case studies.

STEPS	INVESTIGATED FEATURES	VALUES
1. ACTION PLAN CHARACTERISTICS	1.1 Declared relationships with upper-level policies, strategies and plans	
	1.2 Declared relationships with local policies and plans	
	1.3 Period of action	
	1.4 Main funder(s) and integration with funded research programmes	
2. URBAN CONTEXT	2.1 Geographic features	
	2.2 Geomorphological features	
	2.3 Climate features	

3. DESEALING ACTIONS	3.1 Actions	
	3.2 Correlation with desealing	D. Direct I. Indirect
	3.3. Promoters / Funding source	
	3.4 Declared goals	
	3.5 Description	
	3.6 Relations with ordinary spatial planning tools	
	3.7 Urban space use	a. Current b. Planned
	3.8 Urban space ownership	a. Private b. Public
	3.9 Addressed urban challenges	a. Soil quality and water cycle b. Biodiversity c. Heat Island and air quality d. Urban space quality

Firstly, the characteristics of the action plan are highlighted with particular attention to:

- declared relationships with upper-level policies, strategies and plans, such as the international, national, and regional regulatory framework of climate and energy planning taken as a reference for the development and drafting of SECAPs;
- declared relationships with local policies and plans, where some actions of the SECAP are recalled, thus becoming a binding element in land management;
- period of action of the SECAP, dependent on the target year for achieving the goals set by the Covenant of Mayors (2030) and the plan's approval year;
- main funders of the action plans or involvement in funded European programmes or projects.

Secondly, the main characteristics of the urban context are identified, with a focus on the geographic, geomorphological, and climate features. The three case studies, although located in a uniform geographical macro-area, have some local characteristics that differentiate them.

In this phase, both the information encompassed by the SECAP and by other urban planning tools are considered, in order to understand the peculiarities of the analysed urban areas, and their influence on the SECAPs' priorities, aims, and actions.

Finally, the third activity involves the direct investigation of the action plans contents, focusing specifically on the meaning functions, and role played by desealing actions. A fundamental prerequisite for this phase, which is the most complex, is the definition of the actions to be investigated. These are identified as actions that directly or indirectly refer to desealing by generally contributing to restoring soil permeability and ecosystem services (Maienza *et al*., 2021), even if only partially. This assumption, therefore, leads to considering, in the first instance, also actions that merely restore a soil layer with surface permeability, such as the implementation of green roofs in existing buildings or underground car parks, as well as actions that potentially (and indirectly) may include desealing practices, such as urban forestation. It should be noted that actions that might potentially envision desealing interventions, such as river contracts, were also included among indirect actions.

For each identified action, the following aspects are investigated: action promoter(s) and financing methods; goal, i.e. declared urban problems that the action aims to solve or to reduce; description of the interventions envisaged; relations with the ordinary spatial planning tools, i.e. local urban plans and implementation plans; types of spaces involved within the action, sorted by space use and ownership.

The second activity of this last step includes an interpretative work that aims to associate each action with the urban challenge(s) addressed. Four main urban challenges are identified based on the literature review evidence: restoring and protecting soil quality and water cycle, enhancing biodiversity, reducing heat island and improving air quality, and improving urban space quality (soil quality and water cycle, biodiversity, heat island and air quality, urban space quality). This activity was meant to investigate the potential gap of knowledge of the municipalities between the goals they set and the positive effects of desealing which have been recognized in literature.

5. Results And Discussion

The comparison of the three SECAPSs highlighted similar contents as they refer to the same template and instructions published by the European Union (Bertoldi, 2018). Considerable space is given to the description of the projects and the responsible subjects, relations with traditional urban planning instruments and initiatives, spaces affected by the project proposals, funding sources, costs, monitoring indicators, and any results already achieved are indicated. Modena and Parma, moreover, visually report for each action whether they are consistent with the goals of the Agenda 2030, in order to enhance

their synergy.

However, some significant differences can be found in the structure and organisation

of the action planning sheets as the SECAPs of Mantua (MN) and Modena (MO) dedicate two separate chapters to adaptation and mitigation, while the SECAP of Parma (PR) is the only one dealing with mitigation and adaptation in a single section of the document. This might underline a more integrated approach adopted by the city.

Furthermore, adaptation actions are often articulated according to different classifications. The cities of Mantua and Parma articulate them according to three major criticalities produced or aggravated by climate change: 1) heat waves and urban microclimate, 2) drought and water shortage, 3) floods and flooding with strong winds. Otherwise, the SECAP of Modena classifies them according to possible tasks or thematic sections: 1) green and blue infrastructures, 2) optimization of the maintenance and management of public services, 3) training and awareness.

The analytical tables comparing desealing features in three case studies can be found in the appendix. Overall, municipal authorities aim to encourage urban regeneration interventions of built-up areas and the recovery of sealed soils, limiting resource consumption and improving soil permeability and urban drainage. However, reference to desealing does not always emerge clearly and directly, and often needs to be sought.

Desealing, intended as an effective action to increase soil permeability has been approached in various ways also from the terminology perspective. For instance, the SECAP of Mantua does not directly refer to desealing but proposes various actions aimed at increasing soil permeability declaring clearly this intention in the actions' goal. On the other hand, the Municipality of Modena dedicates a specific action to promote the depaving of squares and parking lots, re-designing existing impervious public spaces according to a sort of more urban design-oriented approach, while also addressing soil permeability in the action goals. The SECAP of Parma, similarly to Mantua, encloses indirect reference to desealing actions as well, while addressing the increase of soil permeability in the actions' goals and description.

This underlines the fact that the three cities have recognized or, in some cases, perceived the role and potential played by desealing, but appear to have different perceptions and awareness levels, as they address desealing both as an action and as a goal. Direct mentions to the term desealing (or depaving) have been highlighted (especially in the case of Mantua and Modena), in parallel to indirect mentions diffusely employed in all three SECAPs. Indirect references to desealing were traced back to actions that envisage desealing as a potential preliminary stage, i.e., urban regeneration involving urban reforestation or greening interventions.

While desealing plays a role in the SECAPs of all three municipalities, it has been observed that the range of possible direct or indirect actions is broad, underlining the wide scope of these interventions. These range from general intervention strategies, without a specific spatial location, e.g., green roofs, infiltration trenches, rain gardens, etc. to be implemented in a widespread manner; to specific actions associated with a precise spatial location and funding source or actor(s) (PR, in particular); to traditional/innovative planning instruments or programming strategies, e.g., river contracts.

In this regard, a dichotomy between tradition and innovation has been observed. The analysis of the SECAPs showed a wide variety in the instruments used to promote an increase in urban soil permeability. Desealing is encompassed in more traditional instruments such as river contracts (MN and PR), water plans (MN), municipality emergency plan (MN), hydraulic risk management regulations (PR), as well as in more innovative tools, such as green plans (PR) and urban naturalisation plans (MN) and in relatively new practices, e.g., Sustainable Urban Drainage Systems (MN). The case of the Municipality of Mantua is interesting as it envisions a revision of its urban planning instruments (town plan and building regulation) with new dedicated regulations in order to stimulate these actions. As a final remark, it has been observed that desealing has been envisioned also by participatory or engagement actions such as web platforms (MN), Info-points (MO), and discussion tables (MO).

Concerning the typology of spaces involved in desealing practices, it has been noted that in the majority of cases, the current and planned space use are not specified, and while the urban spaces ownership has been generally more defined, the actions of the SECAP remain, especially in Mantua and Modena, quite theoretical.

The analysed SECAPs appear to have been intended as a container of adaptation and mitigation actions, more than an instrument to implement them systematically, acquiring a catalogue role to be put on the side of the other planning tools.

6. Conclusion

The increase in soil permeability, and, more specifically, the removal of the impervious layers of soil, is foreseen by many actions envisioned by the three analysed SECAPs. Actions are meant for different typologies of spaces (public/private, with different uses, dimensions, and spatial location), where desealing emerges with different roles, purpose and weights. Some actions foresee the increase of permeability as a priority goal (as in MO and PR case studies), while other actions, such as urban reforestation (MN) includes soil desealing and the increase of its permeability as a secondary outcome (e.g., to create the initial conditions to support priority actions).

In this frame, the SECAPs show their strategic function and acquire the role of a ‘container’ for various actions to be applied at different scales and in different frameworks. This voluntary and performance-based tool has the potential to provide municipalities with the data and tools for gaining insight, summarising actions to guide the resilient transition of cities, monitoring constantly the effectiveness of the actions undertaken, while creating a dialogue and synergy with traditional planning instruments. Unfortunately, the expected relationship with traditional town planning tools, often declared within SECAPs, is not yet fully expressed in the planning practice, at least in the Italian context. In addition, the future of SECAPs with the advent of ‘new generation’ urban planning tools, more attentive to climate change and sustainable energy issues, is still to be investigated.

Therefore, while on the one hand these planning documents may be seen as an added value for the municipality, on the other hand they may also become ineffective strategic directions if they do not provide an adequate connection with the instruments responsible for implementing urban transformations, especially for those actions involving the transformation of land use or land cover. The cases analysed revealed a multiplication of tools for implementing actions (e.g., water plans, municipality emergency plan, hydraulic risk management regulations, green plans, urban naturalisation plans) making the situation articulated and often complicated for administrations to manage.

Furthermore, the 'container tool' nature of SECAP, which encompasses a variety of different actions, makes it extremely difficult to set up a comparative analysis between different cities even when focusing on a specific theme such as desealing. That is why the comparative analysis carried out required considerable effort: the SECAPs documents, although quite similar in their general purposes and contents, as previously mentioned, had different articulation of sections and topics and, therefore, the comparison was not straightforward. Standards were sought in order to be able to make a homogeneous comparison and to point out useful information for the research. The various actions were, therefore, carefully analysed in order to extract from each one any possible direct or indirect reference to desealing actions.

The analysis of SECAPs highlights that in all three analysed cases, the increase in soil permeability is a topic of considerable relevance and significant flexibility in application. However, this does not always translate into the use of the term desealing, reflecting what happens in recent Italian regional legislation regarding land management (Garda, 2022) and the absence of a national regulatory framework and a common glossary consistent with the new global and local challenges. Nevertheless, SECAPs are useful tools in their strategic nature, rather than planning tools, for spreading awareness, providing tools, connecting the different urban planning instruments and policies, and implementing concrete actions aimed at addressing the main current urban challenges.

Acknowledgements. This work was carried out in collaboration with the PhD Students Arch. Marianna Ceci (MC) and Ing. Arch. Ilaria De Noia (IDN), whose PhD programme is funded by the National Operational Programme on Research and Innovation 2014-2020 (CCI 2014IT16M2OP005), FSE REACT-EU funds, Action IV.4 “PhD programmes and research contracts on innovation” and Action IV.5 “PhD programmes on green related topics”. CUP: D91B21004730007; scholarship code and number: DOT1321814 n. 2 (MC) and DOT1321814 n. 6 (IDN).

References

Antolini, Gabriele; Valentina Pavan, Rodica Tomozeiu and Vittorio Marletto (2017), Atlante climatico dell’Emilia-Romagna 1961-2015, Bologna, Arpae Emilia-Romagna [online] Available from: https://www.arpae.it/it/temi-ambientali/clima/rapporti-e-documenti/atlante-climatico/atlante-climatico-1961-2015 Accessed [15/05/2023].

Artmann Martina (2014) Assessment of Soil Sealing Management Responses, Strategies, and Targets Toward Ecologically Sustainable Urban Land Use Management. *Ambio*, 43, pp.530-541. [Online] Available from: Doi: 10.1007/s13280-014- 0511-1. Accessed [24/05/2023].

Associazione Nazionale Comuni Italiani (2013) *L’Italia delle città medie - IV Quaderno della collana i Comuni*. [Online] Available from: https://www.fondazioneifel.it/documenti-e-pubblicazioni/item/4674-l-italia-delle-citta-medie-iv-quaderno-della-collana-i-comuni Accessed [15/05/2023].

Associazione Nazionale Comuni Italiani (2022) *Gli studi di MediAree verso una definizione comune di Città Media*. [Online] Available from: https://www.anci.it/gli-studi-di-mediaree-verso-una-definizione-comune-di-citta-media/, Accessed [15/05/2023].

Augusto, Bruno, Peter Roebeling, Sandra Rafael, Joana Ferreira, Ana Ascenso and Carola Bodilis (2020) Short and medium- to long-term impacts of nature-based solutions on urban heat. *Sustainable Cities and Society*, 57, 102122.

Bertoldi, Paolo (ed.) (2018) *Guidebook 'How to develop a Sustainable Energy and Climate Action Plan (SECAP). Part 1 - The SECAP process, step-by-step towards low carbon and climate resilient cities by 2030*. EUR 29412 EN, JRC112986. Luxembourg: Publications Office. [Online] Available from: https://data.europa.eu/doi/10.2760/223399 Accessed [6/05/2023].

Biesbroek, Robbert G., Rob J. Swart and Wim G.M. van der Knaap (2009) The mitigation-adaptation dichotomy and the role of spatial planning. *Habitat International*, 33 (3), pp. 230-237.

Bockarjova, Marija, W.J.Wouter Botzen, Harriet A. Bulkeley and Helen Toxopeus (2022) Estimating the social value of nature-based solutions in European cities. *Scientific Reports*, 12 (1).

Caselli, Barbara, Marianna Ceci, Ilaria De Noia, Giovanni Tedeschi and Michele Zazzi (2022) La desigillazione del suolo nelle azioni partecipate di resilienza urbana: il caso “Green in Parma”. *Urbanistica Informazioni*, 306 s.i., pp. 43-46.

Ceci, Marianna, Barbara Caselli and Michele Zazzi (2023), Soil de-sealing for cities' adaptation to climate change. Planning of priority interventions in urban public space, *Tema. Journal of Land Use, Mobility and Environment*, 16(1), pp. 121-145.

Comune di Mantova (2020) *PAESC approvato.* [Online] Available from: https://www.comune.mantova.it/index.php/news-mantova-sostenibile/item/5295-paesc-approvato Accessed [24/02/2023].

Comune di Modena (2021) *PAESC. Piano di Azione per l'Energia Sostenibile e il Clima - 2030.* [Online] Available from: https://www.comune.modena.it/servizi/ambiente/paesc Accessed [24/02/2023].

Comune di Parma (2021) *PAESC. Piano di Azione per l'Energia Sostenibile e il Clima.* [Online] Available from: https://www.comune.parma.it/pianoenergiaclima/Handlers/Document.ashx?id=b1b5049c-4dfe-4a87-b4ba-f468f820be48&tipo=ord Accessed [24/02/2023].

De Luca, Claudia, Sandra Naumann, Davis Mc Kanna and Simona Tondelli (2021) Nature-Based Solutions and Sustainable Urban Planning in the European Environmental Policy Framework: Analysis of the State of the Art and Recommendations for Future Development. *Sustainability*, 13 (9).

De Noia, Ilaria, Sara Favargiotti, Alessandra Marzadri (2022) Renaturalising lands as an adaptation strategy. Towards an integrated water-based design approach, *Tema. Journal of Land Use, Mobility and Environment,* 2, pp. 263-286.

European Commission (n.d.) *European Green Leaf Award*. [Online] Available from: https://environment.ec.europa.eu/topics/urban-environment/european-green-leaf-award_en Accessed [24/05/2023].

European Commission, Directorate-General for Environment (2012) *Guidelines on best practice to limit, mitigate or compensate soil sealing.* Luxembourg: Publications Office. [Online] Available from: https://doi.org/10.2779/75498 Accessed [24/05/2023].

European Commission, Directorate-General for Environment (2013) *Hard surfaces, hidden costs – Searching for alternatives to land take and soil sealing*. Luxembourg: Publications Office. [Online] Available from: https://data.europa.eu/doi/10.2779/16427. Accessed [24/05/2023].

European Commission, Directorate-General for Regional and Urban Policy (2003) *Partnership with the cities - The URBAN Community Initiative*. Luxembourg: Publications Office. [Online] Available from: https://op.europa.eu/en/publication-

detail/-/publication/acb70cb3-887a-442b-a802-09802cdddad4/language-en Accessed [24/05/2023].

European Commission, Directorate-General for Regional and Urban Policy (2016) *The State of European cities 2016 - Cities leading the way to a better future*. Luxembourg: Publications Office. UN-Habitat. [Online] Available from: https://data.europa.eu/doi/10.2776/643506 Accessed [24/05/2023].

European Spatial Planning Observation Network (2006) *The Role of Small and Medium-Sized Towns (SMESTO).* Vienna: Österreichisches Institut für Raumplanung. (ESPON 1.4.1. Final Report) [Online] Available from: https://www.espon.eu/sites/default/files/attachments/fr-1.4.1_revised-full.pdf, Accessed [16/05/2023].

European Union and United Nations Human Settlements Programme (2016) *The State of European Cities 2016. Cities leading the way to a better future.* [Online] Available from: https://ec.europa.eu/regional_policy/information-sources/publications/reports/2016/state-of-european-cities-report-2016_en, Accessed [15/05/2023].

Eurotowns (n.d.). *The network of medium-sized cities in Europe*. [Online] Available from: https://www.eurotowns.org Accessed [16/06/2023].

Garda, Emanuele (2020) Comunità e depaving. *OFFICINA*, 29, pp. 22-27. [Online] Available from: https://www.officina-artec.com/project/officina-29/, Accessed [24/05/2023].

Garda, Emanuele (2022) Reasons, Concepts, and Methods for Soil De-sealing in the Regulatory Framework of the Italian Regions. *Italian Journal of Planning Practice*, 12 (1), pp. 65-81.

Gibelli, Gioia, Alessandra Gelmini, Elena Pagnoni and Francesca Natalucci (2015) *Gestione sostenibile delle acque urbane. Manuale di drenaggio urbano.* Milano: Regione Lombardia, ERSAF.

Global Covenant of Mayors for Climate & Energy (n.d.). *Who we are. The largest global alliance for city climate leadership*. [Online] Available from: https://www.globalcovenantofmayors.org/who-we-are/ Accessed [15/05/2023].

Häußler, Simone and Wolfgang Haupt (2021) Climate Change Adaptation Networks for Small and Medium-Sized Cities. *SN Social Sciences*, 1 (262).

Intergovernmental Panel on Climate Change (2022) *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Cambridge and New York: Cambridge University Press. (6).

Istituto Superiore per la Protezione e la Ricerca Ambientale (n.d.) *I dati sul consumo di suolo*. [Online]. Available from: https://www.isprambiente.gov.it/it/attivita/suolo-e-territorio/suolo/il-consumo-di-suolo/i-dati-sul-consumo-di-suolo, Accessed [18/05/2023].

Istituto Nazionale di Statistica (ISTAT) (n.d.) *Mantua Population, Summary of Results*, 2022

Data. [Online]. Available from: https://esploradati.istat.it/databrowser/#/it/dw/dashboards

Maienza, Anita, Fabrizio Ungaro, Silvia Baronti, Ilaria Colzi, Laura Giagnoni, Cristina Gonnelli, Giancarlo Renella, Francesca Ugolini and Costanza Calzolari (2021) Biological Restoration of Urban Soils after De-Sealing Interventions. *Agriculture*, 11 (3). [Online] Available from: https://doi.org/10.3390/agriculture11030190 Accessed [25/05/2023].

Munafò, Michele (ed.) (2022). *Consumo di suolo, dinamiche territoriali e servizi ecosistemici. Edizione 2022*. Report SNPA 32/22.

Muscarà, Calogero (ed.) (1978) *Megalopoli mediterranea*. Milan: Franco Angeli.

Musco, Francesco (2018) *Mantova Resiliente. Verso il piano di adattamento climatico - Linee Guida.* Comune di Mantova.

Organisation for Economic Co-operation and Development, OECD Data (2014) *Urban population by city size*. http://data.oecd.org/popregion/urban-population-by-city-size.htm Accessed [19/05/2023].

Prokop, Gundula, Heide Jobstmann and Arnulf Schönbauer (2011) *Report on best practices for limiting soil sealing and mitigating its effects.* Study contracted by the European Commission, Directorate-General for Environment. Brussels (Technical Report-2011-50). Provincia di Modena (n.d.) *Modena statistiche*. https://www.provincia.modena.it/modenastatistiche/ Accessed [23/05/2023].

Servillo, Loris, Rob Atkinson, Ian Smith, Antonio Russo, Luděk Sýkora, Christophe Demazière and Abdelillah Hamdouch (2014) *TOWN, small and medium sized towns in their functional territorial context.* Luxembourg: ESPON. (Final Report). [Online] Available from: https://www.espon.eu/sites/default/files/attachments/TOWN_Final_Report_061114.pdf Accessed [24/05/2023].

SOS4LIFE-Save Our Soil For Life (2017) *Sintesi di norme, linee guida, buone pratiche, casi studio in materia di limitazione di consumo di suolo e resilienza urbana al cambiamento climatico.* (Report A.1.3).

SOS4LIFE-Save Our Soil For Life (2018) *Consumo di suolo, superfici impermeabilizzate, stato di attuazione aree edificabili e aree dismesse recuperabili a Forlì, Carpi e San Lazzaro di Savena* (Report B.1.1).

Stobbelaar, Derk Jan, Wim van der Knaap and Joop Spijker (2021) Greening the City: How to Get Rid of Garden Pavement! The 'Steenbreek' Program as a Dutch Example. *Sustainability*, 13, 3117.

Tedeschi, Giovanni (2023) 'Piani urbanistici e piani per il clima nella città media emiliana: criteri per l'integrazione' (unpublished PhD thesis), Parma, University of Parma.

Tobias, Silvia, Franz Conen, Adrian Duss, Leonore Wenzel, Christine Buser and Christine Alewell (2018) Soil sealing and unsealing: State of the art and examples. *Land Degradation and Development*, 29 (99), pp.1-10.

Turri, Eugenio (2001) *La megalopoli padana*. Venezia: Marsilio Editore.

Voskamp, Ilse M., Claudia De Luca, Monserrat Budding Polo-Ballinas, Helena Hulsman and Reinder Brolsma (2021) Nature-Based Solutions Tools for Planning Urban Climate Adaptation: State of the Art. *Sustainability*, 13 (11), 6381. [Online] Available from: https://doi.org/10.3390/su13116381 Accessed [19/05/2023].

Zucaro, Floriana and Rosa Morosini (2018). Sustainable land use and climate adaptation: a review of European local plans. *Tema - Journal of Land Use, Mobility and Environment*, 11 (1), pp.7-26. [Online] Available from: http://dx.doi.org/10.6092/1970-9870/5343 Accessed [19/05/2023].

Appendices

This annex collects the comparative analysis of desealing features collected from the three case studies: the SECAPs of Mantua, Modena, and Parma. The analysis matrix is reported in table A1 while results are shown in table A2-A3-A4.

Table A1. Matrix for the comparative analysis of the three case studies.

STEPS	INVESTIGATED FEATURES	VALUES
1. ACTION PLAN CHARACTERISTICS	1.1 Declared relationships with upper-level policies, strategies and plans	
	1.2 Declared relationships with local policies and plans	
	1.3 Period of action	
	1.4 Main funder(s) and integration with funded research programmes	
2. URBAN CONTEXT	2.1 Geographic features	
	2.2 Geomorphological features	
	2.3 Climate features	
3. DESEALING ACTIONS	3.1 Actions	
	3.2 Correlation with desealing	D Direct I Indirect
	3.3. Promoters / Funding source	
	3.4 Declared goals	
	3.5 Description	
	3.6 Relations with ordinary spatial planning tools	
	3.7 Urban space use	a. Current b. Planned
	3.8 Urban space ownership	a. Private b. Public
	3.9 Addressed urban challenges	a. Soil quality and water cycle b. Biodiversity c. Heat Island and air quality

d. Urban space quality

Table A2 - SECAP of Mantua

3.1	3.2	3.3	3.4	3.5	3.6	3.7.a	3.7.b	3.8.a	3.8.b	3.9.a	3.9.b	3.9.c	3.9.d
Dispersing wells	D	Assessment as a result of the Sewerage and Stormwater Drainage Works Plan	1. Increase soil permeability and/or groundwater recharge 3. Increase soil retention 4. Reduction of flood areas 5. Avoid stormwater accumulation in "critical" urban areas	Dispersing wells are underground structures that store surface water and allow it to infiltrate into the ground*	New regulations in the urban planning instruments (e.g., PGT) and in the Building Regulations	N.S.	N.S.	N.S.	N.S.	X			
Ditches	D	Assessment as a result of the Sewerage and Stormwater Drainage Works Plan	1. Water lamination 2. Runoff and erosion reduction 3. Increase evapotranspiration 4. Increase soil permeability 5. Reduce temperatures 6. CO2 absorption/retention 7. Reduce of flood areas 8. Urban landscape improvement	Large vegetated linear channels that can store or convey surface water and remove pollutants*	New regulations in the urban planning instruments (e.g., PGT) and in the Building Regulations	Green areas	Green areas	N.S.	N.S.	X	X	X	X
Filtering areas/stripes	D	Assessment as a result of the Sewerage and Stormwater Drainage Works Plan	1. Runoff reduction 2. Increase evapotranspiration 3. Increase soil retention 4. Increase groundwater recharge 5. Reduce erosion 6. Reduce temperatures 7. CO2 absorption/retention 8. Reduction of flood areas 9. Urban landscape improvement	Vegetated, gently sloping areas for slow transport of water and its infiltration into the soil*	New regulations in the urban planning instruments (e.g., PGT) and in the Building Regulations	Green areas	Green areas	N.S.	N.S.	X	X	X	X

3.1	3.2	3.3	3.4	3.5	3.6	3.7.a	3.7.b	3.8.a	3.8.b	3.9.a	3.9.b	3.9.c	3.9.d
Green roofs	D	Public and/or private funding according to the property	1. Reduce UHI phenomenon by Increase evapotranspiration 2. Water lamination 3. Runoff reduction 4. Increase permeability and/or groundwater recharge 5. Reduce erosion 6. CO2 absorption/retention 7. Increase places of refreshment and recreation 8. Decrease the exposure of 'at risk' groups	Multi-layered drainage technology systems that cover the roof of a building with vegetation*	New regulations in the urban planning instruments (e.g., PGT) and in the Building Regulations	Public offices, schools, commercial buildings, warehouses factories	Public offices, schools, commercial buildings, warehouses factories)	X	X	X	X	X	
Infiltration trenches	D	Assessment as a result of the Sewerage and Stormwater Drainage Works Plan	1. Water lamination 2. Runoff reduction 3. Increase soil permeability and/or groundwater recharge 4. Increase soil retention of water 5. Reduce erosion and/or low sediment transport	Shallow excavations filled with rubble or stones*	New regulations in the urban planning instruments (e.g., PGT) and in the Building Regulations	N.S.	N.S.	N.S.	N.S.	X	X	X	X
Interventions in specific areas with a high risk of flooding	D	N.S.	1. Reduce the minimum and eliminate harmful effects due to flooding and stagnation produced by stormwater.	Rehabilitation and redevelopment of the sewerage system and of surface rainwater runoff	Areas of intervention are defined by the urban planning tool (i.e., PGT).	N.S.	N.S.	N.S.	N.S.	X			
Permeable pavements	D	Assessment as a result of the Sewerage and Stormwater Drainage Works Plan	1. Water lamination 2. Runoff reduction 3. Increase permeability and/or groundwater recharge 4. Water storage 5. Reduction of flood areas	Pavements designed to allow rainwater to infiltrate through the surface at a controlled rate*	New regulations in the urban planning instruments (e.g., PGT) and in the Building Regulations	N.S.	N.S.	N.S.	N.S.	X		X	

3.1	3.2	3.3	3.4	3.5	3.6	3.7.a	3.7.b	3.8.a	3.8.b	3.9.a	3.9.b	3.9.c	3.9.d
SuDS (Sustainable Urban Drainage System): Channels and Drains	D	Assessment as a result of the Sewerage and Stormwater Drainage Works Plan	1. Water lamination 2. Runoff reduction 3. Increase evapotranspiration 4. Increase soil permeability and/or groundwater recharge 5. Reduce erosion 6. Reduce temperatures 7. CO2 absorption/retention 8. Reduction of flood areas 9. Urban landscape improvement	SuDS (Sustainable Urban Drainage System), can be identified as canals, streams or other open surface water paths embedded in the ground*	-Municipal Emergency Plan - Water Plan - Urban Renaturalization Plan - River Contract - PGT -Building Regulations	N.S.	N.S.	N.S.	N.S.	X	X	X	X
Forest protection zones (buffer)	I	Public and/or private funding according to the property	1. Reduce UHI phenomenon by Increase evapotranspiration 2. Water lamination 3. Runoff reduction 4. Increase permeability 5. Reduce erosion 6. CO2 absorption/retention 7. Soil improvement 8. Increase places of refreshment and recreation 9. Decrease the exposure of 'at risk' groups	Tree-covered areas that provide a relatively undisturbed zone (buffer) along watercourses and other water bodies *	New regulations in the urban planning instruments (e.g., PGT) and in the Building Regulations	Fluvial areas	Fluvial areas	N.S.	N.S.	X	X	X	X
"*Green Infrastructure*"	I	Integrated project "*Mantova Hub*"	1. Improve environmental quality 2. Contrast the climate change 3. Urban microclimate control 4. UHI phenomenon control	Actions aimed at increasing the resilience of the territory and the sustainability of transformations	N.S.	N.S.	N.S.	N.S.	N.S.	X	X	X	X

3.1	3.2	3.3	3.4	3.5	3.6	3.7.a	3.7.b	3.8.a	3.8.b	3.9.a	3.9.b	3.9.c	3.9.d
Mantova Water Plan "Piano Acque"	I	N.S.	1. Improve the knowledge about urban whitewater networks 2. Verify the hydraulic compatibility of future urban developments 3. Reduction of the damages to people and properties 4. Avoid indemnity and repair costs	Innovative planning instrument addressing hydraulic issues	The outcomes of the document must be incorporated into the urban planning tool (i.e., PGT)	N.S.	N.S.	X	X	X			
Mincio River Contract	I	N.S.	1. Increase the hydraulic resilience of the area 2. Avoid damages to people and properties 3. Avoid water consumes during droughts 4. Avoid indennity costs	Coordination between institutions on environmental and landscape requalification, water quality and availability of Mincio River	The River Contract envisions a Climate Adaptation Plan for the Municipality of Mantua	N.S.	N.S.	N.S.	N.S.	X	X		
Municipal Emergency Plan "Piano di emergenza comunale"	I	N.S.	1. Minimise and eliminate the harmful effects of flooding and stagnation caused by stormwater in the specified areas.	Drawing up a municipal emergency plan	Coordination with PSAI and PGRA supra-municipal instruments on hydrogeological safety	N.S.	N.S.	N.S.	N.S.	X	X	X	
Public green web-portal	I	N.S.	1. Facilitating diffuse knowledge about public green, its functions and the related activities of the public administration.	Updated web-portal on green areas	N.S.	N.S.	N.S.		X	X	X	X	X

3.1	3.2	3.3	3.4	3.5	3.6	3.7.a	3.7.b	3.8.a	3.8.b	3.9.a	3.9.b	3.9.c	3.9.d
Rain garden	I	Public and/or private funding according to the property	1.Reduce UHI phenomenon by Increase evapotranspiration 2. Water lamination 3. Runoff reduction 4. Increase permeability and/or groundwater recharge 5. Reduce erosion 6. CO2 absorption/retention 7. Increase places of refreshment and recreation 8. Decrease the exposure of 'at risk' groups	Small gardens used for water storage and infiltration, planted with vegetation capable of withstanding flooding*	New regulations in the urban planning instruments (e.g., PGT) and in the Building Regulations	N.S.	N.S.	X	X	X	X	X	X
Urban reforestation	I	Regional funding and public-private co-financing	1. CO2 absorption/retention and reduction of pollutants 2. Promote social cohesion through the direct involvement of citizens in the design and management of new and existing green spaces 3. Improve the liveability of the urban environment 4.Reduce UHI phenomenon by Increase evapotranspiration 5. Water lamination 6. Runoff reduction 7. Increase permeability and/or groundwater recharge 8. Reduce erosion 9. Increase places of refreshment and recreation 10. Decrease the exposure of 'at risk' groups	Increase of the tree stock	New regulations in the urban planning instruments (e.g., PGT) and in the Building Regulations	N.S.	N.S.	N.S.	N.S.	X	X	X	X

3.1	3.2	3.3	3.4	3.5	3.6	3.7.a	3.7.b	3.8.a	3.8.b	3.9.a	3.9.b	3.9.c	3.9.d
Urban Renaturalisation Plan "Piano di rinaturalizzazione urbana"	I	European project H2020 "*Urban Green Up"*	1. Improve urban resilience performance through natural solutions (NBS) 2. Avoid damages to people and properties 3. Health costs resulting from extreme weather events 4. Avoid indennity costs	Plan to include NBSs in areas where they can be effective in achieving the objectives	Integral part of the urban planning instrument (i.e., *PGT*)	N.S.	N.S.	N.S.	N.S.	X	X	X	X

N.S.: Not Specified.

*: Retrieved from *"Towards the Climate Adaptation Plan - Guidelines"* (Musco, 2018).

Table A3 - SECAP of Modena

3.1	3.2	3.3	3.4	3.5	3.6	3.7.a	3.7.b	3.8.a	3.8.b	3.9.a	3.9.b	3.9.c	3.9.d
De-paving of squares and parking lots	D	N.S.	1. Contrast heat waves 2. Increase permeability	De-paving of sealed surfaces with the replacement of drainage material.	N.S.	Squares Parking lots	Permeable squares and parking lots	X	X	X		X	X
Urban forests (of public street spaces and green areas)	D	N.S.	1. Increase the level of thermal comfort 2. Mitigating polluting factors and the concentration of Volatile Organic Compounds	Urban forestation of public street spaces and green areas, with the planting of tree species.	N.S.	Public street spaces and green areas	Public street spaces and green areas	X	X	X	X	X	X
Small, gardens, equipped green spaces vegetable gardens or shared gardens	D	N.S.	1. Promote sociability and social gathering	Creation of equipped, welcoming and inclusive public spaces.	N.S.		Green areas	X	X	X	X	X	X
Laminating basins	D	N.S.	1. Water purification of sedimentation of suspended solids 2. Removal of nutrients 3. Natural infiltration of rainwater	Creation of flood basins and/or flood ditches	N.S.	N.S.	N.S.	X	X	X	X	X	X

3.1	3.2	3.3	3.4	3.5	3.6	3.7.a	3.7.b	3.8.a	3.8.b	3.9.a	3.9.b	3.9.c	3.9.d
Changes to municipal urban planning instuments	I	Municipality of Modena	1. Contrast heat waves 2. Contrast cold waves 3. Runoff reduction 4. Contrast flood risk	Approval of the new Urban Building Regulation, which gives priority to urban regeneration processes, soil permeability requirements, sustainable mobility	New regulations to keep soil sealing as low as possible	N.S.	N.S.	N.S.	N.S.	X	X	X	X
Urban forests	I	N.S.	1. Contras heat waves 2. Contrast heavy rainfall	Creation of a new urban forest in continuity with the existing forest area in via Tignale del Garda, next to a residential complex under construction	N.S.		Urban forest	N.S.	N.S.	X	X	X	X
Cavo Cazzola	I	European project H2020 HERA	1. Contrast heavy rainfall 2. Contrast flood risk 3. Contrast drought	Increase of the natural section of the Cavo Cazzola canal and a calibrated hydraulic gate. Biofilter treatment of the mixed water. Part of the project “Grow Green - Nature-based Solutions per la resilienza idrica e climatica”	N.S.	Watercourses	Watercourses	N.S.	N.S.	X	X		
Rain gardens	I	N.S.	1. Contrast heavy rainfall 2. Contrast flood risk	Creation of rain gardens, reconfiguring existing roadside flowerbeds to intercept rainwater from roofs, roads and car parks.	N.S.	Roadside flowerbeds	Rain gardens	X	X	X	X	X	X

3.1	3.2	3.3	3.4	3.5	3.6	3.7.a	3.7.b	3.8.a	3.8.b	3.9.a	3.9.b	3.9.c	3.9.d
Promotion of NBS strategies	I	N.S.	1. Contrast heavy rainfall 2. Contrast flood risk	Definition of guidelines for the promotion of NBS strategies through awareness-raising and capacity-building in cities, supporting the creation of an appropriate policy framework, business models for NBS investments and an NBS market (within the European project "Grow Green")	Integration of NBS strategies into urban planning.	N.S.	N.S.	N.S.	N.S.	X	X	X	X
working table on local floods	I	N.S.	1. Identify strategies and pilot experimental and demonstration actions	Coordination with the competent territorial bodies to identify strategies and pilot actions	N.S.	N.S.	N.S.	N.S.	N.S.	X			
Climate-Energy Info Point	I	N.S.		Reference office for the coordination of all industrial cluster activities related to the topics of climate change mitigation and adaptation, resilience and sustainability	N.S.	N.S.	N.S.	X		X	X	X	X

N.S.: Not Specified

.

Table A3 - SECAP of Parma

3.1	3.2	3.3	3.4	3.5	3.6	3.7.a	3.7.b	3.8.a	3.8.b	3.9.a	3.9.b	3.9.c	3.9.d
Channels and Drains	D	N.S.	1. Water lamination 2. Increase soil permeability and/or groundwater recharge 3. Reduce erosion 5. Improve water management 6. Avoid damage to buildings and people 7. Avoid stormwater accumulation 8. Avoid repair/compensation costs	Sustainable urban drainage technical solutions (SuDS solution).	Inclusion of stringent and binding rules for implementing Sustainable Urban Drainage Solutions (SuDS) in municipal urban planning instruments.	Green areas	Green areas	N.S.	N.S.	X	X	X	X
Desealing	D	University of Parma	N.S.	Future desealing initiatives.	N.S.	Sealed surfaces		X		X		X	X
		ASP-Ad Personam	N.S.	Desealing of outdoor spaces converted to grass and draining paved surfaces.	Villa Parma Park redevelopment project	Urban park	Urban park		X	X	X	X	X
		Committee for the Regeneration of the Productive Area North "Comitato per la rigenerazione dell'Area Produttiva Nord"	1. Promote environmental sustainability	Carry out interventions to increase permeable surfaces in the productive area.	A project for the redevelopment and enhancement of this area is underway.	N.S.	N.S.	N.S.	N.S.	X	X	X	X

3.1	3.2	3.3	3.4	3.5	3.6	3.7.a	3.7.b	3.8.a	3.8.b	3.9.a	3.9.b	3.9.c	3.9.d
		Municipality of Parma Shopping Centres and Supermarkets (Possible funding from participation in European calls for tenders)	1. Heat waves reduction 2. Decrease the exposure of 'at risk' groups 3. Transform car parks into integrated reception areas 4. Increase the green/concrete ratio	Co-design desealing and enhancement initiative focused on shopping centers' and supermarkets' parking areas.	N.S.	Parking areas	Green areas, equipped areas		X	X	X	X	X
Dispersing wells	D	N.S.	1. Water lamination 2. Increase soil permeability and/or groundwater recharge 3. Increase soil retention 4. Contrast the climate change 5. Improve water management 6. Avoid damage to buildings and people 7. Avoid stormwater accumulation in urban areas 8. Avoid repair/compensation costs	Sustainable urban drainage technical solutions (SuDS solution).	Inclusion of stringent and binding rules for implementing Sustainable Urban Drainage Solutions (SuDS) in municipal urban planning instruments.	N.S.	N.S.	N.S.	N.S.	X			
Ditches	D	N.S.	1. Water lamination 2. Runoff reduction 3. Increase soil permeability and/or groundwater recharge 4. Reduce erosion and/or low sediment transport 5. Contrast the climate change 6. Improve water management 7. Avoid damage to buildings and people 8. Avoid stormwater accumulation in urban areas 9. Avoid repair/compensation costs	Sustainable urban drainage technical solutions (SuDS solution).	Inclusion of stringent and binding rules for implementing Sustainable Urban Drainage Solutions (SuDS) in municipal urban planning instruments.	Green areas	Green areas	N.S.	N.S.	X	X	X	X

3.1	3.2	3.3	3.4	3.5	3.6	3.7.a	3.7.b	3.8.a	3.8.b	3.9.a	3.9.b	3.9.c	3.9.d
Filtering areas/stripes	D	N.S.	1. Runoff reduction 2. Increase soil retention of water 3. Reduce erosion and/or low sediment transport 4. Contrast the climate change 5. Improve water management 6. Avoid damage to buildings and people 7. Avoid stormwater accumulation in urban areas 8. Avoid repair/compensation costs	Sustainable urban drainage technical solutions (SuDS solution).	Inclusion of stringent and binding rules for implementing Sustainable Urban Drainage Solutions (SuDS) in municipal urban planning instruments.	Green areas	Green areas	N.S.	N.S.	X	X	X	X
Green roof	D	N.S.	1. Reduce heat flow 2. Reduction of temperature peaks 3. Runoff reduction 4. Increaging evapotranspiration 5. CO2 absorption and/or retention	N.S.	"Piano del Verde"	Buildings	Buildings	N.S.	N.S.	X	X	X	
Infiltration trenches	D	N.S.	1. Water lamination 2. Runoff reduction 3. Increase soil permeability and/or groundwater recharge 4. Increase soil retention of water 5. Reduce erosion and/or low sediment transport 6. Contrast the climate change 7. Improve water management 8. Avoid damage to buildings and people 9. Avoid stormwater accumulation in urban areas 10. Avoid repair/compensation costs	Sustainable urban drainage technical solutions (SuDS solution).	Inclusion of stringent and binding rules for implementing Sustainable Urban Drainage Solutions (SuDS) in municipal urban planning instruments.	N.S.	N.S.	N.S.	N.S.	X	X	X	X

3.1	3.2	3.3	3.4	3.5	3.6	3.7.a	3.7.b	3.8.a	3.8.b	3.9.a	3.9.b	3.9.c	3.9.d
Laminating or storage systems for new interventions	D	Municipality of Parma IRETI	1. Avoid overloading the hydraulic network and receptors 2. Avoid damage to buildings and people 3. Avoid repair/compensation costs	Prescribing lamination or storage systems for new interventions, also encouraging maximum reduction of impermeable surfaces.	N.S.	N.S.	N.S.	N.S.	N.S.	X		X	
Permeable pavements	D	N.S.	1. Water lamination 2. Runoff reduction 3. Increase permeability and/or groundwater recharge 4. Water storage 5. Contrast the climate change 6. Improve water management 7. Avoid damage to buildings and people 8. Avoid stormwater accumulation in urban areas 9 Avoid repair/compensation costs	Sustainable urban drainage technical solutions (SuDS solution).	Inclusion of stringent and binding rules for implementing Sustainable Urban Drainage Solutions (SuDS) in municipal urban planning instruments.	N.S.	N.S.	N.S.	N.S.	X		X	
Stormwater collection	D	Municipality of Parma IRETI	1. Runoff reduction 2. Soil erosion reduction 3. Storage, in distributed form, of significant quantities of rainwater to allow multiple use of water for non-drinking purposes (watering lawns and gardens, washing cars, roads, etc.).	Example of a measure against drought and water scarcity, for residential, tertiary, industrial, agricultural sectors.	Introduction of water cycle regulations in municipal urban planning instruments that incentivise these actions.	N.S.	N.S.	N.S.	N.S.	X			

3.1	3.2	3.3	3.4	3.5	3.6	3.7.a	3.7.b	3.8.a	3.8.b	3.9.a	3.9.b	3.9.c	3.9.d
Forest protection zones (buffer)	I	N.S.	1. Reduce UHI phenomenon by Increase evapotranspiration 2. Runoff reduction 3. Increase permeability and/or groundwater recharge 4. Reduce erosion and/or low sediment transport 5. Soil improvement 6. CO2 absorption and/or retention	N.S.	"Piano del Verde"	N.S.	N.S.	N.S.	N.S.	X	X	X	X

3.1	3.2	3.3	3.4	3.5	3.6	3.7.a	3.7.b	3.8.a	3.8.b	3.9.a	3.9.b	3.9.c	3.9.d
Green Plan "Piano del Verde"	I	Municipality of Parma	1. Decrease the urban heat island and contain summer heat waves by Increase shaded areas and evapotranspiration 2. Increase 'islands' and 'corridors' (including cycle and pedestrian corridors) as places of cooling and recreation 3. Increase CO2 absorption and/or retention (CO2 storage and fixation) 4. Immobilise atmospheric particulate matter 5. Decrease soil sealing with desealing operations 6. Increase biodiversity 7. Increase the socio-psychological benefits of "open" areas 8. Laminating water through flood basins or similar systems 9. Limit surface runoff by slowing it down 10. Increase soil permeability and/or groundwater recharge efficiency 11. Reduce erosion and/or sediment transport 12. Avoid the deployment of people from 'risk' groups (the elderly and children)	Voluntary instrument of government that places public green as a strategic asset for the future development of the city.	The Plan should be incorporated into the municipal urban planning instruments. The three-year public works programme (an integral part of the Single Programming Document - SPD) can become a tool at the junction between the 'adaptive' measures of urban planning and the implementation of public works.	N.S.	N.S.	N.S.	N.S.	X	X	X	X

3.1	3.2	3.3	3.4	3.5	3.6	3.7.a	3.7.b	3.8.a	3.8.b	3.9.a	3.9.b	3.9.c	3.9.d
Hydraulic Risk Management Regulation "Regolamento di gestione del Rischio Idraulico"	I	Municipality of Parma	1. Limiting the degree of soil sealing 2. Choose surface runoff paths wisely and carefully 3. Favouring dispersion on the ground or in the surface layers of the subsoil for water from roofs and green areas that are free of potential pollutants and sedimentable solids sedimentable solids 4. Adopt permeable paving where possible 5. Avoid damage to buildings and people 6. Avoid stormwater accumulation in urban areas 7. Avoid repair/compensation costs	The Hydraulic Risk Management Regulation is a substantial document that pursues the principle of 'hydrogeological and hydraulic invariance' of the anthropic areas of the municipal territory.	Full transposition of the Regulation into the municipal urban planning instruments.	N.S.	N.S.	N.S.	N.S.	X		X	X
Integration and maintenance of public green	I	Committee for the Regeneration of the Productive Area North "Comitato per la rigenerazione dell'Area Produttiva Nord"	1. Promote environmental sustainability	Implementation of measures to integrate and maintain public green areas in the productive area.	A project for the redevelopment and enhancement of this area is underway.	Green areas	Green areas		X	X	X	X	X
Public green web-portal	I	Municipality of Parma	1. Facilitating diffuse knowledge about public green, its functions and the related activities of the public administration.	Update web portal on green areas	N.S.	N.S.	N.S.		X				

3.1	3.2	3.3	3.4	3.5	3.6	3.7.a	3.7.b	3.8.a	3.8.b	3.9.a	3.9.b	3.9.c	3.9.d
Parma-Baganza Stream Contract "Contratto di Fiume"	I	Municipality of Parma Po River District Basin Authority	1. Increase the resilience to climate change 2. Mitigate the hydraulic risk and the prevailing hydrogeological instability phenomena (erosion, local and superficial landslides, overbanking) affecting the Apennine piedmont sector 3. The improvement of water quality and water balance in the Basin 4. The increase and better management of flow rates in the streams 5. The implementation of agri-cultural interventions to improve environmental quality 6. The preservation and restoration of the river landscape 7. The "basin" territorial co-ordination/governance overcoming "municipal" logics 8. The dissemination and sharing of information on the basin 9. Environmental education activities on the theme of water quality with the local population (adults, schools, farmers) 10. Avoid damage to buildings and people 11. Avoid water consumption in drought periods 12. Avoid compensation costs	Coordination between institutions on environmental and landscape requalification, water quality and availability of Baganza Stream	N.S.	Fluvial areas	Fluvial areas	N.S.	N.S.	X	X	X	

3.1	3.2	3.3	3.4	3.5	3.6	3.7.a	3.7.b	3.8.a	3.8.b	3.9.a	3.9.b	3.9.c	3.9.d
Structural works for hydraulic defence	I	Municipality of Parma Emilia-Romagna Region "Consorzio di bonifica Parmense"	1. Contrast heavy rainfall 2. Contrast flood risk 3. Making part of the city safe 4. Water lamination 5. Avoid damage to buildings and people 6. Avoid stormwater accumulation in urban areas 7. Avoid repair/compensation costs	Construction of two lamination cases and a hydraulic defence work.	"Piano Invasi 2020-2029"	N.S.	N.S.	N.S.	N.S.	X			
Rain garden	I	N.S.	1.Reduce UHI phenomenon by Increase evapotranspiration 2. Water lamination 3. Runoff reduction 4. Increase permeability and/or groundwater recharge 5. Increased water retention in the soil 6. Reduce erosion and/or low sediment transport 7. CO2 absorption and/or retention	N.S.	"Piano del Verde"	N.S.	N.S.	N.S.	N.S.	X	X	X	X
Urban reforestation	I	Province of Parma	N.S.	In 2020, as part of the KmVerdeParma initiative, about 80 (eighty) trees were planted at the I.T.I.S. Da Vinci in Via Toscana.	N.S.	N.S.	N.S.	N.S.	N.S.	X	X	X	X

3.1	3.2	3.3	3.4	3.5	3.6	3.7.a	3.7.b	3.8.a	3.8.b	3.9.a	3.9.b	3.9.c	3.9.d
		University of Parma	N.S.	"Tree Project" with the already completed planting of 340 tree and shrub species in various green areas on the university campus.	N.S.	Green areas	Green areas	X		X	X	X	X
		ASP-Ad Personam	N.S.	Total planting of 40 new plants.	Villa Parma park redevelopment project	Urban park	Urban park		X	X	X	X	X
		Barilla	N.S.	More than 1,000 trees and shrubs planting on a 5 hectares area	N.S.	N.S.	N.S.	X		X	X	X	X
		Chiesi Farmaceutici	1. Improve air quality 2. Realising permanent forests	Forestation interventions in the Province of Parma	N.S.	N.S.	N.S.	X		X	X	X	X

3.1	3.2	3.3	3.4	3.5	3.6	3.7.a	3.7.b	3.8.a	3.8.b	3.9.a	3.9.b	3.9.c	3.9.d
		Davines	N.S.	Inclusion of approximately 270 plants in their own area and by 2022 a further 250 to 300 plants in the former Morris area.	N.S.	N.S.	N.S.	X		X	X	X	X
		Molino Grassi	N.S.	Planting of an area of 5 hectares (approximately 3,000 trees)	N.S.	N.S.	N.S.	N.S.	N.S.	X	X	X	X
		Municipality of Parma	1. Reduce UHI phenomenon by Increase evapotranspiration 2. Runoff reduction 3. Increase permeability and/or groundwater recharge 4. Reduce erosion and/or low sediment transport 5. CO2 absorption and/or retention 6. Capture of pollutants in the atmosphere 7. Capture of ultrafine dust (PM10. PM2.5)	New plantings, such as for the four large "Kyoto Forest" areas, according to the urban reforestation projects in the "Piano del Verde".	"Piano del Verde"	N.S.	N.S.	N.S.	N.S.	X	X	X	X
		KilometroVerdeParma Forestry Consortium Emilia-Romagna Region	1. Improve the landscape impact of the highway artery 2. Mitigating its negative impact in terms of air quality and fine dust dispersion 3. Raising awareness in the municipal and provincial territory of the important functions performed by green areas and the consequent ecosystem benefits	11-kilometre tree-lined strip parallel to the section of the "Autostrada del Sole" highway alongside Parma.	Action foreseen in the Municipal Structural Plan (i.e., PSC).	Free and available land	Urban forest	X	X	X	X	X	X

N.S.: Not Specified.

REFRAMING REGIONAL ECONOMIC RESILIENCE FOR COOPERATIVE REGION (1117)

Seongjun Yang[1], Donghyun Kim[1*]

[1] Department of Urban Planning and Engineering, Pusan National University, Republic of Korea; *donghyun-kim@pusan.ac.kr

Abstract. The impact of socio-natural disasters and the process of coping with them vary across regions, primarily due to disparities in their socio-economic structures. This study aims to develop a regional economic resilience model capable of capturing the impact of different socio-natural disasters and the adaptive capacity of regional economies. We analyse regional economic resilience through two complementary dimensions: local residents and local firms. We employ both indicator-based static frameworks and sequence-based dynamic frameworks. By examining the cases of the 2007 financial crisis and the 2018 heat wave, we find that metropolitan cities and provinces in Korea share common characteristics of low resistance to shocks but exhibit rapid rebound. However, the level of adaptive resilience in the short and long term varies across regions. This study contribute to the policy-making process by providing an easily applicable economic resilience model that incorporates considerations of local adaptive resilience.

Keywords: Regional Economic Resilience, Socio-natural Shock, Resilience Framework, Regional Planning.

1. Introduction

Shocks are increasing in frequency and impact. According to the World Economic Forum's report, natural disasters are becoming more intense and more frequent in the last five years due to unprecedented extreme weather events caused by climate change. In addition, downward pressure on the global economy from macroeconomic fragilities and financial inequality is growing, and the 2007 global financial crisis has led to growing uncertainty about the effectiveness of countercyclical policies (World Economic Forum, 2020). Outbreaks of infectious diseases such as COVID-19 and MERS affect not only human lives, but also local economies and the local businesses that make them up (Lee et al., 2022).

This diversity of shocks has led to a growing body of research noting that local impacts vary according to the social, economic, and cultural structures and characteristics of communities (Martin et al., 2016; Kim, 2021; Oliver-Smith, 2022). In this context, local

resilience is gaining traction as a concept that encompasses not only the impact of shocks that vary across regions, but also resistance to shocks and subsequent recovery and adaptation processes (Simmie and Martin, 2010; Martin, 2012; Sánchez-Zamora et al., 2014). Resilience is differentiated from the concept of vulnerability, which focuses on the short-term effects of shocks, in that it takes a more long-term perspective and provides implications for the region's long-term policy direction (Wolman et al., 2017). It also has links to research in the area of regional disparities in that disparities between regional economies lead to disparities in regional responses to shocks (Martin et al., 2016; Le Gallo and Fingleton, 2021). Thus, in contrast to the past focus on identifying regional differences per se, recent trends have focused on the role that resilience plays in regional economies (Simmie and Martin, 2010; Sánchez-Zamora et al., 2014).

The purpose of this study is to construct a framework for measuring the economic resilience of regions to various shocks in a multifaceted way, and to use it to examine regional responses to shocks. Regional economic resilience, as discussed in this study, is the economic dimension of a region's ability to anticipate, prepare for, respond to, and recover from a disturbance (Foster, 2007). In order to consider the impact of various socio-natural disasters on the local economy, resilience is multifaceted through multiple variables, and it is differentiated in that it is analysed not only statically but also dynamically. By providing an easy-to-apply economic resilience model, we aim to solve the problem of applying engineering resilience and contribute to policy processes that consider regional adaptive resilience.

We proceed as follows. First, we review the literature on resilience. We then present the data and methods used to build our resilience framework. We consolidate the discussion in the literature by separating the economic resilience of a region into the dimensions of residents and regional firms. We then present a method to capture the economic resilience of a region in dynamic terms as well as static resilience based on an index.

2. Literature Review

2.1. Concepts and Definitions of Resilience

Resilience began to be discussed in earnest after Hurricane Katrina (2005) destroyed New Orleans and displaced survivors to other regions (Lang and Danielsen, 2006). The concept of resilience has been discussed in many different fields. One of the strengths of resilience research is its interdisciplinary nature, especially when it comes to observing the recovery process as well as the impact of a major problem or event. For example, Martin and Gardiner (2019) estimate the shocks and resilience of the UK sub-regional economy in 2016, when the UK was debating leaving the euro (Brexit). More recently, research has also focused on individual and community resilience in the wake of the COVID-19

pandemic and individual psychological resistance to the Russian invasion of Ukraine (Blanc et al., 2021; Angeler et al., 2022; Fransen et al., 2022; Riepenhausen et al., 2022).

Therefore, resilience is a concept that is gaining traction in many fields and is regarded as an ideal goal for systems. More specifically, resilience discussed in the context of local economies consists of both engineering and ecological dimensions. First, engineering resilience assumes that there is a single equilibrium in the local economic system and focuses on whether it can return to its previous equilibrium after a shock (Pendall et al., 2010). From this perspective, the main topic is the resistance of the system to withstand the shock and the speed of return to the previous state (Martin, 2012). It is understood in terms of the plucking model proposed by M. Friedman (Friedman, 1993): the intensity of the downturn leads to the intensity of the recovery, but the intensity of the recovery does not lead to the intensity of the downturn, and the shock is a temporary phenomenon that does not change the long-term growth path of the region, which returns to its previous state over time (Fingleton et al., 2012).

Ecological resilience is considered a traditional resilience alongside engineering resilience, but there is a clear distinction between the two. From an ecological perspective, a shocked local economy is viewed as one or more multi-equilibrium systems that can return to their previous state, but either get worse or get better (Pendall et al., 2010). The difference is that the recovery process of a system after a shock is considered as a return to a new equilibrium, rather than simply a return to the previous equilibrium. The measure of resilience is not the time or speed of recovery after a shock, but rather the magnitude of the shock that forces structural change in the system, and the greater the magnitude of the shock required for change, the more resilient the economic system (Simmie and Martin, 2010). Martin (2012) borrows the concept of hysteresis, often used in psychology, to suggest that the impact of a shock that causes structural transformation in a local economy affects the region's growth path over a long period of time, not just in the short term.

Traditional resilience is also characterised by the following features. The disaster and psychology literature on traditional resilience shares a systematic approach to the internal and external factors that cause systems to change, a long-term perspective, and the assumption that equilibrium states are path-dependent, shaped over time by cumulative decision-making processes (Pendall et al., 2010). In addition, traditional resilience research tends to view human societies in terms of natural systems. For example, just as an ecosystem composed of a few dominant species is vulnerable to wind and water damage, the idea is that as market economies become more sophisticated, capital is concentrated in certain places and industries become monopolised, the diversity of the system is lost, competition is eliminated, resilience is reduced and the system

becomes vulnerable to external shocks. When this happens, the system is unlikely to return to its previous state, according to the traditional explanation of resilience.

However, the study of local economies based on the traditional concept of resilience, especially engineering resilience, has several limitations. The first is the point about equilibrium. As noted above, engineering resilience studies assume a prior state of equilibrium in the real world and identify the time and speed at which it is reached after a shock. As Martin (2010) points out, local economies cannot be 'locked' into a stable, static equilibrium state; they are subject to gradual and continuous change, rendering the analysis of reaching a prior state meaningless. It has also been suggested that the failure to return to equilibrium is more frequent and common after deindustrialisation (Cowell, 2013). With this in mind, ecological resilience, with its potential for change, can be seen as a concept that reflects the reality of local economies, rather than engineering resilience, which is a static concept.

2.2. Learnings from previous research

The following are the findings from previous studies on resilience. First, at a conceptual level, the definition of resilience needs to be clarified. Resilience is an interdisciplinary concept and while its meaning varies across disciplines, the concept remains ambiguous (Martin, 2012). Therefore, a more sophisticated conceptualisation is needed. In particular, there is a need to focus on specific dimensions of resilience rather than considering all the broad conceptual dimensions it encompasses (Kaye-Blake et al., 2019), such as economic or social resilience.

Second, at a practical level, it is important to note that resilience is often a theoretical and clichéd phrase that is difficult to apply in practice. A study of the use of the concept of resilience found that while resilience in planning is widely discussed as a normative concept, including climate, terrorism, disaster, and economic and regional decline, it remains a vague concept for practitioners (White and O'Hare, 2014). This leads practitioners to focus on easily measurable engineering resilience, which limits their ability to address resilience in its true sense. They warn that the pursuit of engineering resilience, which focuses on overcoming short-term shocks, rather than ecological or evolutionary resilience, which focuses on overcoming existing systemic practices and new institutional changes, may contribute to the reproduction of existing neoliberal growth-oriented planning practices. Thus, the concept of resilience at the planning levels remains theoretical and lacks applicability and practicality (Collier et al., 2013).

Third, as social and natural disasters emerge and economic disparities between regions widen, so does the disparity in resilience. In the past, disasters were often considered as natural phenomena, but recent research suggests that disasters are the result of the

interaction between a destructive agent (such as an earthquake, tsunami, hurricane, flood) and the socio-cultural and environmental context on which it impacts (Cannizzaro et al., 2020). More recently, as a disaster, the COVID-19 pandemic demonstrates that even the same disaster can have different impacts depending on the economic values, priorities, structures and practices of countries, societies and regions (Oliver-Smith, 2022). In particular, Korea has experienced a rapid increase in regional disparities since its rapid economic growth in the 1980s (Moon, 2003), and the different regional environments combined with the increase in socio-natural disasters have led to regional inequality (Jeong and Yoon, 2018; Kang and Skidmore, 2018; Kim and Yoon, 2020). Therefore, it is necessary to reflect the reality that while the scope of socio-natural disasters is expanding, regional inequality is emerging due to the expansion of regional disparities.

3. Data and Methods

The process of this study is illustrated in Figure 1. First, we construct the dimensions of resident and regional firm to conceptualise and operationalise regional economic resilience. The dimension of residents is divided into population and employment, which are measured by the variables total population and working-age population, and total employee and regular employee, respectively. The dimension of regional firm is identified through the profitability of the region, which is measured through gross operating surplus and productivity of capital.

The framework for analysing this consists of a static and dynamic resilience framework. Static resilience is determined through an index-based approach, with the result being whether the region is resilient for each year. Dynamic resilience is captured through a sequence-based approach. This involves assuming a specific shock and dividing the sequence into before, during, and after the shock. Dynamic resilience is then determined by looking at the growth direction and growth rate of the region in each sequence.

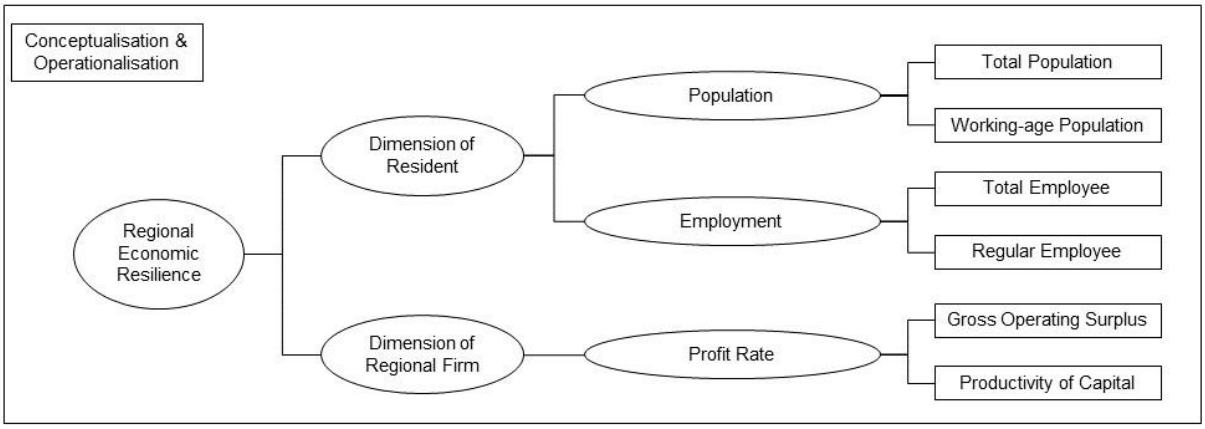


Figure 144. Framework of Study

3.1. Data

The spatial units and periods of analysis used in this study are as follows: metropolitan cities and provinces, 2000-2020. The reason for this choice of spatial and temporal units is to measure the multidimensional resilience of regions at a longer time span. In addition, using a smaller spatial scale would have resulted in many areas with zero values, such as heat wave mortality, making resilience sensitive, so we conducted our analysis at the regional level. Three sources were used to organise the data for the analysis. First, to analyse the resilience of the population at the regional level, we used the Population Statistics Based on Resident Registration (1992–2022) provided by the Ministry of the Interior and Safety. From this data, we collected the total population for each spatial unit and the working age population, i.e. the population aged 15–64.

Next, we used the Census on Establishments (1993–2021) provided by Statistics Korea to analyse regional employment resilience . From this data, we calculated the total number of employees for each spatial unit and the number of regular employees, which refers to relatively high-quality employment with a labour contract of more than one year.

Third, we used the Regional Income (2000–2021) to analyse resilience at the level of regional firms. From this data, we collected gross operating surplus and compensation of employees for each spatial unit and summed them to derive national income at factor cost. We also collected gross fixed capital formation to measure the capital stock of the region.

Finally, the impact of heat waves by region derives from the Causes of Death Statistics (2000–2021). This data is collected for all deaths in the country and is highly reliable as it is based on accurate diagnoses from medical institutions. From this data, we applied the International Classification of Diseases, Tenth Revision (ICD-10) code for heat-related deaths from the US Centers for Disease Control and Prevention (CDC) to derive heat wave mortality, which corresponds to ICD-10 codes X30 (exposure to excessive natural heat) or T67 (effects of heat and light) (Vaidyanathan et al., 2020).

3.2. Measuring Resilience Index

The regional economic resilience framework used in this study consists of an index-based approach to derive resilience at each point in time, and a sequence-based approach that allows for dynamic analysis over multiple time periods. The index-based approach consists of two dimensions: residents and regional firms.

First, the resilience index at the resident level is derived from two variables: population and employment. Population consists of total population and working-age population, and employment consists of total employees and regular employees. Employment represents the performance of the regional labour market, and the impact of shocks is primary and more pronounced in the labour market compared to output (Martin, 2012). It is also characterised by its sensitivity to short-term fluctuations at large spatial units, such as states or NUTS 2 level (Dubé and PolèSe, 2016). Population is a proxy for defining the robustness of labour market conditions and is suitable for application in rural areas, where the number of employees is too small to overestimate changes in resilience (Fantechi and Modica, 2022).

For the four variables, the resilience indicator uses a method that measures the adaptive capacity of a region to socio-natural disasters, and the resilience derived from this means the capacity to adapt to different socio-economic events in an adaptive aspect (Fantechi and Modica, 2022). Resilience is determined by comparing the average annual population growth rate over a five-year period before and after time t. If the later growth rate is higher, the region is considered resilient.

As the economic agents of a region, regional firms are an important factor in the composition of a region's resilience. To reflect this, we use a methodology in which the resilience of regional firms is derived from the growth of the region's profit rate (Navinés et al., 2022). Navinés et al. (2022) suggest that a firm-oriented approach is complementary to traditional employment performance-based approaches, as the long-term survival of firms and profit maximisation are related. They also show that a region is resilient if the growth of its profit rate is higher than the national rate.

Looking at their method in more detail, first, profit rate (r) is the ratio of gross operating surplus gross operating surplus (GOS) to net capital stock (K), i.e. $\mathrm{r} \equiv \frac{GOS}{K}$. regional income (Y) consists of the sum of GOS and compensation of employees (W), as shown in equation (1) below.

$$\mathrm{Y} = \mathrm{GOS} + \mathrm{W} \quad (1)$$

r can be decomposed into the surplus share $(\mathrm{q} = \frac{GOS}{Y})$ and the productivity of capital $(\pi_{\mathrm{k}} = \frac{Y}{K})$. q is defined as the contribution of regional firm's GOS to Y and is a variable that shows the dynamics of income distribution. The productivity of capital is defined as is defined as Y produced per unit of K in the region, and is a variable representing the degree of technological change and innovation in the region. Under this relationship, r is defined as follows:

$$r \equiv \frac{GOS}{K} \equiv \frac{GOS}{Y} \times \frac{Y}{K} \equiv q \times \pi_k \quad (2)$$

At this point, Navinés et al. (2022) note that an increase in q and π_k has different implications for the growth of r in a region. While an increase in π_k implies technological progress and increased utilisation of productive capacity, an increase in q implies a decrease in the share of labour income in constant regional income. Since the 1970s, the stagnation of labour incomes has led to an increase in household debt, resulting in a debt-led growth regime. Therefore, even if a region is resilient with high r growth relative to the nation, a region with a high share of q is unlikely to be resilient in the long run. We classify regions as super-resilient if the growth rate of r is higher than the national rate and the growth rate of growth rate π_k is higher than q, and as moderately-resilient if the growth rate of π_k is lower than q, and as moderately-resilient if the growth rate of π_k is lower than q.

3.3. Resilience framework for Dynamic Analysis

In this part, we describe a framework for taking a multidimensional view of regional economic resilience by extending it to a dynamic dimension. Such a framework aims to evaluate resilience metrics from a dynamic perspective to assess the ability of systems to prepare for and resist unexpected hazards, absorb their impacts, maintain desired functionality, and recover rapidly (Cheng et al., 2022). Dubé and Polése (2016) used a dual decomposition approach to estimate the economic resilience of a region by dividing the whole period into sequences.

They assume a socio-economic shock within the analysis period and divide the analysis period into pre-shock, shock and post-shock sequences for each indicator. Since the resilience of a region can yield different results depending on which time frame is applied (Dubé and PolèSe, 2016), we set the pre-shock period to the entire period before the shock, and the post-shock period to the short (3 years) and long (10 years) periods to examine the impact of the shock in different aspects.

In this study, we apply their dual decomposition approach to the previous resilience variables, which are presented in Table 1 (Dubé and PolèSe, 2016). Although we apply the same methodology as in the previous study, we distinguish between the short term (3 years) and the long term (10 years) in order to examine the results that vary according to the time span. Firstly, Approach 1 was labelled as 8 scenarios reflecting the direction of increase or decrease (i.e. arrows pointing upwards or downwards) over the period of each sequence.

Approach 2 is the assessment of resilience to changes in sequences, categorised as resistance, rebound and recuperation. Resistance means that there is no negative change

in the metric in the year before the shock, rebound means that there is no negative change in the year before the shock, and recuperation means that the overall change during and after the shock is globally better than that recorded in the period before the shock (Dubé and PolèSe, 2016).

Table 1. A Dual Decomposition Approach

Approach 1: Direction of the sequence				
Scenario label	Time sequence			
	pre-shock	Shock	Post-shock	
			short term (3 years)	long term (10 years)
Resistance	↗	↗	↗	or ↗
Resistance and Lagged Shock	↗	↗	↘	or ↘
Standard Resilience	↗	↘	↗	or ↗
Hard Hit, No Recovery	↗	↘	↘	or ↘
Positive Jolt	↘	↗	↗	or ↗
Counter Cyclical	↘	↗	↘	or ↘
Turnaround	↘	↘	↗	or ↗
Systematic Decline	↘	↘	↘	or ↘
Approach 2: Growth or change of the sequence				
Resistance	$g_{shock}(Y) \geq g_{\mathrm{pre}}(Y)$		-	
Rebound	-	$g_{post\_short}(Y) \geq g_{shock}(Y)$		-
Recuperation_short term	$g_{\mathrm{shock}}(Y) + g_{post\_short}(Y) \geq g_{pre}(Y)$			-
Recuperation_long term	$g_{\mathrm{shock}}(Y) + g_{post\_long}(Y) \geq g_{pre}(Y)$			

4. Findings

4.1. Resilience index for residents

The resilience of the resident dimension is divided into two components: population and employment. First, resilience on the population side is derived from the average annual population growth rate of the total population and the working age population over a five-year period. The resilience results for both variables are presented in Table 2. Firstly, we find that different regions have different resilient periods. The longest resilience periods were found in Jeollanam-do (10 years), Jeju-do and Gyeongsangbuk-do provinces (9 years), while Daejeon metropolitan city (1 year) and Gyeonggi-do province (2 years)

had shorter resilience periods than the nation. In contrast to most of the regions that included the nationwide resilient period, Gyeonggi-do and Chungcheongnam-do provinces were not resilient in 2005–2008. Second, the results for the working-age population were almost identical to those for the total population, with the only difference being 2011 for Busan metropolitan city. These results suggest that fluctuations in the total population and the working-age population are highly correlated.

The resilience of the employment side is derived from the average annual population growth rate of total and regular employees over a five-year period. Firstly, the results for total employees and population resilience are broadly similar. The longest resilience periods were found in Jeollanam-do (10 years), Jeju-do (10 years) and Gyeongsangbuk-do provinces (9 years), while Daejeon metropolitan city (1 year) and Gyeonggi-do province (2 years) had shorter resilience periods than the nation. Unlike most of the regions that included the resilient period of the nation, Gyeonggi-do and Chungcheongnam-do provinces were not resilient in 2005-2008. The resilience results for total population and working-age population in terms of population and total employees in terms of employment are similar, indicating a high correlation between changes in these variables.

On the other hand, the resilience results for regular employees, which refers to the quality of employment, are significantly different. The longest period of resiliet was in Jeju-do Province (12 years) and, contrary to the previous results, Gyeongsangbuk-do Province does not have a very high level of resilience for regular employees. In particular, the whole country and all metropolitan cities have not been resilient since 2008, the year of the global financial crisis. Seoul has not been resilient since 2007, meaning that the effects of the global financial crisis were experienced more rapidly than in other regions. In Daejeon metropolitan city, the resilience period for total employees was only one year, while it improved to three years for regular employees. Moreover, metropolitan cities did not regain resilience after the financial crisis. Some provinces, however, were resilient until 2009 and 2010 after the financial crisis, and Jeju-do province remained resilient until 2014. In Gyeonggi-do Province, which has the largest concentration of workers in Korea, there was no period of resilience for regular employees.

Table 2. Resilience at the Residents dimension

region		population		employment	
		total pop	working age pop	total employee	regular employee
National		2005–2008	2005–2008	2005–2008	2003–2008
Metro-	Seoul	2000–2007	2000–2007	2000–2006	2002–2007

politan city	Busan	2004–2011	2004–2010	2004–2011	2004–2008
	Daegu	2005–2010	2005–2010	2005–2010	2005–2008
	Incheon	2003–2010	2003–2010	2003–2010	2003–2008
	Gwangju	2005–2008	2005–2008	2005–2009	2004–2008
	Daejeon	2008	2008	2008	2006–2008
	Ulsan	2006–2010	2006–2010	2006–2010	2005–2008
province	Gyeonggi	2015–2016	2015–2016	2015–2016	–
	Gangwon	2003–2010	2003–2010	2004–2010	2003–2010
	Chungbuk	2003–2008	2003–2008	2003–2008	2003–2009
	Chungnam	2001–2006 2013–2014	2001–2006 2013–2014	2001–2006 2013–2014	2001–2006 2013
	Jeonbuk	2003–2010	2003–2010	2004–2010	2003–2010
	Jeonnam	2003–2012	2003–2012	2003–2012	2003–2011
	Gyeongbuk	2003–2011	2003–2011	2003–2011	2003–2009
	Gyeongnam	2000–2001 2003–2008	2000–2001 2003–2008	2000–2001 2003–2008	2000–2008
	Jeju	2006–2014	2006–2014	2005–2014	2003–2014

4.2. Resilience index for regional firms

Next, we examine resilience at the regional firm level. This resilience is considered to be high if the profit rate, which can be decomposed into gross surplus and capital productivity, is higher for the region than for the national level. As this analysis is based on annual growth rates and covers data for 2000-2021, growth rates for the year 2000 are not calculated. In addition, unlike resilience at the resident level, national values are used for comparison with individual local values.

The results for resilience at the regional firm level are shown in Table 3. A cell marked with hyphen (-) indicates that the region was not resilient in that time period. Resilient regions are further categorised as super-resilient and moderately resilient, where the former is defined as having an absolute value of capital productivity growth greater than the absolute value of gross surplus share growth, and the latter is the opposite. Super-resilient regions are coloured darker green to distinguish them from moderately resilient regions.

For all 20 regions, annualised growth in the profit rate was higher than the national rate in about half of the time periods. Among metropolitan cities, the longest resilient periods were in Incheon and Gwangju, while Busan and Ulsan had the shortest periods of 9 years. Among the provinces, the longest period was 12 years in Gyeongsangbuk-do.

However, a closer look at the duration of the resilient periods reveals different findings. Incheon and Gwangju have the longest resilient periods, but their super-resilient periods are shorter than those of Seoul and Daejeon. These regions are more vulnerable to a decline in local purchasing power and aggregate consumption in a future downturn when the nationwide rate of profit declines, which could trigger an increase in local household debt and negatively affect the region's economic resilience in the future (Navinés et al., 2022). On the other hand, regions with a high proportion of super-resilient periods are those with high capital productivity, which implies technological progress and higher utilisation of productive capacity, and thus a greater capacity to withstand and recover from future downturns.

Table 3. Resilience at the Regional Firm dimension

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Seoul	M	-	S	S	-	S	S	S	-	S	S	-	-	-	-	-	S	-	M	-
Busan	-	-	-	-	M	S	-	M	S	-	M	-	S	M	-	-	-	-	M	S
Daegu	M	-	-	S	-	M	-	S	S	-	S	-	-	M	-	S	S	S	-	-
Incheon	S	-	-	-	M	M	M	S	-	S	M	S	M	M	-	-	S	-	M	-
Gwangju	S	-	-	-	M	-	S	-	S	S	M	M	-	M	S	S	S	-	M	-
Daejeon	S	-	-	S	-	S	-	S	-	-	S	S	-	S	-	-	S	M	M	-
Ulsan	-	-	-	-	S	M	-	M	S	M	-	-	-	-	M	M	-	-	S	S
Gyeonggi	-	S	-	S	-	-	-	-	-	M	-	M	S	-	M	-	M	M	-	M
Gangwon	S	-	-	-	S	M	-	S	-	-	M	-	-	M	M	-	S	S	-	-
Chungbuk	-	-	S	-	S	-	-	S	-	-	S	M	S	-	M	-	-	-	S	S

Chungnam	S	-	-	M	-	-	-	-	M	-	-	S	M	-	M	M	-	S	S	-
Jeonbuk	S	-	-	-	M	-	-	-	M	-	-	M	-	M	S	S	-	-	M	M
Jeonnam	S	-	-	-	M	M	-	-	S	-	-	-	S	S	M	S	-	-	-	M
Gyeongbuk	-	-	S	M	S	-	S	M	-	-	S	-	-	S	S	S	-	S	M	S
Gyeongnam	M	-	-	-	S	-	M	-	S	-	M	-	-	M	-	S	-	-	S	S
Jeju	-	-	-	-	S	S	-	S	-	-	M	-	M	S	-	-	S	S	S	S

Note: S: Super-resilient, M: Moderately-resilient

4.3. Dynamic Resilience – The Global Financial Crisis

While the previous index-based resilience results were for a single point in time, this chapter is about resilience over a period of time. Here we extend the dynamic dimension to look at the aftermath of a specific shock in a dynamic way. In this study, we choose the shocks of the 2007 global financial crisis. The dynamic resilience analysis methodology used in this study provides insights into the resilience of a region before, during and after a shock, regardless of the nature of the shock (Dubé and PolèSe, 2016).

First, we present the results of the dynamic resilience analysis for socio-economic disasters. The shock period is set from 2007, the beginning of the financial crisis, to 2009, taking into account the different end points for different regions. Tables 4, 5 and 6 show the results of applying the two approaches of Dubé and PolèSe (2016) to the resilience variables: total population, regular employees and profit rate (presented in Table 1). For approach 2, red means that each category of resilience corresponds to a positive growth rate, while blue means a negative growth rate. The darker the value, the closer it is to the minimum or maximum value.

Before looking at the results at regional level, we can see that the national trends show resilience for all four variables before, during and after the shock: total population and regular employees show an increasing trend in the three sequences, while the profit rate decreases before and after the shock and increases during the shock.

At the regional level, the results are as follows: In terms of population, 8 out of the 17 regions were resistant to the economic crisis (see Table 4). In terms of total population, Seoul showed a countercyclical response to the shock, while Busan and Jeollanam-do showed a systematic decline in population in all three periods. There are also differences

between the short and long term, with Daegu, Jeollabuk-do and Gyeongsangbuk-do showing a turnaround in population growth in the three years after the shock, but a decline in the long term. In contrast, Chungcheongnam-do experienced a short-term decline in population but a long-term increase. More importantly, there is no standard recovery in terms of population. These results, combined with the different results for different lengths of the post-shock period, suggest that the mechanisms of population movement are not significantly affected by short-term shocks.

We can also see the results of the second approach to dynamic analysis. This allows us to examine the magnitude of change over time. This complements the first approach, which only looks at the direction of change. First, in terms of total population, all but two regions showed a recovery. This means that the population decline caused by the shock recovered quickly after the shock. In Incheon, Gwangju, Ulsan and Gyeonggi-do, resistance was found in Approach 1 but not in Approach 2. Among them, Incheon showed rebound and short- and long-term recuperation, but Ulsan and Gyeonggi-do did not correspond to any resilience category except rebound. Chuncheongnam-do was vulnerable to recession in the short term, but showed remarkable resilience in the long term.

Table 4. Dynamic resilience of the Total Population to the global financial crisis (2007–2009)

region		approach 1		approach 2			
		short-term (3 years)	long-term (10 years)	resistance	rebound	recuperation	
						short term	long term
National		Resistance	Resistance	-2.20%	1.11%	-0.06%	1.98%
Region	Seoul	Counter Cyclical	Counter Cyclical	1.30%	-0.28%	1.18%	-3.39%
	Busan	Systematic Decline	Systematic Decline	4.27%	1.11%	4.14%	0.62%
	Daegu	Turnarround	Systematic Decline	1.09%	0.78%	1.73%	-0.99%
	Incheon	Resistance	Resistance	-2.94%	3.20%	1.98%	6.15%
	Gwangju	Resistance	Resistance	-1.60%	1.05%	0.88%	-0.01%
	Daejeon	Resistance	Resistance and Lagged	-5.92%	2.14%	-3.20%	-6.55%

			Shock				
	Ulsan	Resistance	Resistance	-4.39%	1.55%	-1.49%	-1.42%
	Gyeonggi	Resistance	Resistance	-17.28%	2.33%	-11.75%	-1.75%
	Gangwon	Positive Jolt	Positive Jolt	3.88%	1.10%	5.58%	5.77%
	Chungbuk	Resistance	Resistance	0.78%	1.11%	3.28%	5.53%
	Chungnam	Resistance and Lagged Shock	Resistance	-1.74%	-2.54%	-2.17%	19.20%
	Jeonbuk	Turnarround	Systematic Decline	6.43%	1.43%	7.45%	4.52%
	Jeonnam	Systematic Decline	Systematic Decline	8.55%	0.70%	8.37%	6.24%
	Gyeongbuk	Turnarround	Systematic Decline	3.71%	1.50%	4.78%	3.56%
	Gyeongnam	Resistance	Resistance	-1.65%	0.46%	0.48%	1.81%
	Jeju	Resistance	Resistance	-2.51%	3.13%	1.24%	16.75%

In terms of employment, the crisis seems to have little impact on the resilience of the regions (see Table 5). In 16 of the 17 regions, the number of regular employees increased regardless of the shock, indicating resistance. Ulsan shows an immediate response to short-term shocks in terms of regular employees. In contrast, in approach 2, only two regions were found to be resistant: Daegu and Jeollabuk-do. This means that the regions were vulnerable to the global financial crisis in terms of employment stability. In terms of recovery, all regions rebounded and continued to grow in the long run by adapting to the shock.

Table 5. Dynamic resilience of the Regular Employee to the global financial crisis (2007–2009)

region		approach 1		approach 2			
		short-term (3 years)	long-term (10 years)	resistance	rebound	recuperation	
						short term	long term
National		Resistance	Resistance	-10.76%	9.02%	2.23%	32.53%
Region	Seoul	Resistance	Resistance	-6.20%	2.56%	1.43%	22.51%
	Busan	Resistance	Resistance	-0.68%	10.31%	11.23%	34.28%
	Daegu	Resistance	Resistance	1.93%	9.97%	15.48%	36.36%
	Incheon	Resistance	Resistance	-8.93%	9.59%	2.96%	35.41%
	Gwangju	Resistance	Resistance	-14.82%	8.33%	-1.56%	24.94%
	Daejeon	Resistance	Resistance	-7.55%	3.57%	3.91%	34.80%
	Ulsan	Resistance	Resistance	-20.44%	12.99%	-8.62%	8.64%
	Gyeonggi	Resistance	Resistance	-25.16%	16.57%	-5.75%	41.75%
	Gangwon	Resistance	Resistance	-8.93%	5.12%	-0.03%	38.21%
	Chungbuk	Resistance	Resistance	-12.44%	10.43%	2.17%	44.94%
	Chungnam	Resistance	Resistance	-24.73%	8.54%	-10.18%	50.05%
	Jeonbuk	Resistance	Resistance	0.98%	4.93%	13.46%	39.02%
	Jeonnam	Positive Jolt	Positive Jolt	-0.95%	6.45%	10.51%	47.06%
	Gyeongbuk	Resistance	Resistance	-1.84%	12.41%	12.92%	35.04%
	Gyeongnam	Resistance	Resistance	-18.00%	8.40%	-5.17%	9.43%
	Jeju	Resistance	Resistance	-8.47%	2.48%	0.78%	48.10%

The most frequent scenarios of resilience at regional firm level were counter-cyclical (see Table 6). For all time periods, only one region, Gwangju, shows an increase in the short term and a decrease in the long term. Jeollanam-do, on the other hand, shows a decline in both the short and long term for all sequences. The variation in results over the length of the post-shock period is consistent, with the exception of Incheon and Gwangju, both of which show an increase in profit rates in the short term and a decrease in the long term.

In the case of Gyeongsangnam-do, there is no resilience for the profit rate. At the level of regional firms, with the exception of Incheon, the rest of the regions recovered from the impact of the shock within three years and achieved growth as high as before. In particular, Seoul and Incheon, with the exception of Gyeonggi-do, did not return to growth in the long run of 10 years.

Table 6. Dynamic resilience of the Profit Rate to the global financial crisis (2007–2009)

region		approach 1		approach 2			
		short-term (3 years)	long-term (10 years)	resistance	rebound	recuperation	
						short term	long term
National		Counter Cyclical	Counter Cyclical	9.57%	-8.51%	5.58%	-9.37%
Region	Seoul	Resistance and Lagged Shock	Resistance and Lagged Shock	29.35%	-38.18%	23.69%	-36.35%
	Busan	Counter Cyclical	Counter Cyclical	35.16%	-28.57%	22.76%	6.22%
	Daegu	Counter Cyclical	Counter Cyclical	53.13%	-26.27%	48.70%	34.49%
	Incheon	Turnarround	Systematic Decline	-7.92%	11.33%	-5.50%	-12.61%
	Gwangju	Resistance	Resistance and Lagged Shock	0.68%	2.54%	4.80%	-3.51%
	Daejeon	Positive Jolt	Positive Jolt	10.26%	11.62%	22.39%	10.39%
	Ulsan	Counter Cyclical	Counter Cyclical	19.46%	-31.12%	1.79%	-10.63%
	Gyeonggi	Turnarround	Systematic Decline	9.03%	16.35%	24.25%	6.19%
	Gangwon	Counter Cyclical	Counter Cyclical	5.74%	-6.07%	1.11%	-5.28%
	Chungbuk	Counter Cyclical	Counter Cyclical	16.52%	-3.36%	16.32%	4.37%
	Chungnam	Counter Cyclical	Counter Cyclical	9.23%	-7.63%	3.71%	5.92%

	Jeonbuk	Counter Cyclical	Counter Cyclical	18.07%	-8.26%	12.72%	10.16%
	Jeonnam	Systematic Decline	Systematic Decline	5.77%	-9.79%	-5.81%	-1.46%
	Gyeongbuk	Resistance and Lagged Shock	Resistance and Lagged Shock	-14.67%	-19.15%	-30.39%	-32.62%
	Gyeongnam	Counter Cyclical	Counter Cyclical	19.82%	-27.07%	4.77%	2.35%
	Jeju	Counter Cyclical	Counter Cyclical	39.89%	-18.48%	33.80%	27.46%

4.4. Dynamic Resilience – The Heat Wave

To analyse the dynamic resilience to heat waves, we make several additional assumptions. First, in the case of the heat wave, the arrows pointing upwards represent a decrease in heat wave mortality in order to produce consistent results on past regional resilience. Second, in 2000, the earliest year in the period analysed, there were only six heat wave deaths in the whole country, leaving many regions with no deaths. To prevent this from biasing the results, we start in 2004, when heat wave deaths began to appear in earnest across the country. The three sequences are accordingly pre-shock (2004–2017), shock (2017–2018) and post-shock (2018–2020). Third, the growth rate cannot be calculated in the absence of deaths, so the growth rate was assumed to be 0.1 instead of 0. Fourth, resilience was analysed using mortality by heat wave instead of population, as the population losses due to the heat wave represent a very small proportion of the region's population. Finally, as the impact of the heat wave occurred recently, the recuperation can only be considered from a short-term perspective (2018–2020).

Table 7 shows the dynamic resilience results for the number of deaths caused by the 2018 heat wave. According to approach 1, the majority of regions, including the national level, showed standard resilience or turnaround. That is, the number of mortalities increased and then decreased due to the impact of the heat wave in the shock and post-shock periods, although the pre-shock trends were different. In the case of Daejeon, the number of heat wave mortalities remained unchanged at zero in all three sequences. Incheon and Gyeongsangnam-do had a constant number of deaths in the pre-shock period and Jeju-do had a constant number of deaths in the post-shock period.

Due to the small number of deaths, approach 2, which unlike approach 1 is based on growth rates, showed large fluctuations. Most regions, including the whole country, showed patterns of resistance and recuperation, but not rebound. Jeju-do, on the other

hand, was the only region to show a rebound, as it showed a reverse reaction to the impact of the heat wave. The impact of the heat wave on other regular employees and profit rates is presented in the appendix (see Table A1-A2).

Table 3. Dynamic resilience of the Mortality Rate by Heat Wave (2018)

region		approach 1	approach 2		
		short-term (3 years)	resistance	rebound	recuperation
					short term
National		Standard Resilience	0.0003%	-0.0005%	0.0000%
Region	Seoul	Standard Resilience	0.0002%	-0.0004%	0.0000%
	Busan	Turnarround	0.0002%	-0.0006%	0.0000%
	Daegu	Standard Resilience	0.0004%	-0.0009%	0.0000%
	Incheon	Standard Resilience	0.0001%	-0.0003%	0.0000%
	Gwangju	Standard Resilience	0.0002%	-0.0003%	0.0001%
	Daejeon	No Changes	0.0000%	0.0000%	0.0000%
	Ulsan	Standard Resilience	0.0003%	-0.0003%	0.0001%
	Gyeonggi	Turnarround	0.0001%	-0.0003%	-0.0001%
	Gangwon	Standard Resilience	0.0008%	-0.0009%	0.0004%
	Chungbuk	Turnarround	0.0001%	-0.0006%	-0.0002%
	Chungnam	Turnarround	0.0004%	-0.0010%	-0.0001%
	Jeonbuk	Standard Resilience	0.0003%	-0.0007%	-0.0001%
	Jeonnam	Standard Resilience	0.0005%	-0.0011%	-0.0001%
	Gyeongbuk	Standard Resilience	0.0008%	-0.0010%	0.0004%
	Gyeongnam	Standard Resilience	0.0002%	-0.0003%	0.0000%

	Jeju	Positive Jolt	-0.0005%	0.0002%	-0.0005%

5. Discussions

The significance of this study is that it considers shocks of different nature simultaneously and measures the changes that occur in a region under the same conditions. The implication of this is that it provides information on how regions should manage their resilience characteristics by observing common characteristics that appear at a relatively large regional scale. This study proposes a coordinating strategy for a collaborative resilience region.

A collaborative resilience region is an intra- and inter-regionally coordinated cooperative networking system that uses optimised economies of scale and scope to form an inter-local economic system (Nakamura, 2022). In the sub-locals of the region (e.g., Seoul, Busan, Ulsan) that show poor resilience to profit rate, which is the result of this study, which refers to the resilience of local firms, a pattern of consumer exclusion may emerge that reduces local consumption by locals and perpetuates the decline in the region's attractiveness under the love of variety principle, which states that consumers prefer a variety of goods and services (Dixit and Stiglitz, 1977; Nakamura, 2010), creating a vicious circle for the region's economic development and growth. The resilience region's strategy is to promote co-operative production between the region and the locals, and there are three levels of options.

Nakamura (2022) suggests three strategies to achieve this. First, increase economic efficiency by sharing resources between regions, such as intra- and inter-regional infrastructure, resources and technology. Second, sharing innovative ideas and technologies through intra- and inter-regional technology exchange to promote sustainable economic development. Third, it strengthens the resilience of regional economies by making intra- and inter-regional competition cooperative. This allows firms to benefit from economies of scale and scope, enabling the additional production of more goods and services at lower cost, and a sustainable virtuous circle can emerge in which local consumption increases as the utility of local people increases. This study combines index-based static methods with sequence-based dynamic methods to provide a model for analysing regional economic resilience from multiple perspectives. We are motivated by the idea that in regional economic development, business and non-government residents work collectively to create economic growth and job creation (Swinburn et al., 2006). On this basis, this study structures the economic resilience of a region into two dimensions: the resident dimension, where resilience consists of population and employment, and the regional firm dimension, where resilience consists of the rate of profit, decomposed into gross surplus and capital productivity. The importance of

considering both dimensions of resilience simultaneously is that it reflects the complementarity between them and builds a resilience model that can cover any shock affecting the regional economy.

Limitations of this paper include, on the methodological side, that the dynamic resilience framework we use does not capture the net effect of the shocks under analysis. We have previously analysed dynamic resilience by assuming the duration of the shock in advance and analysing the direction or growth rate of the sequence. It is therefore not an analysis that reflects the content or nature of the socio-natural shocks. A limitation of this resilience framework is therefore that it should be applied to phenomena that occur simultaneously globally or nationally, rather than locally. For example, COVID-19 is an appropriate shock because it occurred simultaneously within a country or region, whereas localised windstorms, accidents are not appropriate for this framework.

Another limitation in terms of content is the lack of consideration of the role of the public in local resilience. Previous research has highlighted the importance of institutional and policy arrangements shaped by local and national governments in the resilience of local economies (White and O'Hare, 2014). While it is important to consider the different socio-political environments of different regions, the purpose of this study was to construct and apply a resilience framework, so it was difficult to identify variables that might reflect this in common across regions. This limitation will be taken into account in the specific application of the collaborative resilience region in future research. The formation of resilience regions requires the establishment of networks for inter-regional exchange and policy and financial support to facilitate collaborative projects (Nakamura, 2022), and a more specific public role could be promoted in the application process in different settings.

Despite these limitations, this paper is significant in that it presents a resilience framework that can reflect different socio-natural shocks. The advantage of the framework is that it can be easily applied to identify the factors of socio-natural hazards that threaten cities in order to minimise damage, recover quickly and enhance the ability to adapt to the new normal. In particular, the concept of smart cities using digital technologies is in line with the goals of resilience and sustainability, and the adaptation, efficiency and knowledge creation of urban systems as a means to enhance innovation capacity is similar to resilience (Tzioutziou and Xenidis, 2021). In addition, big data based on smart city technologies can augment limited human cognitive capacities and enable proactive responses in the era of climate change to enhance regional or urban resilience (Apostu et al., 2022). Therefore, the introduction and implementation of smart cities should be accompanied by considerations of resilience, and it is significant that we have provided a policy basis for static and dynamic analysis of resilience.

Acknowledgement. This work was supported by Korea Environment Industry & Technology Institute (KEITI) through "Climate Change R&D Project for New Climate Regime", funded by Korea Ministry of Environment(MOE)(2022003570002).

References

Angeler, David G. et al. (2022) Adaptation, Transformation and Resilience in Healthcare Comment on 'Government Actions and Their Relation to Resilience in Healthcare During the COVID-19 Pandemic in New South Wales, Australia and Ontario, Canada'. *International Journal of Health Policy and Management*, 11 (9), pp.1949–1952. Available from: https://doi.org/10.34172/ijhpm.2022.7043.

Anselin, Luc (1995) Local Indicators of Spatial Association—LISA. *Geographical Analysis*, 27 (2), pp.93–115.

Apostu, Simona Andreea, Valentina Vasile, Razvan Vasile and Joanna Rosak-Szyrocka (2022) Do Smart Cities Represent the Key to Urban Resilience? Rethinking Urban Resilience. *International Journal of Environmental Research and Public Health*, 19 (22), 15410. Available from: https://www.mdpi.com/1660-4601/19/22/15410.

Blanc, Judite et al. (2021) Addressing Psychological Resilience during the Coronavirus Disease 2019 Pandemic: A Rapid Review. *Current Opinion in Psychiatry*, 34 (1), pp.29–35. Available from: https://journals.lww.com/co-psychiatry/Fulltext/2021/01000/Addressing_psychological_resilience_during_the.5.aspx.

Cannizzaro, Salvatore, Francesco De Pascale, Piero Farabollini and Francesco Muto (2020) Introduction to the Special Issue 'Socio-Natural Disasters and Vulnerability Reduction in the Territorial Ecosystems'. *AIMS Geosciences*, 6 (1), pp.1–5.

Cheng, Yao, Elsayed A. Elsayed and Zhiyi Huang (2022) Systems Resilience Assessments: A Review, Framework and Metrics. *International Journal of Production Research*, 60 (2), pp.595–622. Available from: https://doi.org/10.1080/00207543.2021.1971789.

Collier, Marcus J et al. (2013) Transitioning to Resilience and Sustainability in Urban Communities. *Cities*, 32, pp.S21–S28. Available at: https://www.sciencedirect.com/science/article/pii/S026427511300036X.

Cowell, Margaret M (2013) Bounce Back or Move on: Regional Resilience and Economic Development Planning. *Cities*, 30 (1), pp.212–222. Available from: http://dx.doi.org/10.1016/j.cities.2012.04.001.

Dubé, Jean and Mario PolèSe (2016) Resilience Revisited: Assessing the Impact of the 2007–09 Recession on 83 Canadian Regions with Accompanying Thoughts on an Elusive Concept. *Regional Studies*, 50 (4), pp.615–628. Available from: http://dx.doi.org/10.1080/00343404.2015.1020291.

Fantechi, Federico and Marco Modica (2022) Learning from the Past: A Machine-Learning

Approach for Predicting the Resilience of Locked-in Regions after a Natural Shock. *Regional Studies*, pp.1-14.

Fingleton, Bernard, Harry Garretsen and Ron Martin (2012) Recessionary Shocks and Regional Employment: Evidence on the Resilience of U.K. Regions. *Journal of Regional Science*, 52 (1), pp.109–133.

Foster, Kathryn A. (2007) *A case study approach to understanding regional resilience*. Working Paper 2007–08, Institute of Urban and Regional Development, Berkeley.

Fransen, Jan et al. (2022) The Emergence of Urban Community Resilience Initiatives During the COVID-19 Pandemic: An International Exploratory Study. *European Journal of Development Research*, 34 (1), pp.432–454. Available from: https://doi.org/10.1057/s41287-020-00348-y.

Friedman, MIilton (1993) THE 'PLUCKING MODEL' OF BUSINESS FLUCTUATIONS REVISITED. *Economic Inquiry*, 31 (2), pp.171–177. Available from: https://doi.org/10.1111/j.1465-7295.1993.tb00874.x.

Le Gallo, Julie and Bernard Fingleton (2021) Regional Growth and Convergence Empirics. In Manfred M FISCHER and Peter NIJKAMP (eds.). *Handbook of Regional Science*. Berlin, Heidelberg: Springer Berlin Heidelberg, 679–706. Available from: https://doi.org/10.1007/978-3-662-60723-7_17.

Lee, Seong-Jin, Joong-Hoo Park, Seung-Min Cha, Donghyun Kim. (2022) A Regional Economy's Resistance to the COVID-19 Shock: Sales Revenues of Micro-, Small-, and Medium-Sized Enterprises in South Korea. *International Journal of Disaster Risk Science*, 13 (2), [online], pp.190–198. Available from: https://doi.org/10.1007/s13753-022-00402-9.

Ingram, Matthew C. and Imke Harbers (2020) Spatial Tools for Case Selection: Using LISA Statistics to Design Mixed-Methods Research. *Political Science Research and Methods*, 8 (4), pp.747–763.

Jeong, Seunghoo and D. K. Yoon (2018) Examining Vulnerability Factors to Natural Disasters with a Spatial Autoregressive Model: The Case of South Korea. *Sustainability*, 10 (5), pp.1–13.

Kang, Sung Hoon and Mark Skidmore (2018) The Effects of Natural Disasters on Social Trust: Evidence from South Korea. *Sustainability*, 10 (9), pp.1–16.

Kathryn A. Foster. (2007). A Case Study Approachto Understanding Regional Resilience. *UC Berkeley: Institute of Urban and Regional Development*. Available from: https://escholarship.org/uc/item/8tt02163

Kaye-Blake, William, Kelly Stirrat, Matthew Smith and Simon Fielke (2019) Testing Indicators of Resilience for Rural Communities. *Rural Society*, 28 (2), pp.161–179.

Kim, Danya and Heeyeun Yoon (2020) Demographic Effects of Climate-Induced Disasters in South Korea: A Spatiotemporal Approach. *International Journal of Disaster Risk*

Reduction, 50 (August), 101837. Available from: https://doi.org/10.1016/j.ijdrr.2020.101837

Kim, Donghyun. (2021) Exploratory Study on the Spatial Relationship between Emerging Infectious Diseases and Urban Characteristics: Cases from Korea. *Sustainable Cities and Society*, 66, [online], 102672. Available from: https://www.sciencedirect.com/science/article/pii/S2210670720308878.

Lang, Robert E. and Karen A. Danielsen (2006) Review Roundtable: Is New Orleans a Resilient City?. *Journal of the American Planning Association*, 72 (2), pp.245–257. Available from: https://doi.org/10.1080/01944360608976744.

Martin, Ron (2012) Regional Economic Resilience, Hysteresis and Recessionary Shocks. *Journal of Economic Geography*, 12 (1), pp.1–32.

Martin, Ron, Peter Sunley, Ben Gardiner, Peter Tyler. (2016) How Regions React to Recessions: Resilience and the Role of Economic Structure. *Regional Studies*, 50 (4), pp.561–585.

Martin, Ron and Ben Gardiner (2019) The Resilience of Cities to Economic Shocks: A Tale of Four Recessions (and the Challenge of Brexit). *Papers in Regional Science*, 98 (4), pp.1801–1832.

Moon, Hyungpyo (2003) 'Regional Inequality and Fiscal Decentralization in Korea: Evaluation and Policy Implications' (unpublished working paper). *Korea Development Institute*, pp.1–32. Available from: http://210.114.108.30/data/download/attach/7931_IV_HyungpyoMoon.pdf.

Nakamura, Daisuke (2010) Spatial Competition and Consumer Exclusion: Social Welfare Perspectives in Central-Place System. *Letters in Spatial and Resource Sciences*, 3 (3), pp.101–110.

Nakamura, Daisuke (2022) A Cooperative Regional Economic System for Sustainable Resilience Policy. *Applied Spatial Analysis and Policy*.

Navinés, Ferran, José Pérez-Montiel, Carles Manera and Javier Franconetti (2022) Ranking the Spanish Regions According to Their Resilience Capacity during 1965–2011. *Annals of Regional Science*. Available from: https://link.springer.com/10.1007/s00168-022-01171-5.

Oliver-Smith, Anthony. (2022) The Social Construction of Disaster: Economic Anthropological Perspectives on the COVID-19 Pandemic. *Economic Anthropology*, 9 (1), [online], pp.167–171. Available from: https://onlinelibrary.wiley.com/doi/10.1002/sea2.12236.

Pendall, Rolf, Kathryn A. Foster and Margaret Cowell (2010) Resilience and Regions: Building Understanding of the Metaphor. *Cambridge Journal of Regions, Economy and Society*, 3 (1), pp.71–84.

Riepenhausen, Antje et al. (2022) Positive Cognitive Reappraisal in Stress Resilience, Mental Health, and Well-Being: A Comprehensive Systematic Review. *Emotion Review*,

14 (4), pp.310–331.
Sánchez-Zamora, Pedro, Rosa Gallardo-Cobos and Felisa Ceña-Delgado (2014) Rural Areas Face the Economic Crisis: Analyzing the Determinants of Successful Territorial Dynamics. *Journal of Rural Studies*, 35, pp.11–25. Available from: http://dx.doi.org/10.1016/j.jrurstud.2014.03.007.
Simmie, James and Ron Martin (2010) The Economic Resilience of Regions: Towards an Evolutionary Approach. *Cambridge Journal of Regions, Economy and Society*, 3 (1), pp.27–43.
Swinburn, Gwen, Soraya Goga and Fergus Murphy (2006) *Local economic development: a primer developing and implementing local economic development strategies and action plans*, United States of America, World Bank Group. Available from: http://documents1.worldbank.org/curated/en/763491468313739403/pdf/337690REVISED0ENGLISH0led1primer.pdf.
Tzioutziou, Anastasia and Yiannis Xenidis (2021) A Study on the Integration of Resilience and Smart City Concepts in Urban Systems. *Infrastructures*, 6 (2), 24. Available from: https://www.mdpi.com/2412-3811/6/2/24.
Vaidyanathan, Ambarish, Josephine Malilay, Paul Schramm and Shubhayu Saha (2020) Heat-Related Deaths — United States, 2004–2018. MMWR Morb Mortal Wkly Rep. 69 (24), pp.729–734.
White, Iain and Paul O'Hare (2014) From Rhetoric to Reality: Which Resilience, Why Resilience, and Whose Resilience in Spatial Planning?. *Environment and Planning C: Government and Policy*, 32 (5), pp.934–950.
Wolman, Harold, Howard Wial, Travis St. Clair, Edward Hill. (2017) Coping with Adversity: Regional Economic Resilience and Public Policy. Available from: https://doi.org/10.7591/cornell/9780801451690.001.0001.
World Economic Forum. (2020) The Global Risks Report 2020. Available from: https://www3.weforum.org/docs/WEF_Global_Risk_Report_2020.pdf
Yang, Xiaokai and B. J. Heijdra (1993) Monopolistic Competition and Optimum Product Diversity: Comment. *American Economic Review*, 83 (1), pp.295–301.

Appendix

Table A1. Dynamic resilience of the Regular Employee to the Heat Wave (2018)

region		approach 1	approach 2		
		short-term (3 years)	resistance	rebound	recuperation
					short term
National		Resistance	-59.22%	-3.04%	-59.22%
Region	Seoul	Resistance and Lagged Shock	-43.09%	-4.04%	-44.65%
	Busan	Resistance and Lagged Shock	-35.41%	-3.03%	-37.56%
	Daegu	Resistance and Lagged Shock	-34.91%	-2.68%	-35.90%
	Incheon	Resistance and Lagged Shock	-52.66%	-6.18%	-54.92%
	Gwangju	Resistance and Lagged Shock	-63.93%	-4.80%	-66.27%
	Daejeon	Resistance	-68.19%	0.83%	-65.83%
	Ulsan	Resistance and Lagged Shock	-49.30%	-5.77%	-53.83%
	Gyeonggi	Resistance	-99.25%	-3.11%	-97.71%
	Gangwon	Resistance	-55.54%	-0.69%	-52.42%
	Chungbuk	Resistance	-67.86%	-1.26%	-63.62%
	Chungnam	Resistance	-113.82%	-0.92%	-109.43%
	Jeonbuk	Resistance	-47.35%	-1.67%	-46.20%
	Jeonnam	Resistance	-48.62%	0.95%	-44.10%
	Gyeongbuk	Resistance and Lagged Shock	-39.68%	-2.57%	-40.88%

	Gyeongnam	Resistance and Lagged Shock	-59.60%	-1.77%	-61.07%
	Jeju	Resistance and Lagged Shock	-70.42%	-11.46%	-73.55%

Note: The darker the value, the closer it is to the minimum or maximum value

Table A2. Dynamic resilience of the Profit Rate to the Heat Wave (2018)

region		approach 1	approach 2		
		short-term (3 years)	resistance	rebound	recuperation short term
National		Systematic Decline	7.12%	-12.42%	-7.54%
Region	Seoul	Hard Hit, No recovery	-19.43%	-19.04%	-55.23%
	Busan	Systematic Decline	6.46%	1.68%	-1.65%
	Daegu	Systematic Decline	13.86%	-26.46%	-14.77%
	Incheon	Systematic Decline	-1.54%	-9.54%	-17.69%
	Gwangju	Hard Hit, No recovery	-25.93%	-4.64%	-42.92%
	Daejeon	Systematic Decline	2.43%	-19.72%	-18.01%
	Ulsan	Turnarround	15.18%	7.36%	17.28%
	Gyeonggi	Counter Cyclical	3.92%	-24.29%	-16.86%
	Gangwon	Systematic Decline	9.16%	-13.72%	-4.79%
	Chungbuk	Turnarround	16.27%	5.03%	18.18%
	Chungnam	Counter Cyclical	11.50%	-6.03%	6.83%
	Jeonbuk	Systematic Decline	9.13%	-1.61%	4.22%
	Jeonnam	Hard Hit, No recovery	-15.59%	8.78%	-18.44%
	Gyeongbuk	Resistance and Lagged Shock	-4.92%	-12.05%	-15.11%
	Gyeongnam	Systematic Decline	6.28%	1.35%	4.15%
	Jeju	Counter Cyclical	29.04%	-6.00%	24.64%

Note: The darker the value, the closer it is to the minimum or maximum value

THE RESILIENCE PERSPECTIVE FOR BETTER DEALING WITH TERRITORIAL PLANNING POLICIES IN NON-METROPOLITAN AREAS[1] (1123)

Daniela De Leo[1*], Sara Altamore[1]

[1] Sapienza University of Rome, Italy; [*]daniela.deleo.uniroma1.it

Abstract. The contribution adopts a resilience perspective to reassess the research findings on two territorial planning tools and policies, the SNAI-Italian National Strategy and the River Contract, implemented in a non-metropolitan area of the Lazio Region. Although these policies aimed to address crucial territorial challenges through multi-stakeholder practices, they faced considerable difficulties and limitations. In light of these challenges, the resilience perspective suggests alternative approaches that prioritise the collaborative sharing of responsibilities, knowledge, and competencies. By doing so, it aims to overcome the inherent limitations and rigidity often observed in significant territorial planning policies implemented in non-metropolitan areas.

Keywords: territorial planning, resilience, non-metropolitan areas, inner areas, river contract.

1. Introduction

Inspired by the AESOP conference track 'Planning for Resilience: Territories, Communities and Environment', the contribution rethinks the findings of research on two innovative territorial planning tools in a non-metropolitan area in the Lazio Region in terms of resilience.

The research extensively examined the processes of the SNAI-National Strategy for Inner Areas 'Alta Tuscia-Antica Città di Castro' and the 'Marta-Bolsena-Tarquinia' Lake, River, and Coast Contract. As also explained in the other contribution of the authors in this book of proceedings, the national policy SNAI intended to achieve its goals of development facilitating the collective production of an area strategy through mandatory multi-stakeholder and multilevel processes (Barca, 2013). Similarly, the River Contract aimed to revitalise and protect the water basin through multi-stakeholder and multilevel processes

[1] The paper is the result of shared research work. However, for practical reasons, it is possible to attribute to Daniela De Leo, §1, §2, §4 e §5; and to Sara Altamore §2, §3; §4, §5.

(Barbanente and Monno, 2005).

The two policies invested in multi-level and multi-stakeholder approaches considered promising to achieve ambitious goals (Healey, 1998; Innes and Booher, 2004; 2018). However, the research has shown that both policies and tools were unable to promote new development processes and protect the water basin. Therefore, by adopting the resilience perspective, the paper aims to explore ways to improve multi-stakeholder and multilevel processes to effectively achieve important goals in non-metropolitan areas.

The paper is structured as follows: first, a brief description of the methodology used for this paper and, more importantly, the research on the two policies is provided. Next, a selected theoretical framework on resilience is built to offer useful insight for reframing the research findings. Finally, the research findings are integrated with the theoretical framework to provide recommendations for improving multi-stakeholder practices.

2. Methodological Notes

The research spanned a period of more than two years, starting from the end of 2020. It employed a qualitative methodological approach, which encompassed desk analysis, informal conversations, semi-structured interviews, project manager shadowing, and participatory observations. The desk analysis involved nationally available data, guidelines produced at the regional level, and local documents of the two policies. Moreover, the fieldwork aimed to examine the progression of processes, the relationships among participants, the connection between the produced documents, and the expected outcomes. Specifically, participatory observation focused on stakeholder involvement and relationships, while attending at public meetings and events provided insights for a better understanding of dynamics among stakeholders, both local and institutional. Informal conversations and semi-structured interviews involved different stakeholders and actors, such as the project manager, technical and administrative staff, decision-makers, local experts, and members of the steering committee. The interviews were conducted to deepen stakeholders' perceptions of territorial needs, critical issues in the implementation processes, and potential areas for improvement. The shadowing of the project manager, who was involved in both policies, was carried out to observe the network of actors and their dynamics.

At the end of the research[2] about the processes of the two policies, it appeared that *multi-stakeholder practices did not work* (De Leo, Altamore, 2023a) in their aim to renew the shared practices for better achieving the important goals. The relevance of these

[2] Research Agreement signed by PDTA (Sapienza University) in 2020 has been renewed and extended for supporting the policies implementation in the Area.

processes suggests participating in this Conference Track to reframe the findings of the research in relation to the concept of resilience.

Over the past fifteen years, the concept of resilience has been introduced in territorial planning discourse to provide a better understanding and approach to significant challenges. In the description of this Track, keywords such as *connectivity, awareness, knowledge, flexibility*, and *persistence* appear to be valuable in reconsidering the critical issues that emerged during the research on the multi-stakeholder processes of the two policies. By examining these processes through the lens of the Track's keywords and the concept of resilience, a new interpretation of the failures and an opportunity for their needed success.

3. The Selected Resilience Perspective

Different interpretations of resilience are significantly shaped by various worldviews and approaches (Davoudi, 2012). The emergence of resilience thinking is connected to a fundamental shift in managing natural resources and ecological systems. These shifts challenged traditional assumptions regarding natural resource management, such as stability, predictability, and equilibrium (Wilkinson et al., 2010). This narrative also led to the evolution of new approaches for governing changes in human and natural systems, which moved away from modernist and normative paradigms (ibid.).

In this paper, the ecological definition of resilience proposed by Simin Davoudi (Davoudi et al., 2012) has been taken into account. It supposes a parallel between natural and social science interpretations that, although stimulating, carries the risk of significant misunderstandings. In this regard, Swanstrom argues that 'applying the framework of ecological resilience to human institutions and governance processes generates paths to greater understanding, as well as dead ends' (Swanstrom, 2008, p. 6). Nonetheless, in the article 'Resilience: a bridging concept or a dead end?', in Planning theory & practice, Davoudi et alii (2012) offers a 'more optimistic' (for their admission) point of view. In that contribution, the evolutionary resilience perspective is selected as a valuable framework for comprehending complex socio-ecological dynamics.

In general, Davoudi's work presents promising parallels between evolutionary resilience and the interpretative (or communicative) planning approach [3], as both emphasise

[3] from here onward, the text will refer to collaborative planning, as both communicative and collaborative approaches recognise the importance of inclusive dialogue, active stakeholder participation, and effective communication in the planning process. For further information on the different theoretical foundations and practical applications of collaborative and communicative planning see the works of Healey, 1997; Forester, 1999; Innes & Booher, 2004.

characteristics such as contingency, connectivity, multiplicity, and reflexivity (Davoudi & Strange, 2009, p. 37). Both resilience thinkers and collaborative planners acknowledge the inevitability of change and uncertainties. Evolutionary resilience fosters an understanding of places not as isolated and neutral entities, but as interconnected systems that are complex and unpredictable. It discourages fixed and rigid perspectives, much like the modernist approaches in planning are often discouraged for dealing with territorial complexities (Davoudi, 2011). This interpretation of resilience proposes a relational understanding of spatiality which well matches collaborative planning theory and practice (Massey, 2005). Other aspects proper to evolutionary resilience relate to rejecting equilibrium, acknowledging inherent uncertainty, and recognizing the interplay of persistence, adaptability, and transformability (Davoudi et al., 2012). Moreover, it has the potential to foster interdisciplinary dialogues and collaborations.

Moreover, in translating resilience from the natural to the social domain, Davoudi (2012) suggests four very important critical issues:

- human agency and intentionality,
- desired/intended outcomes,
- system's boundary,
- power dynamics.

According to the first issue, natural cycles seem extremely deterministic compared with human actions, while human 'interventions in processes can indeed diminish, sustain, or enhance resilience' (ibid.: 305). This relates to the idea of self-organisation, which the author directly links to resilience thinking. However, 'while the existence of engaged social networks helps foster adaptive capacity and enhance transformative resilience, it is not a substitute for responsive and accountable governance' (ibid.).

The second issue regards the outcomes and final purpose of resilience. In the social context, normative judgments play a significant role in defining what are the desirable outcomes and what not. Thus, 'if the outcomes depart from the perceived desirable, reaching an alternative outcome may not be seen as a sign of resilience' (ibid.).

In the third issue, the act of defining a boundary needs to be taken into account as it leads to exclusionary practices. Indeed, 'in a particular ecosystem, the analysis of resilience has to determine the 'resilience of what to what'. This means that analysts inevitably focus on some things and discount others' (ibid.).

Lastly, the fourth issue regards power and, thus, the question 'resilience for whom? In the ecological literature, resilience is almost power-blind and a-political (...). This may be true, but in society there are always rewards and punishments: some people gain while others lose in the process of resilience-building' (ibid.).

In other words, by carefully applying the ecological perspective to the social context, resilience must consider more and more both the adaptive capacities of social systems and the power dynamics that influence societal outcomes.

4. The Main Research Findings

Two innovative policies and tools regarding the same area in the north of the Lazio Region have been analysed and supported by the authors: the 'Alta Tuscia-Antica città di Castro' Inner Area within the SNAI (Italian National Strategy for the Inner Area) and the 'Marta-Bolsena-Tarquinia'' River, Lake, and Coastal Contract. The interest in these two policies is related to their important goals for such kinds of non-metropolitan areas aimed at tackling the main challenges of the non-metropolitan areas: socio-economic decline and environmental risks.

Figure 1. The landscape of the area

Source: the authors.

In particular, the SNAI aims to face the local decline by reducing service access inequalities

in marginalised territories (De Leo and Altamore, 2023b). The implementation process[4] involves the participation of social partners, civil society organizations, and citizens in policy definition and implementation. Within this national framework, the process of 'Alta Tuscia-Antica Città di Castro' Inner Area began in 2018 and involved the participation of municipalities, experts, and various territorial stakeholders. Participatory practices were employed to collect data and outline interventions aligned with the SNAI mission.

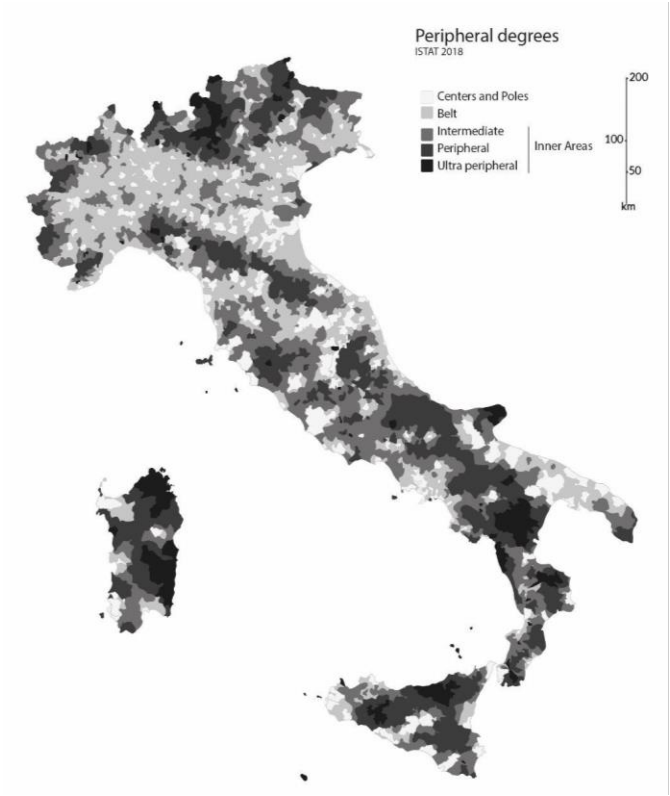


Figure 2. The classification of the peripheral degrees. The darker shapes are the most peripheral areas analysed and elaborated by the SNAI
Source: Italian Cohesion Agency, elaborated by the authors.

The River Contracts are used to address the management of water basins. They involve

[4] Participatory methodologies are promoted in the formal documents. The analysis of local strategies shows that consultative practices, such as thematic tables, public meetings, and focus groups, are more prevalent than deliberative practices. Each phase of the process generates a corresponding document, including Draft Strategy, Preliminary Strategy, Area Strategy, and the Framework Program Agreement, which requires collaboration between the Technical Committee for Inner Areas, regional working groups, and local administrations. The Framework Program Agreement signifies the commitment to further implementation.

multiple stakeholders, including government entities, local communities, NGOs, and other relevant actors, in a joint effort to develop strategies and actions for water resource protection. In the case of the 'Bolsena-Marta-Tarquinia' River, River, Lake, and Coastal Contract[5], the participatory process aimed at encompassed environmental protection, water management, sewage collector monitoring and maintenance, water quality, and the development of agriculture and tourism.

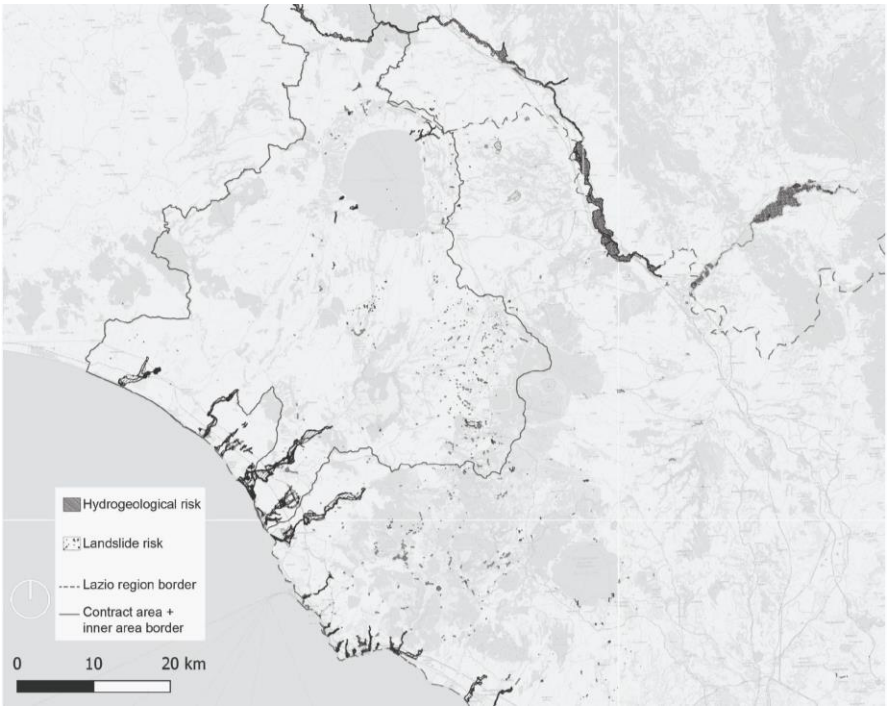


Figure 3. Hydrogeological risk and landslide risk in the area of both policies in the Northern Lazio Region

Source: data from the province of Viterbo, elaborated by the authors.

In summary, from the research on the two different policies' processes, similar problems emerged:

- limitations in cognitive resources and skills and the inability to exchange knowledge: the participatory processes have not created room for enhancing capabilities to work together; as related consequences, knowledge and expertise remained centralised among a selected few individuals or actors, limiting its distribution among a broader range of stakeholders,

[5] The River Contract aims at producing a final Action Plan.

- lack of ordinary planning practices: institutional and non-institutional actors are not used to planning and even worst to planning together, then they suffered the lack of the capacity and expertise to effectively plan on a broader scale,
- difficulties in sharing responsibilities: mayors tend to not delegate and share their own power on urban and planning issues, making the processes to plan together more difficult.

Indeed, the fieldwork of the two policy processes reveals a long-standing absence, often spanning 20 years or more, of any established ordinary planning practices. This is evident from the prevalent lack of up-to-date or recent plans. As a consequence, administrations face significant limitations, lacking not only the essential tools and methodologies at the individual municipality level but also the capacity to effectively engage in planning on a broader scale. Furthermore, the interviews revealed that the main obstacle to associate planning is the belief among mayors and local coalitions that it is a crucial element of their power, which they are unwilling to share.

From the shadowing of the project manager, communication difficulties emerged and showed cognitive asymmetries among public administration officers, mayors, and the project manager. These hindered the effective exchange of information and contributed to misunderstandings.

The process encountered a significant deficiency in facilitating the exchange of knowledge and skills. Consequently, expertise remained concentrated within a limited group of individuals or actors. Specifically, the analysis of local documents highlighted that the participatory process was organized around three thematic tables focusing on services, specifically education, health, and local development. However, through participatory observations and the project manager's shadowing, it became evident that public participation was minimal and primarily characterized by a one-way collaboration led by the state. Paradoxically, there was a lack of institutional commitment, resulting in frequent absences of administrators and office staff. Furthermore, the understaffed offices exacerbated the limitations of resource-intensive processes.

5. Conclusion

In conclusion, the application of the theoretical framework of resilience to the research findings has provided valuable insights and suggestions for enhancing similar processes in the specific non-metropolitan area under study. The concept of resilience proves to be highly beneficial as it takes into account crucial factors such as agency, outcomes, boundaries, and power dynamics. By considering these critical issues, improvements can be made to address the challenges faced and create more effective and inclusive processes.

Certainly, the research findings highlight the importance of empowering different actors involved in the processes. This entails enhancing the collaborative capacity of stakeholders across various levels and fostering engagement with both organized and unorganized civil society. A key aspect is aligning the intended outcomes of these multi-stakeholder processes to ensure a more shared and directed effort, moving beyond the formal and mandatory outputs such as Strategy Documents (SNAI) or Action Plans (River Contract). In addition, addressing the issue of boundaries can facilitate cooperation and coordination among diverse stakeholders. This involves redefining the boundaries of responsibilities by reallocating public roles and responsibilities between institutional and non-institutional actors, thereby promoting more effective and efficient governance arrangements.

Furthermore, power dynamics play a crucial role. Establishing permanent and collaborative processes can facilitate the development of shared practices among mayors and stakeholders, i.e. among Mayors, without the fear of losing control over their respective domains. Thus, within a different availability of knowledge, appropriate skills, and new abilities, multi-stakeholder processes could finally be able to support innovative policies and tools in dealing with the important territorial challenges for which they have been settled up.

References

Barbanente, Angela, and Valeria Monno (2005) Changing discourses, practices and spaces of coexistence: Perspectives for the environmental regeneration of the Ofanto River Basin. *Planning Theory & Practice* 6 (2), pp. 171-190.

Barca, Fabrizio, Paola Casavola, and Sabrina Lucatelli (2014) A strategy for inner areas in Italy: definition, objectives, tools and governance. *Materiali Uval Series* 31.

Davoudi, Simin (2011) Localism and the Reform of the Planning System in England." *disP-The Planning Review* 47(187), pp. 92-94.

Davoudi, Simin, and Libby Porter (eds.) (2012) Applying the resilience perspective to planning: Critical thoughts from theory and practice. *Planning Theory & Practice,* 13(2).

Davoudi, Simin (2012) Resilience: a bridging concept or a dead end? In: Davoudi, Simin, and Porter, Libby (eds.) op. cit., pp. 299-333.

De Leo, Daniela, and Sara Altamore (2022). Territori intermedi del Lazio e Contratti di Fiume. Interpretazioni e strumenti per territori né metropolitani né interni. *Archivio di Studi Urbani e Regionali,* LIII, 135.

De Leo, Daniela, and Sara Altamore (2023a) Why multi-stakeholder practices don't work: looking beyond the extent and diversity of actors for co-producing collective action; a case study from an inner area in Italy. *Planning Practice & Research*, 38(3), pp.1-17.

De Leo, Daniela, and Sara Altamore (2023b) Voluntary territorial planning tools and boundaries changes: soft spaces for better addressing challenging territorial issues in the Lazio Region. In: Integrated planning in a world of turbulence, Track 4 Integrated Planning over The Borders, *AESOP proceedings* 35(1), Lodz, 11-15 July.

Healey, Patsy (1998) Building institutional capacity through collaborative approaches to urban planning. *Environment and planning A* 30(9), pp. 1531-1546.

Innes, Judith E., and David E. Booher (2004) Reframing public participation: strategies for the 21st century. *Planning theory & practice* 5(4), pp. 419-436.

Innes, Judith E., and David E. Booher (2018) *Planning with complexity: An introduction to collaborative rationality for public policy.* London: Routledge.

Massey, Doreen (2005) *For Space.* London: Sage.

Swanstrom, Todd (2008) Regional resilience: A critical examination of the ecological framework, IURD- Berkeley, CA, Institute of Urban and Regional Development, University of California.

Wilkinson, Cathy, Libby Porter, and Johan Colding (2010) Metropolitan planning and resilience thinking: A practitioner's perspective. *Critical planning* 17(17), pp. 2-20.

ACTIVATE THE WATER HERITAGE TO BUILD MORE SUSTAINABLE COMMUNITIES (1130)

Margarida Relvão Calmeiro

Center for the History of Society and Culture, Department of Architecture, University of Coimbra, Portugal; mrcalmeiro@uc.pt

Abstract. Today we recognize the finite character of natural resources, and the need for use it in a sustainable way to ensure the survival of mankind. Water is one of these resources essential to life, thus, over time, man developed systems to carry and capture water, however, the modern infrastructures of water supply made these systems obsolete. This article states the need to reuse the ancient systems to capture and store water, moreover it reflects about the benefits of the preservation of this ancient knowledge as part of a development strategy based on the valorisation of local heritage and resources. It focuses on a set of small villages in the centre of Portugal, in a carsic territory marked by water scarcity, depopulation and low density.

Keywords: Water systems, heritage, vernacular architecture, circularity, sustainable development.

1. Introduction

The awareness that water is a scarce resource essential to life has led to the interrogation of how to reuse this resource and how to manage it better. The problem of water is not only the lack of it but more the lack of management, it is essential to know how to manage water throughout its cycle, even in areas of a scarcity of water, it is necessary to know how to conserve it and make the best use of it.

Over the years, water has played a key role in the development of regions and cities and therefore man has developed techniques and knowledge to ensure its conduction and storage (Hein et al 2020 p.2). This knowledge and techniques developed over years and passed down from generation to generation are part of local cultures and their heritage. However, in many cases, modern water supply and distribution infrastructures have made these systems obsolete and many of them lost their use. Nonetheless, their value as heritage is undeniable and some studies have addressed the need to value the heritage of water systems and in some countries, this heritage has been subject to conservation policies and preserved.

Today, with the challenges of climate change and the need to transition society towards greener and bluer systems, the discussion about valorization and the use of these systems

becomes even more important. At least in the countries most affected by the scarcity of water due to climate change.

Portugal is living an atypical drought year, with some areas of the country with very low precipitation values compared to the usual. The South of the country and some regions in the interior of Trás-os-Montes are at this time of spring with water reserves below normal values in the middle of summer (IPMA, 2023; Público, 8 May 2023). This can be particularly problematic in rural and less populated areas and requires a new strategy for water management, with implications for land planning and management of the territory and its settlements.

Moreover, Portugal is a country marked by an unequal urban system distribution, the coast is marked by concentration and the interior is marked by depopulation and abandonment of the territory. At the same time, all over the country there is an accentuated demographic loss, which is only compensated in the Lisbon metropolitan region and the Algarve. This situation is even more serious in the rural regions and most isolated areas. On the other hand, these more depressed areas face every year the plague of fires, a situation that is worsened by years of drought and by the absence of local populations to control and respond quickly to small fires. To address this situation there has been an attempt to develop policies to improve these territories by introducing new activities, including tourism and by the enhancement of local resources and heritage.

Following the European strategies that advocate the reinforcement of territorial cohesion as a way to promote the development of the territory for all and in a sustainable way, it is pertinent to develop new strategies to strengthen the rehabilitation of rural settlements (UN, 2015; CEC, 2008, Alexiadis, 2017). However, the lack of investment in rural territories has led to the closure of some essential services (schools, hospitals and courts). Therefore, it is urgent to rethink how it is possible to improve the quality of life of those who still live in these territories, as well as to introduce new activities that can attract new residents and visitors. One strategy is to enhance the distinctiveness of these areas, like it's endogenous resources and their natural and cultural heritage, such as the rural settlements and their vernacular architecture buildings that create the cultural landscape of rural territories. This landscape is the result of a process of transformation by man and of a know-how that has been built over decades and which stands out from newer landscapes due to its harmony with the environment and the sustainable use of resources, namely for the construction of buildings. In a period when attention is being drawn to the urgency of preserving resources, it becomes particularly pertinent to analyse these landscapes and promote their rehabilitation and conservation (ICOMOS, 2017). This requires a work of analyses, surveys and learning to fully understand this heritage and propose informed actions for its rehabilitation and sustainable development.

This analyse is being developed in the Massif of Sicó in Portugal with the collaboration of the Department of Architecture of the University of Coimbra, which is working with the region to characterize the existing vernacular heritage help to design an integrated strategy for the territory. One of the particularities of this heritage has to do with the karstic soil, which makes this a place where surface water is scarce. Therefore, over the years local communities have developed strategies to collect and store water that today should be valued as part of the local heritage and needs to be included in the rehabilitation strategies This paper aims to draw attention to this distinctive factor and argues for the need to value vernacular architecture and ancient water systems as keys for local sustainable development.

2. Water systems from know-how to heritage for sustainable development

The enlargement of the heritage concept in the last years and the recognition of its importance to the well-being, self-esteem and development of communities demands a new attitude towards conservation policies (CE, 2005; Labadi, 2022). On the other hand, the recognition of the value of landscape as heritage requires that these policies become broader (UNESCO, 2003). The landscape is the result of human appropriation and construction, but it depends largely on each territory's physical features. According to these features, communities have developed knowledge to adapt the site to their needs and one of their main needs was water, therefore the appropriation and transformation of the territory includes the collection, conduction, and storage of water.

If in urban areas this need gave rise to large infrastructure works, such as aqueducts, in rural areas this infrastructure had a much smaller expression. Therefore, and also because of their size, these large aqueducts that supplied the main cities are easily recognized as heritage and are classified as national monuments since the early twentieth century (Lopez-Bravo, López and Adell, 2022). However, in rural areas, it is more difficult to recognize the existence of water infrastructure with heritage value. Nevertheless, we know that the rural environment needed water for irrigation and food, so we still recognize today some equipment related to water collection, such as the “picotas”[1] and

[1] The “picota” is a simple device used to pull water from wells. It consists of two long, hinged pieces of wood, one of which is upright and firmly attached to the ground. The other, perpendicular to the first, weights at one end and a water container at the other. The container is lowered into the well and the weight at the other end helps to lift the container.

the “noras”[2]. But beyond these, there were other smaller works such as tanks and cisterns that fed agricultural fields and dwellings. With the creation of modern water supply and distribution networks, and with the modern electric motors, many of the existing equipments lost their use and many disappeared completely. However, these techniques and devices, similar to the vernacular architecture that built rural settlements, are the result of know-how and practices that are part of the local knowledge and culture, so it is relevant to consider their conservation and protection. Moreover, some of these facilities may be an important contribution to coping with the lack of water caused by climate change and atypical droughts. Thus, once again, heritage conservation and enhancement may contribute to the sustainable development of rural communities.

3. Vernacular architecture and circularity

Architecture and vernacular settlements have been highlighted not only by the recognition of their cultural value but also by their relationship with the natural environment and their balance with the consumption of natural resources. This building practices used local natural materials and renewable energy to environmentally protect the building occupants from climatic changes and to reduce their reliance on other energy resources. Thus, vernacular architecture and urbanism are recognized as sustainable models worth preserving and rehabilitating (Dabaieh, Maguid and El-Mahdy, 2022; Foster, 2020; Fajer Al Tawayha , Luis Braganca and Ricardo Mateus, 2019). Unlike industrialized construction, vernacular building systems use local materials of great durability and versatility, which allows their reuse and rehabilitation, adapting them to today's needs and allowing the conservation of this heritage built over the years. Despite the particularities of each region, the vernacular construction all share the same principles of harmony with the environment, the use of very few materials, natural materials of great durability and adaptability, and a low carbon footprint (Simões, Rui, Inês Cabral, Fernando Cerqueira Barros, Gilberto Carlos, Mariana Correia, Bruno Marques, Manuel Correia Guedes, 2019). In this sense vernacular architecture can be linked to circular and sustainable concepts and because of this is gaining new academic recognition (Sala, Marco, Antonella Trombadore, Laura Fantacci, 2019).

However, today most of the traditional building practices have been forgotten, those who possessed the necessary skills for vernacular construction have disappeared or are disappearing. Thus, it is necessary to study the construction techniques to rehabilitate them, but also to know how to adapt them to allow transformations and adaptations that

[2] “Nora” is a device for collecting water from wells, rivers, or cisterns. It consists of one or more wheels with small containers or buckets that collect and transport the water.

serve the current needs of environmental and thermal comfort, among others.

4. Massif of Sicó

The Massif of Sicó corresponds to a territory in the centre of Portugal, between Lisbon and Coimbra, that despite being located in the coastal strip of the country is a rural-based territory and like all rural territories faces the abandonment of the population. Besides the difficulties of the rural areas, this territory is very marked by harsh geography which justifies why it has always been a territory of low density. Covering six municipalities (Alvaiázere, Ansião Pombal, Condeixa a Nova, Penela and Soure), the territory corresponds to a karstic massif, of poor calcareous soils and with a great scarcity of water at surface. This territory was developed based on dryland agriculture and the pastoralism of small flocks of goats and sheep (Cunha, 2003). The landscape was very marked by stones on the surface, which required hard work to prepare the land for cultivation and resulted in dry stone walls and shepherd's shelters built in dry stone. This stone was also used for the construction of the buildings of the few settlements that were gradually growing, taking advantage, whenever possible, of implantation near a "dolina"[3], where local community could find water, and the half slope or in dry valleys. The small settlements depended on the low agricultural production.

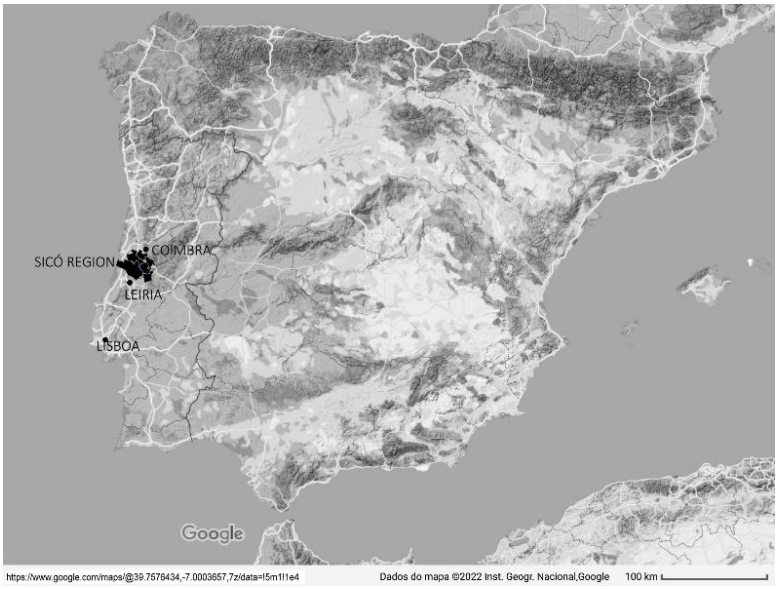


Figure 1. Sicó Region location.

[3] "Dolina" is a circular depression which occurs in karst relief and is formed from the depression of soil and rocks in the ceiling of a cave by means of underground drainage. In the case of Sicó they are usually flooded and form lagoons.

Source: Basemap provided by Google Maps online.

Figure 2. Field of stones (Lapiás)
Source: Margarida Relvão Calmeiro.

Figure 3. “Dolina” near Poios Village
Source: Adelino Gonlaves.

Figure 4. Dry-stone walls
Source: Margarida Relvão Calmeiro.

Despite this apparent hostility to human occupation, the karst spaces contain natural, environmental and heritage resources of high value (Cunha, 2003, p. 3). This justifies that part of this area is classified as a site of the Natural 2000 network (the site Sicó-Alvaiázere) for its biodiversity. Besides the biodiversity, there are also caves and scarps very attractive for climbing.

Despite the difficulty of the territory, this is a strategic area in the connection between the North and South of the country and has been occupied since the Roman period. Today concentrates a rich set of remains of these occupations with emphasis on Roman ruins, and castles of the period of the Christian reconquest (Carvalho, 2020, Seixas, 2015).

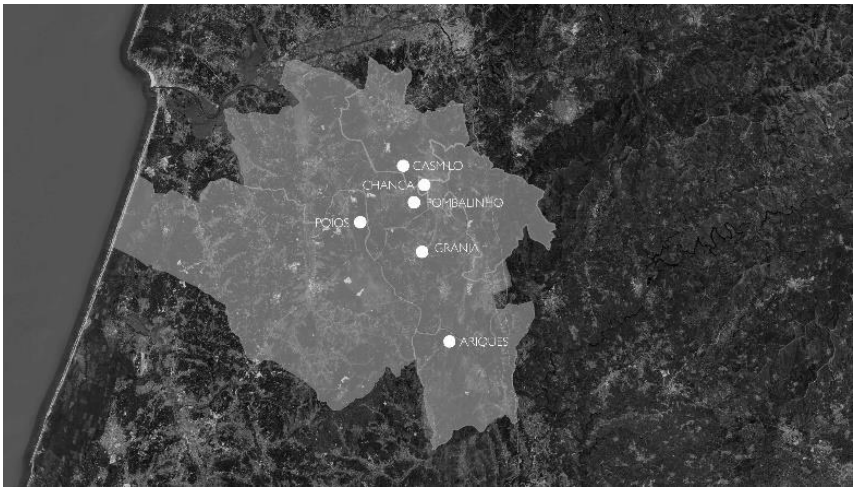


Figure 5. Network of Limestone Villages, 1st phase
Source: basemap provided by google.earth.

To promote the development of this territory and to counter depopulation was created in 1988 the Association of Municipalities of Serra de Sicó - ADSico. This association has supported several local development projects proposed by the communities and has developed a set of others, where we highlight three projects related to the enhancement of their natural and cultural heritage. The delimitation of a Protected Landscape Area, to preserve biodiversity and regulate the use of endogenous resources and the preservation of the rich natural heritage. The creation of a Rede de Aldeias do Calcário (RAC) (Network of Limestone Villages). The goal is to promote the rehabilitation of the villages, some of which are practically abandoned, and to promote local tourism. It also intends to create the RAC brand, for promoting local products, practices, and knowledge. Within these practices and knowledge is the construction of settlements and buildings built with local products, limestone and wood, but also the construction of dry-stone walls which divide the properties and a set of agricultural support buildings such as the threshing houses that mark the fields. The recognition of this knowledge gave rise to another project that intends to inscribe the construction of dry-stone walls on UNESCO's world heritage list.

These projects are being developed in collaboration with the Department of Architecture at the University of Coimbra and aim to boost the development of this territory through its resources and its sustainable exploitation. All of them are characterized by the valorisation of local culture, resources and the harmony with nature, in short by their sustainable way.

4.1. Good practices and other village rehabilitation cases

The promotion of networks for the reuse of villages for tourism is a practice that has had

good results in Portugal. The most successful examples are the Rede de Aldeias do Xisto (Schist Villages Network) and the Rede de Aldeias Históricas (Historical Villages Network), both in the central region of Portugal, and with a significant impact on the rehabilitation of the almost abandoned villages and the creation of businesses associated with tourism and the enhancement of the local cultural heritage (Carvalho, 2006; Natário, Manuela, Ana Melo, Ricardo Biscaia, Paula Rocha, Carlos Santos, Augusta Ferreira, Dalila Dias, Gonçalo Gomes, Graça Azevedo, Ruben Duarte, Rui Marques 2019). The network of limestone villages intends to follow these examples, setting as its main goal the improvement of the quality of life of those who live here.

The case of the Rede de Aldeias do Xisto can be seen as the most successful example in Portugal. It was initiated in 2001 by CCDR in partnership with 14 municipalities and created a network that rehabilitated 24 villages in central Portugal with the help of the EU Cohesion Fund. The intervention rehabilitated buildings and improved infrastructures in the villages and articulated directly with the local community. All villages presented a rich cultural heritage and a characteristic landscape, but only 13 of the 24 villages had a water supply network, only 10 had a sanitation network and there were only a lodge unit and two restaurants. (Carvalho, 2006, p. 28). The main objective was to "requalify a set of mountain villages" enhancing the endogenous resources and cultural heritage, in order to improve the quality of life of the local communities and allow the creation of 'a network of sites of tourist interest' capable of fostering the development of the economic and social fabric (CCRC, 2001, p. 38) and with this attract new population.

Over 8 years, more than 500 buildings were rehabilitated, the public space was re-qualified and were created networks of basic infrastructure such as sanitation and water supply. In addition, a network of 21 river beaches was created to encourage tourism. And today, after 22 years Aldeias de Xisto have become dynamic tourist attractions and have stimulated the creation of a new economic base for private investment. In fact, if in the first phase the investment was mainly public but since 2009 the principal investments have been private. (Estratégia de Eficiência Colectiva Rede de Aldeias do Xisto,p. 19)

This example inspired the creation of the Rede de Aldeias do Calcário, however, the particularities and natural constraints of the Massif of Sicó must be strengthened. Despite some similarities in shape and size, the limestone's vernacular architecture has particularities and distinctive factors that should be studied and preserved in rehabilitation strategies.

On the other hand, the traditional practices of water storage and the architecture of limestone villages, responsible for the construction of the cultural landscape, can be drivers for new sustainable rehabilitation strategies, for example, by creating eco-villages or self-sustainable villages. In Portugal, there are some experiences of eco-villages and

rural settlements that develop sustainable practices. Some are associated with the Global Ecovillage Network (GEN) (Dawson, 2010), as is the case of the village of Cabrum in Viseu (Grybėnaitė, 2016) or Aldeia da Tamera in Beja (Vale Pires, 2012 and Vale Pires and Lima, 2013).

In other cases, there has been the introduction of some community practices and village rehabilitation valuing the ecological construction and more sustainable ways of life characteristic of rural life, such as the production of local food and efficient water management, or even community construction practices. Basically, these are villages with an ecological awareness that aims at alternative ways of living in harmony with the environment, an upgrade back to the origins, and meeting contemporary needs and current knowledge. They are also associated with community tourism and tourism of experience in which those who visit can experience more sustainable ways of life in harmony with the environment, and which basically resume many of the local cultural practices that have been forgotten by contemporary dynamics.

Another example that has inspired the strategies underway in Sicó was the inscription process of the Cultural Landscape of the Pico Island Vineyards in the UNESCO World Heritage list in 2004. This was an exemplary survey of what characterises the cultural landscape: the practices of wine production in "currais"[4], but fundamentally the way local communities transformed the territory and adapted it. This work is today an example of good practice because it was grounded on the study of the built environment and ways of life of the island in conjunction with local communities. As a result, today, after the Good inscription and after a set of incentives for the rehabilitation of the built environment and the regeneration of the wine production practices, Pico Island preserves its landscape and its vitality, has created jobs and managed to keep those who live here, with a dynamic economy, especially in terms of wine production and tourism (Jorge, 2018, p. 29 and Costa, 2018, p.58-60).

4.2. The villages of Chanca and Casmilo two examples of the network of limestone villages

The village of Chanca is part of the municipality of Penela and is located on the eastern slope of the Rabaçal Valley. This is one of the valleys of the Massif, where a small stream runs on the surface and this valley is one of the most fertile areas of the Massif, which explains its occupation already by the Romans. Marked by the ruins of the Roman Villa of

[4] Currais are stone walls erected to protect the vines from wind and sea water. There are thousands of small rectangular enclosures all over the Pico Island.

Rabaçal a large Roman country house that preserves several traces that allow us to reconstruct the property and its production.

However, the village of Chanca located on the hillside, does not benefit from the same fertility of the valley and is deeply marked by the stone landscape. Man gradually cleared the fields to cultivate them, and today dry stone walls remain. Near the village, there is a “dolina”, crucial to feed animals and the fields. Besides this water point, there are also some wells for collecting groundwater and many buildings have cisterns for collecting rainwater. In the village, there are several buildings in ruins or in bad state of conservation. But it is possible to verify that most of them are composed of a two floors main volume for housing and a set of other volumes for agricultural annexes and animals. To have access to water, these buildings have a cistern to collect rainwater.

Figure 6. Limestone Building in Chanca

Figure 7. Cisterns for rainwater storage under the stairs in Chanca

Figure 8. System of channel and pipes conducting the water from the roof

Figure 9. Cisterns for rainwater storage under the stairs in Chanca

Another village from the Rede de Aldeias do Calcário is the village of Casmilo. This village is in the Condeixa municipality and is also located in the middle of the hillside and near two dolines, one that is still visible today and another that was covered with earth and therefore only the local community can localize it. Casmilo is a bigger settlement than Chanca and apart from the olive oil production, its main activity was cattle-raising, having still today several flocks. Its proximity to Condeixa and Coimbra has allowed the village to maintain much of its dynamism, although today the population no longer depends on agricultural activities, and mostly works at the municipality's centre or even in Coimbra. However, it is still possible to observe a set of buildings of vernacular architecture that retain their original characteristics. Despite being used today mostly for agricultural or animal storage. Like Chanca, the vernacular architecture buildings are constructed of stone masonry, laid with argil mortar, interior structure in wood and ceramic tile roof. Most of the buildings have two floors, with the ground floor being occupied by agricultural

or animal storage and the upper floor for housing. The masonry of limestone, some balconies and chimneys and some decorative elements next to the windows stand out. Also, in this village cisterns for rainwater storage are common, located under the stairs or in tanks on the outside of the building. The location under the stairs facilitated the construction and extraction of water but required greater attention to the impermeabilization of the walls.

Figure 10. Tanks outside of the building, visible the channel conducting the water from the roof

Despite the potential of these buildings and their ability to accommodate new uses, the lack of dynamism and people have not been able to counteract the abandonment, leading to the disuse and ruin of several buildings and the loss of heritage. The delimitation of the RAC is still in its early stages, as well as the process for the inscription of the art of dry-stone construction on the World Heritage List, but we hope that these initiatives enable the design of a new development strategy that fosters the rehabilitation of the vernacular-built heritage and contributes to the dynamism of these villages. The vernacular architecture built with local materials of great durability and adaptability is particularly suitable for sustainable rehabilitation. The existence of cisterns and water tanks can be an important asset to foster the creation of more sustainable settlements.

5. The rehabilitation of villages an opportunity for sustainable development

The vernacular construction of the Sicó region, as in other regions, is the result of years of experimentation and learning and therefore responds perfectly to local needs, particularly and crucial to our study to water needs. Although this area was forgotten in the surveys of popular architecture in Portugal in the 1960s (Ordem dos Arquitetos, 2004) the reduced

demographic pressure preserved the buildings and most of the settlements and today the Massif of Sicó presents most of the buildings in stone masonry and ceramic roof, thus maintaining their original characteristics.

The building materials are restricted to local materials (limestone, wood and clay), with one or two floors, the first floor being reserved for animals and storage, with a rectangular plan. The walls are made of limestone masonry, with exposed stonework, in the case of residential buildings bonded with clay and lime mortar, in the case of agricultural buildings only bonded. The roofs are ceramic tiles produced locally with local clay. The doors, windows, and wooden beams and floors are made of local wood. We can highlight the recurrent use of porches and exterior stairs, with large blocks of limestone and sometimes chimneys (Mendes Silva, Catarino, Almeida and Mouraz, 2021). The interior distribution is quite modest, with the kitchen assuming a central role in the functioning of the dwelling. The scarcity of water gave rise to the recurrent use of cisterns and water tanks to store rainwater, usually located under the stairs or in an underground volume built next to the main building. The water is canalized by exterior pipes or even grooves in the masonry walls to channel the water from the roofs to these water tanks essential for the functioning of the dwelling. This heritage gains importance not only for enclosing local knowledge and practices and for its value as heritage, but also because of its contribution to a more sustainable development of these settlements. The reuse of these buildings reuses materials but also reuses water capture and storage strategies that can contribute to overcoming water scarcity in times of drought, in addition to contributing to the family economy, since this resource is no longer paid for, as well as to sustainability.

The ongoing strategy for Sicó, is still in its early stages, however the articulation between the three projects: Delimitation of the Protected Landscape Area, Rede de Aldeias do Calcário and the inscription of the Art of Building in Dry Stone to the list of intangible heritage of Humanity have a great potential for the sustainable development of the region. On one hand, they are based on a detailed study of the cultural landscape, the practices and models that allowed the communities to settle here, and on the other hand, they aim to rehabilitate the villages using local materials and restoring some of the traditional practices from the construction to water management and food production. On the other hand, it is being conducted with the involvement and sensitization of local communities, which strengthens local self-esteem, but also allows the creation of jobs.

We believe that if this is achieved, it will be possible to implement a successful strategy to enhance and develop this territory based on its heritage and existing natural resources, contributing to the strengthening of the communities' self-esteem. It will also contribute to circularity and the reduction of resource consumption by introducing more responsible practices, with less impact on the environment and which can make a fundamental contribution to improving the quality of life and to the sustainability of the territory.

References

Alexiadis, Stilianos. (2017) Territorial cohesion and prospects for sustainable development: A cointegration analysis. Habitat International, 68, pp. 75–83. https://doi.org/10.1016/j.habitatint.2017.03.001 Accessed [19/05/2023].

Carvalho, Armando (2006) Programa das Aldeias do Xisto: caminhos para o Turismo de Natureza. Revista Turismo & Desenvolvimento, 6, pp. 27-30.

CCRC (2001) Programa Operacional da Região Centro: 2000-2006. Coimbra.

Commission of the European Communities (2008) Green Paper on Territorial Cohesion: Turning territorial diversity into strength. [Online] Available from:https://bit.ly/3cXOJfu Accessed [13/05/2023].

Costa, Manuel (2018) Paisagem da Cultura da Vinha da Ilha do Pico. In: Laje, Maria Otília, Manuel Paulino da Costa (coord.) *Paisagem da cultura da vinha da Ilha do Pico (quinze anos Património Mundial da Unesco).* Porto: CITCEM - Centro de Investigação Transdisciplinar Cultura, Espaço e Memória, pp. 47-61. [Online] Available from: https://ler.letras.up.pt/uploads/ficheiros/16375.pdf Accessed [19/05/2023].

Council of Europe (CE). (2005) Framework Convention on the Value of Cultural Heritage for Society, Faro, 27 October.

Cunha, Lúcio (2003) Maçico de Sicó. Valorização dos recurso naturais e criação de emprego a nível local. Territórios do Global ao local e trajectórias de desenvolvimento, 185-198. Coimbra: Centro de Estudos Geográficos de Coimbra.

Dabaieh, Marwa, Dalya Maguid, Deena El-Mahdy (2022) Circularity in the New Gravity—Re-Thinking Vernacular Architecture and Circularity. *Sustainability* 2022, 14, 328. https://doi.org/10.3390/su14010328 Accessed [19/05/2023].

Dawson, Jonathan (2010) Ecoaldeias: Novas fronteiras para a sustentabilidade, Edições Sempre-Em-Pé.

European Environment Agency (2022) Natura 2000 data - the European network of protected sites. [Online] Available from: https://www.eea.europa.eu/data-and-maps/data/natura-14 [Accessed: 09/05/2023].

Foster, Gillian (2020) Circular economy strategies for adaptive reuse of cultural heritage buildings to reduce environmental impacts. *Resources, Conservation & Recycling* 152. [Online] Available from: https://doi.org/10.1016/j.resconrec.2019.104507 Accessed [19/05/2023].

Grybėnaitė, Saulé (2016) Uma outra forma. Modos de habitar alternativos na Ecoaldeia de Cabrum, Viseu. Msc Thesis, Porto: FAUP [Online] Available from: https://sigarra.up.pt/faup/pt/pub_geral.pub_view?pi_pub_base_id=158038 Accessed [19/05/2023].

Hein, Carola (ed.) (2020) Adaptive Strategies for Water Heritage. Past, Present and Future Springer Nature, Switzerland. [Online] Available from: https://doi.org/10.1007/978-3-030-00268-8_1 Accessed [19/05/2023].

International Council on Monuments and Sites - ICOMOS. (2017) ICOMOS-IFLA principles concerning rural landscapes as heritage. In 19th ICOMOS General Assembly (Issue GA 2017 6-3-1 –Doctrinal Texts). [Online] Available from: https://bit.ly/3cWppXj [Accessed: 19/05/2023].

IPMA (n.d.) https://www.ipma.pt/pt/oclima/observatorio.secas/ Accessed [19/05/2023].

Jorge, Hernâni (2018) Paisagem da Cultura da Vinha da Ilha do Pico — Prémio Nacional da Paisagem. In: Laje, Maria Otília, Manuel Paulino da Costa (coord), *Paisagem da cultura da vinha da Ilha do Pico (quinze anos Património Mundial da Unesco).* Porto: CITCEM - Centro de Investigação Transdisciplinar Cultura, Espaço e Memória, (27-33) [Online] Available from: https://ler.letras.up.pt/uploads/ficheiros/18550.pdf Accessed [19/05/2023].

Labadi, Sophia (2022) Rethinking Heritage for Sustainable Development. UCL Press. [Online] Available from: https://discovery.ucl.ac.uk/id/eprint/10148310/1/Rethinking-Heritage-For-Sustainable-Development.pdf Accessed [19/05/2023].

López-Bravo, Celia, José Peral López, Eduardo Mosquera Adell (2022) The management of water heritage in Portuguese cities: Recent regeneration projects in Évora, Lisbon, Braga and Guimarães, Frontiers of Architectural Research, 11(1), pp. 73-88 https://doi.org/10.1016/j.foar.2021.09.002 Accessed [19/05/2023].

Mendes Silva, José, Lídia Gil Catarino, Vanessa Almeida, Catarina Mouraz (2021) Construção em calcário em Terras de Sicó: uma abordagem pedagógica. CONREA'21 O congresso da Reabilitação Livro de Atas, pp. 499-507.

Mouraz, Catarina, José Mendes Silva, Tiago Ferreira (2022) Portuguese Vernacular Construction and Its Sustainable Rehabilitation Challenges: The Schist Villages, Lousã. REHAEND 2022 Congress, Construction Pathology, Rehabilitation Technology and Heritage Management September, pp.13-16.

Natário, Manuela, Ana Melo, Ricardo Biscaia, Paula Rocha, Carlos Santos, Augusta Ferreira, Dalila Dias, Gonçalo Gomes, Graça Azevedo, Ruben Duarte, Rui Marques (2019) O impacto do turismo das Aldeias Históricas de Portugal: um quadro de análise. Finisterra, 54(111), p.21–36. [Online] Available from: https://doi.org/10.18055/Finis14861. Accessed [09/12/2022]

Nguyen, Anh Tuan, Nguyen Song Ha Truong, David Rockwood, Anh Dung Tran Le, (2019) Studies on sustainable features of vernacular architecture in different regions across the world: A comprehensive synthesis and evaluation. Frontiers of Architectural Research, 8(4), pp.535–548. https://doi.org/10.1016/j.foar.2019.07.006 Accessed [19/05/2023].

Ordem dos Arquitetos (2004) Arquitetura Popular em Portugal, 4th Editions. Lisboa:

Centro Editor Livreiro da Ordem dos Arquitetos.
Público (8 May 2023) Declarado estado de seca severa e extrema em 40% do território português. https://www.publico.pt/2023/05/08/azul/noticia/declarado-estado-seca-severa-extrema-40-territorio-portugues-2048869 [Accessed: 09/05/2023]
Sala, Marco, Antonella Trombadore, Laura Fantacci (2019) Chapter 12: The Intangible Resources of Vernacular Architecture for the Development of a Green and Circular Economy. In Sayigh, Ali (ed), Sustainable Vernacular Architecture-How the Past Can Enrich the Future, Springer: Berlin/Heidelberg, p. 229–256.
Seixas, Joana (2015) Remanescências culturais da Idade Média no concelho de penela- Proposta de um percurso turístico interpretado para crianças e respetivo guia de atividades, Msc dissertation, Escola Superior Agraria de Coimbra
Silva, Carlos (2011) Sicó A Dimensão cultural das paisagens- Um estudo de Turismo nas suas vertentes cultural e Natureza. Pdh thesis, Faculdade de Letras da Universidade de Coimbra.
Simões, Rui, Inês Cabral, Fernando Cerqueira Barros, Gilberto Carlos, Mariana Correia, Bruno Marques, Manuel Correia Guedes (2019) Chapter 4: Vernacular Architecture in Portugal: Regional Variations.In Sayigh, Ali (ed.) Sustainable Vernacular Architecture-How the Past Can Enrich the Future, Springer: Berlin/Heidelberg, p. 55–91.
Tawayha, Fajer Al, Luis Bragança, Ricardo Mateus (2019) Contribution of the Vernacular Architecture to the Sustainability: A Comparative Study between the Contemporary Areas and the Old Quarter of a Mediterranean City. Sustainability,11 (3), 896. Available at:10.3390/su11030896 [Accessed: 09/05/2023]
UNESCO (2003) Convention for the Intangible Cultural Heritage of Humanity. Paris: UNESCO. Available at: https://ich.unesco.org/en/convention. [Accessed: 09/05/2023]
United Nations (2015) Transforming our world: the 2030 Agenda for Sustainable Development. In A/RES/70/1. https://doi.org/10.1163/157180910X12665776638740 Accessed [09/05/2023].
Vale Pires, Cristiana (2012) *Ecoaldeias: Construindo Alternativas – Estudo exploratório do movimento social das Ecoaldeias através do Global Ecovillage Network, Tamera e Los Angeles Ecovillage, Dissertação* de Mestrado em Antropologia: Globalização, Migrações e Multiculturalismo, Instituto Superior das Ciências e do Trabalho, Universidade de Lisboa.
Vale Pires, Cristiana e Antónia Lima, Ecoaldeias: práticas de cuidado a nível global e local, *Configurações* [Online] Available from: http://journals.openedition.org/configuracoes/1935; https://doi.org/10.4000/configuracoes.1935 [Accessed: 09/05/2023]

INTEGRATION OF LOCAL AGRI-FOOD SYSTEMS IN SPATIAL PLANNING: FOODSHED ASSESSMENT THROUGH ECOSYSTEM SERVICES (1131)

Serim Dinç[1*], Zeynep Türkay[1], Azime Tezer[1]

[1] Istanbul Technical University, Urban and Regional Planning, [*]srmdinc@gmail.com,

Abstract. Agri-food systems (AgrFS) has come to the agenda of spatial planning with the concerns of sustainability and resilience. One of the tools used to change cities/regions into self-sufficient settlements by developing local food systems is "The Foodshed Assessment (FsA)". However, based on the neglect of ecological values in determining the foodshed boundaries, the "Ecosystem Services" (ESs) approach is proposed to fill this gap. Accordingly, it's aimed to develop an assessment tool that will guide the handling of local AgrFS within spatial planning by integrating foodsheds with ESs approach. This study consists of four steps: (1)Conceptual approach based on secondary source literature research related to the "local AgrFS" and "foodshed". (2)Definition of the FsA based on predicted ESs indicators for decision-making on local AgrFS. (3)Evaluation of existing national/regional/local-scale spatial planning tools affecting Istanbul, with a focus on foodsheds and ESs. (4)Cross-scale discussion of the integration of the FsA into the Istanbul planning system. This research will contribute to local AgrFS as a priority area in spatial decision making. The opportunities include creating win-win relationships between ESs achieving food resilience, food security, and regional/social/environmental resilience at different scales.

Keyword: Agri-food system (AgrFS), Foodshed, Ecosystem services (ESs), Spatial planning tools, Istanbul.

1. Introduction

Considering the relationship of cities with agriculture and rural areas, food was understood as a non-urban, marginal issue and was not seen as an urban policy and research topic (Doernberg et al, 2019; Pothukuchi & Kaufman, 2000; Sonnino, 2009). Thus, the city food systems and their hinterland were increasingly connected over greater distances (Schreiber et al., 2021). However, today that is changing. As a result of removing food growing from an urban land use system, it has been understood that the vulnerability of agri-food systems (AgrFs) has increased, and sustainability efforts have weakened. The pressure of urbanization on natural and agricultural areas, the climate crisis that we unequivocally acknowledge, and the failure of the current food system,

which the COVID-19 process has clearly shown, reduce the resilience of regions/cities/societies. Along with these concerns, the unrestrained growth of urban population puts spatial planning in a critical position before in the development of resilient and sustainable food systems more than ever (Cabannes & Cecilia, 2018).

While the Milan Urban Food Policy Pact, the UN New Urban Agenda, and the Sustainable Development Goals support inclusive, resilient, safe and sustainable food systems. They also explicitly demand that food systems to be a part of spatial planning (MUFPP, 2015; UN, 2015; UN Habitat, 2016). In response to these calls, national, regional, and local governments and academia are in search of new planning approaches and tools that cities/regions can develop local AgrFs and become selfsufficient settlements. "The Foodshed Assessment (FsA)" is also emerging as a planning policy tool that is increasingly used to discuss the geography of urban food supply and to describe the links between food growing-consuming regions at different scales (Brinkley, 2013; Zasada et al., 2019; Vicente-Vicente et al., 2021a; Peters et al., 2022).

A foodshed, with its most general definition, has been accepted in the literature as the agricultural area required to feed the population in a city/region (Brinkley, 2013; Peters et al., 2009). FsA is valuable as it provides input into spatial planning to increase the sustainability and resilience of food systems. However, foodshed boundaries are defined by political boundaries such as a region, metropolitan area, or municipality (Vicente-Vicente et al., 2021b; Wascher et al., 2015), or a radius around the place where the food is consumed (Kriewald et al., 2019; Schreiber et al., 2021; Zasada et al., 2019). The most important issue that is overlooked in determining these boundaries is the ecological character and connectivity. Even the studies (Sylla et al., 2022; Vicente-Vicente et al., 2021b) that point out this gap and emphasise the importance of considering the landscape character couldn't go beyond drawing a circle based on distance. This research defends that it's necessary to define the qualities that can reveal the ecological functionality of the specific city/region for an integrated spatial planning and policy. In this research, the applicability of "Ecosystem Services (ESs)" approach to fulfil this gap will be examined.

ESs are defined as all the direct or indirect benefits that humans derive from ecosystems (MEA, 2003). AgrFS have a multifaceted relationship with ESs because they are simultaneous providers and consumers of them (La Notte, 2022). For instance, ESs such as crops, water purification, carbon sequestration are provided by AgrFS too, where ESs such as pollination, nutrient regulation, pest/disease control underpin the productivity and ensure the sustainability of AgrFS (Power, 2010). The way of agri-food practices determines the lifetime and the quality of ESs. While the quantity of the use of chemical inputs can cause the destruction of ESs, while the existence of an agro-ecological system can provide a range of ESs too. Research on the use of ESs knowledge in spatial decision

making has become a very popular topic (Gret-Regamey et al., 2017; Tezer et al., 2020; Goldstein et al., 2012; Menteşe et al., 2019). However, there is few research focusing on ESs and AgrFS (Rusinamhodzi,2019; Varyvoda and Taren, 2022). Since AgrFS cannot be considered independently from ESs, the proposed methodology has the potential to contribute to the existing literature.

Accordingly, it's aimed to reconsider the FsA that guides the development of local AgrFS with the approach of ecosystem services and to discuss its integration on spatial planning tools on different scales. The policy-level trials on which scale and with which spatial planning tools can be evaluated within the current planning system was made for the Istanbul Metropolitan Area. Considering that Istanbul's food system has a very fragile structure due to its dependence on the outside of the metropolitan area, and serious concerns are raised about the sustainability of resources despite the existence of unique ecosystem values, this study will be a guide for Istanbul's AgrFS.

This study consists of four steps:

(1) Conceptual approach based on secondary source literature research related to "local AgrFS" and "foodshed".

(2) Definition of the "FsA" based on predicted ESs indicators for spatial decision-making on local AgrFS.

(3) Evaluation of existing national/regional/local-scale planning tools affecting Istanbul, with a focus on AgrFS.

(4) Cross-scale discussion of the integration of the FsA into the spatial planning tools, focusing on Istanbul.

This research will contribute to local AgrFS as a priority area in spatial decision making with examining Istanbul Metropolitan Case. The opportunities include creating win-win relationships between ESs achieving food resilience, food security, and regional, social, and environmental resilience at different scales.

2. Background: Agri-food Systems and Foodsheds in Spatial Planning

The sprawl of cities has caused the loss of land that fed the urban population (Steel, 2008) and the urban-rural relationship to weaken or even disappear (Sonnino, 2009; Zazo-Moratalla et al., 2018). In addition, since the second half of the 20th century, repositioning food growing (Delgado, 2010), the global/industrial food system has separated production from consumption, both in time and space (Oosterveer et al., 2012). However, under the impacts of the crises such as COVID-19, climate change (Béné, 2020; IPES-Food, 2020; Vittuari et al., 2021) and the growing socio-economic inequalities

(Sonnino, 2016; Stierand, 2012) and the challenges of sustainable development and food security, the resilience of local AgrFS is gaining increasing attention (Sylla et al, 2022). Self-sufficient local or regional food systems based on food security and resilience are supported against the ecological and social disruption of the global food system.

When Pothukuchi and Kaufman (2000) placed local AgrFS on the agenda of spatial planning, they clearly stated that AgrFS has a spatial counterpart in the built environment (Cabannes & Cecilia, 2018; Raja et al., 2017) and the inseparable relationship between food and issues such as transportation, land use, environment, economy, health, energy, water which are the interests of planners. Therefore, it is inevitable that food should be integrated within the framework of the planning discipline that claims to create healthy communities and liveable environments. The “Policy Guide on Community and Regional Food Planning” prepared by the American Planning Association also urged planners to take an active role in establishing relation to the food system (Raja et al., 2008).

Although it has been accepted by academia and policymakers that food systems, by their very nature, interact with and shape places (Marsden and Sonnino, 2012; Sonnino et al., 2014), recent empirical studies (Doernberg et al. al., 2019; Van Haren et al., 2023) show that spatial planning has still little to do with food at the practical level. Similarly, Sonnino (2023) states that the idea of food systems is treated as a macro-level metaphor rather than a defined analytical concept of how to translate it into practice. This also explains the reason for the limited debate (Battersby, 2017; Buchan et al., 2015; Doernberg et al., 2019) on the relationship between spatial planning tools and food.

As a methodological tool, the FsA stands out among the few available tools for the spatiality of food. Assessing the self-sufficiency levels of cities/regions (Saavedra et al., 2017) is seen as an effective assessment tool (Peters et al., 2008; Zazo-Moratalla et al., 2018) to advance efforts to discuss the geography of AgrFS (Schreiber et al, 2021) and define the links between production and consumption at different scales (Sali et al., 2014).

The earliest definition of a foodshed was made by Hedden (1929) as the geographical region that represents the flow of food from the area where it is produced to the area where it is consumed. However, Getz (1991), introduced the concept to literature, advocating the protection of the food source, namely the agricultural area. According to Kloppenburg et al. (1996), the proximity of the consumer to the food source should define the foodshed, based on the coexistence of society (culturally food) and nature (-shed). This approach adds a new interpretation to Getz's definition, linking the concept of foodshed with the idea of a local and alternative food system. Since then, there has been a growing literature with empirical studies at different scales on FsA, in which the spatial context, capacity and functions of a AgrFS are assessed by spatial analysis, considering specific regional conditions (Zasada et al., 2019).

These studies highlight the benefits of FsA with the potential to reshape cities/regions by associating them with local AgrFS and carrying the subject beyond the romantic narrative of the local movement (Doernberg et al., 2016; Schreiber et al, 2021):

- It becomes possible to reveal the impact of food systems on the environment and the degree of vulnerability of societies to disruptions in food supplies (Peters et al., 2008).
- Existing interdependencies regarding resources and food security can be defined spatially (Schreiber et al, 2021).
- Through a better understanding of land resources, food demand and supply, it may contribute spatial planning decisions such as future infrastructure, ecological protection, recreation (Buchan et al., 2015; Wascher et al., 2014).
- It may contribute to improve climate resilience of food systems (Lengnick et al., 2015).
- At the highest level, it may contribute to sustainable and resilient futures of settlements and societies by ensuring food security and resilience (Sonnino, 2014).

FsA is still a new research area and has not yet found a place in the spatial planning system. Although there is no attempt by the administrations at the implementation level, academic studies are becoming more and more widespread. However, in these studies, there is still no consensus among the methods and terminology. Therefore, the objectives, methodology, and results of a range of quantitative data-based studies of food production and consumption at different spatial scales vary widely.

Consumption and demand-based models focus on the spatial dimension and production potential of agricultural land needed to provide food for cities & regions (Cardoso et al., 2017; Kurtz et al., 2020; Van Haren et al., 2023; Zasada et al., 2019).

In these studies, theoretical issues related to food-land footprint and self-sufficiency are evaluated with the criteria of local/regional population, current diets, land cover, available agricultural areas, and regional yield data (crop and soil) (Schreiber et al, 2021). Production-based models focus on current productive capacity of studied area and estimate population to be fed from these lands (Swiader et al., 2017; Zazo-Moratalla et al., 2019). Models combining food production and consumption assess the dependencies in food systems based on export and import data and explore how local AgrFS are affected and their level of vulnerability and potential (Kriewald et al., 2019; Sylla et al., 2022; Vicente-Vicente et al., 2021b).

In studies where research questions, data and methodologies differ, it is expected that the foodshed boundaries will also differ by considering the landscape character, geomorphological characteristics, cultural codes etc. of the region. However, these boundaries are represented either by administrative boundaries as they concern

responsibilities in planning, or by buffers drawn according to certain geographical distances centred on the place where food is consumed. However, as Kloppenburg et al. (1996) stated, foodshed boundaries shouldn't be fixed and should be shaped according to the original values of the place. Taking the *"nature as a measure"* in the definition of the foodshed has been shown among the principles by the same authors.

By this means, the efficiency of spatial decisions that will ensure the sustainable development of AgrFS will increase. Food security and resilience levels will be strengthened for the future of societies.

The contribution of the ESs-based foodshed to the criteria highlighted here and to spatial planning is discussed in the next chapter.

3. Ecosystem Services-Based Foodshed Assessment in the Spatial Planning Tools/System

Although the emergence of the ESs approach can be traced back to the 1970s, it was only after the publication of the Millennium Ecosystem Assessment (2004) that work on this topic gained momentum (de Groot et al., 2010). There are many key studies in the literature about the integration of ESs in terms of spatial decision-making (Daily et al., 2011; de Groot et al., 2010; Egoh et al., 2008; Fisher et al., 2009; Goldstein et al., 2012; Gret-Regamey et al., 2017; Haase et al., 2012). In Turkey, there are many scientific studies related to the ESs integration in spatial planning in different contexts:

ESs-based watershed management (Albayrak, 2012; Tezer et al., 2012; Tezer et al., 2015; Tezer et al, 2020); ESs for climate change adaptation (Onur and Tezer, 2015), integration of soil ESs for climate change mitigation in spatial planning (Delibas et al., 2021). In terms of food security, it is seen that the study of ESs has grown very recently and there is a research gap related to explicitly outlining how the ESs framework can be utilized to achieve food security and environmental sustainability (Cruz-Garcia et al., 2016; Poppy et al., 2014b).

Food security *"exist when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life"* is the definition of FAO (FAO, 1996). Four complementary pillars classified as:

i) availability,

ii) stability of supplies,

iii) access and

iv) biological utilization of food must need to be simultaneously assured in order to achieve food security (Poppy et al., 2014a). Availability of food is related to having enough supply of food. Food stability means that the pillars are fulfilled over time, e.g., seasonally and from year to year. Access to food refers to having sufficient access or economic capacity to get food. Biological utilization is related to having nutritional status and diversity and means that a person has the energy and nutrients that are necessary for being healthy (Cruz-Garzia et al., 2016; Poppy et al., 2014a).

Agricultural ecosystems simultaneously provide and rely on a variety of ESs (Zhang et al., 2007). They are managed by humans primarily for provisioning services such as food, fuel, fiber and timber (Poppy et al., 2014b). Aside from provisioning services, agricultural ecosystems are also related to regulating services such as climate regulation, soil erosion prevention and cultural ESs such as agro&eco-tourism, scientific research and indigenous local knowledge (Cruz-Garcia et al., 2016; Poppy et al., 2014b, IPBES, 2019). Also, the agricultural process depends on different ESs including both regulating and supporting services such as water, soil fertility and pollination (Zhang et al., 2017). In the complex relationship of ESs and agricultural systems, it can be seen that the term "ecosystem disservices" is used to describe the negative impacts of agricultural activities on ESs (Swinton et al., 2007; Zhang et al., 2017). Agricultural activities are considered as one of the major drivers of global environmental change in land use/land cover and the quality and quantity of freshwater ecosystems (Thiaw et al., 2011). These unintended effects of agriculture on ESs such as habitat loss, diversion of rivers, groundwater depletion, erosion, pest invasion and eutrophication are defined as ecosystem disservices with significant negative impacts (Swinton et al., 2007). ESs to/from agricultural ecosystems together with disservices is shown in Figure 1.

The ESs matrix approach, which defines landscapes' capacities to provide ESs-based on land use/land cover data with expert estimations (Jacobs et al., 2015), can also be a guideline to explain the relationships between agricultural ecosystems and ESs. In matrix approach, land cover classes/ecosystem types are associated with ESs through participatory expert-based scoring (Campagne and Roche, 2018); it is a widely used ES assessment method amongst others as it provides simple and easily mapable data (Jacobs et al., 2015) and a very flexible and adaptable model to different data sources (Campagne and Roche, 2018). The matrices developed by Burkhard et al. (2014) show different aspects of the relationships between agricultural ecosystems and ESs (Burkhard et al, 2014). The matrix correlating agricultural land cover classes with ESs potential is shown in Figure 2 (Burkhard et al., 2014). ES potential refers to an ecosystem's potential or capacity to produce services (Wang et al., 2022).

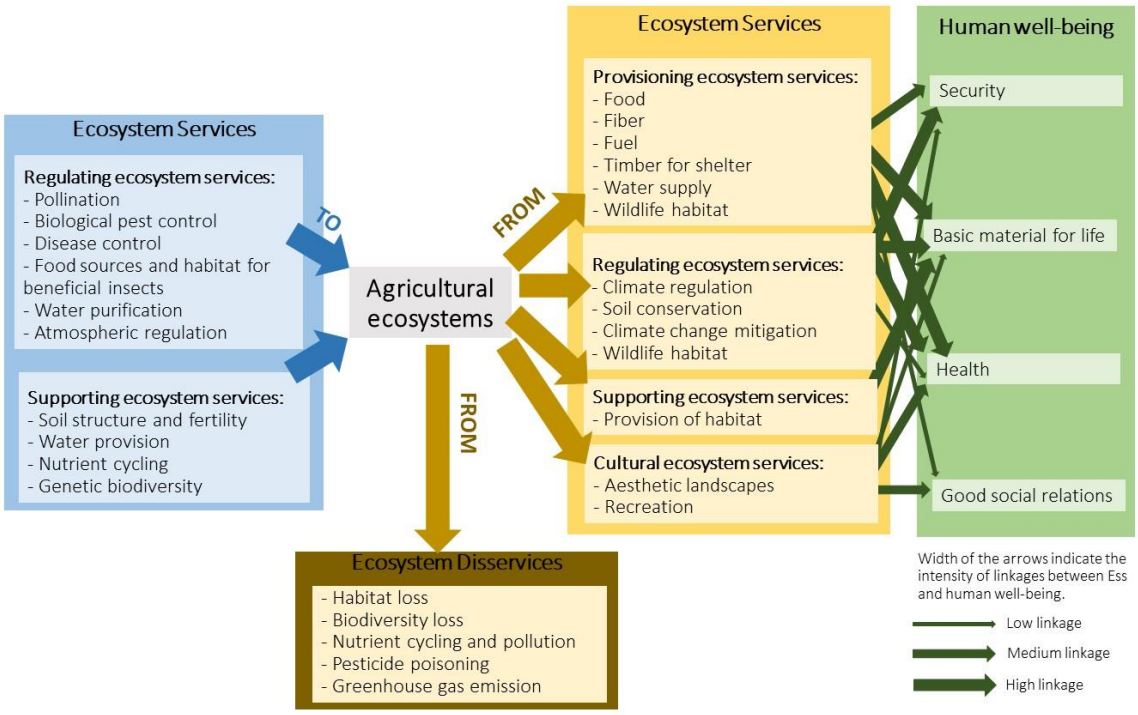
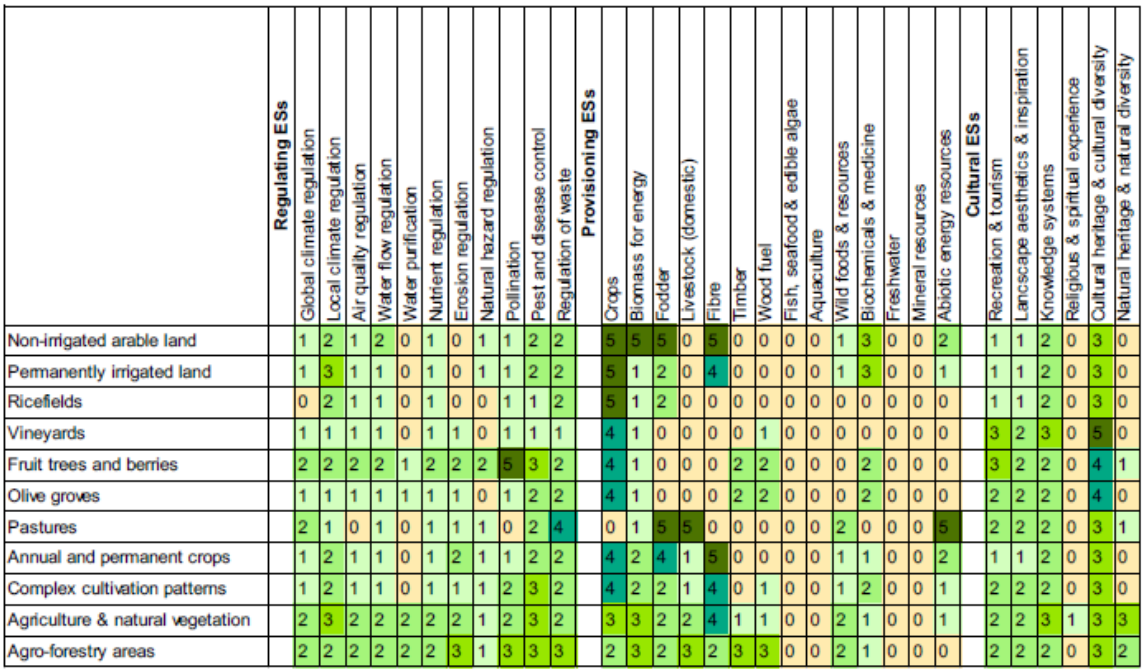


Figure 1. ESs to and from, ecosystem disservices from agriculture and linkages between human wellbeing from ESs provided by agriculture

Source: Adapted from Albayrak, 2012; Cruz-Garcia et al., 2016; Power, 2010; Thiaw et al., 2011; Zhang et al., 2007.



	Regulating ESs	Global climate regulation	Local climate regulation	Air quality regulation	Water flow regulation	Water purification	Nutrient regulation	Erosion regulation	Natural hazard regulation	Pollination	Pest and disease control	Regulation of waste	Provisioning ESs	Crops	Biomass for energy	Fodder	Livestock (domestic)	Fibre	Timber	Wood fuel	Fish, seafood & edible algae	Aquaculture	Wild foods & resources	Biochemicals & medicine	Freshwater	Mineral resources	Abiotic energy resources	Cultural ESs	Recreation & tourism	Lanscape aesthetics & inspiration	Knowledge systems	Religious & spiritual experience	Cultural heritage & cultural diversity	Natural heritage & natural diversity
Non-irrigated arable land		1	2	1	2	0	1	0	1	1	2	2		5	5	5	0	5	0	0	0	0	1	3	0	0	2		1	1	2	0	3	0
Permanently irrigated land		1	3	1	1	0	1	0	1	1	2	2		5	1	2	0	4	0	0	0	0	1	3	0	0	1		1	1	2	0	3	0
Ricefields		0	2	1	1	0	1	0	0	1	1	2		5	1	2	0	0	0	0	0	0	0	0	0	0	0		1	1	2	0	3	0
Vineyards		1	1	1	1	0	1	1	0	1	1	1		4	1	0	0	0	0	1	0	0	0	0	0	0	0		3	2	3	0	5	0
Fruit trees and berries		2	2	2	2	1	2	2	2	5	3	2		4	1	0	0	0	2	2	0	0	0	2	0	0	0		3	2	2	0	4	1
Olive groves		1	1	1	1	1	1	1	0	1	2	2		4	1	0	0	0	2	2	0	0	0	2	0	0	0		2	2	2	0	4	0
Pastures		2	1	0	1	0	1	1	1	0	2	4		0	1	5	5	0	0	0	0	0	2	0	0	0	5		2	2	2	0	3	1
Annual and permanent crops		1	2	1	1	0	1	2	1	1	2	2		4	2	4	1	5	0	0	0	0	1	1	0	0	2		1	1	2	0	3	0
Complex cultivation patterns		1	2	1	1	0	1	1	1	2	3	2		4	2	2	1	4	0	1	0	0	1	2	0	0	1		2	2	2	0	3	0
Agriculture & natural vegetation		2	3	2	2	2	2	2	1	2	3	2		3	3	2	2	4	1	1	0	0	2	1	0	0	1		2	2	3	1	3	3
Agro-forestry areas		2	2	2	2	2	2	3	1	3	3	3		2	3	2	3	2	3	3	0	0	2	1	0	0	0		2	2	2	0	3	2

Figure 2. ES potential matrix. (Scale from 0/rosy = no relevant potential; 1/grey green = low relevant potential; 2/light green = relevant potential; 3/yellow green = medium relevant potential; 4/blue green =high relevant potential; 5/dark green = very high (maximum relevant potential) (Burkhard et al., 2014).

Figure 2 indicates that agriculture-related land cover classes are diverse and every each offers a variety of ESs with potentials at different scales. For example, nonirrigated arable land has the potential to offer very high levels of crops, biomass, fodder and timber as expected; but it also has the capacity to offer medium levels of biochemicals & medicine, cultural heritage & cultural diversity and relevant scale of potential for provisioning ESs such as local climate regulation, water flow regulation, pest & disease control and regulation of waste (Figure 2).

Burkhard et al. (2014) also provides matrices of ESs flow, demand, and flow & demand budget. The flow of an ES indicates the actual use of an ES or the amount of that ES delivered to people. ES demand is defined as the ESs currently consumed or used in a given area regardless of where ESs actually are provided (Wang et al., 2022). All agricultural activities demand highly for regulating ESs and they must be fulfilled by ES potentials (Burkhard et al., 2014). The ES flow and demand budget matrix provided by Burkhard et al. (2014) shows that the demand of ESs are exceeding the flow of services for most of the ESs related with agricultural ecosystems (Figure 3). For example, for the regulating ES water purification, there is a strong undersupply in relation to permanently

irrigated land and rice fields accompanied by the strong undersupply of freshwater (Figure 3).

	Regulating ESs	Global climate regulation	Local climate regulation	Air quality regulation	Water flow regulation	Water purification	Nutrient regulation	Erosion regulation	Natural hazard regulation	Pollination	Pest and disease control	Regulation of waste	**Provisioning ESs**	Crops	Biomass for energy	Fodder	Livestock (domestic)	Fibre	Timber	Wood fuel	Fish, seafood & edible algae	Aquaculture	Wild foods & resources	Biochemicals & medicine	Freshwater	Mineral resources	Abiotic energy resources	**Cultural ESs**	Recreation & tourism	Lancscape aesthetics &	Knowledge systems	Religious & spiritual	Cultural heritage & cultural	Natural heritage & natural
Non-irrigated arable land		-1	0	0	0		0	-3	-1	0	-2	-1			-1									-1					1	1	0		0	
Permanently irrigated land		-1	1	0	1	-5	0	-2	-1	0	-2	-1			-1									-1	-5				1	1	0		0	
Ricefields		-3	0	0	-1	-5	0	-2	-2	0	-3	-1			-1									-1	-5				1	1	-1		-1	
Vineyards		0	-2	0	0	-4	-2	-4	-3	0	-3	-1			-1				-1					-2	-4				2	1	0		1	
Fruit trees and berries		1	0	1	1	-1	-1	1	-1	0	-1	0			-1				-1					-2	-3				2	1	-1		1	1
Olive groves		0	-1	0	0	-1	-2	0	-3	0	-2	0			-1									-2	-1				2	2	0		1	
Pastures		-2		-1	0	-2	-2	0	-1	0	-2	0			-1	-1	2		-1					-1	-2				2	2	1		1	1
Annual and permanent crops		0	1	0	1	-2	-3	1	-2	0	-1	0			-1									-1	-1				1	1	0		1	
Complex cultivation patterns		0	1	0	1	-2	-3	0	-1	0	0	0			-1	1								0	-1				2	2	0		1	
Agriculture & natural vegetation		0	2	1	1	-1	-1	1	0	0	0	0			-1	1		1		1				0	-2		1		2	2	1	1	1	1
Agro-forestry areas		0	1	1	1	-1	-2	2	-1	0	0	1			-1		1	1	1	1				0	-2				2	2	0		1	1

Figure 3. ES flow-demand budget matrix. (Scale from -5/brown red = demand exceeds flow significantly

= strong undersupply; via 0/rosy = demand = flow = neutral balance; to 5/dark green = flow exceeds the demand significantly = strong oversupply. Empty fields = neither a relevant flow of nor a relevant demand for the particular ES (Burkhard et al., 2014).

It is argued that if 50% more food, 50% more energy and 30% more fresh water are not provided by 2030, it is claimed that a simultaneous food, water, and energy nexus will be observed on a global scale (Poppy et al., 2014b). Managing the agricultural ecosystems and their interaction with natural ecosystems has become increasingly important because of the conflict between the aims of achieving/increasing food security and maintaining environmental sustainability and resilience (Poppy et al., 2014b). As shown in Figure 1, 2 and 3, the ESs framework offers the opportunity to both reveal the components and interrelationships associated with the sustainability of agricultural systems and to express the negative impacts of agricultural activities in terms of quality, quantity and spatially explicitly to manage land in order to achieve both food security and environmental sustainability (Poppy et al., 2014b). As can be concluded from all of this, food security is directly linked not only to increasing food supply, but also to ensuring the sustainability of the ESs associated with the four pillars of food security and essential for food supply.

A trade-off among ESs arises when a single ecosystem service decreases as a result of an increased use in another ecosystem service (Rodriguez et al., 2006). On the other hand, in the case of change in the same direction (positively or negatively) this relationship type

is called as synergistic (Lee and Lautenbach, 2016). As ESs are generated simultaneously and continually by ecosystems; it is considered impossible to manage ecosystems to maximize the benefits from all kinds of services at the same time, resulting in trade-offs (King et al.2015). It is obvious that agriculture related ESs have the similar interrelation of synergy and trade-off as the other ESs (Figure 1). For instance, it is expected that an increased use in food ES to result in an increase (synergy) and decrease in some other ESs (trade-off). The typical trade-off among ESs for agricultural activities is between provisioning services (e.g., food, fibre, bioenergy) and regulating services (e.g., water purification, soil conservation, carbon sequestration) (Power, 2010).

Trade-offs are characterized along three dimensions: spatial scale, temporal scale, and reversibility (Rodriguez et al., 2006). The effects of the trade-off may be felt at a distant location (spatial scale); these effects may take place in a short or long term (temporal scale); and the perturbated ESs may/may not return to its original state after irreversible impacts (reversibility) (Rodriguez et al., 2006). Sometimes the trade-offs can occur between different stakeholders. For example, expanding irrigation schemes for improving agricultural production may result in an increase in one site but negatively may affect the fishermen's productivity as a result of degraded water sources (Cruz-Garcia et al., 2016). ESs framework enables the knowledge and awareness of the interactions between ESs and this knowledge is crucial to understand the quantitative, spatial, temporal, social and ecological consequences (intended and unintended) of the land and water management processes (Rodriguez et al., 2006).

In the literature, the evaluations on specific trade-offs between AgrFS (food) and other ESs are stated as biodiversity, water quality, soil quality, water availability for other present and future uses and carbon sequestration (Power, 2010; Rodriguez et al., 2006). On the other hand, it is clear that regulating and supporting ESs such as pollination, pest and disease control, water purification, nutrient cycling and biodiversity are crucial for the sustainability of agri-food ecosystems (Figure 1). In connection with this study, the development of an ES-based foodshed assessment planning tool that takes into account ESs that provide food, support food production and are important in food production in terms of climate change sensitivities is thought to contribute to the literature. In this context, the ESs proposed for the identification of foodsheds are shown in Table 1.

Table 1. The proposed ESs for the identification of ESs-based foodshed assessment.

Regulating ESs	**Supporting ESs**	**Provisioning ESs**	**Cultural ESs**
- Climate regulation - Water flow regulation - Water purification - Nutrient regulation - Pollination - Pest and disease control	- Soil structure and fertility	- Crops (Food) - Freshwater - Wildlife habitat	- Landscape aesthetics and inspiration

For this study, the integration of ESs in terms of AgrFS in spatial planning is investigated in order to achieve all pillars of food security and environmental sustainability. It is aimed to conduct research on the identification of foodsheds with the ESs approach and to make suggestions on how this integration can be realized at the level of planning tools through ESs-based FsA. In this context, the inclusion of ESs boundaries in the planning borders and the border based on geographical distance between production-consumption areas will reveal ecological sensitivity in relation to AgrFS. It will provide opportunities for ESs to ensure spatial connectivity and revitalisation/restoration for ESs disservices. The spatial representation of selected ESs related to agriculture will also contribute to the assessment of the ecological connectivity of the ESs. Spatial representation and identification of ecologically connected areas of ESs will support areas with high biodiversity and ESs potential and thus increase the resilience and sustainability of AgrFS. Thus, ESs-based foodshed assessment tool will be able to guide spatial planning to manage and reduce the effects of AgrFS that already have significant impacts on natural resources and the environment.

4. Case Study: Istanbul Metropolitan Area

Istanbul Metropolitan Area, with a population of more than 16 million, includes rural areas/neighbourhoods, approximately 12% of which still have agricultural activities, in an area of 5,461 km2. However, the need for new parcels for construction and large urban projects in Istanbul have triggered the transformation of agricultural lands in the periphery of the city and created a structure that is highly dependent on the outside of the city for food supply. Despite the occupation of agricultural lands by urban uses due to

the decisions made by the administrations regarding transportation and land use plans, agriculture and livestock activities are observed in the rural areas of Istanbul.

However, this production is quite insufficient for the domestic consumption of Istanbul (Aslan and Demir, 2017; Solduk, 2012). Self-sufficiency studies for Istanbul show a similar situation not only in terms of current production values, but also in terms of production capacity and potential (Aslan and Demir, 2017; Yerkure Local Studies Cooperative, 2020).

It can be said that the food system of Istanbul has a very fragile structure due to its dependence on the outside of the city, and the logistics sector endanger ecological sustainability in terms of energy consumption and greenhouse gas emissions.

Concurrently, the unequal accessibility of food for all groups seriously threatens food security (Dinc & Tezer, in press). The inclusion of food in spatial planning is essential to mitigate the social, economic, and ecological risks caused by these conditions and to increase food resilience -and urban and community resilience-.

With Buchan et al.'s (2015) suggestion, it is difficult to effectively move towards for the identification of Istanbul Metropolitan Area's local AgrFS through the FsA unless it's known where the AgrFS is in the current spatial planning system. For the purpose of this study, it is important to analyse the existing spatial planning tools so that the FsA may provide input to spatial planning. Accordingly, it's analysed at what levels AgrFS has been covered within the legal instruments and policy documents guiding spatial planning activities. Due to the hierarchical structure of planning, the binding nature of upper-scale legal documents on spatial planning necessitates an inter-scale analysis.

Hence, planning tools that affect spatial decisions regarding food systems in the Istanbul metropolitan area have been examined at the national, regional, metropolitan, and urban scales.

Although concepts such as food safety, agricultural land protection and agricultural land use plans regarding AgrFS are encountered in spatial planning tools at the national scale, it is seen that they remain at the conceptual or strategic level and are not associated with spatial planning. Spatial Plan Making Regulation, which defines and binds spatial planning, clearly illustrates this deficiency. This regulation emphasizes the representation and the protection of agricultural lands in Environmental Plans, in the regional scale. On the urban scale, it is stated in the Master Plans to show only the agricultural land use within the planning boundary.

Environmental Plan is the most interactive tool at the regional scale demonstrating the relationship between AgrFS and spatial planning. In the plan, "marginal agricultural areas" and "agricultural areas that must be absolutely protected" are shown as areas whose agricultural quality will be preserved within the scope of sustainable development. In the

areas where the natural and rural character will be preserved, it is envisaged that agricultural activities and rural settlements such as vineyardfarmhouses and hobby gardens will take place, and urban agriculture has been prioritized. It is mentioned that a land use plan for agricultural purposes should be prepared in order to meet the food needs of Istanbul (IMM, 2009).

Turkey Spatial Strategy Plan and Marmara Region Spatial Development Strategic Framework Document are the only official documents that deal with the concepts of food and ESs together. These documents stated that the status and width of critical ecological areas based on ESs (including critical ESs areas for food) should be determined in order to guide spatial planning decisions.

Although “Istanbul Food Strategy” document is valuable because it is the first document in Turkey that includes concepts such as food safety and the right to food, it has remained at the conceptual level. The areas where solutions need to be presented are still in the problem definition stage. In short, medium, and long-term recommendations for AgrFS, what needs to be done is not clearly stated. Most of the proposals and solutions are left vague, emphasizing only “the necessity of doing” it. In terms of spatial planning, the document states that the effective use of existing policy and planning tools -such as infrastructure and logistics, public procurement, land use planning- is necessary for the development of a resilient AgrFS. Emphasis is placed on making holistic and integrated land use planning with the ecosystem approach.

Various spatial activities such as urban agricultural park, ecological life centre, community gardens, ecological/organic markets related to AgrFS are recommended at the urban scale. However, in the upper scale planning documents, there is no point to refer to each other for local government activities, and there is no relationship with the concept of food between the definitions of master and implementation plans where spatial decisions are reflected in real life. This causes local planning processes to be fragmented, independent from each other and to prevent continuity.

Consequently, the relationship between AgrFS and spatial planning is not adequately defined in spatial planning tools. Although the spatial strategy plans at the national and regional scales include the AgrFS-ESs-spatial planning trio, which is the research topic of this study, they do not have reflections on the sub-scale plans or the implementation level yet. Although the environmental plan mentions the agricultural land use plan, it can be said that this relationship is insufficient due to the concern of crop pattern planning in these plans.

5. Cross-scale discussion

It is more difficult for agro-food systems to find a place in spatial planning in developing cities (Van Haren, 2023). Because planning systems are construction oriented. Even if there are sentences in the plans to support and develop the food system, it is possible to come across another contradictory decision in the same plan - e.g., with a regulation on the development of agricultural lands, the discourses of protection have no meaning-. In this case, the sustainability of ESs is also in danger, like in the Istanbul Environmental Plan.

This section discusses at what scale and how ESs-based FsA and its possible tools can be incorporated into the planning tools that guide the spatial planning of Istanbul.

Suggestions are made based on data and analyses that will inform inter-scale planning processes, especially land use decisions. The necessary regulatory changes for the full integration of the FsA will create the opportunity to start thinking about the transformation of the existing system.

- **National scale**

First, in Spatial Plan Making Regulation, where the scope and principles of all plans are defined, indicating the place of ESs and AgrFS at the plan levels is essential for the inclusion of foodsheds in the spatial planning system.

Due to the top-down nature of the planning system, it is important that the upper scale plans are binding for the FsA. Strategic planning can help integrate AgrFS into broader planning goals and objectives. It should include strategies to increase food access and safety and promote local food production and distribution by conceiving ecological values. The Spatial Strategy Plan of Turkey has a suitable basis for unifying the AgrFS and ESs strategies that it already points to within the scope of foodsheds.

The Agricultural Sheds Regulation, published in 2010, is an important example among legal regulations for the inclusion of foodsheds in the spatial planning system, although it has never been implemented. The Agricultural Sheds approach, which has been defined for the purpose of planning the crops pattern on a country level, has a content that can be developed within the scope of FsA with the objectives of future demand projections and the protection and sustainable use of natural resources. In particular, the identification of these sheds, conceiving the critical ESs for the AgrFS proposed in the study, will also ensure the achievement of the targets.

- **Regional scale**

It is clear that the food system of metropolitan areas in particular goes far beyond administrative borders. Moreover, it is unrealistic to expect the population of Istanbul to be adequately fed from limited production resources. Therefore, it is necessary to include

the FsA in regional plans as an assessment tool and to define foodshed boundaries in a regional context. In this study, the region refers to the Marmara region.

In this context, the Marmara Region Spatial Development Strategic Framework document creates an important opportunity for FsA.

It is the agricultural capacity that will be considered in the evaluation of foodsheds at the regional scale. In other words, it is important to evaluate the agricultural production capacity that meets the demands of the population for a self-sufficient foodshed (Zasada et al., 2019). Accordingly, the use of production data at the regional scale comes to the fore. Agricultural land use and food production data can be used in the analyses to be made for the definition of foodsheds at the regional scale. This method is called carrying capacity by Peters et al. (2022).

In addition to statistical data, landscape characters, geomorphological features, and the spatial representation of ESs should also be evaluated within the scope of the analysis. For ESs-based FsA, it is very important to map the distribution and quality of ES and to define ecological connectivity through these maps. In addition to using GISbased tools for this mapping/inventory, surveys and data analyses evaluating the quality and quantity of ESs can be conducted.

- **Metropolitan scale**

FsA's strongest relationship with spatial planning should be at the metropolitan scale. This scale, in which self-sufficiency calculations are an important method, stands out because of the view that the level of rural-urban connections can affect the food selfsufficiency.

However, it is essential for this scale to establish a mutual relationship with the regional scale. The Environmental Plan will be the first plan level to include spatial decisions on AgrFS at the foodshed boundary to be defined in its legend, and to guide land use planning.

Analysis methods that can be used to assist the spatial decision-making process are listed below:

- Ecological Footprint: This method evaluates the environmental impact of human activities. It refers to the equivalent land area required for the energy and resource inputs required during food production and consumption (Peters et al., 2022; Wascher et al., 2015). This concept has been transformed by Jansma et al. (2013) as “Urban Food Print”. It discusses the environmental impact of agri-food lands by calculating the city's total food production and consumption capacity for each crop.
- Life Cycle Assessment: The method that assesses the environmental impact of products and processes can be used to assess the environmental impact of the farm to soil AgrFS (Notarnicola et al., 2017).

- Metropolitan Area Profile and Scenario (Zasada et al., 2014): It is a method that allows to generate demand scenarios at the level of administrative units based on different food consumption patterns.
- Metropolitan Foodscape Planner (Wascher et al., 2015): It is a method that reveals the supply balance at the level of landscape units.

When these methods are used together, an overview of the situation of potential supply and estimated demand can be developed. They offer a rich assessment of spatial data for foodsheds. At the same time, these methods support integrative spatial planning that allows resource management at the level of infrastructure, zoning, nature conservation and recreation, and AgrFS.

In the data sets required for metropolitan scale analysis, consumption capacity remarks as well as production capacity. It uses available spatial data such as land cover, administrative boundaries, distance of production areas to consumption areas, population and regional efficiencies (crops and soil) to map the spatial distribution of production and consumption. In order to evaluate the regional food demand, the dietary habits of the population are also examined within the consumption data.

ESs should be shown in AgrFS mapping, as well as at regional scale. In this way, land use planning decisions such as AgrFS infrastructures, allocation of land uses, and protected areas management will be informed. For example, ESs mapping can help identify areas that are important to certain services, such as biodiversity conservation, water treatment, and prioritize these areas for conservation or restoration. In addition, ESs can be used to evaluate trade-offs between different land use options. For example, a spatial plan might consider trade-offs between developing a particular parcel of land for housing and preserving it for its value as a food production area.

At the metropolitan scale, ESs-based FsA will guide spatial decision-making processes for ecosystem-based protection of agricultural lands, sustainable land use, local food production and consumption, reducing food waste and strengthening ESs.

- **Urban scale (Local scale)**

Cities attract the attention among the dynamics shaping the new global geography of food security (Sonnino, 2014) and the strategic roles defined for the development and management of sustainable and resilient food systems (MUFPP, 2015). It is not surprising, therefore, that the urban scale is becoming increasingly important in AgrFS.

However, due to the hierarchy of the plans, the local scale does not have the authority to impose specific sanctions on the plans in line with their potential.

In addition to the restrictiveness of the plan hierarchy, in Turkey, agricultural production has always been left outside the boundaries of spatial planning. The reason for this exclusion is not to increase the cost by enlarging the planning area or to prevent the use of agricultural areas as a development plot. However, the removal of agricultural lands beyond the planning boundaries creates problems in land management and the sustainability of these areas is endangered.

At the local level, special attention has been given to urban agriculture (Doernberg et al., 2019). On the other hand, as Sonnino et al. (2019) state, the new policy area in the role of planning and food system planning is related to urban design approaches.

These two findings intersect in urban design approaches such as productive urban landscapes or edible landscapes (Viljoen & Bohn, 2014; Viljoen et al, 2015). However, the difficulties encountered in applying these design approaches to existing policy and planning systems are noted (Doernberg et al., 2019).

For the urban scale, where the spatial reflections of the upper scale decisions are

seen, legal arrangements should be made, and the agricultural areas should be included in the master and implementation plans. This will also help the settlement to establish its relationship with foodsheds, and it will be possible to establish local food networks with zoning regulations, protection of agricultural lands and spatial decisions such as urban agriculture and community gardens.

6. Concluding Notes

AgrFS and spatial planning are often governed by different policies and regulations. This makes it difficult to coordinate planning efforts for the development of AgrFS. Spatial decisions are made in favour of profitable land uses, this increases the pressure on agricultural land and negatively affects local AgrFS. The spatial distribution of activities associated with the AgrFS is also affected in various ways by spatial planning. Therefore, effective integration of AgrFS into spatial planning is critical. Awareness and interest in foodsheds, which represent a geographical region that provides food resources for a community, is increasing day by day. As an assessment tool, the FsA has the potential to guide spatial decision-making regarding AgrFS.

FsA research has looked at whether the current agricultural production can meet the food needs of the region so far. In cases where it could not meet this gap, it was discussed how much to expand the agricultural lands and whether additional land resources were available. However, this approach will not go beyond deepening the problems, considering that AgrFS are the trigger of the climate crisis and responsible for the loss of biodiversity. Therefore, in this study, it is proposed to add the ESs approach to the existing

definitions of the FsA tool. Thus, it will be possible to identify ecologically sensitive areas and ecological connectivity for the AgrFS. By considering trade-offs, the balance between ecological functions and AgrFS that will feed each other will be provided.

This study discusses integrating ESs-based FsA's as an assessment tool into the Istanbul metropolitan area planning tools. The scales where the FsA comes into play as a planning tool are the regional and metropolitan scales. Here, in the mutual relationship of the two scales, all analyses are made and the boundaries of the foodsheds are determined. The national scale for the FsA is descriptive, supportive, and binding. The metropolitan scale, where the upper scale spatial decisions are made, is followed by the urban scale at the implementation level. ESs-based FsA is promising for the future of cities and societies as it identifies the existing interdependencies between resources and food security and thus includes understanding the local impacts of AgrFS and opportunities for regional changes.

The fact that this discussion is being held for the first time for Istanbul shows that there is a long road ahead of the ES-based FsA model. It is planned to close existing gaps by including governance and practice of the model in future research.

References

Albayrak, İ. (2012). Ekosistem servislerine dayalı yönetim modelinin İstanbul-Ömerli Havzası örneğinde uygulanabilirliği (Doctoral Dissertation), Istanbul Technical University, Istanbul.

Aslan, B., Demir, Y. (2018). Organik Tarımla Beslenme: Türkiye ve İstanbul, beyond.istanbul, 03-2018, 56-60.

Battersby, J. (2017). Food System transformation in the Absence of Food System Planning: The Case of Supermarket and Shopping Mall Retail Expansion in Cape Town, South Africa. Built Environ., 43, 417–430.

Béné, C. (2020). Resilience of local food systems and links to food security – A review of some important concepts in the context of COVID-19 and other shocks. Food Security, 12(4), 805–822.

Brinkley, C. (2013). Avenues into food planning: a review of scholarly food system research. Int. Plan. Stud. 18(2), 243–266.

Buchan, R., Cloutier, D.S., Friedman, A. (2019) Transformative incrementalism: Planning for transformative change in local food systems. Prog. Plan., 134.

Burkhard, B., Kandziora, M., Hou, Y., Müller, F. (2014). Ecosystem service potentials, flows and demands – Concepts for spatial localisation, indication and quantification, Landscape Online, 34:1-32.

Cabannes, Y., Marocchino, C. (Eds.). (2018). Integrating food into urban planning. London, UCL Press, Rome, FAO.

Campagne, C. S., Roche, P. (2018). May the matrix be with you! Guidelines for the application of expert-based matrix approach for ecosystem services assessment and mapping, One Ecosystem 3: e24134.

Cardoso, A.S., Domingos, T., de Magalhaes, M.R., de Melo-Abreu, J., Palma, J. (2017). Mapping the lisbon potential foodshed in ribatejo e oeste: a suitability and yield model for assessing the potential for localized food production. Sustain 9.

Cruz-Garcia, G. S., Sachet, E., Vanegas, M., Piispanen, K. (2016). Are the major imperatives of food security missing in ecosystem services research?, Ecosystem Services, 19, 19-31.

Daily, G. C., Kareiva, P. M., Polasky, S., Ricketts, T. H., Tallis, H. (2011). Mainstreaming natural capital into decisions in Kareiva, Peter M., et al. (Eds), Natural Capital: Theory and Practica of Mapping Ecosystem Services, Oxford University Press, Oxford [England], New York, pp. 3-14.

Delgado, M. (2010). El sistema agroalimentario globalizado: Imperios alimentarios y degradación social y ecológica. Econ. Crit., 10, 32–61.

de Groot, R. S., Alkemade, R., Braat, L., Hein, L., Willemen, L. (2010). Challenges in integrating the concept of ecosystem services and values in landscape planning, management and decision making, Ecological Complexity, 7(3), 260-272.

Delibas, M., Tezer, A., Bacchin, T. K. (2021). Towards embedding soil ecosystem services in spatial planning, Cities, 113, 103150.

Dinc, S., Tezer, A. (in press). Sürdürülebilir Gıda Üretimi Çerçevesinde Gıda Dayanıklılığı ve Yenilenme Kapasitesi: İstanbul Kent Çeperi için Politika Önerileri.

Beykoz 2023 Kentsel Tarım Sempozyumu Tebliğler Kitabı.

Doernberg, A., Horn, P., Zasada, I., Piorr, A. (2019). Urban food policies in German city regions: An overview of key players and policy instruments, Food Policy 89.

Egoh, B., Reyers, B., Rouget, M., Richardson, D. M., Le Maitre, D. C., van Jaarsveld, A. S. Mapping ecosystem services for planning and management, Agriculture, Ecosystems and Environment, 127, 135

Fisher, B., Turner, R. K., Morling, P. (2009). Defining and classifying ecosystem services for decision making, Ecological Economics, 68, 643-653.

FAO-Food and Agriculture Organization. (1996). Rome Declaration on World Food Security, Italy.

Getz, A. (1991). Urban foodsheds. Permac. Act., 24, 26–27.

Goldstein, J. H., Caldarone, G., Duarte, T. K., Ennaanay, D., Hannahs, N., Mendoza, G., Polasky, S., Wolny, S., Daily, G. C. (2012). Integrating ecosystem-service tradeoffs into land-use decisions, Proceedings of the National Academy of Sciences of the United States of America, 109(19), 7565-7570.

Gret-Regamey, A, Altwegg, J., Siren, E. A., van Strien, M. J., Weibel, B. (2017). Integrating ecosystem services into spatial planning–A spatial deision support tool, Landscape and Urban Planning, 165, 206-219.

Hedden,W. (1929). How Great Cities are Fed, D.C. Health and Company: New York.

İMM (2009) İstanbul 1/100.000 Ölçekli Çevre Düzeni Planı Raporu, Büyükşehir Belediyesi İmar ve Şehircilik Daire Başkanlığı Şehir Planlama Müdürlüğü. İstanbul.

IPBES. (2019). Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. E. S. Brondizio, J. Settele, S. Diaz, and H. T. Ngo (editors). IPBES secretariat, Bonn. Germany. 1148 pages.

IPES-Food, (2020). COVID-19 and the crisis in food systems: Symptoms, causes, and potential solutions. [Online]Available from: https://www.ipes-food.org/_img/upload/fles/COVID-19_Communique EN.pdf. Accessed 23/04/2023.

Jacobs, S., Burkhard, B., Daele, T. V., Staes, J., Schneiders, A. (2015). 'The Matrix Reloaded' : A review of expert knowledge use for mapping ecosystem services, Ecological Modelling, 295, 21-30.

Jansma, J.E., Veen, E.J., Sukkel, W., Visser, A.J. (2013). Urban Food Print: A tool to calculate the land needed to feed Dutch cities. In Proceedings of the 5th AESOP Sustainable Food Planning Conference: Innovations in Urban Food Systems, Montpellier, France, 28–29 October 2013.

King, E., Cavender-Bares, J., Balvanera, P., Mwampamba, T. H., Polasky, S. (2015). Trade-offs in ecosystem services and varying stakeholder preferences: evaluating conflicts, obstacles, and opportunities, Ecology and Society, 20(3):25.

Kloppenburg, J., Hendrickson, J., Stevenson, G.W. (1996) Coming in to the foodshed. Agriculture and Human Values 13:3, 33-42.

Kriewald, S., Pradhan, P., Costa, L., Ros, A.G.C., Kropp, J.P. (2019) Hungry cities: How local food self-sufficiency relates to climate change, diets, and urbanisation. Environ. Res. Lett.,14.

Kurtz, J.E., Woodbury, P.B., Ahmed, Z.U., Peters, C.J. (2020). Mapping U.S. food system localization potential: the impact of diet on foodsheds. Environmental Science & Technology 54(10), 12434–12446. https://doi.org/10.1021/ acs.est.9b07582.

La Notte, A. (2022). Ecologically intermediate and economically final: The role of the ecosystem services framework in measuring sustainability in agri-food systems, Land, 11(1).

Lee, H., Lautenbach, S. (2016). A quantitative review of relationships between ecosystem services, Ecological Indicators, 66, 340-351.

Lengnick, L., Miller, M., Marten, G. G. (2015) Metropolitan foodsheds: a resilient response to the climate change challenge? J. Environ. Stud. Sci., 5, 573–92.

Marsden, T., Sonnino, R. (2012). Human health and wellbeing and the sustainability of urban-regional food systems Current Opinion in Environmental Sustainability, 4, 427–30.

Menteşe, E. Y., Tezer, A., Demir, M. (2019). Development of a GIS Tool for the Identification of Environmental Sustainability Performance of Spatial Plans, Planning, 29(1).

MEA-Millennium Ecosystem Assessment. (2003). Ecosystems and Human Well-Being: AFramework for Assessment. Washington: Island Press.

MUFFP-Milan Urban Food Policy Pact (2015). Milan Urban Food Policy Pact and Framework for Action. [Online]Available from: http://www.foodpolicymilano.org/en/thetext-of-the-milanurban- food-policy-pact/ Accessed 26/04/2023.

Onur, A. C., Tezer, A. (2015). Ecosystem services based spatial planning decision making for adaptation to climate changes, Habitat International, 47, 267-278.

Oosterveer, P., Sonnenfeld, D.A. (2012). Food, Globalization and Sustainability, Routledge: New York.

Peters, C., Bills, N., Lembo, A.,Wilkins, J., Fick, G.(2008). Mapping potential foodsheds in New York State: A spatial model for evaluating the capacity to localize food production. Renew. Agric. Food Syst., 24, 72–84.

Peters, C.J., Bills, N.L., Wilkins, J.L., Fick, G.W. (2009). Foodshed analysis and its relevance to sustainability. Renewable Agriculture and Food Systems, 24(1), 1–7.

Peters, C. J. (2022). Foodshed analysis and carrying capacity estimation. Food Systems Modelling, 105-128.

Poppy, G. M., Jepson, P. C., Pickett, J. A., Birkett, M. A. (2014a). Achieving food and environmental security: new approaches to close the gap, Philosophical Transactions of the Royal Society B, 369.

Poppy, G. M., Chiotha, S., Eigenbrod, F., Harvey, C. A., Honzak, M., Hudson, M. D., Jarvis, A., Madise, N. J., Schreckenberg, K., Shackleton, C. M., Villa, F., Dawson, T. P. (2014b). Food security in a perfect storm: using the ecosystem services framework to increase understanding, Philosophical Transactions of the Royal Society B, 369.

Pothukuchi, K., Kaufman, J. (2000). The food system: a stranger to the planning field. J. Am. Plan. Assoc. 66(2), 113–124.

Power, A. G. (2010). Ecosystem services and agriculture: tradeoffs and synergies, Philosophical Transactions of the Royal Society B.

Raja, S., Born, B.M., Russell, J.K. (2008). A planners guide to community and regional food planning: transforming food environments, facilitating healthy eating. Planning Advisory Service report, no. 554, American Planning Association, Chicago, Ill.

Raja, S., Morgan, K., Hall, E. (2017). Planning for equitable urban and regional food systems. Built Environ., 43(3), 309–314.

Rodriguez, J. P., Beard, Jr., T. D., Bennett, E. M., Cumming, G. S., Cork, S. J., Agard, J., Dobson, A. P., Peterson, G. D. (2006). Trade-offs across Space, Time, and Ecosystem Services, Ecology and Society, 11(1):28.

Rusinamhodzi, L. (2019). Challenges in maximizing benefits from ecosystem services and transforming food systems, in Rusinamhodzi, L. (ed.) The Role of Ecosystem Services in Sustainable Food Systems, pp. 263-274.

Saavedra, A., Domingos, T., Raposo, M., De Melo-Abreu, J., Palma, J. (2017). Mapping the Lisbon potential foodshed in Ribatejo e Oeste: A suitability and yield model for assessing the potential for localized food production. Sustainability, 9, 2003.

Sali, G., Corsi, S., Monaco, F., Mazzocchi, C., Glavan, M., Pintar, M. (2014). Urbanrural relationships in feeding metropolis: A case study in Ljubljana metropolitan area. Adv. Eng. Forum, 11, 259–264.

Schreiber, K., Hickey, G.M., Metson, G.S., Robinson, B.E., MacDonald, G.K. (2020). Quantifying the foodshed: A systematic review of urban food flow and local food selfsufficiency research. Env. Res. Lett., 16.

Solduk, B. B. (2010). Sürdürülebilir kentsel gelişmenin sağlanması açısından kentsel tarımın rolü. Master Thesis. İstanbul Teknik Üniversitesi Fen Bilimleri Enstitüsü, İstanbul.

Sonnino, R. (2009). Feeding the city: towards a new research and planning agenda. Int. Plan. Stud., 14(4), 425–435.

Sonnino, R., Moragues-Faus, A., Maggio, A. (2014). Sustainable food security: An emerging research and policy agenda. International Journal of the Sociology of Agriculture and Food, 21(1), 173–188.

Sonnino, R. (2016). The new geography of food security. Exploring the potential of urban food strategies. Geograph. J., 182(2), 190–200.

Sonnino, R. (2023). Food system transformation: Urban perspectives. Cities 134.

Steel, C. (2008) Hungry City. How Food Shapes Our Lives, Chatto & Windus, Vintage: London, UK.

Stierand, P. (2012). Food Policy Councils: recovering the local level in food policy. In: Viljoen, A.M., Wiskerke, J.S.C. (Eds.), Sustainable Food Planning: Evolving Theory and Practice. Wageningen Acad. Publ., Wageningen, pp. 67–77.

Swiader, M., Szewranski, S., Kazak, J.K. (2018). Foodshed as an example of preliminary research for conducting environmental carrying capacity analysis. Sustain, 10.

Swinton, S. M., Lupi, F., Robertson, G. P., Hamilton, S. K. (2007). Ecosystem services and agriculture: Cultivating agricultural ecosystems for diverse benefits, Ecological Economics, 64, 245-252.

Sylla, M., Swiader, M, Vicente-Vicente, J. L., Arciniegas, G. (2022). Assessing food self-sufficiency of selected European Functional Urban Areas vs metropolitan areas. Landscape and Urban Planning 228.

Tezer, A., Sen, O. L., Cetin, N. I., Onur, A. C. T. (2012). Integrated planning for the resilience of urban riverine ecosystems: the Istanbul-Omerli Watershed case, Ecohydrology&Hydrobiology, Volume 12, Issue 2, 153-163.

Tezer, A., Çetin, N. İ., Onur, A. C., Menteşe, E. Y., Albayrak, İ., Cengiz, E. (2015). Ömerli Havzası'nda Ekosistem Servislerine Dayalı Bütünleşik Havza Yönetim Planının Geliştirilmesi Projesi, Nihai Rapor, İstanbul.

Tezer, A., Turkay, Z., Uzun, O., Terzi, F., Koylu, P., Karacor, E., Okay, N., Kaya, M. (2020). Ecosystem services-based multi-criteria assessment for ecologically sensitive watershed management, Environment, Development and Sustainability, 22, 2431-2450.

Thiaw, I., Kumar, P., Yashiro, M., Molinero, C. (2011). Food and Ecological Security: Identifying synergy and trade-offs, UNEP Policy Series, Issue 4.

UN, 2015. Sustainable Development Goals. Available from:https://sdgs.un.org/goals. Accessed 26/04/2023.

UN-Habitat (2016) New Urban Agenda. Available from:habitat3.org/wpcontent/uploads/New- Urban-Agenda-GA-Adopted-68th-Plenary-N1646655-E.pdf. Accessed 26/04/2023.

Van Haren, C., Kumar, I., Cormont, A., Terwisscha, C., Rooij, B., Islam, S., Verweij, P. (2023). The Role of Spatialisation and Spatial Planning in Improving Food Systems: Insights from the Fast-Growing City of Dhaka, Bangladesh. Sustainability 2023, 15.

Varyvoda, Y., Taren, D. (2022). Considering ecosystem services in food system resilience. Int. J. Environ. Res. Public Health, 19.

Vicente-Vicente, Jose Luis, Doernberg, Alexandra, Zasada, Ingo, Ludlow, David, Staszek, Damian, Bushell, Joanna, Hainoun, Ali, Loibl, Wolfgang, Piorr, Annette. (2021a). Exploring alternative pathways toward more sustainable regional food systems by foodshed assessment – City region examples from Vienna and Bristol. Environmental Science and Policy, 124, 401–412.

Vicente-Vicente, J.L., Sanz-Sanz, E., Napoléone, C., Moulery, M., Piorr, A. (2021b). Foodshed, Agricultural Diversification and Self-Sufficiency Assessment: Beyond the Isotropic Circle Foodshed—A Case Study from Avignon (France). Agriculture 2021.

Vittuari, M., Bazzocchi, G., Blasioli, S., Cirone, F., Maggio, A., Orsini, F., …De Menna, F. (2021). Envisioning the future of European food systems: approaches and research priorities after COVID-19. Frontiers in Sustainable Food Systems, 5(March), 1–9.

Wang, L., Zheng, H., Chen, Y., Ouyang, Z., Hu, X. (2022). Systematic review of ecosystem services flow measurement: Main concepts, methods, applications and future directions, Ecosystem Services, Volume 58, 101479.

Wascher, D., Zasada, I., Jeurissen, L., Arciniegas, G., de Kroes, J., Sali, G., Corsi, S., Monaco, F., Schmutz, U., Glavan, M., Pohle, D., van Eupen, M. (2014) D3.3 Indicators, Tools and Method for Metropolitan Footprint Tools.

Yerkure Local Studies Cooperative, 2020. İstanbul Nasıl Beslenir?: Üretici Odağında Alternatifler ve Olanaklar.

Zasada, I., Schmutz, U., Wascher, D., Kneafsey, M., Corsi, S., Mazzocchi, C., Monaco, F., Boyce, P., Doernberg, A., Sali, G. (2019). Food beyond the city— Analysing foodsheds and self-suffciency for different food system scenarios in European metropolitan regions. City Cult. Soc., 16, 25–35.

Zazo-Moratalla, A., Troncoso-Gonzalez, I., Moreira-Muńoz, A. (2019) Regenerative food systems to restore urban-rural relationships: insights from the concepción metropolitan rea foodshed (Chile), Sustainability, 11.

Zhang, W., Ricketts, T. H., Kremen, C., Carney, K., Swinton, S. M. (2007). Ecosystem services and dis-services to agriculture, Ecological Economics, 64, 253-260.

A LADDER OF URBAN RESILIENCE: TOWARDS A PARADIGM OF EVOLUTIONARY RESILIENCE TO SUPPORT COMMUNITIES FACING CHRONIC CRISES (1152)

Dario Esposito

Polytechnic University of Bari, Bari, Italy; dario.esposito@poliba.it

Abstract. This paper explores the concept of urban resilience in the context of complex socio-technical ecosystems within cities. Its objective is to move beyond the functional schematization of capacities along successive implementation phases. Instead, it proposes an integrated framework for a comprehensive approach to urban resilience that considers the interaction between i) appropriate qualities based on the specific problem characteristics, ii) processes across different system domains forming a city, and iii) the involvement of agents in decision-making and action implementation. Through an analysis of the challenges posed by chronic crises and structural disorders, the article underscores the need for a paradigm shift in governance to support communities grappling with the impossibility of contradictory adaptation choices. This is essential to ascend the ladder of city resilience through adaptive strategies, inclusive decision-making, and the co-generation of innovation, including the application of information and communication technology for this purpose.

Keywords: Urban Resilience, Evolutionary Resilience, Participatory Design, System Thinking, Complex Socio-Technical Eco-System

1. Introduction

Resilience is a concept that is increasingly being used in the urban context because it aligns with the complex socio-technical ecosystem inherent to cities. Through continuous and lively debates, with various theoretical interpretations and controversial outcomes, the concept of urban resilience has expanded beyond its initial engineering reference. It now encompasses the ability of an urban area to not only withstand and respond to disruptions such as natural disasters, economic crises, or social upheavals but also to proactively establish preventive mechanisms capable of anticipating and mitigating the negative impacts of potential stressors. Additionally, it emphasizes the improvement mechanism through reflection on lessons learned from unexpected events, enabling the activation of upgrading processes, which ensures the continuous development of the system.

However, while this systemic view encompasses the impact of internal and external factors, it only represents part of the story, particularly the one that can be addressed

using traditional management approaches. It simplifies societies as coherent self-correcting systems capable of using feedback to adjust their activities towards clear desired outcomes. Although this approach may seem reasonable for providing a comprehensive framework for understanding resilience in urban contexts and supporting the identification of operational tools to strengthen cities against potential disruptions, it often fails to account for timely or accurate feedback. This is due to the inherent difficulty of correctly predicting outcomes in complex decision environments, leading to the potential collapse of all or part of the system. Moreover, this closed-system interpretation neglects the intrinsic uncertainty of socio-environmental contexts due to their openness, as well as the multiplicity of roles, interests, and relationships among the agents that constitute them. Consequently, it is incapable of addressing the frequent paradoxical situations of choices that permeate such contexts.

Despite these considerations, the huge number of papers on resilience available in literature suggests that it is no longer a mystery. Assuming that there are means and resources available to develop economic, technological, organizational, political, and infrastructural capacities to address risks, the principle of a "one-size-fits-all" approach seems to prevail. Consequently, extensive research activities are focused on how to better characterize, implement, and achieve resilience through a pragmatic, linear or circular, but unambiguous process. Additionally, there is a quest to identify measurable indices and indicators that can be integrated into this framework. As a result, the emphasis has shifted from how to attain resilience to determining how much resilience is both relevant and acceptable. Therefore, considerable effort is dedicated to establishing methods for measuring a city's resilience capacity, as opposed to its vulnerability. An example can be seen in the normative targets 1.5.X of the Sustainable Development Goal (SDG) No. 11: "Make cities and human settlements inclusive, safe, resilient, and sustainable." These targets aim to address global challenges at the urban human scale and measure progress towards achieving them. Notably, they seek to enhance resilience by reducing community exposure and vulnerability to extreme climate events, as well as other economic, social, and environmental shocks and disasters (UN 2015).

Reports of emergencies affecting cities worldwide demonstrate that, in most cases, the conventional understanding of resilience is nothing more than a utopian ideal to be achieved or, at best, a broad objective that can only be pursued through an uncertain and variable path. The realization of resilience is highly dependent on cultures and the availability of intangible resources at the local scale. It is crucial to recognize that resilience should not be solely associated with the vulnerability of physical infrastructure. It appears that resilience has evolved into an independent concept, albeit one that is related to, and interconnected with, vulnerability (Graveline, Marie-Hélène et al, 2022). In broader socio-ecological systems, the capacity to demonstrate resilience often emerges as a result of

experiencing and learning from crises. Thus, the ability to learn from disasters and adapt accordingly contributes to the actual state of being resilient. This understanding is a valuable lesson that social science has adopted, as it recognizes the courage and resilience of individuals and communities through their willingness to be vulnerable (Brown C. Brené, 2012).

This paper is developed within the context of the reCITY research project, which seeks to establish a socio-technical ecosystem capable of fostering community-oriented resilience. Resilience is not solely viewed as preparedness for response, which refers to the ability to withstand and absorb impacts, or as recovery capacity, which relates to the efficiency and speed of recovering from stressors. Instead, it emphasizes the importance of learning and creativity as integral components of resilience. These elements enable the harnessing of adversity to drive system innovation. In line with this perspective, the paper proposes a paradigm shift from the implementation of mainstream resilience approaches that are primarily focused on specific types of disasters. Instead, it advocates for the reinforcement of resilience without having undergone a earlier shock through the development of transversal and systemic capacities that support the sustainable co-development of territories. The goal is to create a supportive, dematerialized, and flexible backbone for communities. This foundation enables communities to perceive themselves as a unified system capable of reorganizing and adapting to various types of emergencies. In doing so, it aligns more closely the concept of resilience with them.

In the reCity project, this objective has been pursued through the development and dissemination of ICT platforms for communities and administrations. These platforms have a dual purpose: firstly, they enable the creation and operation of horizontal smart communities, fostering truly cooperation and support. Secondly, they facilitate a constant two-way communication between urban governance and citizens, creating an integrated and intelligent service ecosystem in a vertical dimension. As a whole, this framework would provide the city with a nerve system, enabling it to adapt and respond to emerging dynamics and various needs, including environmental and socio-economic emergencies. The dual-level connectivity would establish a flexible network structure capable of integrating different types of resources, tangible and intangible and to support the sustainable development of territories through the identification and sharing of effective local resilience practices. Additionally, this framework supports the long-term development of territories, enabling a more efficient and coherent system preparedness to unforeseen events, allowing for a swifter and coordinated action and a proactive response to potential crises.

More specifically, this contribution reflects on the implications of applying this approach to the city of Taranto, Italy, drawing on the lessons learnt from local community involvement. Taranto is a significant Mediterranean port city characterized by a declining

industrial economy and decades of pervasive social and environmental problems, which have led to high pollution levels and detrimental impacts. This case serves as an emblematic example of chronic stress and long-term structural disorder resulting from unresolved issues and inconclusive decision-making. Taranto represents an atypical disaster situation that is not limited to a specific time frame and is difficult to confine spatially. It is a condition characterized by continuous structural challenges and multiple emergency implications with transversal and multi-scalar effects. This context highlights the importance of resilience, not only in terms of having efficient mechanisms in place to respond to and recover from natural or man-made disruptions, but also in recognizing and supporting bottom-up changes. Taranto's situation demonstrates the need to go beyond traditional approaches and focus on developing means to identify emerging innovative practices and support their growth. It emphasizes the importance of fostering resilience by nurturing and leveraging bottom-up initiatives and empowering communities to drive positive change.

This contribution critically examines the current state of research on urban resilience, drawing on evidence from an emblematic case study. It proposes an integrated framework that reorganizes the multiple components encompassed by the concept of resilience, considering categorical dimensions and the subsequent community processes and actions. This approach provides a more comprehensive and intentional structure for addressing the specific types of problems and emergency situations that cities need to manage, while promoting their evolution.

The paper is structured as follows: after introducing the problem and objectives of the study, the next section provides background on resilience definitions and formalizations. This is followed by a methodological chapter that explores the characteristics of socio ecological resilience in a qualitative ladder pattern and following both system and problem domain, with a process-based description of each step. The discussion section elaborates further on the main innovative potentials of such approaches when applied to tackle critical conditions and the degree of ICT application for this purpose. It also offers reflections on the implications and limitations of the proposed approach for decision-making at different scales. Final remarks draw out overall conclusions.

By following this organizational structure, the paper aims to provide a comprehensive analysis of urban resilience, considering the specific insights from the case study and offering a blueprint into how resilience can be effectively fostered to support communities facing chronic crises.

2. Background

The world today is predominantly urban and if rural to urban migration trend will remain unchallenged driven by inequity in resource distribution, real and perceived job opportunities and investments backing cities, it will continue to grow. Cities due to rapid urbanisation are facing increasing development challenges and problems which can increase disaster risk. Fast urban development drives the concentration of people on high density and poorly planned areas, which are prone to disaster, e.g. the soil sealing increases the risks of flash flooding and give rise to the urban heat island effect (Wamsler, Christine et al. 2019). Indeed, cities are highly vulnerable to many types of shocks and stresses, including natural hazards like storms and earthquakes, but also man-made ones like pollution, terrorist acts or accidents. Unexpected crises have the potential to bring city systems to a stop and reverse years of socio-economic development gains. Therefore, urban government thrive to find ways to address these. Moreover, cities must prove resilience at an increasing pace in order to adapt to the constantly changing demands of the citizens, but the built environment changes very slowly in comparison to the new functions that want to fill it. Therefore, it must be considered that change for resilience's sake must be met without losing historical-architectural and cultural identity (Esposito, Dario et al., 2021). Instead, each city must cultivate its past and exploit its memory and peculiarities as resources, which can boost resilience.

Urban science has benefited from the conceptual development of resilience that is following a debated path to establish and stabilise itself, and this is thanks to the contribution of different scientific fields. At the same time, however, it can offer a significant contribution to the interpretative advancement of the concept in that it is a liquid discipline with dilated and blurred margins that constitutively welcomes contributions from other fields and with constant effort strives to coherently connect them into a web of meanings and practices that are useful in sustaining the sustainability and resilience of the communities. A survey of the main definitions of urban resilience from literature sources and international organisations is given in the Annex.

From these, a word cloud was constructed to visually represent coherences in terms of semantic recurrence, see figure 1.

Figure 1. World cloud of urban resilience definitions

The qualitative analysis conducted reveals a gap in the definitions collected regarding the themes of socio-ecological resilience, with a clear bias towards the engineering perspective. Moreover, it is evident that each definition reflects the specific interests and viewpoints of its proponents. Economists emphasize the economic aspect, sociologists stress the political aspects, and so on. As a result, the term resilience is used ambiguously with different intentions (Brand Fridolin S., et al, 2007).

Furthermore, literature proposes a long list of diverse capacities that need to be developed to achieve resilience. These capacities range from resistance to recovery, absorption to response, repair to adaptation, and learning to transformation (Holling Crawford S., 1973; Walker Brian, et al., 2004; Carpenter Steve, et al., 2001). These, in turn, rely on multiple properties and qualities that the system must implement, including anticipation, robustness, redundancy, resourcefulness, rapidity, stability, change, persistence, flexibility, identity, learning, fluidity, reflexivity, contingency, connectivity, multiplicity, inclusivity, polyvocality, redundancy and diversity (Davoudi S. et al. 2012; Graveline, Marie-Hélène et al, 2022). Issues of social justice, equity, legitimacy, and participatory democracy have also been raised in the quest to prioritize whose resilience is emphasized. This highlights the wisdom that a more equal society requires a greater citizen participation and diverse range of people in civic discourse surrounding resilience

(Leach Melissa 2008).

Urban resilience primarily pertains to the resilience of human-made territories and predominantly urbanized environments (resilience in urban contexts). Therefore, at the operational level, the concept of urban resilience is primarily spatially contextualized. However, this raises questions about the advantages and disadvantages of defining the boundaries of an open system like a city and the need to clarify the dimensions considered in describing it. Initially, a normative simplification addressed the question of the spatial dimension by referring to the administrative boundaries of the relevant areas.

Traditionally, urban resilience was mainly focused on responding to unexpected risks and managing disasters. Indeed, the engineering view of resilience, which is embedded in disaster risk planning, has traditionally focused on short-term post-disaster responses. Thus, aligned with it, these capabilities are typically organized along the temporal dimension.

Consequently, urban resilience is primarily defined in relation to specific time and space frameworks, explaining which properties to activate at different times within these frameworks. This representation suggests what actions to take and when to take them in response to the location and timing of a disaster. Sometimes, the variability of the spatial dimension is also considered by referencing the type and size of the emergency, as well as the affected community and context.

The well-known framework of "prevent, prepare, respond, and recover" follows a linear approach that places emphasis on the temporal order of interventions. However, this rigid and linear categorization of phases starkly contrasts with resilience thinking, which views cities as interconnected open systems with extensive feedback processes. The framework fails to demonstrate the relative variability of proposed actions and identify gaps, and it also fails to acknowledge the interconnections between phases that occur across multiple scales and time frames (Davoudi S. et al. 2013).

In a continuous growth research, the Disaster Risk Management Cycle (DRMC) encompasses this linear process within a recursive Deming-style cycle, where each stage incorporates some capabilities (Bosher Lee et al. 2021). In this formalization, the notion of resilience is rooted in the idea of closing the circle and returning to the initial state. However, it is generally the initial state that gives rise to the causes of these disruptions and their consequences (Adolphe Luc 2022). The view of resilience expecting a system to return to a state of normality is problematic because normality is neither adequate nor desirable since that state is what initially caused the vulnerability (Wagemann Elizabeth, et al. 2019). Indeed, this type of formalization has been criticized by many scholars who agree that for complex socio-technical ecosystems, returning to the normal state after a perturbation is not a solution, as that state constituted the preconditions that allowed the

perturbation to develop and impact the system.

Subsequently, recognizing the need for a more comprehensive approach for operationalizing resilience, an analysis of the temporal development of resilience from short to long term was proposed. The ISO 37101 standard (ISO, 2016), as well as the Smart Mature Resilience project (SMR project, 2019), with their focus on community improvement, suggested the introduction of maturity models for operationalizing resilience.

The Sendai framework, driven by the understanding of systemic risks, i.e. that cascading effects form a single disaster event, e.g. that climate change will lead to more future disasters, further advanced the concept from "bounce back" to "build back better" (UNDRR, 2015). This evolution signifies that resilience is not confined to a specific timeframe but entails an ongoing and continuous process of improvement. Thus, urban resilience to withstand unpredictable catastrophes, now encompasses not only the ability to bounce back but also to bounce forward.

More recent Disaster Risk Management Cycles (DRMCs), such as the one outlined in CEN CWA 17727, have incorporated this perspective through a phase dedicated to reviewing the entire process and the achieved results (CEN, 2022).

However, despite the progress made, these traditional formalizations primarily serve to determine when and where to utilize resilience capabilities, assuming that they are embedded in communities, easily attainable, and clearly implementable. This perspective, however, does not provide sufficient guidance on i) how selecting the appropriate capabilities based on the specific characteristics of the problem being addressed, ii) what processes develop across the different domains of the socio-technical ecosystem that constitute a city, and iii) how capacities and processes involve the various agents in decision-making and action implementation. These crucial aspects, along with their interconnections, are precisely the focus of our investigation. The following chapter proposes an integrated framework addressing these crucial issues and their interconnection, to provide a comprehensive approach to urban resilience.

3. Method

Urban resilience appears to be usually viewed as a functional rather than theoretical concept, i.e. an operational approach that addresses the challenges of sustainability within the city (Adolphe Luc, 2022), while the resilience of urban communities from a socio-ecological perspective is frequently overlooked. Davoudi (Davoudi S. et al., 2012) also identifies this limitation in the resilience concept adopted in the draft London Climate Change Adaptation Plan. The socio-ecological aspects of resilience in the urban context

are sometimes assumed to be inherent, for example, the inherent drive for evolution, while in other cases they are neglected due to their innate complexity in the implementation. There are also instances where these aspects are misunderstood or underestimated due to a lack of clarity. Wilkinson argues that there is a gap between the advocacy of socio-ecological resilience in scientific literature and its practical implementation as a policy discourse. This raises the question of how we would govern for resilience (Wilkinson Catherine, 2012).

There is a lack of understanding attributed to an interpretation of the city that focuses only on spatial, administrative, and morphological aspects, while neglecting other crucial elements such as the environment, economy, society, and information. In simple terms, a city is more than just the sum of its buildings. The challenges related to urban system resilience extend beyond technical responses and touch upon broader societal issues. Viewing the city purely as an artifact or self-referential artificial product only allows for linear operational processes. This leads to an accumulation of increasingly challenging problems. Even if we were to hypothetically perfect the structure and functioning of the urban machine, resulting in a highly optimized city, it would remain stagnant and devoid of novelty (Michael Batty, 2017).

Through studies on the relationship between sustainability and cities, there is a growing recognition of cities as living ecosystems that strive to balance social, economic, and environmental concerns. However, this implies that the urban system, in order to evolve, must be open to risk, disequilibrium, and ambiguity. The balance to be sought can only be dynamic and transformative. This condition presents a paradox to the mainstream conception of resilience as equilibrium. Rather than attempting to resolve this paradox, it is more fruitful to embrace and learn to navigate it, or even support it. In fact, this perspective suggests that only through a conscious interpretative extension does the city become not only a source of problems but also a source of solutions. This reconstitutes the eco-systemic circularity of its functional process, as a fundamental element of the generative evolutionary path of humankind on Earth. Thus, while an urban organism is physically instantiated in a specific place defined by the built environment, addressing resilience requires consideration of other spheres, their dimensions, and their interrelationships.

The resilience thinking recognizes the urban system as a complex socio-technical ecosystem consisting of interdependent ecological, social, and technical components and informing resilience-building processes at the city scale (Folke Carl, et al., 2010). To operationalize this broad understanding, The Resilience Alliance, in an oversimplified manner, divides the urban system into four major subsystems: i) governance networks, ii) metabolic flows, iii) built environment, and iv) social dynamics, which were later elaborated by Meerow into: i) governance networks, ii) networked material ad energy

flows, iii) urban infrastructure and form, iv) socio-economic dynamics (Meerow Sara et al., 2016). This framework allows us to conceptually break down urban resilience as a process that involves different system domains in varying ways and at different times, considering their unique characteristics and interrelations.

The description of the system domains is as follows:

- Infrastructure: This domain encompasses the physical structures, material resources, cognitive agents, and all other constituent elements of the urban system. These elements are described based on their specific properties and characteristics and differences between them. The infrastructure serves as the prerequisites that must be fulfilled for the system to exist. The domain involves the process of categorization and grouping into sets.
- Flows: This domain represents the flow of resources within the urban system, such as energy, economy, water, waste, and more. These flows enable the mechanical-like functioning of the system. The flows serve as possibilities, allowing multiple mechanisms within the system to operate. The domain consists of parallel and overlapping horizontal layers, each traversed by linear input-output flows. The domain is formed through the additive overlay of functional layers.
- Networks: This domain comprises the data networks that provide information for decision-making processes, including governance dynamics and formalized knowledge creation. It includes three-dimensional networks that traverse the system and establish external connections through predefined main paths. The networks play a power role in activating and focusing the system's energies. The domain is generated through the formation of networks across different scales.
- Community: This domain encompasses the tangible and intangible qualities that bind the community together, such as social connections, cohesion, learning, and the cognitive abilities of individuals and groups. It also includes creativity that supports innovation and/or survival, through phenomena like exaptation.

The community domain has two forms: either as individual independent particles or as a single system dynamically moving as a coherent wave along a path of successive and increasingly frequent bifurcations. It serves as the potentiality for the system, offering prospects for overcoming crises and fulfilling desires for change. Thus, it is dual and circular, changing its shape depending on the perspective from which it is observed, as Max Planck famously wrote, "If from the outside the world appears to be bound by a causal relationship, from an internal, subjective point of view, the will appears free" (Planck, Max, et al., 2022).

On a temporal scale, the nature of the urban system as a complex system operating in a

state of non-equilibrium along a single oriented temporal direction suggests that a return to the pre-disturbance state is effectively impossible. Resilience is understood as a combination of persistence, transition, and transformation (Chelleri Lorenzo, 2011). It encompasses the complementary capacities of bouncing back, building back better, and bouncing forward (Graveline, Marie-Hélène et al, 2022). Therefore, when an urban system undergoes a disturbance or upheaval, it transforms into something different, which should not be seen as a failure in terms of resilience but as an inherent possibility within the system (Reghezza-Zitt Magali et al., 2021). Thus, resilience is not an achievable target but a quality of change that fosters the evolution of the system, and that can never be definitively achieved. This implies that the concept of normality itself, even without disruptive events, is already a condition that should be improved through the pursuit of resilience.

This understanding demonstrates why it is not possible to identify an optimization point for the various properties through which resilience could be realized. It is not feasible to determine specific percentages for qualities such as redundancy, flexibility, connectivity, and resistance, or any combination thereof, as a measure of a resilient urban system. The development of such a resilience perspective is qualitatively different from the search for optimal efficiency. The schematic figure 2, adapted from Linkov, visually illustrates this distinction (Linkov Igor, 2018).

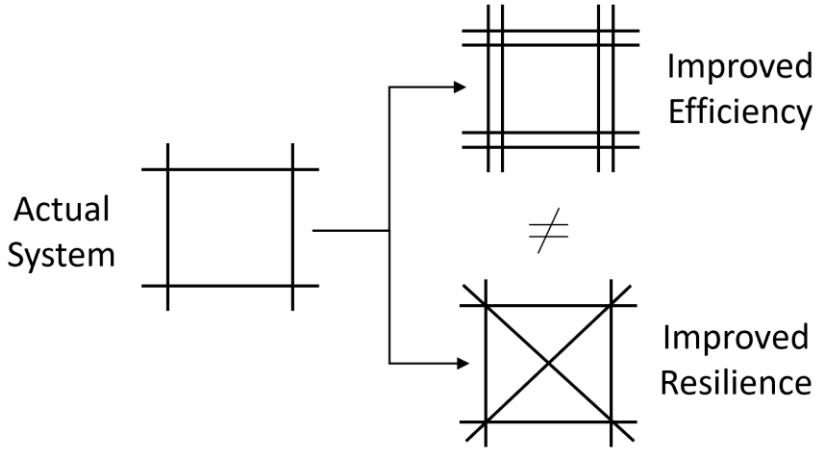


Figure 2. Representation of the difference in improving the efficiency or resilience of systems

Nevertheless, to define a progression toward resilience, it would be ideal to have a unit of measurement. One approach could be to identify several dimensions corresponding to the multiple qualities associated with resilience, drawing a single multidimensional

representation. However, this representation would not result in a continuous, or complete form because progress towards resilience does not follow a constant grow, along a consistent and measurable surface. Instead, resilience crosses thresholds of discontinuity, which act as transitional steps between different states of dynamic equilibrium in the system. At each step, a new quality emerges in the system, similar to climbing the steps of a ladder. This new quality is not simply equal to a greater quantity of the previous one but rather a new emergent quality that follows the previous one in a coherent process.

The reason why the system follows a step-by-step path, here represented as ladder steps, rather than alternative or parallel branching paths from the status quo, is related to the knowledge progression that can be formalized between the domains of the problems being addressed and which apply the adjacent possible principle, which explains how organization propagates from diversity in biosphere (Stuart A. Kauffman, 1991). At an intuitive level, we can represent this progression as a gradual learning process that follows several steps. For an exemplification, the first two are visualized in the figure 3: the first step involves a simpler replication requiring analogical duplication through parallel and specular series, and the second step involves a transformation requiring a second-degree modification through rotation in the plane, thus also necessitating a change in perspective.

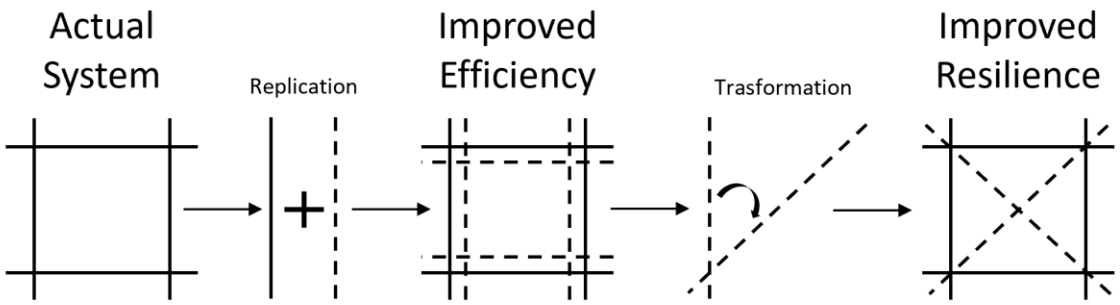


Figure 3. Representation of the incremental improvement process from efficiency to resilience in systems

Indeed, ecosystems can become increasingly complex, i.e. evolve, through the systemic increase in the quantity and diversity of interactions among their constituent elements, giving rise to emergent properties that are qualitatively new (Lobo Ingrid, 2008). This wonder resembles fractal formation, which nature is replete with, enabling complex systems to develop new qualities out of quantity growth, which can be followed by selection. The ladder image depicting the evolution along a scale towards urban system resilience, as shown in figure 4, formalizes this evolutionary path through successive bifurcations, having evolution on the y-axis and time on the x-axis. It also reflects the

schematic representation of evolution through successive levels of organization in living systems and innovation in business systems (Bettencourt M. A. Luís, et al., 2007; Novikoff, Alex B. 1945; Webster Ken, 2013), as well as the shift in scientific paradigm (Kuhn, Thomas S., 1962).

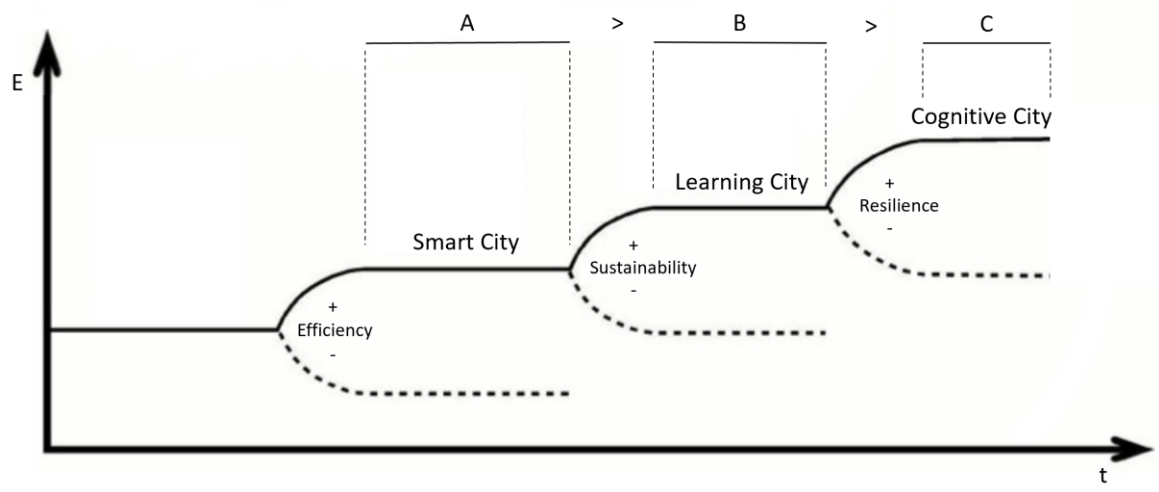


Figure 4. Qualitative ladder model of system evolution toward resilience

Within this framework, which views the man-made environment as a complex socio-technical ecosystem, our interest lies in understanding how capabilities can be selected and applied according to the type of situation (which cannot be known in advance) that requires the system to employ resilience. Therefore, we present a typological analysis of the situation as it is based on the degree of simplicity, inversely related to its complexity. This conceptual framework echoes the four-part structure of the Cynefin framework for decision making proposed by Snowden (Snowden, David J., 2007).

The integrated matrix presented below in table 1, illustrates the order in which different domains of the system are activated depending on the type of situation requiring some form of resilience. This matrix aims to explicitly outline how capabilities are developed and activated, which actions follows decisions, and who and how to involve based on the type of problem being faced. By following this matrix, urban resilience processes can be better understood, as well as determining the power of communities according to Arnstein's scale (Arnstein, Sherry R. 1969), the type of practice experts are called upon to implement following the series proposed by De Roo (de Roo Gert, 2015), and the nature of the system in accordance with the definitions provided by Weaver (Weaver, Warren, 1948).

Table 1. Integrated Urban Resilience Framework

System domains →				Infrastructures	Flows	Networks	Community
↓ Problem domains							
Simple Causality	Techno-rational	Non participation	Simple	2	3	1	-
Organized complexity			Complicated	3	2	1	-
	Communicative	Degrees of tokenism	Complex	2	1	3	4
Disordered Complexity	Adaptive sel-organizing	Degrees of citizen power	Chaotic	2	3	4	1
Weaver	*De Roo*	*Arnstein*	*Snowden*				

The figures 5 and 6 illustrate a formal schematic representation of the creation and combination of each domain within the urban system. They depict how these domains interact and function as interdependent multiplex networks. The ultimate outcome is the emergence of a complex sociotechnical eco-system, which is a multilevel and nested complex system that proceeds within the evolutionary framework previously described.

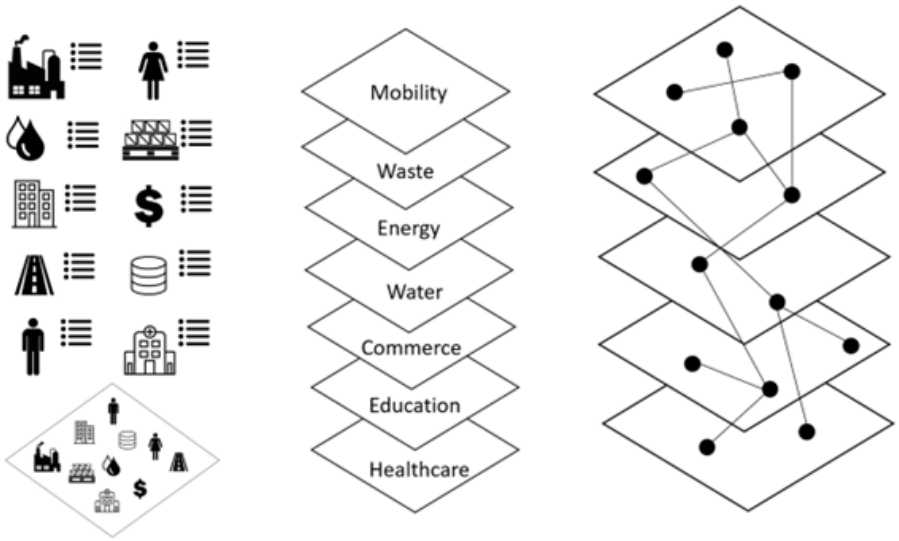


Figure 5. Domain formation for: i) Categorization, Description, Grouping; ii) Additive Overlay; iii) Inter-scalar Networking.

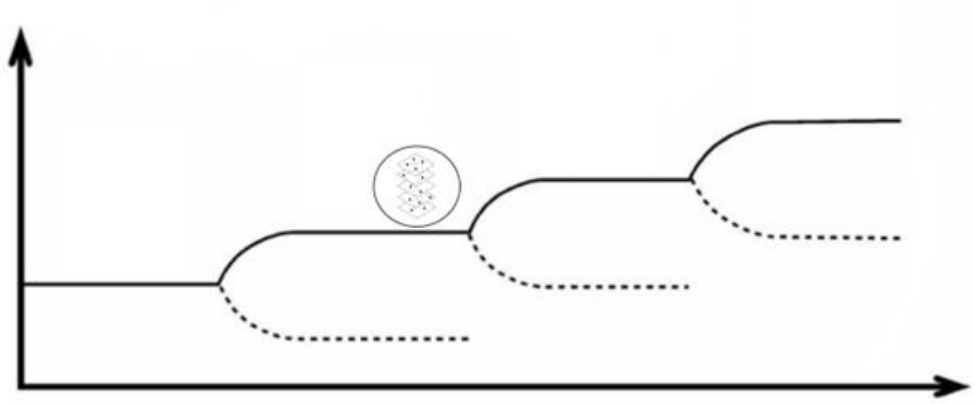


Figure 6. Representation of the evolutionary resilience of a complex sociotechnical eco-system

According to the four-part typological structure, below is described how problems are addressed using a sequential activation process of the system domains, following the order of steps proposed in the matrix. It is also discussed the implications for the agents involved.

- Simple: In this scenario, the community adheres to a predetermined hierarchical structure, and they are mostly passive participants. Decision-making is centralized, as is the form of the network representing the system. The necessary resources have been

allocated in advance and are readily available. The activation process involves following a codified procedure in a repetitive manner or replicating a proven best practice.

- Complicated: The decision-making process involves initiating an analysis phase where the actively involved community consists of experts who study the best approach to solve a specific case. The network structure remains hierarchical but decentralized, with multiple parallel verticals in various fields of interest stemming from a central decision-making body. The necessary resources are mobilized to identify and implement good practices that can be continuously improved through the analysis of results and iterative approximations, toward a knowable optimal.
- Complex: In situations characterized by uncertainty and ambiguity, often referred to as "wicked" problems, one or more parallel trial-and-error and safe to fail experimental processes are considered. The necessary resources are estimated and allocated to initiate these processes. Decisions are made regarding which processes to nurture and which to dampen, and learning from mistakes is emphasized. The process involves analyzing and internalizing the practices that emerge, incorporating useful insights, and embracing serendipitous discoveries. Communities are formed around the shared purpose of addressing the situation, creating distributed networks that are guided by the coherence of the situation acting as an attractor.
- Chaotic: In chaotic situations, the community takes immediate action to address an emergent situation, such as the need for innovation or overcoming crises. Planned coordination between agents usually lack and if arises is a unpredictable or random result. Available resources are utilized for survival or repurposed to drive change, for example like exaptation in biology, by which a causal consequence of a part of an organism that might turn out to be useful in some environment and therefore be selected. The decision-making process is new, and the decision is focused on avoiding catastrophic consequences, or it may simply acknowledge the new state of equilibrium that the system autonomously achieves. The collective effort binds the community into a recognizable and holistic systemic entity, yet each agent feels individually free. From an external perspective, the system can be observed both as a cohesive wave and as a collection of different particles.

In the evolution of human civilization, both in terms of tangible development and epistemological understanding, there is a shifting significance of the system domains along the horizontal and vertical directions. Horizontally, the weight of the domains moves progressively towards potentialities, from the preconditions that form the foundation of the system. Vertically, the shift occurs downwards, starting with processes driven by predetermined ends in the case of simple and complicated problems, through a shift to

processes driven by underlying causes for complex problems, and finally, to processes driven by means, where for chaotic problems the means themselves become the ends due to compelling circumstances, and opportunistically serve as cause to act.

The recognition of the complexity of the urban system and the realization that prediction is impossible has prompted a shift in spatial planning approaches. In the latter half of the previous century, there was a backtracking on planning methods that relied heavily on standards, performance measures, and predetermined outcomes. Instead, there has been a growing emphasis on process-oriented planning and the use of tools to navigate and respond to the dynamic nature of urban systems (Wildavsky, Aaron, 1973). This shift acknowledges the need for adaptive and flexible planning approaches that can better accommodate the inherent complexity and uncertainties of urban development.

As communities navigate the complexities of urban systems, they find themselves in a dynamic equilibrium state between order and disorder, striving for a delicate equilibrium at the edge of chaos (Normandin, Julie-Maude, et al 2016). In this context, communities must adapt to a paradigm shift where multiple and fast innovations become an integral part of the process, rather than an afterthought. However, traditional institutions that were designed to manage simple and complicated problems struggle to effectively address the complexities and chaos of contemporary reality. They lack the necessary tools to navigate this new terrain. This growing discrepancy between how the system is structured and how reality functions exacerbates the challenges at hand. While new forms of governance, capable of embracing this evolving framework, have yet to fully emerge, existing institutions still hold formal power. They are tasked with endorsing and internalizing all forms of change, including those that spontaneously emerge from the grassroots level. However, without proper reception and support, these grassroots initiatives run the risk of fading away, even if they hold potential for the system's evolution.

In summary, the current gap between the functioning of reality and the institutional structure highlights the need for new forms of governance and decision-making processes that can effectively respond to the complexities of unexpected situations and chaotic facets of the urban system. In order to foster a flexible and agile urban management system that transcends traditional managerialism and embraces a community-based approach, it is crucial to delve into the necessary insights. By understanding these insights, governance can adapt and redefine its means and scopes, aligning with the ladder pattern proposed for achieving resilience starting from community-level. This shift enables governance to effectively address unsustainable situations and support communities when faced with conflicting choices.

4. Discussion

In biological systems, species evolve in response to changes in the external environment. For example, the ongoing natural selection of bacteria enables them to develop resistance to antibiotics. In social systems, individuals have the capacity to communicate, imagine, invent, and strategically act in anticipation of future situations. System components and agents possess the ability to learn and generate new knowledge, thereby influencing the behaviour of the system through their interventions.

Complex and chaotic situations give rise to emergent solutions, prompting significant efforts to understand and harness the process of innovation in place. There is a quest for that elusive "magic formula" composed of numerous qualities also those mentioned to define resilience. It is through this resilience that individuals, groups, and humanity as a whole have historically managed to succeed, even in the most challenging and desperate circumstances. The state of confusion, the questioning of established ideas and perspectives, and the need to solve overwhelming problems serve as the driving forces behind creative inspiration.

The ultimate aspiration is to transition from foresight to anticipation, systematically guiding the system in the desired direction that resonates at a profound level as if it were already present, but unknown. This perspective offers a positive reinterpretation of the human inclination for control, with the expectation of greater awareness regarding the limitations of prediction and effective emergency management. By recalibrating the concept of management from government to governance, there is a growing understanding of the necessity to collaborate closely with communities in order to establish the preconditions for spontaneous emergence of what is sought.

Based on the framework presented in the previous chapter, this section proposes guidelines for accompanying communities and their contexts in developing resilience from within, particularly in complex or chaotic problematic conditions. To facilitate this, a progressive breakdown is identified, comprising three interdependent levels, each building upon the other, for as many scenarios.

It is essential to clarify from the outset that this community-centered perspective should not be misconstrued as an excuse to absolve governments of their responsibilities. Instead, it calls for a renewed role of institutions that can actively support communities throughout this progression, providing less constraining assistance. By doing so, administrations can ensure that communities are not burdened with the sole responsibility of building inherent and self-sustaining resilience, along with the associated risks and consequences (White Iain et al., 2014; Beilin Ruth et al. 2015; Evans Brad et al., 2014).

In the baseline scenario, the priority to involve and to empower community members in the planning and decision-making processes. This includes engaging residents, local businesses, and other stakeholders in the development of strategies and policies, ensuring

that their needs and priorities are considered. Additionally, several complementary aspects are encompassed within this scenario, ranging from intangible to tangible measures. Some examples include:

- Developing social networks and enhancing community cohesion, as stronger social connections and a sense of community can foster mutual support during emergencies.
- Improving access to information and resources, ensuring that people have access to accurate and timely information, as well as essential resources like food and emergency shelter, enabling effective responses to unforeseen disasters.
- Promoting and encouraging sustainable practices, such as recycling, reducing energy consumption, and preserving green spaces, to ensure resource availability for future generations.
- Cultivating a culture of preparedness through education and awareness campaigns, equipping residents with the knowledge and skills to better prepare for emergencies and mitigate their impact.
- Building diverse and redundant urban systems, including multiple transportation options, diverse energy and water sources, and a variety of housing types.

By implementing these adaptive and reformist measures, communities can foster resilience by empowering their members, promoting cooperation, and developing sustainable practices. It is crucial for governments and institutions to actively support and collaborate with communities in these efforts, recognizing the shared responsibility and the benefits of a collective approach to resilience building.

However, resilience is not solely determined by vulnerability, where an increase in one necessitates a decrease in the other. It requires careful attention to contextual analysis and the elicitation of local knowledge regarding both the intricacies of the problem and the resources available within the local context to address it. This becomes even more critical in circumstances giving rise to dilemmas, such as the case of Taranto, where the roots of the disaster lie within the structure and functioning mechanisms of the system itself. Hence, it is hard to identify and address structural dysfunctions without jeopardizing the system's survival, as doing so may lead to unintended consequences more challenging than the original problem, e.g. social unrest. Moreover, constructing alternative strategies that are acceptable to all system agents without undermining established organizational structures, often fortified by long-standing personal interests, proves to be equally arduous.

Resilience-building needs to adopt an approach that surpasses the baseline scenario. This enhanced approach can be seen as an upgrade specifically tailored for a system grappling

with conflicting choices, it becomes evident that a comprehensive and adaptable resilience approach is vital. This involves considering a range of potential risks and opportunities while striking a balance between competing priorities like economic development and environmental protection. Active involvement of diverse stakeholders in the planning and decision-making process becomes crucial (Borri, Dino et al., 2015).

In this critical scenario, cities should embrace a participatory approach to foster collaboration and dialogue among stakeholders, enabling the evaluation of alternative solutions that balance competing priorities. Additionally, efforts should be made to align regulations and contextual constraints with the overarching goal of urban resilience. This may entail revising or reinterpreting regulations or devising new ways to incentivize behaviour that enhances resilience. It is important to recognize that urban resilience in such variable conditions is a dynamic and continuous process. Cities must continuously adapt and evolve in response to changing circumstances and priorities, rendering the mere application of best practices or guidelines insufficient. Internal monitoring systems should be established to track progress and evaluate the effectiveness of regulations and policies over time. This enables the identification of decisions which contribute to resilience and those that require further modifications or changes.

In this context, several useful measures can be implemented:

- Identifying the root causes of the problem, e.g. understanding the underlying factors that contribute to the conflict situation, and developing effective solutions to alleviate it.
- Establishing close collaboration with stakeholders by engaging a diverse group, including community members, administrative officials, and business leaders. This not only aids in identifying potential solutions but also builds strong support for change.
- Emphasizing the development of multiple complementary and flexible solutions that can adapt to changing circumstances and contexts, rather than pursuing a singular approach.
- Exploring alternative bottom-up approaches, such as self-governance, community-based solutions, or legal challenges to regulations that perpetuate the deadlock.
- Establishing a coalition of community members, organizations, and leaders to generate political will for change, which is pivotal in overcoming conflictual situations.

It is important to note that implementing inclusive decision-making processes does not guarantee the achievement of resilience. However, they can be instrumental in identifying new areas of opportunity and catalysing momentum for change, which are prerequisites for resilience.

In this incremental journey towards resilience of complex urban environments

Information and Communication Technologies (ICTs) can play a crucial role, offering the advantage of continuous service. Indeed, all the aforementioned aspects can benefit from technological innovations that extend and enhance the capacities of individuals and communities (Esposito Dario, 2021). New technologies and ICT platforms, coupled with data analytics, can help identify patterns and trends, providing valuable insights for decision-making and suggesting opportunities for change Esposito Dario, et al., 2020). However, in the context of supporting urban, social, and environmental resilience, the technological component should address three fundamental aspects:

- Improving awareness of the role of individuals in relation to their communities and vice versa, fostering collaboration and information sharing.
- Assisting communities in identifying and achieving sustainable social and environmental balances.
- Influencing and accompanying behavioral change, particularly in response to risk factors and unpredictable events such as disasters.

Aligned with these overarching objectives, the reCITY project has been actively involved in the co-design and impact assessment of technological tools following these principles:

- WHY: Designed and created to empower city users, providing training, information, and activation opportunities.
- WHO: Targeted at all stakeholders involved in territorial governance to support resilient political-administrative decision-making.
- WHAT: Aimed at identifying and enabling everyday resilience practices within communities, enhancing existing practices, and amplifying and spreading them vertically and horizontally throughout the territory in an open innovation perspective.
- HOW: Achieved through the development and dissemination of ICT tools that are:
  - Sentient: Capable of capturing, processing, and responding to data in a customized manner.
  - Customizable, updatable, and reusable: Allowing for adaptability and scalability.
  - Citizen-centric: Focused on providing accessible and user-friendly interfaces and services to individuals.
  - Equipped with ubiquitous sensory networks: Creating an 'intelligence' layer for physical infrastructure and communication systems, forming an urban nervous system.

By adopting this approach, ICTs can support the resilience-building process, facilitating knowledge sharing, enhancing decision-making capabilities, and fostering a more proactive and responsive approach to urban challenges and conflicts.

Notwithstanding these two steps, the analysis conducted at the operational level of various case studies, including the one under consideration, reveals that this complex and interconnected picture often becomes fuzzy and instable. Consequently, chronic crises and structural disorders emerge, surpassing the scope of the measures proposed in the initial two levels of approach. In such cases, the pursuit of resilience becomes intertwined with the need to develop capacities for addressing paradoxes, hidden levers, and lock-in mechanisms that subtly or invisibly undermine the efforts of urban communities in enhancing territorial resilience. These challenges may prevent the results of their efforts from materializing, leaving populations trapped in a state of limbo with no viable, tangible, or feasible way forward.

Indeed, for communities grappling with the impossibility of contradictory choices, it is insufficient to independently implement an adaptive and flexible reformist approach aimed at improving community organization, or to favour informed and risk-aware democratic processes of decision-making and action to resolve conflicts arising from opposing interests. This is due to the near impossibility for communities to navigate the complex and sometimes contradictory information, norms, and contextual constraints that characterize these paradoxical no-win situations, regardless of the decisions made. Moreover, different choices often do not represent mutually exclusive possibilities but instead create a false sense of choice that merely binds the system to a predetermined outcome, lacking transformative potential. It is a scenario in which the involved agents seem to be playing a strange game, where the only winning move is not to play.

In such obstructive situations, promoting resilience requires agents to develop a profound awareness of the current structural crisis condition. Once the acceptance of the impossibility of contradictory adaptation is acknowledged, it becomes necessary to foster a paradigm shift in how agents perceive themselves as propositional and decision-making agents (Esposito Dario et al., 2020). This involves reflecting on their own circumstances, constraints, and dilemmas, reinterpreting available resources, and discovering and harnessing energies to creatively generate opportunities and entirely new alternatives. Consequently, the reform efforts employed for managing complex systems must give way to a more revolutionary approach that embraces chaos generativity. A coherent and purposeful effort is required to construct an alternative escape route in a creative manner, enabling the breaking free from the opposing logical demands of the existing double constraint and the tertium non datur limit. To quote Scott Fitzgerald, "Intelligence is given when in the mind there are two contradictory thoughts. One proof of it is that mankind knows that it is lost, and although it does everything it can to save itself”. To address this type of disorder, planners should move away from attempting to control and predict the future of cities through traditional plans and models. Instead, they should aim to invent or design it in direct collaboration with communities (Ackoff Russell, 1994). The co-

generation of innovation entails working with communities to create the necessary and sufficient conditions that allow for the emergence of a desirable future from the bottom-up, thereby provoking a required shift in the system.

Therefore, the previously identified measures, presented in a clear and didactic manner, must be complemented by processes that enhance local knowledge and social creativity. These processes should be supported by external experts who are not directly involved in or affected by the current crisis but possess the ability to recognize and unleash resilience resources if they are enabled and trained to do so.

At an early stage of the process, these experts can gain an understanding of the complexity of the situation to dispel contrived confusion. They can then engage in discussions with communities, e.g. share the results of preliminary desktop analyses. By capitalizing on social diversity, which is seen as a repository of diverse knowledge rather than a source of fragmentation and conflict, these experts can involve individuals with diverse skills and widespread capacities in the collaborative generation of alternative solutions.

One opportunity for generating new ideas is through the use of urban lab and other forms of open innovation (Scozzi Barbara, et al., 2017). Cities can also leverage online platforms, hackathons, and other methods to engage as many stakeholders, businesses, and other participants as possible in the development of new solutions. Additionally, cities can promote innovation through methodologies such as design thinking, which encourages human-centred design to generate customized perspectives. By involving residents and other stakeholders in the creative design process, cities can create opportunities to shape the development of their communities in ways that not only meet their needs and priorities but also uphold principles and values of sustainability and resilience. This perspective also emphasizes the importance of believing in and investing in education and training programs that equip residents and community organizations with the necessary skills and methodological knowledge to actively contribute to the development of their communities.

Finally, in order to pursue urban resilience through the co-generation of innovation to envision an escape route from the double constraint posed by opposing logical demands, the creative design of social and community organizations themselves, and their concrete implementation, should not be overlooked. By promoting new forms of organization and collaboration, cities can create opportunities for stakeholders to come together and discover new, more effective ways and solutions that address multiple challenges simultaneously. One example of this is the emergence of community-based organizations such as community land trusts, cooperatives, and social enterprises. These organizations can empower residents to take ownership of their neighbourhoods and foster more resilient communities that can develop local solutions to diverse issues, including

affordable housing, economic development, and environmental protection.

It is important to emphasize that the three stages discussed — adaptive and reformist strategies, inclusive decision-making processes, and co-generation of innovation — are interdependent. They must be built upon one another to enable communities to ascend the ladder of city resilience.

5. Conclusion

In conclusion, the concept of resilience has gained significant importance in the urban context due to its alignment with the complex socio-technical ecosystem inherent to cities. This article has explored the multifaceted nature of urban resilience and the challenges faced by communities in fostering resilience in the face of chronic crises and structural disorders. We have highlighted the need for a comprehensive approach that combines adaptive and reformist strategies with informed and inclusive decision-making processes.

Throughout the discussion, it became evident that urban resilience goes beyond mere adaptation and requires the development of capacities to navigate paradoxes, hidden levers, and lock-in mechanisms. Communities must reflect on their own conditions, constraints, and dilemmas, and creatively generate opportunities and entirely new alternatives. This calls for a shift from traditional planning and control to a more revolutionary approach that embraces chaos generativity.

Moreover, planners and experts must work collaboratively with communities to co-create the necessary conditions for a desirable future. Enhancing local knowledge, social creativity, and diversity is crucial in dispelling confusion and generating innovative ideas. Open innovation methodologies, such as crowdsourcing and design thinking, can empower stakeholders and residents to shape their communities and foster sustainability and resilience.

The creative design of social and community organizations should not be overlooked, as they play a vital role in addressing multiple challenges simultaneously. By promoting new forms of organization and collaboration, cities can create resilient communities that take ownership of their neighbourhoods and develop local solutions.

In summary, the endless journey towards urban resilience is complex and requires a holistic and participatory approach. By embracing the principles of resilience and working together, communities and stakeholders can navigate the intricate web of challenges and create cities that are capable of adapting, transforming, and thriving in the face of uncertainty.

Acknowledgements. This research was financially supported by Italian National Operational Programme for "Research and Innovation" 2014-2020; Area: Smart Secure and Inclusive Communities, Project: "Resilient City- Everyday Revolution (ARS01_00592)

Annex - Definitions of urban resilience

2007, Resilience Alliance: Urban resilience is the ability of a city or urban system to absorb disturbance while retaining identity, structure, and key processes (Meerow Sara et al., 2016)
2009, United Nations Office for Disaster Risk Reduction: The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management (UNDRR, 2015)
2014, 100 Resilient Cities by the Rockefeller Foundation: Urban Resilience is the capacity of individuals, communities, institutions, businesses and systems within a city to survive, adapt and thrive no matter what kinds of chronic stresses or acute shocks they encounter. (Rockefeller Foundation, 2015)
2014, Intergovernmental Panel on Climate Change (IPCC): "The capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure while also maintaining the capacity for adaptation, learning and transformation" (IPCC, 2014).
2016, URBACT: Urban resilience is the capacity of urban systems, communities, individuals, organizations, and businesses to recover or maintain their function and thrive in the aftermath of a shock or a stress, regardless its impact, frequency, or magnitude (Poli Irene, et al., 2022)
2016, Urban resilience refers to the ability of an urban system and all its constituent socio-ecological and socio-technical networks across temporal and spatial scales to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity (Meerow Sara et al., 2016).
2017, European Commission's Joint Research Centre (JRC): resilient system (or society) as being able to face shocks and persistent structural changes in such a way that it keeps on delivering societal well-being without compromising that of future generations. This approach focuses on individual and societal well-being and emphasises the role of social capital. It can therefore be adapted to complex 'human' systems, such as cities (Manca Rita

A. et al., 2017).
2019 Local Governments for Sustainability ICLEI: A resilient city is prepared to absorb and recover from any shock or stress while maintaining its essential functions, structures, and identity as well as adapting and thriving in the face of continual change. Building resilience requires identifying and assessing hazard risks, reducing vulnerability and exposure, and lastly, increasing resistance, adaptive capacity, and emergency preparedness (Bizzotto Matteo, et al., 2019).
2019, The capacity of urban citizens, settlements and nation-states to respond to different forms and levels of stressors and shocks (Michael Burayidi et al. 2019)
2019, Resilience is the ability of cities, communities, and households to adapt to changing conditions and to withstand shocks and chronic stress while maintaining essential functions (World Bank, 2019)
2020, ISO /TR 22370: Urban resilience is the ability of any urban system, with its inhabitants, in a changing environment, to anticipate, prepare, respond and absorb shocks, positively adapt and transform in the face of stresses and challenges, while facilitating inclusive sustainable development (ISO 2020).
2021, Urban Resilience refers to a multidimensional dynamic process among stakeholders aiming to prepare and adapt the urban environment to absorb and recover from external and internal disturbance and reduce urban vulnerabilities (Kapucu Naim, 2021)
13. 2022 UN HABITAT: Urban resilience is the measurable ability of any urban system, with its inhabitants, to maintain continuity through all shocks and stresses, while positively adapting and transforming toward sustainability (UN HABITAT 2022)
14. 2022 Resilience is the capacity of urban systems to first adapt and then overcome various disruptions. Thus, it is considered as the possibility that the complex urban system contains, on the one hand, the ability to absorb a disruption but, on the other hand, able to recover its former functionalities as quickly as possible (Adolphe Luc 2022).
15. OECD*:* Resilient cities are cities that have the ability to absorb, recover and prepare for future shocks (economic, environmental, social & institutional). Resilient cities promote sustainable development, well-being and inclusive growth (OECD, 2023).

References

Adolphe, L. ed., 2022. *Integrated Urban Environment Management and Resilience: From the Contemporary City to Sustainable Urbanity*. John Wiley & Sons.

Ackoff, R.L., 1994. Systems thinking and thinking systems. *System Dynamics Review*, *10*(2-3), pp.175-188

Batty, M., 2017. Cities in disequilibrium. *Non-Equilibrium social science and policy: introduction and essays on new and changing paradigms in socio-economic thinking*, pp.81-96.

Beilin, R. and Wilkinson, C., 2015. Introduction: Governing for urban resilience. *Urban Studies*, *52*(7), pp.1205-1217.

Bettencourt, L.M., Lobo, J., Helbing, D., Kühnert, C. and West, G.B., 2007. Growth, innovation, scaling, and the pace of life in cities. *Proceedings of the national academy of sciences*, *104*(17), pp.7301-7306.

Bizzotto, M., Huseynova, A., & Estrada, V. V. (2019). Resilient Cities, Thriving Cities: The Evolution of Urban Resilience. Available from: *https://e-lib.iclei.org/publications/Resilient-Cities-Thriving-Cities_The-Evolution-of-Urban-Resilience.pdf*

Borri, D., Camarda, D., Pluchinotta, I. and Esposito, D., 2015. Supporting environmental planning: knowledge management through fuzzy cognitive mapping. In *Cooperative Design, Visualization, and Engineering: 12th International Conference, CDVE 2015, Mallorca, Spain, September 20-23, 2015. Proceedings 12* (pp. 228-235). Springer International Publishing.

Bosher, L., Chmutina, K. and van Niekerk, D., 2021. Stop going around in circles: towards a reconceptualisation of disaster risk management phases. *Disaster Prevention and Management: An International Journal*, *30*(4/5), pp.525-537.

Brand, F.S. and Jax, K., 2007. Focusing the meaning (s) of resilience: resilience as a descriptive concept and a boundary object. *Ecology and society*, *12*(1).

Brown, C.B. and LMSW, B., 2012. The power of vulnerability.

Graveline, M.H. and Germain, D., 2022. Disaster Risk Resilience: Conceptual Evolution, Key Issues, and Opportunities. *International Journal of Disaster Risk Science*, *13*(3), pp.330-341.

Burayidi, M.A., Allen, A., Twigg, J. and Wamsler, C. eds., 2019. *The Routledge handbook of urban resilience*. Routledge.

Carpenter, S., Walker, B., Anderies, J.M. and Abel, N., 2001. From metaphor to measurement: resilience of what to what?. *Ecosystems*, *4*, pp.765-781.

Chelleri, L., 2012. From the «Resilient City» to Urban Resilience. A review essay on understanding and integrating the resilience perspective for urban systems. *Documents d'anàlisi geogràfica*, *58*(2), pp.287-306.

CEN CWA 17727: 2022 City Resilience Development - Guide to combine disaster risk management and climate change adaptation – Historic areas. Available from: https://www.cencenelec.eu/media/CEN-CENELEC/CWAs/RI/cwa17727_2022.pdf

Davoudi, S., Shaw, K., Haider, L.J., Quinlan, A.E., Peterson, G.D., Wilkinson, C., Fünfgeld, H., McEvoy, D., Porter, L. and Davoudi, S., 2012. Resilience: a bridging concept or a dead end?"Reframing" resilience: challenges for planning theory and practice interacting traps: resilience assessment of a pasture management system in Northern Afghanistan urban resilience: what does it mean in planning practice? Resilience as a useful concept for climate change adaptation? The politics of resilience for planning: a cautionary note: edited by Simin Davoudi and Libby Porter. *Planning theory & practice*, *13*(2), pp.299-333.

Davoudi, S., Brooks, E. and Mehmood, A., 2013. Evolutionary resilience and strategies for climate adaptation. *Planning Practice & Research*, *28*(3), pp.307-322.

de Roo, G., 2015. Going for Plan B–conditioning adaptive planning: about urban planning and institutional design in a non-linear, complex world. In *Handbook on complexity and public policy* (pp. 349-368). Edward Elgar Publishing.

Esposito, D., Cantatore, E. and Sonnessa, A., 2021, May. A multi risk analysis for the planning, management and retrofit of cultural heritage in historic urban districts. In *Innovation in Urban and Regional Planning: Proceedings of the 11th INPUT Conference-Volume 1* (pp. 571-580). Cham: Springer International Publishing.

Esposito, D., Milano, G., Redavid, R., 2021. Dalla Smart City alla Cognitive City: le tecnologie digitali e ambientali per la prosperità inclusiva delle comunità resilienti. In Atti della XXIII Conferenza Nazionale SIU - Società Italiana degli Urbanisti_Innovazione Tecnologica Per La Riorganizzazione Spaziale. Planum Publisher

Esposito, D., Schaumann, D., Camarda, D. and Kalay, Y.E., 2020. Decision support systems based on multi-agent simulation for spatial design and management of a built environment: the case study of hospitals. In *Computational Science and Its Applications–ICCSA 2020: 20th International Conference, Cagliari, Italy, July 1–4, 2020, Proceedings, Part III 20* (pp. 340-351). Springer International Publishing.

Esposito, D., Abbattista, I. and Camarda, D., 2020. A conceptual framework for agent-based modeling of human behavior in spatial design. In *Agents and Multi-Agent Systems: Technologies and Applications 2020: 14th KES International Conference, KES-AMSTA 2020, June 2020 Proceedings* (pp. 187-198). Springer Singapore.

Evans, B. and Reid, J., 2014. *Resilient life: The art of living dangerously*. John Wiley & Sons.

Folke, C., Carpenter, S.R., Walker, B., Scheffer, M., Chapin, T. and Rockström, J., 2010. Resilience thinking: integrating resilience, adaptability and transformability. *Ecology and society*, *15*(4).

Holling, C.S., 1973. Resilience and stability of ecological systems. *Annual review of ecology and systematics*, *4*(1), pp.1-23.

Independent Evaluation Group, 2019. *Building Urban Resilience: An Evaluation of the World*

Bank Group's Evolving Experience (2007-2017). World Bank.

IPCC (Intergovernmental Panel on Climate Change). 2014. Annex II: Glossary. In Climate change 2014: Impacts, adaptation, and vulnerability. Part B: Regional aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, ed. V.R. Barros, C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, et al., 1757–1776. Cambridge and New York: Cambridge University Press.

ISO/TR 22370:2020 Security and resilience — Urban resilience — Framework and principles. Available from: https://www.iso.org/standard/50273.html

ISO 37101:2016 Sustainable development in communities — Management system for sustainable development — Requirements with guidance for use. Available from: https://www.iso.org/standard/61885.html

Kapucu, N., Martín, Y. and Williamson, Z., 2021. Urban resilience for building a sustainable and safe environment. *Urban Governance*, *1*(1), pp.10-16.

Kauffman, S.A., 1990, January. The Sciences of Complexity and" Origins of Order". In *PSA: proceedings of the biennial meeting of the philosophy of science association* (Vol. 1990, No. 2, pp. 299-322). Philosophy of Science Association.

Kuhn, T.S., 2012. *The structure of scientific revolutions*. University of Chicago press.

Leach, M., 2008. Re-framing resilience: trans-disciplinarity, reflexivity and progressive sustainability–a symposium report.

Linkov, I. 2018 Linking different forms of resilience. Available from: https://www.oecd.org/naec/Linking_different_forms_of_resilience.pdf

Lobo, I., 2008. Biological complexity and integrative levels of organization. *Nature Education*, *1*(1), p.141.

Meerow, S., Newell, J.P. and Stults, M., 2016. Defining urban resilience: A review. *Landscape and urban planning*, *147*, pp.38-49.

Normandin, J.M. and Therrien, M.C., 2016. Resilience factors reconciled with complexity: The dynamics of order and disorder. *Journal of Contingencies and Crisis Management*, *24*(2), pp.107-118.

Novikoff, A.B., 1945. The concept of integrative levels and biology. *Science*, *101*(2618), pp.209-215.

Organisation for Economic Co-operation and Development (OECD) Resilient city definition. Available from: https://www.oecd.org/cfe/resilient-cities.htm

Planck, M., Bellone, E. and Persico, E., 2022. *La conoscenza del mondo fisico*. Bollati Boringhieri.

Poli, I., Ravagnan, C. and Ricci, L., 2022. A Planning Framework for Urban Resilience toward Climate Adaptation and Mitigation: Potentials and Limits of “Eco-Districts”. *Urban Science*, *6*(3), p.49.

Reghezza-Zitt, M., Rufat, S., Djament-Tran, G., Le Blanc, A. and Lhomme, S., 2012. What resilience is not: uses and abuses. *Cybergeo: European Journal of Geography.*

Rita, M.A., Peter, B.E.N.C.Z.U.R. and Enrico, G.I.O.V.A.N.N.I.N.I., 2017. Building a Scientific Narrative Towards a More Resilient EU Society Part 1: a Conceptual Framework.

Rockefeller Foundation, 2015. City Resilience Index. Understanding and Measuring City Resilience. Available from: https://www.rockefellerfoundation.org/report/city-resilience-index/

Scozzi, B., Bellantuono, N. and Pontrandolfo, P., 2017. Managing open innovation in urban labs. *Group Decision and Negotiation*, *26*, pp.857-874.

Smart Mature Resilience Project – for more resilient cities in Europe. Available from: https://smr-project.eu/home/

Snowden, D.J. and Boone, M.E., 2007. A leader's framework for decision making. *Harvard business review*, *85*(11), p.68.

Arnstein, S.R., 1969. A ladder of citizen participation. *Journal of the American Institute of planners*, *35*(4), pp.216-224.

UNDRR Sendai Framework for Disaster Risk Reduction 2015-2030. Available from: https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030

UNDRR 2015 Sendai Framework Terminology. Available from: https://www.undrr.org/terminology/resilience

UNHABITAT Urban Resilience Hub. Available from: https://urbanresiliencehub.org/what-is-urban-resilience/

UN Sustainable Development Goal indicators, available from: https://unstats.un.org/sdgs/metadata/?Text=&Goal=&Target=1.5).

Wagemann, E. and Greene, M., 2019. Resilience, reconstruction, and sustainable development in Chile. In *The Routledge Handbook of Urban Resilience* (pp. 320-328). Routledge.

Walker, B., Holling, C.S., Carpenter, S.R. and Kinzig, A., 2004. Resilience, adaptability and transformability in social–ecological systems. *Ecology and society*, *9*(2).

Wamsler, C., Reeder, L. and Crosweller, M., 2019. The being of urban resilience. In *The Routledge Handbook of Urban Resilience* (pp. 47-58). Routledge.

Weaver, W., 1948. Science and complexity. *American scientist*, *36*(4), pp.536-544.

Webster, K., 2013. What might we say about a circular economy? Some temptations to avoid if possible. *World Futures*, *69*(7-8), pp.542-554.

White, I. and O'Hare, P., 2014. From rhetoric to reality: which resilience, why resilience, and whose resilience in spatial planning?. *Environment and Planning C: Government and Policy*, *32*(5), pp.934-950.

Wildavsky, A., 1973. If planning is everything, maybe it's nothing. *Policy sciences*, *4*(2), pp.127-153.

Wilkinson, C., 2012. Urban resilience–what does it mean in planning practice?. *Planning Theory & Practice*, *13*(2), pp.319-324.

TRACK 08: PLANNING FOR CULTURE AND TOURISM: PUBLIC SPACES, HERITAGE, IDENTITY, REGENERATION

THE PUBLICNESS OF SPACE IN HELSINKI LIBRARIES: LETTING THE OUTSIDE IN AND THE INSIDE OUT (1040)

Christine Mady[1*], Hossam Hewidy[1]

[1] Department of Architecture, Aalto University, Espoo, Finland; *christine.mady@aalto.fi

Abstract. This research aims to address through the changing role of public libraries, and their relation to public spaces, the extent to which they enable peaceful, spatially just, diverse and inclusive activities. Using qualitative methods to gain insights from designers, librarians and users, the research builds on two case studies, Oodi and Maunula in Helsinki, Finland. This paper presents work in progress, and explores several questions, starting with the design and its intention to generate peaceful, inclusive, and just spaces, which play a role in supporting everyday life spontaneous encounters and activities. The initial findings indicate that public libraries in their design and management can be catalysts for improving inclusive urban space, and empowering communities.

Keywords: Helsinki, public space, libraries, diversity, inclusion.

1. Introduction

Urban everyday life unfolds within the different interfaces of streets, open and interior public spaces. The complexity of multiculturalism caused by the flow of people seeking better or different life experiences meant that the public domain is charged with meeting diverse and often conflicting needs and uses. Nikšič and Sezer (2017) focused on the role of public space in serving spatial justice, especially in cities with growing commodification and need to attract investment. In this context, a spatially just city is that which allows enjoying a good quality of life for inhabitants of various profiles (Nikšič & Sezer, 2017, p. 165). Reference to quality of life also includes peaceful living, which is not understood in contrast to armed conflict. Peace is rather an everyday operation of negotiation that instils a sense of equilibrium within a spectrum of simultaneously occurring differences in shared open and enclosed urban spaces. Moreover, public space qualities echo what a just city offers: equity, diversity and democracy (Fainstein, 2010). While diversity is often understood through the users, it could also refer to the variegated functions and activities offered in public space (Montgomery, 1998; Nikšič & Sezer, 2017). Addressing the challenge of multiculturalism, the programming, activities and rhythms of the public domain could take various forms, which are determined by power

relations among diverse stakeholders in time. Public libraries are not an exception, and have struggled to maintain their just, pivotal cultural, educational and social role in cities, by allowing differences to coexist and activities to be freely practised (van Melik & Hazeleger, 2023). One Informative case is in Finland.

While the changing role of libraries in the digital era has been addressed in recent literature – moving from only readership or from 'collections to connections' to facilitating other educational, cultural and social activities (Golten, 2019, p. 1) – this research investigates the role of libraries in supporting spatial justice, and relation to public space. We do so by examining their design process, their programming, and functions.

The diversity of functions, spaces and activities is related to the possibility for different social groups to be present and engaged within the public library premises. This aspect is similar to democracy in public spaces and participatory approaches and decision making, including co-design (Carmona et al., 2008; Madanipour, 2010; Nikšič & Sezer, 2017). Moreover, 'the physical design and aesthetics of public space are a measure of its level of democracy, as it influences who will feel invited to use public space and who not.' (Nikšič & Sezer, 2017: 167) A co-designed space could mitigate or even avoid exclusion. Acknowledging that public libraries are planned and designed to be accessible, connect to surrounding public spaces, and attract diverse users, this paper explores the presence of such spatial relations and their potential contribution to peace building. This research explores their role in supporting spontaneous everyday encounters and activities by spilling out into the public domain and equally inviting it into the library spaces.

We ask the following questions:

- *What functional and programmatic operations in public libraries enable intertwining or merging public outdoor and indoor activities towards just spaces?*
- *What degrees of freedom in libraries allow for spontaneous activities by often-marginalised user identities?*

Following this introduction, in the next section the literature review focuses on aspects of public space participation and co-design more broadly, the governance of libraries in terms of stakeholders involved and the programming of its spaces, as well as the relation of internal and external public spaces towards serving peace building. An overview of the Finnish context is provided to set the basis for the case studies. The research methodology is then explained and the two selected libraries Maunula and Oodi in Helsinki, Finland are presented. At the time of submitting this paper to the AESOP conference, we have not finalised the empirical work, which comprises the interviews with various stakeholders, and a questionnaire survey addressed to the users at both libraries. This was due to the required time for processing permission applications to access librarians and users. The interviews and questionnaire survey are scheduled to take place in May and early June 2023. In addition, a two-day workshop is scheduled on 15 and 16 May 2023 in Helsinki to address the topic of libraries as spaces for peace building. Therefore, only the framework for the analysis of findings is presented in this working paper, while the results will be presented during the conference in July 2023. Finally, comes the conclusion.

2. From a Reading to a Social Public Space

In addressing the role of libraries in facilitating peaceful, diverse and inclusive public spaces, we frame public libraries as public spaces, and examine their design approaches, their governance, their changing role in the current era, and their potential for connecting with surrounding public spaces, to expand the public domain and enable its interaction with diverse users and activities.

2.1 Public Space and Public Libraries

The spectrum of what constitutes public space, especially in relation to management is broad, and could even include third places or shopping malls (Carmona et a., 2008). This breadth challenges the reality of who actually constitutes ‘the public’ (Colleen & Ann, 2003). Such places are frequently manufactured environments creating an illusion of being public spaces (Banerjee, 2011). Similar to public spaces, public libraries are open, accessible and inclusive (Van Melik & Merry, 2021). They ‘are places that are accessible to everyone, and where difference is encountered and negotiated (Young, 1990 in Agyekum, 2022, p. 47).’

The locations of public libraries are generally chosen to serve a wide catchment area, and are connected to the public domain – whether as minimally as through a sidewalk and street or as extensively as a square or park. The location choices unavoidably create variances in spatial accessibility for individuals and communities (Cheng et al., 2021), which concern issues of equity of distribution. Thus, a public library offers an alternative for an open public space, and often fills the gap for a public space that is safe, welcoming, inclusive, conducive to civic engagement and public discourse. This space is welcoming to all socio-economic backgrounds, age groups, political and sexual orientations, and interests (Colleen & Ann, 2003). Moreover, the regulations of libraries should maintain these qualities of public space, and their facilities should promote democracy; for example, through their websites contributions in newspaper columns, radio and television talk shows and discussions on issues involving democratic governance (Kargbo, 2014).

2.2 Co-design Processes and changing roles of libraries

As Harvey states (2010, p. 315) 'The right to the city is far more than the individual liberty to access urban resources: it is a right to change ourselves by changing the city.' This subsection situates the co-design and participation of library users in the decision-making process as the right to change the self. The co-design process is one of engagement and initiation of a dialogue with people outside the professional design practice, allowing them to participate in decision-making (Sanya, 2016). Co-design facilitates the transformation of conventional design into a creative collective common (Teder, 2018). Co-design challenges the architectural practice by positioning the professionally trained architect as a social worker who facilitates the contextualisation of buildings within their societal demands (Adjaye et al., 2011). Equally, co-design provokes users to shift from being passive subjects of a design process, to becoming active participants in the design decision-making process (Lee, 2008). Co-design is rooted in the credence that all people are creative and may contribute to design if the appropriate setting and tools are at their disposal (Vaajakallio & Mattelmaki, 2014). Given their public traits, public libraries as communal spaces would ideally benefit from the co-design approach.

The design of library spaces has been commonly conferred in the scholarly body giving a number of guidelines available for both new buildings and the refurbishment of existing ones (e.g. Dewe, 2006; Khan, 2009; Schlipf, 2020). Such guidelines highlight the consideration of library functions, and as noted earlier, since libraries at present respond to requirements beyond the process of the physical printed material and the storage of volumes (Wakeling et al. 2022). The guidelines recommend shaping spaces that meet functional and operational requirements (Baleiko, 2019; Dewe, 2006). Functional requirements relate to the experience of the facilities and services by the users, while the operational ones relate to the staff members' everyday practices to provide the functional requirements. Public libraries with their emerging role as hubs sustain not only physical resources but safe spaces for social interaction (Wakeling et al. 2022). Furthermore, the continuous change in technological aid in the operation of libraries imposes flexibility as a key feature in libraries design to fulfil the ability of spaces to adapt (Schlipf, 2011; Wakeling et al. 2022). According to Hapel (2020, p. 403), 'the building belongs to the community; it is the citizens who own the library, not the staff or the politicians'. Allan (2013) calls for prioritising designing for people rather than for books, an approach mentioned earlier as well. Scholars extend participatory co-design beyond merely asking the users about their demands to place them at the core of the design process (Dogunke, 2020; Clugston, 2013). In this paper, we examine how public library co-design is situated in the Finnish context.

2.3 Programming, Functions and Supporting Diversity and Inclusion

According to the International Federation of Library Associations and Institutions IFLA/UNESCO Guidelines for Development (2013), public libraries should be governed by a well-established body of local community representatives, be they those elected either to the local council or to the library board. Library committees and/ or boards should have rules of procedure and their proceedings should be open to the public. van Melik and Hazeleger (2023) indicate how libraries' role as social infrastructure requires the collaboration of various stakeholders. Here social infrastructure refers to what spaces are required to support social networking and interactions or encounters. Library acts play an important role in guiding the governance of libraries, and the Library Act in Finland is not an exception, as discussed later in this paper.

Public libraries are part of everyday social infrastructure, and have the capacity to act as mediums for social inclusion (van Melik & Hazeleger, 2023). They are perceived as safe spaces, which indicates that trust is the cornerstone of interactions between staff and users, and most importantly for vulnerable groups (Agyekum, 2022; Brewster, 2014; van Melik & Hazeleger, 2023).

A public library as non-commercial community service has been identified as a location, which can be relaxing and restorative (Korpela & Ylén, 2007). Libraries have the capacity to play such a role as they are commonly understood as politically neutral community places (Leckie & Hopkins, 2002). Considering the diversity of power dynamics inherent in library practices, 'power relations are central' (Mowforth & Munt, 2009, p. 48) 'to any critical treatment of library users.' (Agyekum, 2022, p. 47) The changing role of libraries from reading spaces to providing shared spaces, enables them to support social networks and community building (Kretzman & Ranz, 2005). Public libraries provide a sense of freedom of expression, though within the rules of the library as an institution (Germain, 2013).

Public libraries can support building a sense of community, social capital, and social cohesion amidst a safe, healthy and peaceful place, in contrast to commodified spaces, and simultaneously cater for diverse user groups (van Melik & Hazeleger, 2023). Libraries now focus on different user groups, the youth and the elderly. Derr and Rhodes (2010) call for hiring youth librarians to think outside of the box, and invent methods of engagement coping with their independent lifestyles. 'Public libraries support the information, educational, cultural and recreational needs of adults in communities through access to books and online resources.' (Agyekum, 2022, p. 46) In addressing inclusivity, public libraries support lifelong learning, especially for the elderly who have to cope with new technologies (Agyekum, 2022). Also, some libraries provide programmed learning such as languages or other skills, possibilities for self-learning, which would facilitate integration and participation in different social circles (Agyekum, 2022: 45). Despite the intentions for inclusivity (even if through library acts), the practice requires an integration and consideration of diverse users in the library's design and operation (Agyekum, 2022), for example through co-design and inclusive library boards.

2.4 Internalising the External and Externalising the Internal

Recalling that the public library is a civic, freely accessed space, brings to this discussion the Nolli plan of Rome as a physical analysis and a metaphoric discourse on internal and open public spaces. In fact, the represented 'void' of Nolli's map contains many 'hues and nuances of meaning' (Krieger, 2009, p. 126). It is a benchmark for representations of the character of urban space (Sease, 2015). The spatial mapping of anthropological places is geometric lines and intersections of lines drawn through everyday experiences as 'routes, axes or paths' (Augé, 2008, p. 46). The flow between urban space and internal space impose a challenge to integrate a civic public space within its vicinity. This means that the internal space of the public library – similar to the urban open public space – acquires an important role in enabling the peaceful coexistence of differences by nurturing diverse activities over time. This implies the engagement of the public both in the management of activities inside the library (alongside librarians), and the freedom to externalise some of the activities into adjacent open public spaces (in a planned or spontaneous manner).

As Sennett (2017) argues, 'designing the experience of passage from place to place', particularly the flow between interior and exterior, has been a challenge for urban designers and planners. To overcome such deficiency, Sennett calls for porosity, indeterminacy and mix (see also Rădulescu, 2017). Sennett clarifies the possibility to achieve porosity by differentiating between boundary and border; the former marks a clear limit between two mediums and the latter generates opportunities of mixture and activity. According to Sennett, porosity allows the public space to flow spontaneously from street to interior in a sequence of different instances diminishing the separation between city and building. Re-reading the space of the public library suggests that continuous visibility and transparency are needed to allow such a flow with the adjacent open public space, which should be equally equipped with tools to enable attachment. 'Bryant, Matthews and Walton (2009) found that the open-plan space was a popular area, supporting a range of student activities in a flexible learning environment' (Agyekum, 2022, p. 47) and offering a flexibility of changing uses while being present in the same space.

2.5 Public Libraries in the Finnish Context

The role of libraries intended in the new Finnish Library Act is to allow the transformation of library service provision towards interaction with their users, and ability to attract new audiences and groups by developing their performance, and inventing opportunities for citizens to participate in democratic decision making (Hyysalo & Hyysalo, 2018). The need for the 2016 Finnish Library Act included the important role libraries can play in social integration, social equity and intercultural dialogue regarding the rapid growth of the multicultural component in the Finnish society (van Kempen et al, 2021). Some public libraries in the Finnish capital Helsinki have been used as places for working or teleworking by some user groups (Di Marino & Lapintie, 2015). Public libraries have an established role in Finnish culture (Hatch, 1971). Moreover, the Library Act clearly defines their objectives in relation to inclusion, free expression and active civic engagement (Ministry of Education in Finalnd, website):

> The objective of the reform of the Public Libraries Act was to improve the operating environment of public libraries and to promote active citizenship, democracy and lifelong learning. The revised Public Libraries Act takes account of the changes that have occurred in the municipal and regional structures.

The act further mentions that implementing these objectives should support community building, pluralism and cultural diversity. In fact, there was a very active perspiratory flagship project for user involvement conducted between 2012 and 2015 in the context of the Helsinki Central Library (CeLib) (Hyysalo & Hyysalo, 2018). This flagship project has included twelve participation activities and was politically supported strongly by the leftist and green parties, but conservatives both in city and national governments ultimately accepted the project (Hyysalo & Hyysalo, 2018).

3. Methodology

To investigate the process of peace building from the initial design phase, to the library governance and then its use, we used qualitative methods including interviews and a questionnaire survey. We conducted in-depth interviews with librarians at both libraries Maunula and Oodi who expressed their interest in our engagement as academicians from the urban planning field to explore the social role of their libraries and the relation to the surrounding public spaces. The librarians were identified and contacted on the library websites. The interview included topics related to the management of the library and implications of the library act, the board members and governance issues including target population, and organisation of activities other than reading that encourage diverse and broad use of the library; what is known about encounters, exchange, and socialising in the library; the library's role within the local community; seasonal changes in using the library; considerations for the adjacent public space as an extension to the library activities; limitations to diversity and inclusion

For the design phase, we reached out to the architectural firms whose competition entries were selected. In Maunula's case, we interviewed the architect in charge. In Oodi's case, we could not interview the involved architects. Instead, we contacted the Helsinki City planning authorities, to interview one of the planners involved in the process. The interview included topics on considerations for the library as a public space; spatial, temporal and use requirements; design considerations for different user groups (age, special needs, social needs, language and culture); programmatic requirements, decisions and limitations: participatory and co-design approaches and actors involved; relation of the internal spaces to the external public space; inspirations; design limitations and alterations made; defining the library in 2023.

For the questionnaire survey, we involved the librarians in helping us identify the languages to which it should be translated and in disseminating it through their social media. According to the librarians, printed copies of the questionnaire might not yield any responses and the digital online version was preferred and implemented. The questionnaire specifically stated that the respondent should be a regular user of either Maunula or Oodi library. The questionnaire included basic questions on the users; spatial and temporal preferences at the library (frequency, visiting times, preferred spaces within the library and use of the public space); activities at the library (main purpose for visiting and types of activities) and open comments.

One component of this research was in response to the AESOP Thematic Group on Public Spaces, Urban Cultures call for events on public spaces and peace building[1]. The thematic group's event for Helsinki addressed the role of public libraries for peace building, and invited explorations into the relation between public libraries and public spaces, and their capability towards the construction of peace within their context at the neighbourhood or city scale. We

[1] Call for Abstracts: Public libraries as generators of peace - An event of the AESOP Thematic Group on Public Spaces and Urban Cultures (aesop-planning.eu)

held a two-day workshop with academicians working on public libraries and peace building, which involved researchers, students, librarians, one library designer and attendance from the library users. Following visits to both libraries, and discussions with the librarians, the participating researchers shared their work on the event theme, and this was followed by a working session focusing on two main topics, the relation of public libraries to adjacent public spaces, and the programming of libraries to support diverse, spontaneous and inclusive activities. The results of the working session were presented in the form of an open discussion held at the Oodi library.

Further developing this investigation of both libraries could be achieved through focus groups with library committees or boards, more interviews with librarians, and a follow up focus group session after the users' questionnaire survey. Next, we briefly describe the two libraries.

3.1 Maunula Public Library

The Maunula library is situated inside the Maunula House, which serves as the central cultural and learning hub of a neighbourhood under upgrading in terms of the maintenance of the adaptive reuse and redesign of their elevations, open spaces and the provision of light rail. It can be reached by bus from the city centre. Maunula area is located in the northern suburbs of Helsinki and has suffered from social problems due to high unemployment rate, large number of low-income families and challenges of immigrant integration. The main entrance of Maunula House is located in the middle of the building on the side of Maunula Park. The youth centre has its own entrance at the southwestern side of the site. The library is located in the northern wing. There is direct access from the library to the grocery store. Maunula House is a centre for public services for local residents of all ages. It also has a public square adjacent to it. The House comprises an adult education centre, the library and youth centre. The library opened in 2017, and covers an area of 3100 square metres, and has three floors (Archdaily, website). These three facilities cooperate to enable co-usage and maximise the utilisation of the spaces. The library is open all week with hours 9.00-20.00 on weekdays, 10.00-16.00 on Saturday and is closed on Sundays (Maunulatalo, website).

The Maunula House and especially from the facade of the library fulfils the call by Sennett (2017) in keeping a flow between interior and exterior and a porosity that extends the volume of the library to serve in a harmonised way with the urban space. For those whose destination is not the library, the multi-level glass facade verifies visually such a relation between interior and exterior.

3.2 Oodi Central Public Library

Oodi has been described as 'Helsinki's urban living room' (This is Finland, website). It opened in December 2018 and was a competition entry in 2012-2013 (ALA, website). It covers an area of 17100 square metres over four floors including the basement. the programme as described

on the designers' website includes: a restaurant, pop-up exhibitions, gallery, family library, meeting area, movie theatre and multipurpose hall on the ground floor; in the basement toilets and services; group working spaces, offices, working space, studios, living lab, meeting area, recording and maker spaces on the middle floor (there are 16 meeting rooms and nine event spaces); a cafe, terrace towards the park, and library functions on the upper floor (Oodi, website). The library has about 45-55 staff members, excluding the restaurant staff (Oodi, website).

The central library is located at the heart of the capital city, in proximity to the central railway station, which is a multimodal hub. This makes it accessible within a walking distance for those in the centre and equally for those commuting to the centre. It opens all week with hours 8.00-21.00 on weekdays and 10.00-20.00 on weekends. Oodi is located in place of an undeveloped public site – formerly known as makasiinit that were railway warehouses, which served for a specific time period as a meeting point for alternative uses until it burnt in a fire in 2006 (Lehtovuori, 2010) – and is adjacent to the largest linear park in Helsinki city, which is surrounded by civic and governmental buildings. The library has public access from three sides, and opens onto the linear park from one side. From the other side, it connects to the street network and is accessed at the street corner intersection. It is divided into three floors, whose functions range from social and service ones to utilities and facilities (printing, office and meeting spaces), and the open-stacks library space on top, with an extension to an open terrace that is seasonally accessible.

Based on the changing role of libraries as explained in the literature review, Oodi complies with the literature in meeting social needs and encouraging interaction among diverse users. The public library has been designed through a participatory approach: 'Our guiding principle in the central library development has been the voice of citizens,' says the project's leading planner' as stated by Pirjo Lipasti, the lead planner from the city on this project (Oodi, website).

4. Analysis of Findings

Although the empirical work has not been conducted at the time of the paper submission, nevertheless, we can outline the themes upon which the findings will be analysed, and from our initial analysis of the locations of the two libraries and references available on them, we can provide an initial assessment.

4.1 The Functional and Programmatic operations

This section responds to the first question by reviewing the design process, and the library daily uses and activities:

- *What functional and programmatic operations in public libraries enable intertwining or merging public outdoor and indoor activities towards just spaces?*

We examine aspects of the urban planning and urban design processes in relation to participatory and inclusive approaches, noting that participatory approaches are a legal requirement in Helsinki, Finland. We will highlight what was distinctive in the case of the two libraries, and how these processes have affected the decision for programming and functions. The space programmes of the two libraries have common characteristics that enable their interiors to adapt to potential change, such as open floor and movable furniture (cf. Schlipf, 2011; Wakeling et al. 2022). Both libraries have a free form of wooden roof and continuous high glass facades extending the interior space and its uses' activities to passers-by, which transitions to the adjacent open public spaces.

We analyse the diversity of engaged stakeholders, which is distinctive regarding peace building features, as defined earlier, and identify catalysts or barriers to inclusion and diversity. This also includes the explanation of the roles of each: community representatives, library, lifelong learning, cultural and youth staff within the library committees and board. In this investigation we assess the affordance of spaces, variety of events, and management of the spaces.

4.2 Linking to the Wider Urban Public Space

This section responds to the second question by reflecting on the relation to the wider public space, and the possibilities of spontaneous activities by often-shadowed user identities:

- *What degrees of freedom in libraries allow for spontaneous activities by often-marginalised user identities?*

In addition to the internal dynamics within the libraries, we further examine the flow and possible linkages to the adjacent open spaces in terms of planned events and spontaneous activities, to identify opportunities and limitations of this continuum, which could be tangible or intangible.

This analysis supports the identification of the library's role not only within its enclosed premises, but also affecting adjacent open spaces to serve as urban living rooms. In such a setting, the two libraries offer a safe public space, free from consumption but also encourage place attachment. The diverse and innovative functions available at the libraries make them ideal locations for encounter and socialising.

5. Conclusion

Public libraries in Finnish society are cultural assets that are highly appreciated by their users. Their role in society is extended beyond culture to serve as urban hubs and inclusive spaces. In this research, we have explored the approach of public libraries for peace building in general, and identified aspects related to libraries' changing roles as social infrastructure, learning from

concepts of just public spaces in terms of equity, diversity and democracy. In addition to the programming and provision of supporting spaces within, this research emphasised the importance of the relation of the inside to the outside, in particular surrounding public spaces. This included investigating the process of designing/ planning the public libraries, their governance and stakeholders involved, and forming an understanding of the users' experiences and perceptions. This paper focused on two libraries located centrally and peripherally in Helsinki City, Oodi and Maunula respectively.

Some of our research limitations relate to the outreach to respondents – both library users and other stakeholders – which was time bound, and limited observations in both libraries. However, this research suggests new avenues for exploring the public indoor to public outdoor continuum that would reinforce urban peace building in a globally uncertain, and volatile global era.

References

Adjaye, D., Hirsch, N. and Otero-Pailos, J. (2011) On architecture and authorship: a conversation. *Places Journal,* https://placesjournal.org/article/on-architecture-and-authorship-aconversation/

Agyekum, B. (2022) Public Libraries: enacting "public spaces" for community development and lifelong learning. *Journal of Learning Spaces,* 11(1), 45–57.

ALA (n.d.) Helsinki Central Library Oodi. [Online] https://ala.fi/work/helsinki-central-library/ [Accessed 12/05/2023].

Allan, C. (2013) Thinking inside the box. In L. Watson (ed.) *Better library and learning space: Projects, trends and ideas,* (pp. 159–165). Facet Publishing.

Archdaily (n.d.) Maunula House/ K2S Architects [Online] https://www.archdaily.com/805375/maunula-house-k2s-architects [Accessed 12/05/2023].

Augé, M. (2008) *Non-Places: Introduction to an Anthropology of Supermodernity* 2nd ed. English language, Translated by John Howe. New York: Verso.

Baleiko, R. (2019) Libraries of today and tomorrow: How architecture can help craft a responsive new language. *Public Library Quarterly, 38*(4), 369–387. https://doi.org/10.1080/01616846.2019.1576116

Banerjee, T. (2001) The Future of Public Space. *Journal of the American Planning Association, 67*(1), 9-24.

Brewster, L. (2014) The public library as therapeutic landscape: A qualitative case study. *Health and Place, 26*, 94–99. https://doi.org/10.1016/j.healthplace.2013.12.015

Bryant, J., Matthews, G., and Walton, G. (2009) Academic libraries and social and learning space: A case study of Loughborough University Library, UK. *Journal of Librarianship and Information Science,* 41, 7-18.

Carmona, M., de Magalhães, C., and Hammond, L. (2008) *Public space: The management dimension.* London: Routledge.

Cheng, W., goltenWu, J., Moen, W., and Hong, L. (2021). Assessing the spatial accessibility and spatial equity of public libraries' physical locations. *Library and Information Science Research*, *43*(2), 101089–. https://doi.org/10.1016/j.lisr.2021.101089

Clugston, V. (2013) The interior designer's view. In L. Watson (ed.) *Better library and learning space: Projects, trends and ideas,* (pp. 249–257). Facet Publishing.

Colleen, A., and Ann, C. (2003) Public space, public discourse, and public libraries. *LIBRES* (Kent, Ohio). [Online] 13 (1) [Accessed 12/05/2023].

Derr, L. and Rhodes, A. (2010) The Public Library as Urban Youth Space: Redefining Public Libraries through Services and Space for Young People for an Uber Experience. *Australasian Public Libraries and Information Services*. 23 (3), 90–97.

Dewe, M. (2006). *Planning public library building: Concepts and issues for the librarian.* Ashgate.

Di Marino, M. and Lapintie, K. (2015) Libraries as transitory workspaces and spatial incubators. *Library and Information Science Research*, [Online] 37 (2), 118–129. https://doi.org/10.1016/j.lisr.2015.01.001 [Accessed 12/05/2023].

Dogunke, S. (2020). Co-design in libraries. *The New Review of Academic Librarianship, 26*(2–4), 243–260. https://doi.org/10.1080/13614533.2020.1810081

Fainstein, S. S. (2010) *The Just City.* New York: Cornell University Press.

Germain, N. (2013) Why our future depends on libraries, reading and daydreaming. *The Guardian*. https://www.theguardian.com/.../2013/.../neil-gaiman-future-libraries-reading-daydreaming

Golten, E. (2019) *Public Libraries as Place and Space – New Services, New Visibility*. IFLA WLIC https://library.ifla.org/id/eprint/2708/1/s09-2019-golten-en.pdf

Hapel, R. (2020) Building a contemporary public library through community engagement: A personal journey. *Public Library Quarterly, 39*(5), 391–409. https://doi.org/10.1080/01616846.2020.1772621

Harvey, D. (2010) *Social Justice and the City.* University of Georgia Press.

Hatch, L. (1971) Public libraries in Finland. *The Journal of Library History,* 6(4), 337–359. https://www.jstor.org/stable/25540323

Hyysalo, V., and Hyysalo, S. (2018) The Mundane and Strategic Work in Collaborative Design. Design Issues. 34(3):42–58. https://ieeexplore.ieee.org/document/8850537

Kargbo, J. A. (2014) The Role of Public Librarians in Disseminating Information for True Democracy. *Public Library Quarterly (New York, N.Y.), 33* (4), 362–371.

Khan, A. (2009) *Better by design: An introduction to planning and designing a new library building.* Facet Publishing.

Korpela, K.M., and Ylén, M. (2007). Perceived health is associated with visiting natural Favourite places in the vicinity. *Health Place,* 13(1),138–151.

Kretzman, J. and Ranz, S. (2005) *The engaged library: Chicago stories of community building.* Evanston, IL: Northwestern University.

Krieger, A., (ed) (2009) *Urban Design.* Minneapolis: University of Minnesota Press.
Leckie, G., and Hopkins, J. (2002) The public place of central libraries: Findings from Vancouver. *The Library Quarterly,* 72(3), 326–372.
Lee, Y. (2008) Design participation tactics: the challenges and new roles for designers in the codesign process*. Co-Design: International Journal of Co-creation in Design and the Arts,* 4(1), 31–50.
Lehtovuori, P. (2010) *Experience and conflict: the production of urban space.* London: Routledge.
Madanipour, A. (ed) (2010) *Whose Public Space? International Case Studies in Urban Design and Development.* London: Routledge.
Maunulatalo (n.d.) [Online] https://maunulatalo.hel.fi/en/ [Accessed 12/05/2023].
Ministry of Education in Finland (n.a.) [Online] https://okm.fi/en/legislation-libraries and https://www.libraries.fi/legislation?language_content_entity=en [Accessed 12/05/2023].
Montgomery, J. (1998) Making a city: urbanity, vitality and urban design. *Journal of Urban Design, 3*(1), pp. 93–116.
Mowforth, M., and Munt, I. (2009). *Tourism and sustainability: Development, globalization and new tourism in the third world*. London and New York: Routledge.
Nikšič, M. and Sezer, C. (eds) (2017) Public space and urban Justice. *Built Environment, 43*(2), 165–172.
Oodi (nd.) Welcome to Oodi! [Online] https://oodihelsinki.fi/en/what-is-oodi/tours/library-professionals/ [Accessed 12/05/2023].
Rădulescu, S. (2017) Interior Public Spaces. Addressing the Inside-Outside Interface. *Studii de istoria și teoria arhitecturii*. [Online] 2017 (5), 99–114. [Accessed 12/05/2023].
Sanya, T. (2016) Participatory Design: an intersubjective schema for decision making. *International Journal of Architectural Research, 10*(1), 62–74.
Schlipf, F. (2011) The dark side of library architecture: The persistence of dysfunctional designs. *Library Trends, 60*(1), 227–255. https://doi.org/10.1353/lib.2011.0034
Sease, A., (2015) Landscape (and) urbanism? Engaging Nolli. *Journal of Urbanism: International Research on Placemaking and Urban Sustainability, 8*(4), 352–372. https://doi.org/10.1080/17549175.2014.909517
Sennett, R. (2017) Lecture at the LSE Events | *The Quito Papers: Towards the Open City.* London.
Teder, M. (2018) Placemaking as co-creation – professional roles and attitudes in practice. *Co-Design: International Journal of Co-creation in Design and the Arts, 4*(1) 2–19.
This is Finland (n.d.) Oodi Library acts as Helsinki's urban living room. [Online] https://finland.fi/life-society/oodi-library-acts-as-helsinkis-urban-living-room/ [Accessed 12/05/2023].
Vaajakallio, K. and Mattelmaki, T. (2014) Design games in codesign: as a tool, a mindset and a structure. *Co-Design: International Journal of Co-creation in Design and the Arts, 10*(1), 63–77.

van Kempen, van den Dool, A., Lindberg, P., and Parviainen, L. (2021) Trends in the Dutch and Finnish library landscape. *Library Management*, *42*(3), 167–183. https://doi.org/10.1108/LM-03-2020-0040

van Melik, R., and Hazeleger, M. (2023) Routinised practices of community librarians: Daily struggles of Dutch public libraries to be(come) social infrastructures. *Journal of Librarianship and Information Science, 0*(0), 1–13. https://doi.org/10.1177/09610006221149203

Van Melik, R. and Merry, M. S. (2021) Retooling the public library as social infrastructure: A Dutch illustration. *Social & Cultural Geography, 24*(5), 758–777. https://doi.org/10.1080/14649365.2021.1965195

Wakeling, S., Shephard, M., Hider, P., Jamali, H. R., Coe, M., and Garner, J. (2022) Public Library Building and Development: Understanding Community Consultation and the Design Process. *Journal of the Australian Library and Information Association*, *71*(4), 1–20. https://doi.org/10.1080/24750158.2022.2115587

Young, I. M. (1990). *Justice and the Politics of Difference.* Princeton: Princeton University Press.

EVALUATING THE ACCESSIBILITY OF GREEN NETWORKS: A CASE STUDY ON NEW CITIES IN SEOUL METROPOLITAN AREA (1065)

Mingu Kang[1], Youngsang Kwon[2]

[1] Department of Civil and Environmental Engineering, Seoul National University, Seoul, Republic of Korea; gmg1012@snu.ac.kr

[2] Department of Civil and Environmental Engineering, Seoul National University, Seoul, Republic of Korea; Smart City Research Center, Advanced Institute of Convergence Technology, Seoul National University, Suwon, Republic of Korea

Abstract. Demand for urban green networks has increased and the accessibility have become major concerns, but related discussions have so far been restricted only to green spaces. Through a case study on second- and third-phase new cities in Seoul metropolitan area, this study suggests new indicators to evaluate the synergy between road and green networks in urban areas. Applying the suggested method on the new cities of Dongtan, Wirye, Wangsuk and Gyosan, this study demonstrates how the indicators explain the spatial structure of the green networks and verifies the structural characteristics of each new city. One of the main conclusions are that third-phase new cities' green networks have higher integration and lower control. Implications for the difference between cities and phases are further discussed.

Keywords: Green Network, Spatial Accessibility, Space Syntax, Korean New City, Synergy

1. Introduction

Recently, the demand for open spaces near residential areas has rapidly increased in South Korea due to the experience of COVID-19. Concerns about densely populated urban hotspots have led to a higher appeal for open spaces located in less densely populated areas and outdoors. Kim (2021) compared the movement and stay patterns of citizens before and after the COVID-19 outbreak based on telecommunication data of Seoul citizens. The study revealed an increase in the usage and stay time of parks within the citizens' walking distance after the occurrence of COVID-19. In addition, a survey on citizen satisfaction and improvement demands regarding parks revealed that the highest demand was for 'strengthening the residential area planning regarding green space'. Along with this change in citizen awareness, keywords such as walking, greenery, and neighborhoods have emerged in urban design in Korea. This trend is also rising worldwide, with the 15-minute neighborhood plan in Paris being a prominent example. This plan, which focuses on environmental preservation and human-centered urban design, has had a significant global impact on urban spaces. There have been cases in the Seoul metropolitan area where attempts were made to implement a 30-minute neighborhood plan.

New cities, especially those in the Seoul metropolitan area, serve as the most accessible subjects for understanding the flow of Korean urban design. The new cities particularly reflect the trend of urban design for each period very well. Korean new cities refer to the planned development areas created according to 'the Land Development Acceleration Act'. In the late 1980s, in order to alleviate the shortage of land supply within the Seoul metropolitan area, five first-phase new cities were constructed. Then, in the 2000s, 12 second-phase new cities were built, followed by ongoing construction of around ten third-phase new cities. The number of third-phase new cities varies somewhat depending on the definition and classification, so it is expressed as "around ten." According to Oh and Lim (2014), the construction of the first-phase new cities was hastily pursued around the 1988 Seoul Olympics, resulting in various side effects. The construction beyond the development restriction areas increased unnecessary travel distances and the large-scale construction projects led to material shortages and price increases. Furthermore, there was criticism that the focus on land supply resulted in a decline in the self-sustainability of cities and increased transportation costs to the Seoul metropolitan area. As a result, from the 2000s, the urban design approach of "pre-planning followed by development" emerged to minimize the side effects of large-scale development.

The second-phase new cities, constructed under the new design approach, gradually addressed the issues that arose in the first-phase new cities. According to the Specialization Plan and Design Guidelines for the High-Quality Development of Second-Phase New Cities (Korea Land and Housing Corporation, 2009), unlike the first-phase new cities, which mostly became bed-towns, the second-phase new cities were planned, designed, and constructed to encompass urban culture, nature, and industrial revitalization for self-sufficiency. The second-phase new cities actively utilised natural resources with various mountainous areas and rivers being reborn as parks integrated into residents' daily lives. From the second-phase new cities onwards, green spaces began to receive significant attention as an essential element of urban design. This trend was further strengthened in the third-phase new cities, with an increase in the overall proportion of green spaces and efforts to activate green networks within.

2. Literature Review

2.1. New City and Green Spaces

Various studies have been conducted on green spaces in the fields of urban design. New cities, in particular, have been extensively utilised as subjects for green space studies, showcasing distinct design principles from different time stamps. This has allowed for a direct evaluation of the results of urban design, including the planning process and public reactions. Consequently, many studies related to green spaces in new cities have approached the subject from the perspectives of residents' satisfaction and accessibility. Kim Y. and J. Kim (2011) conducted a macro-level analysis on the impact of green spaces in the metropolitan area on residents' quality of life. Um and Lee (2008) established an accessibility model based on residents' utilisation rates of green space systems in small-scale towns in the metropolitan

area, deriving improvement strategies for planning. Lim and Kim (2011) aimed to identify the connection between green spaces in new cities and their surrounding areas, emphasizing the improvement of ecological connectivity within green networks.

Research on the usage patterns of green spaces has also been actively pursued. Lee (2011) discovered that service quality and accessibility are crucial for the users. Additionally, Yeom and Park (2011) found that efficient access and connectivity systems for parks can enhance overall satisfaction for green spaces. Furthermore, Kim (2010) revealed that linear urban elements are frequently embraced in the design of green networks in new to activate such networks. As a result, research on green spaces in Korea has extensively involved surveys targeting users and studies focusing on the forms of green spaces. This has provided insights into the types of green spaces preferred by citizens and how to design them to enhance convenience. Examining the history of Korean new cities, we can observe that the green networks has continuously evolved based on these research findings. In particular, designs based on natural elements such as rivers and mountains, as well as linear parks, have been actively implemented.

In this study, we aim to go beyond the insights obtained from previous research and evaluate the placement of green spaces from a perspective of the overall urban structure. While previous studies have focused solely on green spaces, our study intends to assess the accessibility of green spaces within the city, considering not only the green areas but also the riverbanks, pedestrian paths, walkways, and all the routes and squares frequented by citizens. We consider the road and green networks as key elements in urban design, and based on their relationship, we aim to evaluate the accessibility of green spaces. Kim and Choi (2013) explain this concept as "synergy". They argue that to evaluate the quality of linear systems, a concept beyond the traditional point-based assessment is required. The notion of a good network goes beyond the distribution of individual facilities and implies the existence of an overall linear connectivity that is intricately linked to residents' daily activities, movement patterns, and the essential functions of the city. In other words, a high level of synergy implies that green spaces are networked and have a close relationship with the flow of the city itself. Therefore, in this study, we aim to evaluate the connectivity and excellence of green spaces in new cities based on the concept of synergy.

2.2. Space Syntax Theory

Among various methods that analyse the form and scale of networks, the most representative one is space syntax. Space syntax is a set of analysis tools or theories that analyse spatial structures, particularly as networks. It was invented and developed by Hillier and Hanson in the late 1970s, and has since been widely used as a useful tool. Space syntax encompasses the domains of accessibility, which analyses linear networks, and visibility, which analyses the areal space. Accessibility is mainly used to analyse road and green networks within cities, while visibility analysis is primarily applied to a single street or indoor spaces. In this study, we use

the accessibility analysis to examine the relationship between road and green networks.

Space syntax has been used to analyse accessibility in various aspects of urban spaces, both macro and micro. Yıldırım and Celik (2023) conducted accessibility analysis and on-site behavioral observations to analyse the pedestrian environment of Istanbul's central marketplace. They investigated how the results of space syntax indicators associates with people's actual behavioral patterns. El-Darwish (2022) used accessibility analysis to investigate the pedestrian environment within a university campus in Egypt. By comparing the current pedestrian network with potential revised network which might result from changes in building entrances and the utilisation of open spaces, they provided quantitative validity for improving the pedestrian environment within the campus. Joo and Kwon (2022) used space syntax to examine the changes in road structure resulting from the introduction of super-grids in Seoul's central district. They analysed macro-level traffic flow along with spatial changes in small-scale living areas. Additionally, Kim and Yang (2021) and Park (2021) analysed changes in gentrification areas of Seoul from the perspectives of commercial activation and urban regeneration, respectively. They empirically analysed which types of shops are likely to be established based on the differences in road accessibility. As such, space syntax enables network analysis of urban systems and provides meaningful insights when combined with various elements of the city.

In Space syntax, accessibility is primarily interpreted from an angular perspective. The angular perspective values how many turns pedestrians experience while using a network. In other words, accessibility evaluates paths with straight and intuitive understandability as more accessible, even if they are slightly longer in distance compared to paths with complex routing but shorter travel distance. Turner (2001) and Hillier and Iida (2005) developed space syntax based on the concept of accessibility to represent and analyse urban structures as axial lines. Initially, the methodology used axial lines for analysis, but the subsequent development of segment lines enhanced the explanatory power of accessibility analysis. Unlike axial lines, segment lines break at points where intersections occur between axial lines, which allows recognizing and analysing a long road as multiple shorter segments. This difference enables the analysis and recognition of road segments that occur at multiple intersections in a city as separate elements, enhancing the precision.

When people use roads, they consider not only the topological perspective but also various factors including distance. Researchers have continuously improved the methodology to reflect these pedestrian characteristics. Particularly, Hillier (2007) and AI-Sayed (2014) introduced a technique in segment analysis that incorporates metric distance alongside angular distance. This enables the analysis of different urban networks based not only on topological aspects but also on the distance people travel, i.e., the range of their daily lives. In particular, by setting a metric range, they demonstrated the possibility of conducting patchwork analysis at a local level, typically at a radius of around 500 meters. Additionally, Turner (2007) demonstrated the effectiveness of using street center lines in performing space syntax, providing a rational basis for many researchers to conduct their analysis with road

center lines. Therefore, it can be inferred that the most effective method of performing space syntax currently is angular segment analysis (ASA) based on road center lines with metric thresholds. It is evident that accurately defining segment lines of the study area and setting appropriate analysis thresholds according to research objectives are crucial for conducting space syntax analysis effectively.

Space syntax analysis starts by dividing the overall spatial structure into segment lines. It calculates various values such as depth, connectivity, control, and integration. Depth refers to the number of spaces traversed when moving from one space to another. When a space is traversed through a segment line, the depth value increases by one, indicating lower accessibility as depth increases. Connectivity represents the extent to which a line interacts with other lines. A higher value is assigned when connected to a larger number of other lines. Control and integration are more comprehensive indicators. Control values the influence of a segment line on movement occurring in the surrounding spaces. Control is also referred to as "choice" because there is a higher likelihood of using segment lines with higher control (choice) when arbitrary movements occur within the network.

Integration is the fundamental indicator extensively used in interpreting urban structure. It primarily represents the probabilistic distribution of movement occurring along a segment line. It is determined based on factors such as average depth and relative depth, where a higher value is assigned to segment lines with frequent connections to other spaces and shorter connection depth. Integration includes global and local integration. Global integration values the entire network without considering depth distinctions, while local integration focuses on a limited area within a specific threshold to understand localized distribution.

Among various indicators of space syntax, control and integration are the most adequate indicators to illustrate the connectivity of a network. By calculating these indicators for road and green networks, we can understand their compositional characteristics. We can comprehensively evaluate the centrality, potential for movement, and spatial cognition within each segment of the overall system. However, using these indicators without calibration presents a limitation in comparing different cities. Space syntax analysis results can vary depending on the extracted axial maps, such as resolution, scale, number of axes, and total area, which differ among cities. To overcome these limitations, normalized angular choice (NACH) and normalized angular integration (NAIN) were introduced. Hillier, Yang, and Turner (2012) developed normalized values of control and integration to enable quantitative comparison among cities. This normalization overcomes the absolute differences in the size of cities and allows for evaluating the relative importance of segments within each city. Therefore, in this study, we aim to utilise NACH and NAIN for intercity comparisons.

3. Materials and Methods

3.1. Study Area

In this study, four cities were selected from the second- and third-phase new cities (two from each) in the Seoul metropolitan area to examine the changes in the connectivity of green networks. The second-phase new cities aimed to alleviate the side effects of the first-phase new cities by increasing the proportion of green areas and actively adopting linear design techniques. Additionally, they targeted to improve the livability within the cities by reducing population density compared to the first-phase new cities. There are total of 10 second-phase new cities, starting with Hwaseong-si Dongtan-1 in 2001, and construction is still ongoing. The average site area of the second-phase new cities is 12.41km^2, the average population capacity is 155.9 thousand people, and the average population density is 127.8people/ha.

The third-phase new cities were planned to be more environmentally friendly and self-sufficient than the second-phase new cities. As the completion of the second-phase new cities approached, the land-use plans for the third-phase new cities were gradually being officialised. The third-phase new cities are smaller in scale compared to the second-phase new cities and have a higher proportion of self-sufficient area. The goal is to minimize the risks associated with excessive development of large sites and create multiple small cities that are as close as possible to Seoul. Furthermore, many of the third-phase new cities have lifted development restrictions in the metropolitan region, aiming to maximize transportation efficiency. (Debates for and against the lifting of development restrictions continue to emerge). Among these third-phase new cities, there are six where land-use plans have been officially announced. The average site area is 5.5km^2, the average population capacity is 68 thousand people, and the average population density is 125.7people/ha. These second- and third-phase new cities exhibit different planning trends over time and show considerable differences in scale and functional distribution. Therefore, in this study, it is necessary to select cases that can represent the planning trends of each period and allow for comprehensive comparisons between them. Accordingly, Dongtan-1(Dongtan) and Wirye were selected from the second-phase new cities, and Wangsuk-2(Wangsuk) and Gyosan were selected from the third-phase new cities.

Dongtan-1 and -2 is located in the southern part of the metropolitan region, surrounded by the Gyeongbu Expressway, which connects Seoul and Busan. It was developed sequentially with Dongtan-1 to the west and Dongtan-2 to the east. Currently, Dongtan-1 is in a completed state, while Dongtan-2 still has many undeveloped areas. In this study, we aim to analyse the green network system of Dongtan-1, which incorporates a unique radial form. It consists of a large central park and dispersed green networks intersecting in circular grids. Smaller green networks intertwine and intersect with radial road system to form a radial green network itself. Wirye is located on the border of Seoul's Songpa-district, Hanam-city and Seongnam-city, making it easily accessible to various parts of the metropolitan region. It is located adjacent to the development restriction zone and is characterized by the presence of the Changgok stream, flowing from the Cheongnyangsan mountain. In Wirye, the natural features of the southern Changgok stream were preserved and utilised, while another waterway was secured in the north, forming two river axes flowing east and west to activate the green network. Additionally,

commercial spaces linked to the green axis were established in the city center to promote the coexistence of green areas and commercial activities.

Table 1. Indices of Seoul Metropolitan Area New Cities (2nd and 3rd Phase)

Phase	City	Administrative Region	Area [km^2]	Housing [1,000]	Pop. [1,000]	Pop. Density [pers./ha]	Project Duration
2nd	Pangyo	Sungnam-si, Gyeonggi-do	8.9	29.3	88	98	2003-2017
	Dongtan-1	Hwaseong-si, Gyeonggi-do	9.0	41.5	126	139	2001-2018
	Dongtan-2	Hwaseong-si, Gyeonggi-do	24.0	116.5	286	119	2008-2025
	Gimpo	Gimpo-si, Gyeonggi-do	11.7	61.3	167	146	2002-2017
	Woonjeong	Paju-si, Gyeonggi-do	16.6	88.2	217	130	2003-2023
	Gwanggyo	Suwon-si, Gyeonggi-do	11.3	31.3	78	69	2005-2019
	Yangju	Yangju-si, Gyeonggi-do	11.2	63.4	163	146	2007-2018
	Wirye	Songpa-gu, Seoul Hanam-si, Gyeonggi-do Sungnam-si, Gyeonggi-do	6.8	44.8	110	163	2008-2024
	Godeok	Pyeongtaek-si, Gyeonggi-do	13.4	57.2	140	104	2008-2020
	Geomdan	Seo-gu, Incheon	11.2	74.7	184	164	2009-2025
3rd	Wangsuk-1	Namyangju-si, Gyeonggi-do	9.4	54.0	125	133	2019-2028
	Wangsuk-2	Namyangju-si, Gyeonggi-do	2.4	14.0	35	146	2019-2028
	Gyosan	Hanam-si, Gyeonggi-do	6.3	33.0	78	114	2019-2029
	Gyeyang	Gyeyang-gu, Incheon	3.3	17.0	41	123	2019-2026
	Chang-neung	Goyang-si, Gyeonggi-do	7.9	36.0	86	109	2020-2029
	Daejang	Bucheon-si, Gyeonggi-do	3.4	19.0	44	129	2020-2029

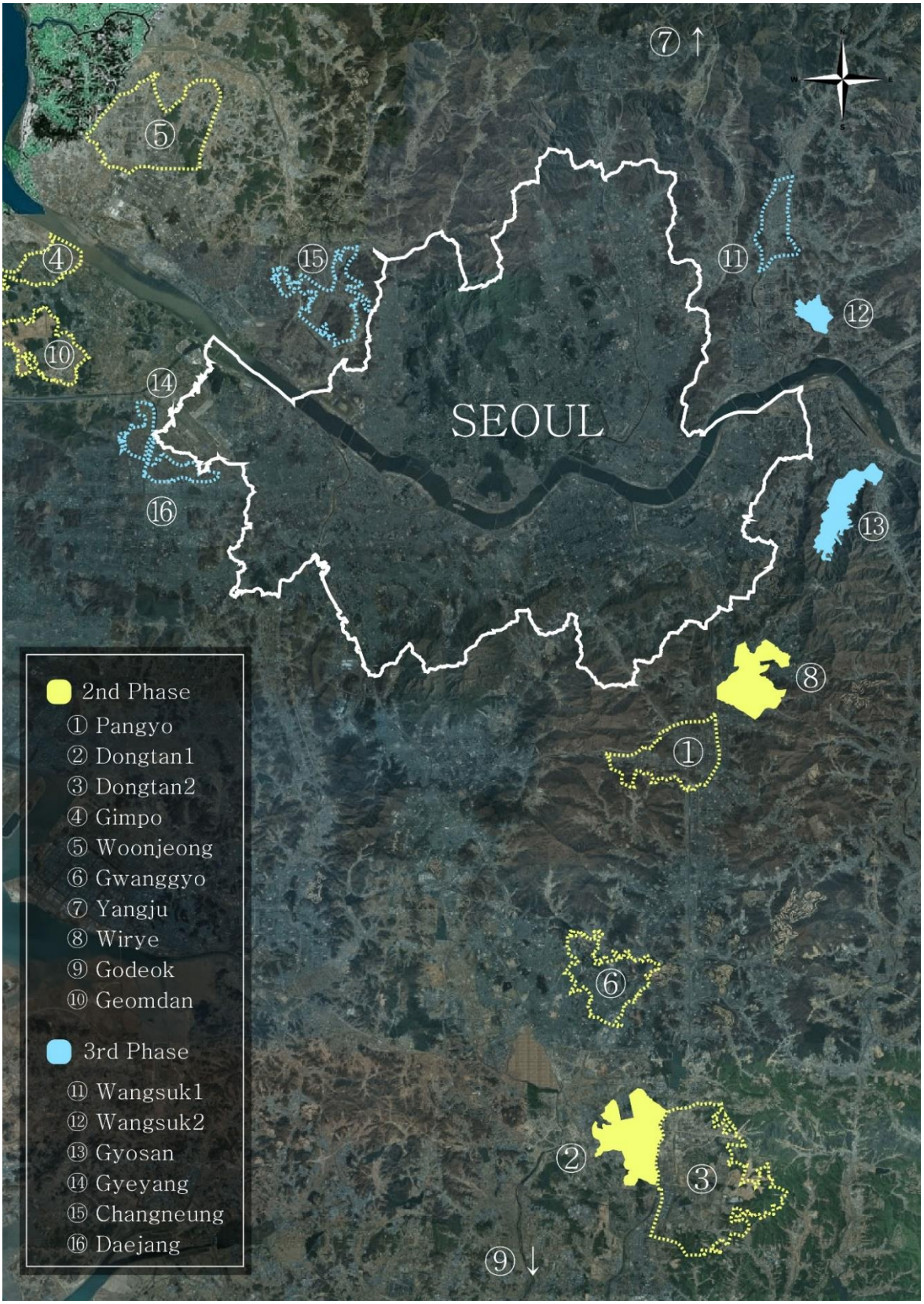


Figure 1. New Cities of Seoul Metropolitan Area (2nd and 3rd Phase)

Wangsuk is located in the northeast of Seoul, in Namyangju City, and it is positioned between Gangwon-province and Seoul, especially in proximity to the Han-river. In particular, the adjacent area has seen active development of numerous new cities or development sites including Yangjeong and Dasan. Wangsuk is relatively smaller in scale compared to other cases and also features the utilisation of existing waterways to create a large green area in the confluence area. Gyosan is located in Hanam-City, to the south of Wangsuk and the southeast of Seoul. It is planned to be constructed as an expansion area of the recently completed Hanam-Misa-district. It is characterized by the significant lifting of development restrictions and ongoing construction. Therefore, Gyosan is surrounded by mountains on all sides and is planned as a city centered around a river that flowed inwards from surrounding valleys. The central green axis is formed along the river, and it is worth noting that following this river towards the north leads directly to the Han-river.

Dongtan is currently in a completed state, while Wirye has completed construction for only about half of its area. The two third-phase new cities have only formalized their land-use plans yet to reach the stage of construction. Therefore, if we were to analyse each case based on the current topographic map or land-use status, the content would be completely different, and the resolution would vary for each case. Therefore, in this study, while referring to the information regarding the current situation, we will primarily analyse the official land-use plans announced for each city. Open spaces such as rivers, transformed water bodies, parks, special pedestrian paths, and plazas that are reflected in the land-use plans are all included in the road and green networks. However, elements such as roads within residential complexes, stroll paths within green areas, and commercial arcades, which are not designated in the land-use plans are excluded from the networks.

Table 2. Green Indices of the New Cities

	Dongtan	Wirye	Wangsuk	Gyosan
Area [km^2]	9.03	6.77	2.39	6.31
Green Area [km^2]	2.53	1.73	0.79	2.21
Percentage [%]	28	25.6	33.4	35

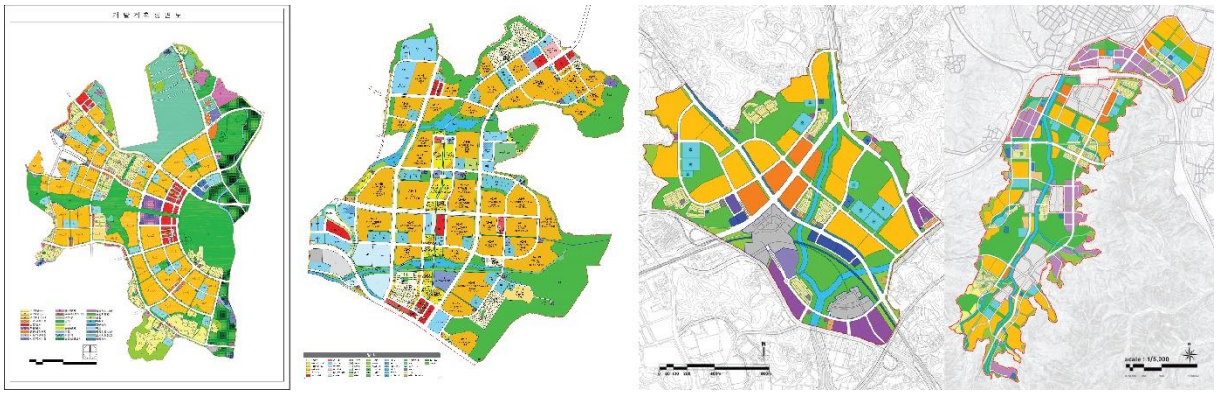


Figure 2. Land-Use Plan of the New Cities (From the Left, Dongtan, Wirye, Wangsuk, Gyosan)

3.2. Development of Green Synergy Indicators

In order to evaluate the synergy of road and green networks for the four cities, spatial syntax theory will be utilised. However, simply using spatial syntax indicators is not sufficient for analysing the connectivity between different facilities or networks; it requires calculations or combinations of the indicators. Kim, S., Y. Kim and Ji (2021) analysed the relationship between the change in building use and the spatial structural characteristics of roads in the central area of Gunsan City by introducing new evaluation indicators induced from original space syntax indicators. They derived spatial structure values at the store level to understand the spatial characteristics of commercial and non-commercial buildings scattered along the roads. They performed spatial syntax analysis on the roads and calculated the integration values of the roads facing the entrances of each store, which were then used to determine the integration level of each store. Similarly, Kim and Choi (2013) developed evaluation indicators for the connectivity of green spaces for linear and areal green spaces respectively. For linear green space integration, they multiplied the integration level of the road installed along the linear green space by the area of the linear green space to calculate the integration level. For areal green space integration, similar to the example of buildings, they multiplied the integration level of the road facing the entrances by the area of the areal green space. They applied the concept of green space integration to the first- and second-phase new cities and conducted an analysis on changes in the green networks. In this study, similar to the previous cases, the spatial syntax results for roads and the arrangement of green spaces will be combined to create new evaluation indicators. Based on these indicators, the green networks of the second- and third-phase new cities will be analysed.

Kim and Choi (2013) incorporated only one road's spatial syntax value for each green space into the evaluation indicator. However, assuming that only one road is connected to each green space has limitations when analysing the complex and intricate green network of the present. Therefore, we are introducing a new concept of green space syntax indicators. The proposed

indicators will reflect the spatial syntax values of all roads adjacent to each green space. In other words, if multiple roads or green axes are connected to a green space, the spatial syntax values of all those roads will be considered and allocated to that green space. Moreover, to facilitate the comparison between cities using these indicators, we employed NACH and NAIN for calculations. The first two indicators are green angular choice (GACH) and green angular integration (GAIN) which are allocated to each green space. They are the sum of choice values and integration values, respectively, of the connected segment lines, which include not only one but all the linked networks. Then another two indicators, green choice ratio (GCR) and green integration ratio (GIR) are introduced to quantify the synergy of the cities. GCR is a ratio of GACH over NACH and GIR is a ratio of GAIN over NAIN. Both indicators show the amount of synergy the road and green networks of each city has in consideration of original space syntax values. Hence, higher GCR means that the green network is highly centered and crucial in connecting the overall network and higher GIR means higher synergy between the road and green networks.

Table 4. Definition of Green Synergy Indicators

Green Synergy Indicator	Calculation Formula
Green Angular Choice [GACH]	$\mathrm{GACH} = \frac{\sum(Area_{green}) \times (NACH_{linked\ segment})}{\sum Area_{green}}$
Green Angular Integration [GAIN]	$\mathrm{GAIN} = \frac{\sum(Area_{green}) \times (NAIN_{linked\ segment})}{\sum Area_{green}}$
Green Choice Ratio [GCR]	$\mathrm{GCR} = \frac{\mathrm{GACH}}{\mathrm{NACH}}$
Green Integration Ratio [GIR]	$\mathrm{GIR} = \frac{\mathrm{GAIN}}{\mathrm{NAIN}}$

3.3. Analysis Framework

The analysis consists of four stages: segment map production, green space extraction, spatial syntax analysis, and evaluation indicators calculation. First, we used AutoCAD 2022 to create segment maps. Based on the officially designated land-use plans, segment maps were manufactured for each city. Segment maps include not only roadways, sidewalks, and pedestrian bridges but also the green spaces, plazas, walking paths within green areas, and waterfront areas specified in the land-use plans. Previous studies primarily focused on analysing roadways, which had limitations in reflecting human movement. In this study, we aimed to incorporate as many pathways for pedestrian movement as possible. According to Turner (2004), spatial syntax is influenced by the extent of segment maps, and 'edge effect'

occurs at the boundaries where the networks break. For this study, the target areas are mostly constructed near development-restricted zones and it is expected that the influence of such peripheral areas will be minimal. In addition, to further minimize the 'edge effect', the nearby crucial road network and major connections were included in the segment maps.

Next, green spaces were extracted based on the land-use plans. Using boundary lines, the distribution of green spaces in each city was determined. For area-based green spaces, extraction was relatively straightforward. However, for linear green spaces, which often had interconnected relationships, separate criteria were established to distinguish different types of green spaces. The objective of this study was to calculate all road networks connected to a specific green space. Therefore, green areas serving as pathways were initially identified, followed by the extraction of smaller green spaces (buffer spaces and connecting spaces). Additionally, during the green space extraction process, all waterways were included as part of the green spaces. Although direct access by pedestrians is not possible, waterways and their usage through waterfront areas, along with bridges offer both functional and scenic effects similar to green spaces. Thus, waterways were classified as a type of green space for the analysis.

For the space syntax analysis and evaluation indicators calculation, we utilized QGIS 3.22.4. The UCL Space Syntax Lab provides depthmapXnet, a tool that enables spatial syntax analysis within QGIS. As determined through theoretical considerations, we performed angular segment analysis for the road networks for each new city. The radius type was set to metric, considering the influence of pedestrian movement based on distance, and we conducted analyses at both the global (n) and local (400m, 800m) levels. The space syntax values calculated for each segment were directly entered into the attribute tables of the shapefiles in QGIS.

Lastly, we combined the results of the analysis with the green spaces to calculate the evaluation indicators. Using the join function in QGIS, we identified the segments connected to each green space and assigned the corresponding space syntax values to the respective green spaces. We employed the 'Join Attributes by Nearest' function, without imposing any restrictions on the 'maximum nearest neighbor', and limited the 'maximum distance' to 30m. This ensured that segments located beyond 30m from a specific green space were not assigned to it. As a result, multiple segments directly connected to each green space and their corresponding space syntax values were correctly assigned. After the assignment, we used StataSE 17 to calculate the synergy evaluation indicators and conduct statistical validation.

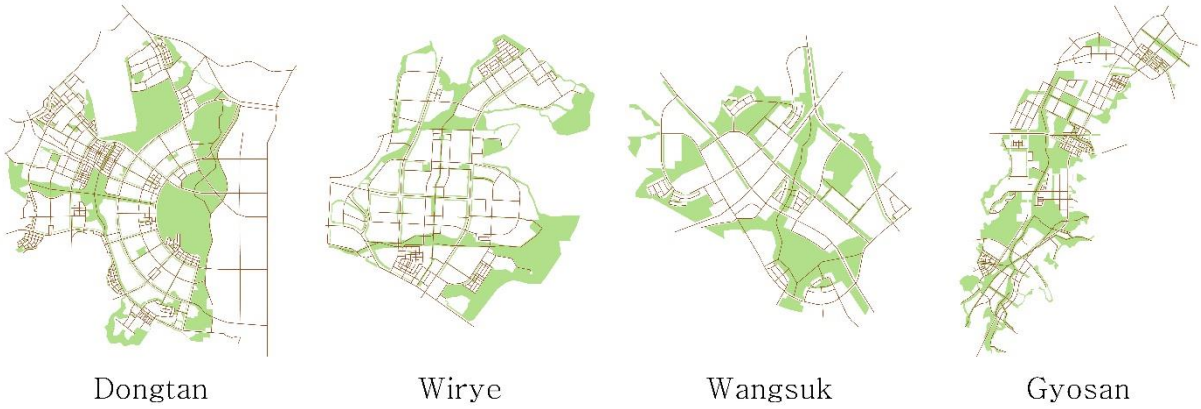


Figure 3.45 Road and Green Networks of the New Cities (Made Using QGIS 3.22.4)

4. Results

4.1. Spatial Structural Characteristics of the Four New Cities

Using the principles of space syntax, I first examined the overall spatial structures of the four new cities. The findings reveal distinct characteristics in terms of control and integration values within the urban networks. Figure 4 is the visual result of space syntax analysis and displays the value of NAIN and NACH of the segments through the difference in thickness; thicker the line, higher the value. Dongtan features a radial road network centered around the central park on the east side. Consequently, the integration values are high for the semi-circular roads connected to various linear-crossing road networks, particularly in the dense commercial area at the city center. The control value shows that the roads surrounding the central park have the highest values, indicating that the central park serves as a convergence point for all roads in Dongtan. Wirye exhibits a uniform distribution of green spaces throughout the city, without a specific central point. Notably, the outskirts of the city have abundant green spaces that connect with the peripheral natural environment. The integration value is highest in the city center and the southern district, while the northern region, with sparse road extensions, shows relatively lower integration. In terms of control, the main roads in the southern central area have the highest values, indicating their frequent use as pathways within Wirye.

Wangsuk displays a similar distribution of green spaces to Wirye, and the integration value is highest along the arterial roads. Moreover, the integration value is significant for the green axes that traverse the central green axis and the riverside axis. In terms of control, the areas surrounding the large park in the south and the arterial road in the northwest exhibit the highest values. Gyosan, characterized by its long-shape in the north-south direction, has major north-south road networks with grid-like green spaces aligned along them. The integration and control values are both high for the main north-south road networks, indicating their prominence within the city.

Table 5. NACH and NAIN of the New Cities

		2nd generation		3rd generation	
		Dongtan	Wirye	Wangsuk	Gyosan
NACH	Global	0.92	0.823	0.869	0.731
	Local(400m)	0.793	0.551	0.707	0.453
	Local(800m)	0.949	0.759	0.858	0.63
NAIN	Global	1.066	1.083	1.234	1.088
	Local(400m)	1.742	1.558	1.616	1.343
	Local(800m)	1.627	1.591	1.54	1.356

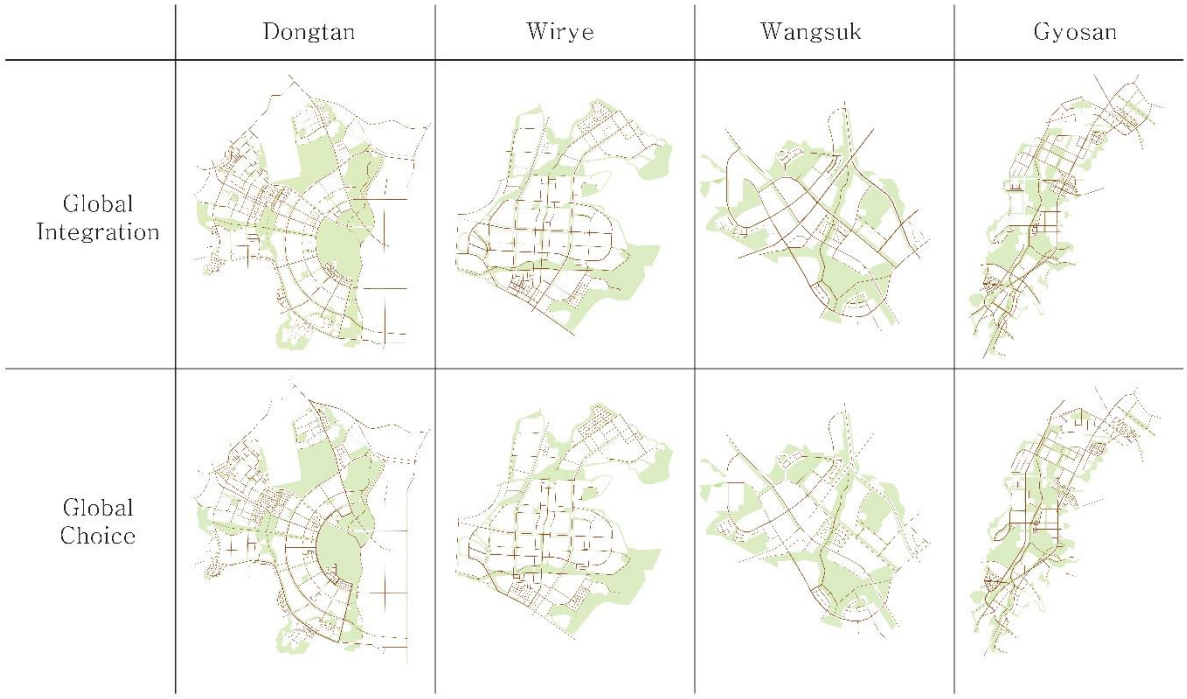


Figure 4. Space Syntax Result of the New Cities (Values Expressed in Thickness)

Compared to the second-phase new cities, the third-phase new cities generally have higher integration values and lower control values. This suggests that the road networks in the third-phase new cities are designed with improved connectivity and reduced centrality. However, when comparing local integration values, the second-phase new cities show higher values, indicating that they are more effectively designed for pedestrian movement. This difference might be due to the lack of detailed road designs in the planning of the third-phase new cities. The introduction of various design elements such as white-zoning has led to the incorporation

of many features that are not reflected in the land-use plans. It is necessary to reassess these aspects after detailed parcel-based designs are completed. Additionally, the increase in self-sufficient land and the rise in industrial land use in the third-phase new cities may have contributed to the lower local integration values. Industrial land, generally characterized by larger scale, can disrupt the continuity of road networks at a finer level. Nevertheless, from a macroscopic perspective in the land-use planning stage, it is evident that the pedestrian-oriented neighborhood design in the third-phase new cities has been spatially compromised compared to the second-phase new cities.

4.2. Green Synergy of the Four New Cities

Through analysing the green synergy indicators for the cities, the following results were observed. Firstly, among the four cities, Dongtan showed the highest GCR (18.49), which indicates a strong centrality of the network, and in the case of Dongtan, this can be attributed to the presence of a large central park. Although GIR (13.48) in Dongtan is lower compared to the third-phase new cities, it is significantly higher than that of Wirye. Dongtan garnered attention as a city with innovative green space planning when the second-phase new cities were first established in the early 2000s. It received praise for its grid network of roads and green spaces extending from the central park, which is now reflected in the high GIR. Local GCRs (15.20, 17.23) decreased as the range decreased. This indicates that the distinctiveness of the central park is not clearly manifested at a local level. In other words, while the role of the central park is evident at a citywide scale, green spaces with centrality are not readily visible at a local level. This effectively demonstrates the characteristics of Dongtan's green space network, which is primarily composed of linear parks. Local GIRs (15.40, 15.76) were higher than the global GIR, indicating that Dongtan's green space network is effectively connected even at a local level. Particularly, the higher values at a local level indicate that green spaces are better connected in the pedestrian range of neighborhoods. In summary, Dongtan demonstrates high GCR with a central park and high GIR with a grid network of roads, even at a local scale, indicating a high synergy within linear parks.

Wirye recorded the lowest values in all indicators. Unlike Dongtan, Wirye has a green space network similar to other second-phase new cities. Many second-phase new cities utilised development restriction zones on the outskirts of the city to secure the ratio of green spaces, and this characteristic is also evident in Wirye. As a result, its GCR (11.54) and GIR (10.05) were the lowest among the target areas. At a local level, it showed even lower value, highlighting the limitations of green spaces concentrated at the outskirts of the city. Wirye’s commercial and residential areas are primarily located in the city center, while green spaces are mainly situated on the outskirts. This indicates that the overall synergy at a local level is diminished due to the segregation of main living areas and green spaces.

Wangsuk ranked third in GCR (17.68) but showed significantly higher values compared to Wirye. Wangsuk does not have a concentrated large green space in a specific area but rather

has multiple medium-sized green spaces distributed throughout the city. This is why the GCR is relatively low. However, Wangsuk shows high local GCRs (18.12, 17.34), which are the highest among the target areas. This indicates that the secondary central green spaces are functioning as central parks at the neighborhood level. Medium-sized green spaces must be effectively connected as networks. Wangsuk's GIR (14.77) ranked the highest among the target areas. It also showed high local GIRs (15.55, 13.99), with the integration rate at the 400m scale ranking the highest. This demonstrates the excellent synergy of Wangsuk's green spaces, not only in the overall range but also at a local scale. In sum, Wangsuk demonstrates high synergy at a local level due to the dispersed green spaces throughout the city and the effective network of roads connecting each green space.

Gyosan showed the second-highest GCR (18.09) right behind Dongtan, and its absolute size was competitively large. Although not as distinct as Dongtan, Gyosan also has a long central green space centered around the river in north-south direction, and the centrality of this green space is evident through GCR. However, it showed lower local GCRs (12.66, 14.81) compared to Dongtan and Wangsuk, indicating that there are fewer green spaces with centrality at a local scale. Unlike Wangsuk, green spaces in Gyosan do not play a central role in each neighborhood unit. Gyosan's GIR (14.62) was similar to that of Wangsuk. This indicates that Gyosan, as a third-phase new city, also exhibits a high level of synergy. However, at a local level, particularly in the 400m range, it showed lower values (14.42, 15.26) compared to Wangsuk, indicating relatively lower synergy at a local scale. In conclusion, Gyosan also shows a high GCR and GIR, and the long rectangular central park is performing its role effectively. However, it exhibits slightly lower synergy at a local level compared to Wangsuk.

Table 6. Green Synergy Indicators of the New Cities

		2nd generation		3rd generation	
		Dongtan	Wirye	Wangsuk	Gyosan
GACH	Global	17.01	9.50	15.37	13.22
	Local(400m)	12.05	5.50	12.81	5.73
	Local(800m)	16.35	8.40	14.88	9.33
GAIN	Global	14.37	10.89	18.22	15.91
	Local(400m)	26.83	15.08	25.13	19.37
	Local(800m)	25.64	15.73	21.55	20.69
GCR	Global	18.49	11.54	17.68	18.09
	Local(400m)	15.20	9.99	18.12	12.66
	Local(800m)	17.23	11.07	17.34	14.81
GIR	Global	13.48	10.05	14.77	14.62

	Local(400m)	15.40	9.68	15.55	14.42
	Local(800m)	15.76	9.89	13.99	15.26

Based on the analysis of synergy, a comparative study between the cities was conducted. The analysis results showed that the GCR was high in order of Dongtan-Gyosan-Wangsuk-Wirye, while the GIR was high in order of Wangsuk-Gyosan-Dongtan-Wirye. Control value differed according to the scale of analysis and showed the difference of centrality in terms of scale and neighborhood-level of the four cities. Regarding integration, both Wangsuk (14.77) and Gyosan (14.62) showed significantly higher values compared to Dongtan (15.40) and Wirye (10.05). This indicates that the green spaces in the third-phase new cities are more efficiently connected to the road network compared to the second-phase new cities. However, at a local level, Dongtan (15.40) had the highest GIR, while Wangsuk and Gyosan also showed higher values compared to Wirye. Overall, the third-phase new cities demonstrated superior green space arrangement and connectivity compared to the second-phase new cities, indicating a higher level of synergy.

5. Conclusion

Based on the application of space syntax theory to the representative second- and third-phase new cities, the following key conclusions were drawn regarding the synergy between road and green networks. First, in terms of road networks, the third-phase new cities showed higher integration and lower control compared to the second-phase new cities. This indicates that the overall connectivity of street networks in the third-phase new cities is good, with a dispersed pattern rather than a concentration of networks in central locations. However, from a local perspective, they exhibited lower connectivity compared to Dongtan, although they showed higher values compared to Wirye, which is expected to have similar characteristics to typical second-phase new cities. Second, regarding the synergy of the two networks, the analysis revealed that the third-phase new cities also demonstrated superiority over the second-phase new cities. Particularly, the global GIRs of the third-phase new cities were significantly high, indicating efficient connections throughout the road and green networks. However, the local integration ratio in the third-phase new cities was lower than that of Dongtan, suggesting the need for improvement in the design of neighborhood units.

In future research, we intend to increase the number of target sites to strengthen the statistical basis. Specifically, further analysis of the synergy of other second-phase new cities, which will soon all be constructed, should be conducted. Additionally, as the construction of second- and third-phase new cities progresses, more accurate analysis results can be obtained by considering the detailed street networks of completed new cities, including the interconnections between residential complexes, waterways, green spaces and commercial open spaces. In this study, the analysis of detailed street networks was limited due to the use

of land-use plans rather than the current state of the cities. Through this research, new quantitative evaluation indicators for synergy, GACH, GAIN, GCR and GIR, were defined and applied to the analysis of major new cities. Through future improvements, it is proposed to refine the indicators and provide a more accurate and precise evaluation framework. This can be utilised not only for new cities but also for diagnosing the synergy of road and green networks in existing urban areas, enabling effective urban regeneration that reflects citizens' demand for green spaces.

Funding. This research is financially supported by Korea Ministry of Land, Infrastructure and Transport (MOLIT) as [Innovative Talent Education Program for Smart City], the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea (NRF-2021S1A5C2A03087287), the Institute for Peace and Unification Studies (IPUS) at Seoul National University under the project of “Laying the Groundwork for Unification and Peace” and the Korea Agency for Infrastructure Technology Advancement(KAIA) grant funded by the Ministry of Land, Infrastructure and Transport(Grant RS-2022-00143404).

References

Al-Sayed, K. (2014) Space Syntax Methodology: A Teaching Guide for the MRes/MSc Space Syntax Course (Version 5). London: Bartlett School of Architecture, UCL.

El-Darwish, I. (2022) Enhancing outdoor campus design by utilizing space syntax theory for social interaction locations. Ain Shams Engineering Journal, 3(1).

Hillier, B. (1996, 2007) Space Is the Machine. Cambridge: Cambridge University Press.

Hillier, B. (2009) Spatial Sustainability in Cities: Organic Patterns and Sustainable Forms. Proceedings of the 7th International Space Syntax Symposium, K01:1–K01:20. Stockholm, Sweden: Royal Institute of Technology (KTH).

Hillier, B. and S. Iida. (2005) Network Effects and Psychological Effects: A Theory of Urban Movement. Proceedings of the 5th International Space Syntax Symposium. Delft, Netherlands: Delft University of Technology (TU Delft), pp. 553–564.

Hillier, B., T. Yang and A. Turner (2012) Normalising Least Angle Choice in Depthmap: And How It Opens up New Perspectives on the Global and Local Analysis of City Space. Journal of Space Syntax, 3(2), pp. 155–193.

Joo, Y. and Y. Kwon (2022) Evaluating the consequences of supergrid developments with relation to the modernization and conservation of historic street patterns: a case study on early 20th century Seoul. Journal of Asian Architecture and Building Engineering, 21(2), pp.618-632.

Kim, J. (2010) The Influences of Linear City Form on the Spatial Schemes of Korean New Towns and Their Characteristics. Journal of Korea Planning Association (JKPA), 45(2), pp. 51-68.

Kim, J. and S. Choi (2013) Investigation on Planning Tendency of Green Network System in Korean New Towns in View of Spatial Configuration. Journal of The Urban Design Institute

of Korea, 14(3), pp. 145-159.
Kim, S. and S. Yang (2021) Space Syntactic Interpretation on the Gentrification with the Urban Spatial Configuration - Focused on Commercial Gentrification Area, Seoul. Journal of Urban Policies, 12(3).
Kim, S., Y. Kim and B. Ji (2021) A Study on the Building Usage Change in the Gentrification Area from Spatial Configuration Perspective – Focused on the Old Downtown of Gunsan-si. Journal of Architectural Institute of Korea, 37(9).
Kim, Y. and J. Kim (2011) Citizens' Perception and Satisfaction for Urban Parks and Greens – A Case Study of Anyang City, Bucheon City and Uijeongbu City in Korea. Journal of Korea Planning Association (JKPA), 46(1), pp. 157-170.
Kim, Y., S. Kim, O. Kwon, Y. Yoo and G. Choi (2021) Strategies for Improving Neighborhood Parks and Green Spaces for the post-COVID-19 Era. Sejong: AURI.
Korea Land Corporation (2008) Report on Specialization Plan and Design Approach for Upgrading the Second-Phase New Towns into Luxury Cities. Sungnam: Korea Land Corporation.
Lee, J. (2011) Study on the citizen's evaluation for urban parks and greens in Bu-cheon city (MArch thesis) Suwon, Sungkyunkwan University.
Lim, Y. and C. Kim (2011) A Study on Establishment Standard of Green Space Area In Consideration Of Distribution Of Surrounding Green Land – Focused on Second New-Town. Journal of Korea Planning Association (JKPA), 46(1), pp. 143-156.
Oh, S. and D. Lim (2014) 50 Years of planned cities in Seoul metropolitan area 1961-2010. Anyang: AURI.
Omer, I. and N. Kaplan (2017) Using space syntax and agent-based approaches for modeling pedestrian volume at the urban scale. Computers, Environment and Urban Systems, 64, pp. 57-67.
Park, G. et al. (2021) A Study on Spatial Structural Characteristics of Gentrification Sites in Seoul Urban Regeneration Revitalization Areas. Journal of the Architectural Institute of Korea, 37(9).
Turner, A. (2001) Angular Analysis. Proceedings of the 3rd International Space Syntax Symposium, 30.1–30.11. Atlanta, GA, United States: Georgia Institute of Technology.
Turner, A. (2004) Depthmap 4: A Researcher's Handbook. London: Bartlett School of Graduate Studies, UCL.
Turner, A. (2007) From Axial to Road-Centre Lines: A New Representation for Space Syntax and A New Model of Route Choice for Transport Network Analysis. Environment and Planning B: Planning and Design, 34(3), pp. 539–555.
Um, S. and S. Lee (2008) Development and Application of an Assessment Model of Greenspace – A Case Study for Pyeongchon and Sanbon Newtown. Journal of Korea Planning Association (JKPA), 43 (3), pp.263-273.
Yeom, S. and C. Park. 2011. "Satisfaction Experienced in Urban Parks and Green Spaces according to Their Component and Arrangement- A Case Study on Tama Newtown, Japan." Journal of the Korean Institute of Landscape Architecture, vol. 39, no. 5, pp. 12-20.

Yıldırım, O. and E. Celik (2023) Understanding pedestrian behavior and spatial relations: A pedestrianized area in Besiktas, Istanbul. Frontiers of Architectural Research, 12, pp. 67-84.

Appendix: Descriptive Statistics of Space Syntax Result

Descriptive Statistics of Space Syntax Result (Dongtan)

Variable	Obs	Mean	Std. Dev.	Min	Max
Angular Connectivity	1036	.658	.754	0	4.034
Connectivity	1036	1.967	.87	0	5
Segment Length	1036	117.395	168.265	1.611	3216.177
Choice	1036	1129.011	2792.861	0	19887
Choice(400m)	1036	30.211	71.793	0	628
Choice(800m)	1036	76.491	134.311	0	780
Integration	1036	24.488	47.109	0	1024
Integration(400m)	1036	26.716	70.972	0	1152
Integration(800m)	1036	22.587	47.811	0	1024
Node Count	1036	67.566	74.99	1	208
Node Count(400m)	1036	10.858	9.892	1	44
Node Count(800m)	1036	17.718	14.296	1	61
Total Depth	1036	323.703	477.662	0	1944.883
Total Depth(400m)	1036	12.415	21.429	0	113.77
Total Depth(800m)	1036	28.772	40.259	0	190.445
NACH	1036	.92	.615	0	2.199
NACH(400m)	1036	.793	.645	0	2.075
NACH(800m)	1036	.949	.647	0	2.28
NAIN	1036	1.066	.632	.286	3.627
NAIN(400m)	1036	1.742	.737	.49	4.488
NAIN(800m)	1036	1.627	.792	.483	4.279

Descriptive Statistics of Space Syntax Result (Wirye)

Variable	Obs	Mean	Std. Dev.	Min	Max
Angular Connectivity	348	.711	.762	0	3.133
Connectivity	348	1.816	.964	0	5
Segment Length	348	171.771	192.622	5.686	1570.909
Choice	348	179.04	329.253	0	1924
Choice(400m)	348	5.937	13.002	0	104
Choice(800m)	348	17.451	29.053	0	208
Integration	348	19.405	76.947	0	1024
Integration(400m)	348	9.417	95.091	0	1024
Integration(800m)	348	20.688	77.898	0	1024

Node Count	348	25.431	22.487	1	67
Node Count(400m)	348	5.655	4.043	1	22
Node Count(800m)	348	9.046	5.914	1	23
Total Depth	348	64.822	79.132	0	323.68
Total Depth(400m)	348	.055	1.205	0	8
Total Depth(800m)	348	8.795	10.865	0	56.41
NACH	348	.823	.638	0	1.985
NACH(400m)	348	.551	.581	0	1.767
NACH(800m)	348	.759	.65	0	1.896
NAIN	348	1.083	.48	.333	2.884
NAIN(400m)	348	1.558	.592	.66	3.299
NAIN(800m)	348	1.591	.627	.466	3.475

Descriptive Statistics of Space Syntax Result (Wangsuk)

Variable	Obs	Mean	Std. Dev.	Min	Max
Angular Connectivity	245	.696	.704	0	3.132
Connectivity	245	1.894	.792	0	4
Segment Length	245	110.298	104.083	12.844	989.754
Choice	245	155.559	250.711	0	1300
Choice(400m)	245	10.796	17.231	0	86
Choice(800m)	245	34.927	54.235	0	340
Integration	245	15.423	8.141	0	40.96
Integration(400m)	245	16.627	12.737	0	78.769
Integration(800m)	245	16.11	10.645	0	83.592
Node Count	245	22.461	18.574	1	52
Node Count(400m)	245	7.633	4.855	1	22
Node Count(800m)	245	12.62	9.27	1	39
Total Depth	245	49.21	56.372	0	211.117
Total Depth(400m)	245	6.837	8.692	0	39.668
Total Depth(800m)	245	17.008	20.646	0	87.668
NACH	245	.869	.657	0	2.09
NACH(400m)	245	.707	.6	0	1.808
NACH(800m)	245	.858	.655	0	1.933
NAIN	245	1.234	.566	.538	3.227
NAIN(400m)	245	1.616	.613	.68	3.197
NAIN(800m)	245	1.54	.686	.596	3.78

Descriptive Statistics of Space Syntax Result (Gyosan)

Variable	Obs	Mean	Std. Dev.	Min	Max
Angular Connectivity	450	.796	.775	0	4.181
Connectivity	450	1.747	.899	0	4
Segment Length	450	160.908	186.981	10.494	1321.232
Choice	450	123.998	223.494	0	1200
Choice(400m)	450	5.009	9.469	0	64
Choice(800m)	450	17.553	34.698	0	220
Integration	450	11.468	8.957	0	68.267
Integration(400m)	450	12.795	26.178	0	512
Integration(800m)	450	11.867	11.033	0	104.727
Node Count	450	18.093	16.398	1	51
Node Count(400m)	450	5.22	3.707	1	17
Node Count(800m)	450	8.218	6.405	1	29
Total Depth	450	43.389	57.457	0	248.012
Total Depth(400m)	450	3.93	5.37	0	27.738
Total Depth(800m)	450	9.27	12.177	0	53.484
NACH	450	.731	.66	0	2.061
NACH(400m)	450	.453	.534	0	1.487
NACH(800m)	450	.63	.619	0	1.745
NAIN	450	1.088	.496	.385	3.22
NAIN(400m)	450	1.343	.48	.572	3.449
NAIN(800m)	450	1.356	.559	.502	3.721

THE PERCEPTION AND PREFERENCE OF COMPOUND SPACES IN TRADITIONAL VILLAGES IN CHINA (1066)

Jia Feng[1*], Xiaojian Chen[1]

[1] School of Architecture, Xi'an University of Architecture and Technology, China; [*]fengjia91@163.com

Abstract. Traditional villages in China are undergoing spatial renewal and reorganization, resulting in the emergence of compound spaces comprising modern and historical buildings. As integral parts of these traditional villages, these compound spaces have a significant impact on the perception preferences of the historical spaces within them. This study employs deep learning techniques to analyze photos and videos containing compound spaces and extract the visual occupation ratio and visual change ratio of modern and historic buildings. The specific focus is to explore the influence of the visual occupation ratio and visual change ratio on spatial perception preferences, aiming to analyze and understand the delicate balance between sustainable development and heritage preservation in traditional villages. The paper examines the external representation of architectural elements within compound spaces, including the potential increase in perception preferences by reducing modern buildings and the influence of trends in modern and historical buildings on perception preferences. The findings from this research provide valuable insights for addressing spatial dissonance amidst rapid development in traditional villages in China.

Keywords: Perception, Preference, Visual Occupation Ratio, Compound Spaces, Traditional Villages

1. Introduction

Traditional villages are an important part of China's rural heritage, embodying the country's rich farming civilization. They hold historical, cultural, and ecological significance and serve as repositories of historical memory(Liu & Xu, 2021). Recognizing their value, the Chinese government has introduced laws and policies since the beginning of the new millennium to protect and revitalize traditional villages(Guo & Sun, 2016). However, the rapid renewal and reorganization of these villages have led to disorderly development and construction. This haphazard expansion has negatively impacted the spatial features of the villages(Zhao et al., 2016) undermining their historical charm and endangering their heritage and cultural value.

Early research on the perception of traditional village aesthetics primarily focused on landscape feature analysis, evaluation and optimization, as well as protection and management. The objective was to analyze the composition, development, evolution, essential characteristics, and existing issues of village spaces. The research was divided into

two approaches: Imagism and Imageism. Imagism drew upon the research methodology of Kevin Lynch's urban image theory, utilizing spatial intention maps from different groups within the village to explore the deep-level spatial continuation in the process of village evolution. This approach integrated space syntax analysis to identify invariant elements within the spatial style. On the other hand, Imageism employed picture data as the research object, drawing upon methods such as psychological scales, emotional evaluation techniques, cognitive scorecards, visual preference surveys, and scenic beauty evaluation methods. Experimental methods were used to understand the relationship between village aesthetics and people's aesthetic responses, while assessing variations in individual participants' impressions of the village's external appearance(Foltête et al., 2020)(Jiang et al., 2015)(Zhang & Lin, 2011)(Gobster et al., 2019). During this period, the image data aimed to reveal perceptual preferences related to large-scale landscape elements such as heritage environment, agricultural environment, and natural environment(Yang et al., 2021).

In recent years, significant breakthroughs have been achieved in using computational and data techniques to analyze the feature information contained in images through deep learning (DL) algorithms. Compared to traditional machine learning approaches, intelligent recognition based on deep learning and large-scale image datasets has greatly improved accuracy. Within the research paradigm of deep learning, each image possesses distinctive features that set it apart from others. Some of these features are natural and perceptible, such as brightness, edges, textures, and colors, while others may require transformation or processing to be observed. This research approach aids in analyzing the composition and characteristics of physical environmental elements in villages. For instance, by identifying traditional village elements and socio-environmental attributes in images and utilizing image recognition based on physical environmental features(Yin & Wang, 2016), the perceptual preferences of people's cognitive concepts can be linked, enabling intelligent evaluations of village style (Cheng et al., 2017) and visual quality(L. Liu et al., 2017). Currently, deep learning techniques primarily focus on image recognition and evaluation, rural landscape identification, evaluation, and protection in the research on the perception of traditional villages.

However, existing research on traditional villages has primarily focused on the overall spatial characteristics, with limited exploration of the perceptual preferences regarding compound spaces formed by the combination of modern and historical architecture. For instance, there is a lack of study on the impact mechanism of the combination of modern and historical architecture on people's perceptual preferences and which tendencies in modern and historical architecture may increase or decrease such preferences. This study employs deep learning methods to extract visual occupancy and visual change rates of modern and historical architecture from photographic and video data containing compound spaces. In conjunction with neurophysiological experiments, this research investigates people's perception and preferences regarding the compound spaces in traditional villages.

2.Methods

2.1 Data Collection And Preprocessing

2.1.1 Data Collection Method

The collection of visual data was accomplished using the Gopro8 model from Gopro company. The video functionality of this device allowed for continuous and intermittent recording of image data and coordinate positions based on the user's travel distance. Additionally, the device provided various settings and modes, such as timed burst mode and video mode, which facilitated the use of different options when capturing environmental images. By connecting the device with the accompanying application on a smartphone, the surveyors were able to traverse predefined routes. The built-in stabilization feature of Gopro effectively reduced errors between the recorded video data and the actual environment caused by shaking and vibration. For this study, the entire environmental images were captured in video mode. All collected data were saved in a database.

2.1.2 Survey Location

In order to minimize the potential errors resulting from regional variations in geographical, economic, and cultural environments, we selected five villages within a concentrated and contiguous protection area of traditional villages as the experimental subjects. This area is located in Jinhua City, Zhejiang Province, China. The data collection process commenced at the same time over a span of five working days. We predetermined the areas to be measured, and the surveyors collected data by walking through the villages. Based on the proportional relationship between historical and modern buildings in traditional villages, the entire environmental data were categorized into six types: Single Type Ⅰ (a), Single Type Ⅱ (b), Mixed Type Ⅰ (c), Mixed Type Ⅱ (d), Mixed Type Ⅲ (e), and Natural Type(f) (Figure 1).

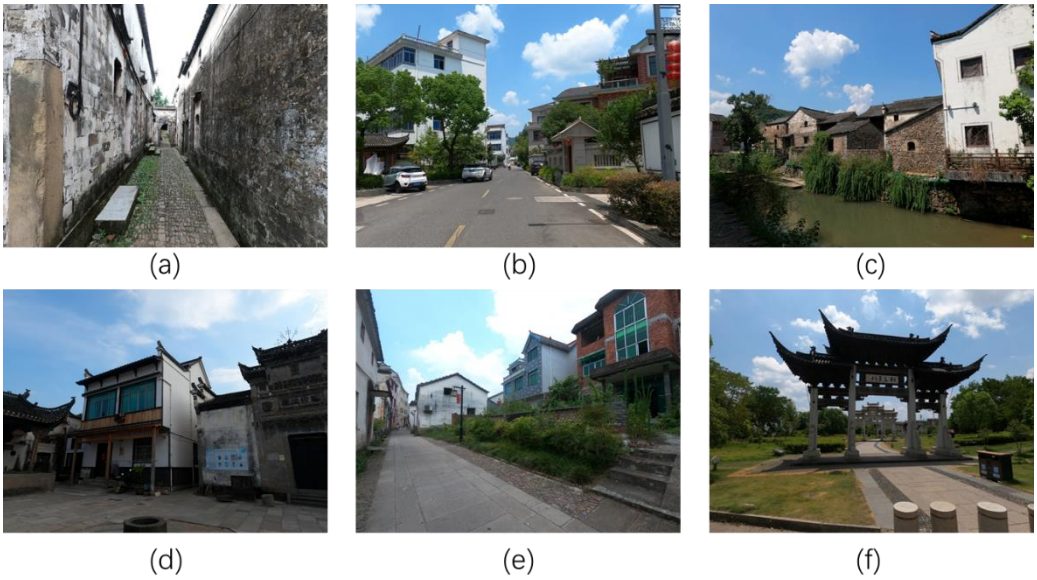


Figure 1. The six different proportional types of composite spaces in traditional villages are represented as follows: (a) historical architectural spaces, (b) modern architectural spaces, (c)historical spaces with low hybridity, (d)complex spaces with high hybridity, (e)modern spaces with low hybridity, (f)natural spaces.

The collected data underwent preprocessing to select video data that effectively reflected the environmental characteristics. In the preprocessing stage, video data was segmented into 1-minute clips(Li & Kang, 2019) from the original video data. Finally, through the preprocessing step, we identified and selected 20 video data clips.

2.2 Data Analysis

2.2.1 Deep Learning Model

Deep learning (DL) is a method of learning the intrinsic patterns and hierarchical representations of sample data by extracting indicators from collected image datasets. The model used in this study is Convolutional Neural Network (CNN), which is primarily employed in computer vision tasks such as semantic segmentation (SS). DL requires image datasets for training, and currently available open datasets include ADE20K, ImageNet, and others, which contain basic environmental elements of cities but fail to differentiate between historical and modern architecture. In this research, we developed a small-scale semantic annotation database specifically for traditional village images. In addition to the dataset, we utilized MobileNetV2 and PSPNet as the architecture for the entire deep learning model, with its primary function being video semantic segmentation (VSS) (Figure 2). The visual dataset training was conducted using PyTorch, and the training and utilization of the entire model were performed in PyCharm.

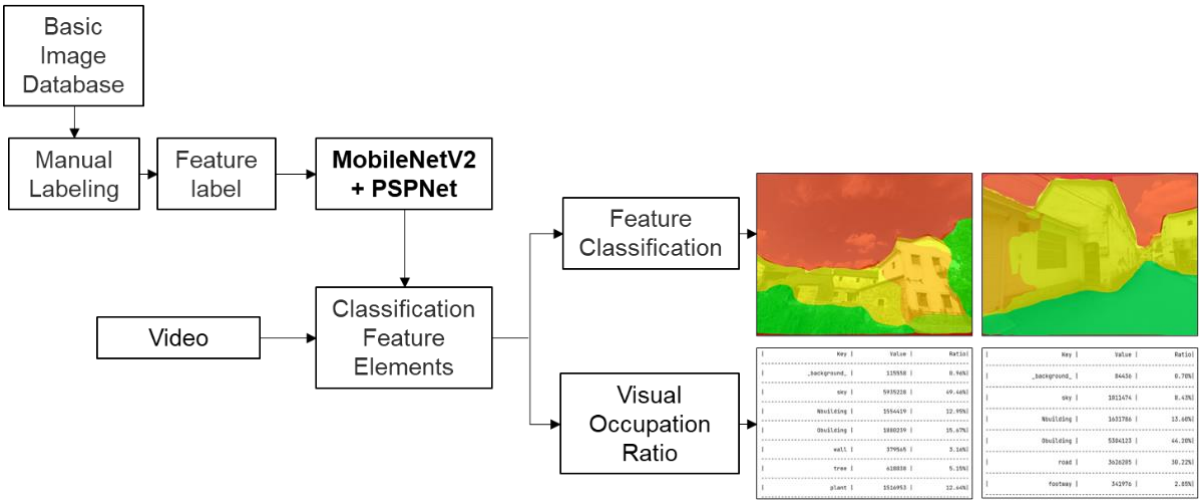


Figure 2. Demonstrates the workflow and results of the semantic segmentation task (VSS) based on MobileNetV2+PSPNet

2.2.2 Measure From Videos

To quantify the visual occupancy rates(VOR) of historical and modern architecture in the videos, we employed the VSS function of the SS model to measure the percentage of pixels occupied by modern and historical architecture per second in each video. Pixels are the smallest units that can be displayed and controlled in a raster image. Digital photographs consist of a two-dimensional grid of pixels. By inputting photos containing historical and modern architecture into the SS model, we obtained sets of percentages representing the pixel occupancy of modern architecture (N-VOR) and historical architecture (O-VOR) in the video data on a per-second basis. Based on the acquired VOR features, we defined different spatial types using three levels: high (H; VOR > 40%), moderate (M; 40% ≥ VOR > 10%), and low (L; 10% ≥ VOR). To distinguish between historical and modern architecture, we used Ho, Mo, Lo, and Hn, Mn, Ln to represent different levels of O-VOR and N-VOR, respectively.

2.3 Physiological Measurements

2.3.1 Experimental Procedure

We employed an experimental approach to measure the physiological perception process of the video data. Physiological indicators have been proven to be more suitable for studying continuous data. The experiments were conducted in a university classroom with controlled room temperature (22°C), air humidity (65%), and illumination (500lx). There were no other distracting objects in the room. Participants were instructed to sit comfortably at a distance of 1.5m from the screen. The experiments were conducted throughout the day, from 9:00 AM to 11:30 AM and from 2:00 PM to 5:00 PM. The study aimed to provide the same environmental conditions for each category to reduce errors. The procedure for each participant was as follows: the experimental process and requirements were explained to the participants. After obtaining their consent, the researchers attached the electroencephalogram (EEG) devices to the participants. Calibration of the baseline EEG data was performed first. The videos were also processed to remove sound to minimize its impact on the experiment. Subsequently, the participants randomly selected a type of video data, and EEG data were recorded during this period (Figure 3). A total of 398 EEG data recordings were collected in this experiment.

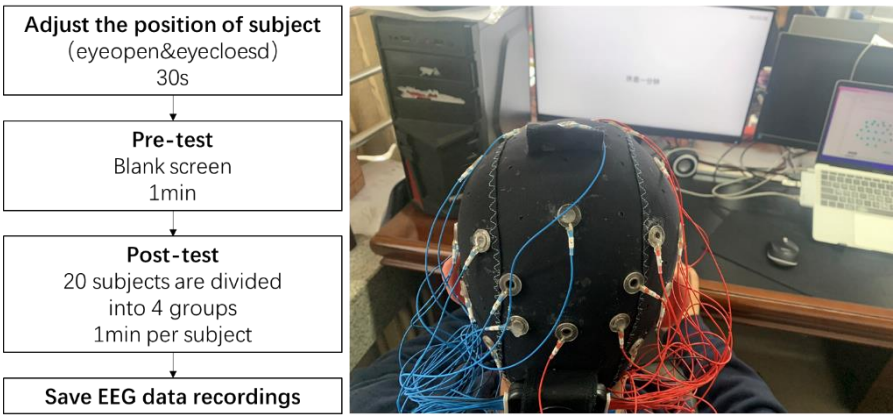


Figure 3. Experimental procedure

2.3.2 Physiological Measurements

This experiment utilized the Emotiv EPOC FLEX system to detect physiological signals. It is a non-invasive and harmless electroencephalogram (EEG) device. The reliability and accuracy of the Emotiv EEG device have been validated in previous studies. The device consists of 14 channels (AF3, F7, F3, FC5, T7, P7, O1, O2, P8, T8, FC6, F4, F8, AF4), covering four regions of the brain (frontal, temporal, parietal, and occipital lobes). The EPOC FLEX system continuously captures the brainwave signals from the entire brain (i.e., 14 electrodes) and transmits these signals to a computer hard drive via Bluetooth for storage as raw EEG data. The Emotiv Pro software calculates the participants' performance metrics based on the raw EEG data, including Engagement, Excitement, Focus, Interest, Relaxation, and Stress dimensions. The

device generates data every 10 seconds.

2.4 Data Analysis

The statistical analyses were conducted using SPSS version 25. Firstly, the mean values of the Visual Occupancy Rate (VOR) for historical and modern architecture were calculated at a 10-second interval. Additionally, the Visual Change Rate (VCR) was defined based on the changes in VOR between consecutive 10-second intervals. Covariance analysis (ANCOVAs) was performed with the resting-state physiological indicators as covariates and O-VOR and N-VOR as independent variables to analyze the main effects and interaction effects. Subsequently, simple effects analyses were conducted on the physiological indicators showing significant interactions. Furthermore, the relationship between spatial VCR and changes in physiological indicators was statistically analyzed using k-means cluster analysis.

3. Results

3.1 Main Effect Analysis Of VOR And Physiological Indicators

We analyzed the main effects of O-VOR and N-VOR on six physiological indicators: engagement, excitement, focus, interest, relaxation, and stress (Figure 4, Table 1). The results indicated significant correlations between baseline physiological indicators and the outcomes. The main effects of engagement and interest were not significant, and there was no significant interaction effect. Excitement measured before and after the experiment showed significant differences, with a decrease in excitement during the experimental process. The main effect of O-VOR was significant, with the following corresponding results: Lo (M=0.421) > Ho (0.396) > Mo (0.363). O-VOR also showed a significant difference in its impact on focus, with the following results: Lo (M=0.504) > Ho (M=0.500) > Mo (M=0.467). Additionally, the results demonstrated a significant interaction effect between O-VOR and N-VOR on focus. There were significant differences in the effects of O-VOR and N-VOR on relaxation. The main effect of O-VOR was significant, with the following results: Lo (M=0.321) > Mo (M=0.309) > Ho (0.293). The main effect of N-VOR was significant, with the following results: Hn (0.332) > Ln (0.323) > Mn (0.303). The stress values decreased before and after the experiment, but the differences in the effects of O-VOR and N-VOR on the stress indicator were not significant, although the

interaction effect was significant.

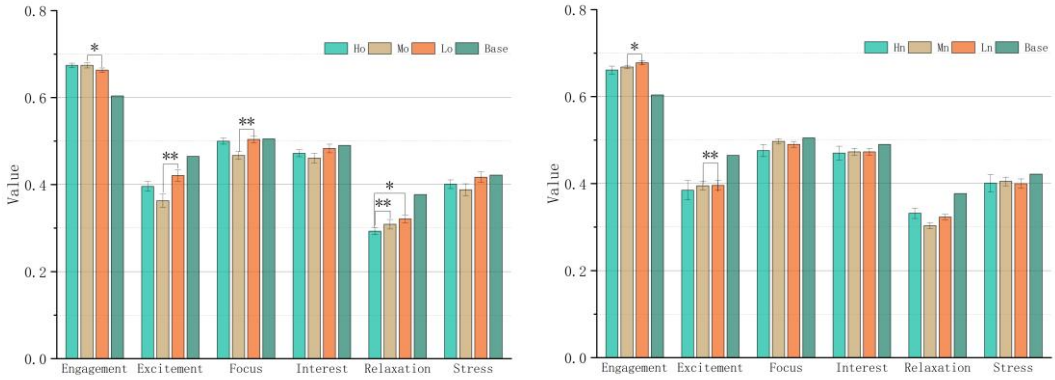


Figure 4. Value of Physiological indicators in the main effect analysis(N=1155,standard error, * $p < 0.05$； ** $p < 0.01$).

3.2 Simple Effect Analysis Of Significant Interaction Effects

The results of the main effect analysis showed significant differences in the values of the Fcous, Relaxation, and Stress physiological indicators before and after the experiment, showing a decreasing trend (Figure 5, Table 2). The interaction analysis between N-VOR and O-VOR revealed that these three indicators were not only influenced by the main effects but also by the interaction effects, necessitating further analysis through simple effect analysis to explain the different roles of N-VOR and O-VOR.

The simple effect results for Fcous are as follows: Mo-Ln (M=0.499) > Mo-Hn (M=0.486); Hn-Lo (M=0.525) > Hn-Mo (M=0.426); Mn-Lo (M=0.523) > Mn-Mo (M=0.477). The simple effect analysis further demonstrated that the interaction effect was stronger for Mo-Ln compared to Mo-Hn. The interaction effect of Hn-Lo was greater than Hn-Mo, and the interaction effect of Mn-Lo was also greater than Mn-Mo. In spaces where one element has a low visual occupancy rate, the combined effect of H-VOR and N-VOR is higher on Fcous. In other words, in compound spaces with lower mixing rates, the visual occupancy rate of the buildings has a positive impact on Fcous, and lower mixing rates are more likely to increase Fcous neurons.

The simple effect results for Relaxation are as follows: Mo-Ln (M=0.349) > Mo-Hn (M=0.270), Mo-Ln (M=0.349) > Mo-Mn (M=0.309); Ln-Lo (M=0.308) > Ln-Ho (M=0.298). The simple effect analysis further demonstrated that the interaction effect of Mo-Ln was greater than Mo-Hn and Mo-Mn, indicating that in historical spaces, the lower the proportion of modern spaces, the higher the Relaxation. The interaction effect of Ln-Lo was greater than Ln-Ho. This result suggests that in lower levels of N-VOR, a smaller proportion of O-VOR can increase people's

Relaxation.

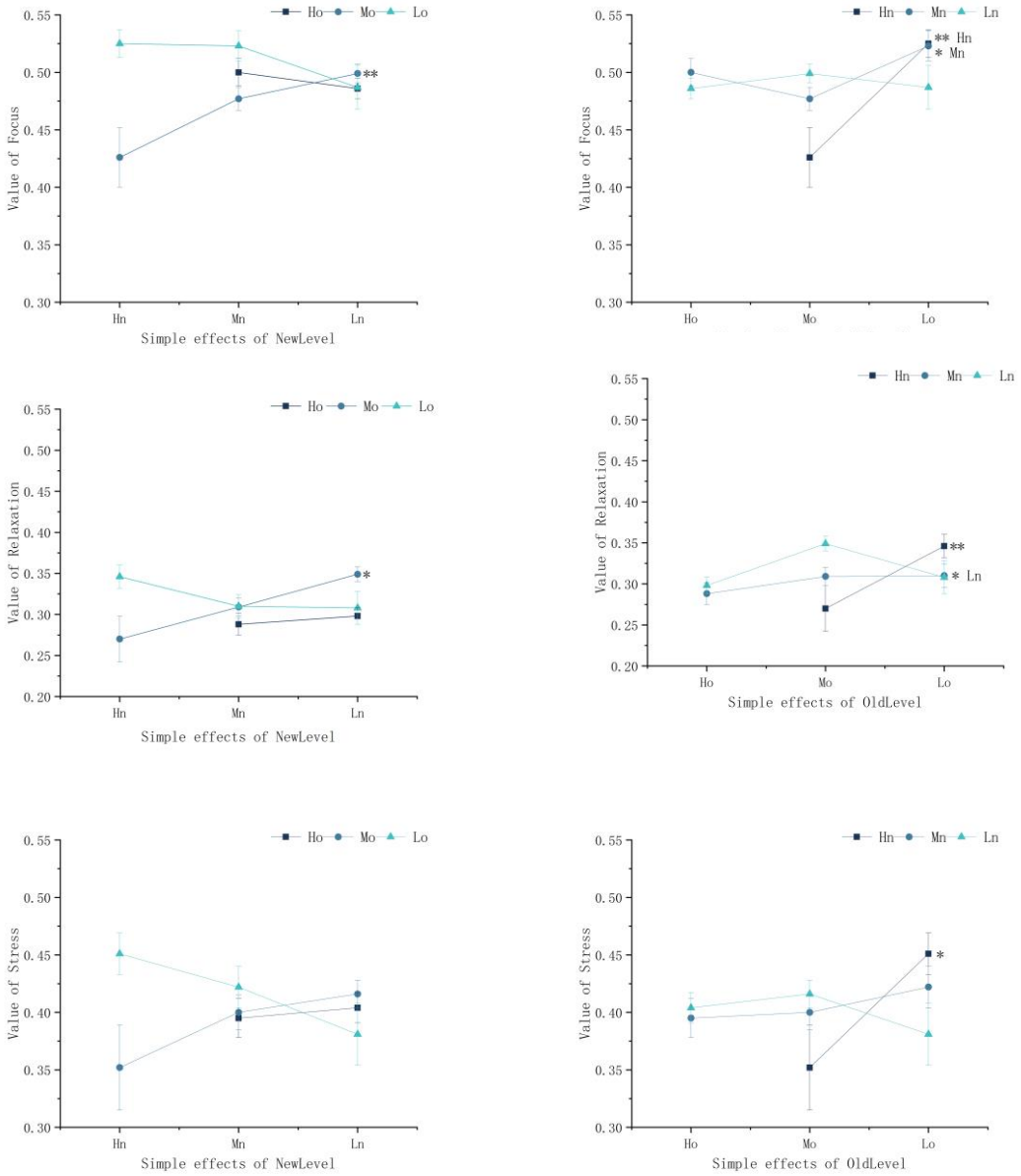


Figure 5. Value of Physiological indicators in the simple effect analysis(N=1155,standard error, * $p < 0.05$； ** $p < 0.01$).

The simple effect results for Stress are as follows: Hn-Lo (M=0.451) > Hn-Mo (M=0.352). The simple effect analysis further demonstrated that in higher levels of N-VOR, a smaller proportion of O-VOR leads to lower Stress values. In other words, when a large number of historical buildings are reconstructed as modern buildings, the Stress value of the space increases."

3.3 Cluster Analysis Of Visual Change Rates

In addition to the VOR analysis, we conducted a cluster analysis of visual change rates(VCR) in relation to changes in the six physiological indicators. The results of the study showed that when there were changes in VCR within the space, corresponding changes were observed in the six physiological indicators among participants. We statistically analyzed the differences between post-test and baseline physiological indicators (pos-pre) as a measure of VCR changes (Figure 6). We further performed K-means cluster analysis on the change features, with the number of clusters set to 5 (Table 3). Cluster 1, Cluster 2, Cluster 3, Cluster 4, and Cluster 5 represented negative-strong change, negative-moderate change, weak change, positive-moderate change, and positive-strong change, respectively.

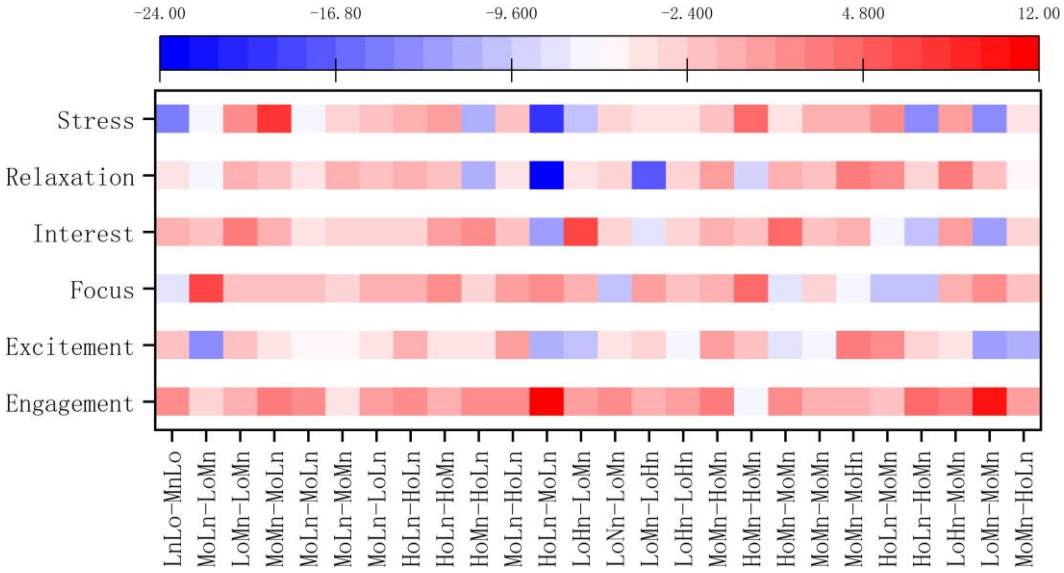


Figure 6. Statistical Heatmap of Physiological Indicator Changes due to Different VCRs

The results revealed that LnLo-MnLo indicated a decrease in stress when transitioning from open spaces to historical spaces at a moderate level. MoLn-LoMn indicated an increase in focus and a decrease in excitement when transitioning from historical spaces with moderate VOR to modern spaces with moderate VOR. The results of MoMn-MoLn suggested that transitioning from spaces with high mixing rates to spaces with low mixing rates increased both stress and relaxation. HoLn-MoLn represented an increase in engagement and a decrease in stress and relaxation when transitioning from high-density historical spaces to moderate-density historical spaces. The results of LoHn-LoMo and LoMn-LoHn indicated that reducing the proportion of modern buildings in a space primarily composed of modern architecture increased interest and relaxation. LoMn-MoMn represented an increase in engagement and a decrease in interest when transitioning from spaces with moderate-density modern buildings to mixed spaces.

4. Discussion

There is a growing body of research on the perception preference of heritage spaces, and most studies have discussed the impact of aesthetic qualities of heritage landscapes on people's well-being(Sektani et al., 2021). For example, exploring the influence of historical urban environment features on public visual preferences(Deghati Najd et al., 2015). Many studies have assessed the effects of perceived preferences for different types of heritage spaces in urban environments. However, only a few studies have focused on the differences between heritage physical buffer zones and perceptual buffer zones, and there is limited research on the proportion of historical and modern buildings in combination. Furthermore, there is a lack of research on the neural and physiological mechanisms underlying the relationship between visual occupancy rates and perception from a neurophysiological perspective. Importantly, there have been no reports on the dynamic perception preference of heritage spaces from a neurophysiological perspective. Our study found that O-VOR and N-VOR have varying degrees of influence on the experience of traditional village compound spaces.

4.1 Continuous Historical Spaces Are More Likely To Enhance Focus And Excitement

The diversity of landscapes experienced by individuals is limited to appropriate patterns, while landscape clutter refers to an increase in landscape diversity accompanied by the invasion of other visual elements and a lack of coherence, which affects our perception of the environment(Wagtendonk & Vermaat, 2014). Our study found a significant main effect of O-VOR on focus and excitement, while N-VOR did not have a significant main effect, demonstrating that historical spaces can control focus and excitement. Visually, high O-VOR and low N-VOR share a common characteristic of high continuity of elements. In low O-VOR spaces, the sky and greenery exhibit high continuity, while in high O-VOR spaces, historical buildings exhibit high continuity. However, in spaces with medium O-VOR, various elements are mixed together, especially the interaction between N-OVR and O-VOR, making it difficult for individuals to sustain their attention on a particular element. Additionally, the interaction between O-VOR and N-VOR significantly affects focus, indicating that N-OVR has an influence on the continuity of historical spaces to some extent. This is manifested by the fact that in spaces with medium to high O-VOR, fewer NVOR elements result in less disruption to the continuity of historical spaces.

4.2 Low Mixing Ratio Of O-VOR And N-VOR Can Enhance Relaxation

Furthermore, we found significant main and interaction effects of O-VOR and N-VOR on relaxation, indicating that these two factors not only individually influence relaxation but also interact with each other to affect relaxation. Analyzing the results, O-VOR and N-VOR yield completely opposite outcomes. O-VOR shows a negative correlation with relaxation, which may be attributed to the fact that high O-VOR typically represents narrower street and alley

spaces, resulting in a higher aspect ratio that increases environmental stress and reduces relaxation. The characteristics of the N-VOR index also indirectly support this conclusion. In traditional villages, Ln and Mn represent Ho, while Hn spaces often have a minimal or non-existent presence of O-VOR. Therefore, Hn has a more positive impact on relaxation compared to Mn and Ln. Regarding the significance of the interaction effect, in historical spaces, a lower proportion of modern spaces generates higher relaxation. In lower levels of N-VOR, a smaller proportion of O-VOR increases relaxation. Previous studies have focused on the negative effects of modern buildings surrounding historical heritage. This study further demonstrates, from a neurophysiological perspective, that a low mixing ratio of O-VOR and N-VOR enhances spatial relaxation. The aforementioned results confirm that monotonous environments are more conducive to the restoration of focused attention and alleviation of mental fatigue, leading to relaxation compared to complex environments. Additionally, the results of simple effect analysis demonstrate that individuals are more likely to experience higher relaxation in environments dominated by O-VOR, with the most pronounced positive effect observed in Mo's O-VOR.

4.3 Significant Increase In N-VOR In Heritage Spaces Can Elevate Stress

Visual perception plays a dominant role in human-environment interaction. Previous studies have confirmed the positive impact of aesthetic sensory experiences on well-being(Sektani et al., 2021), where buildings with perceived aesthetic quality positively influence individuals' happiness, while unattractive buildings have detrimental effects. Our study found that the main effects of O-VOR and N-VOR on stress were not significant, but the interaction effect was significant. The possible reason is that the individual indicators of historical and modern buildings do not directly influence spatial stress, but their mutual variations affect spatial stress. From the results of the simple effect analysis on stress, the reconstruction of historical buildings into modern ones significantly increases spatial stress. One possible reason is that in traditional villages, haphazardly constructed modern buildings are considered unattractive and have a detrimental impact on our sense of well-being, thus generating higher stress levels.

4.4 The Impact Of Spatial VCRs Changes On Physiological Indicators

In this study, the influence of entering different types of spaces on individual experiences was analyzed. The results demonstrate a certain relationship between different spatial characteristics and individuals' psychological states. Firstly, the findings indicate that transitioning from open spaces to moderately historical spaces reduces the sense of stress. This could be attributed to open spaces providing better comfort and relaxation, while historical spaces exert a positive influence due to their unique cultural and historical value. Secondly, the results show that transitioning from moderate VOR (historical spaces) to moderate VOR (modern spaces) increases focus and decreases excitement. This may be because individuals find it easier to concentrate in historical spaces and experience fewer

stimuli in modern spaces, leading to reduced excitement. Furthermore, the results suggest that transitioning from highly mixed spaces to low-mixed spaces increases individuals' stress and relaxation. This could be due to the need for individuals to adapt to diverse environments in highly mixed spaces, while low-mixed spaces result in reduced environmental stimuli, thereby increasing stress and relaxation. Additionally, the results demonstrate that transitioning from high-density historical spaces to moderate-density historical spaces enhances individuals' sense of engagement and reduces stress and relaxation. This may be because high-density historical spaces make individuals more aware of the compactness of the environment, thus increasing their sense of engagement. Finally, the results indicate that in spaces predominantly characterized by modern architecture, reducing the proportion of modern buildings increases individuals' interest and relaxation. This may be because modern buildings tend to be more stimulating, and reducing the proportion of modern architecture can create a more attractive and relaxing environment.

5.Conclusion

This study explores the effects of different combinations of O-VOR and N-VOR in complex traditional village spaces on individual neuro-psychological responses. By investigating people's perceptual preferences for different types of heritage spaces, we examined the influence of the landscape aesthetic quality of heritage spaces on individual happiness. The results demonstrate the positive impact of continuous historical spaces on enhancing attention and excitement. Historical spaces with higher physical continuity and lower perceived clutter contribute to individuals focusing their attention on specific elements and experiencing greater excitement. Conversely, excessive landscape clutter and lack of coherence have a negative impact on individuals' environmental perception. Furthermore, a lower proportion of O-VOR and N-VOR with low mixing ratios can enhance individuals' relaxation. Compared to higher proportions of heritage physical buffer zones, lower combinations create a simpler, more monotonous environment that helps alleviate mental fatigue and enhance relaxation. This suggests that in heritage spaces, an excessive presence of modern buildings may increase individuals' stress and tension, while fewer modern buildings can provide a better relaxation experience. However, the results also indicate that a significant increase in modern buildings within heritage spaces may increase individuals' sense of stress. In traditional villages, haphazardly constructed modern buildings, considered unattractive structures, may negatively impact individuals' sense of happiness, resulting in higher levels of stress. In summary, this study provides a comprehensive understanding of the neuro-psychological effects of different combinations of O-VOR and N-VOR in complex traditional village spaces. These findings have important implications for urban planning and heritage preservation, offering guidance for creating pleasant and relaxing environments in traditional villages.

Further research can explore the perceptual preferences for heritage spaces among different

populations and differences across various cultural backgrounds. Additionally, studying the influence of different age groups, genders, cultural backgrounds, and socioeconomic conditions on the perception of heritage spaces can provide insights. Understanding these differences can help us better meet the needs of diverse populations and design heritage spaces that are inclusive and diverse. Finally, the findings of this study hold significance for urban planning and heritage preservation practices. We should prioritize the protection and restoration of heritage spaces while considering the psychological needs of individuals. Through thoughtful planning and design, we can create heritage spaces that have positive impacts, offering enjoyable, relaxing, and meaningful experiences for people. In conclusion, this study provides valuable insights into the neuro-psychological effects of different combinations of O-VOR and N-VOR in complex traditional village spaces, shedding light on the relationship between spatial characteristics and individual experiences. These findings offer useful guidance for creating more attractive, comfortable, and satisfying heritage spaces.

Foundation: The National Key Research and Development Program of China (Project No. 2019YFD1100905)

Appendix

Table 1. Main effects and interaction effects of O-VOR and N-VOR on the physiological indicators across the experimental groups (covariate: pre-test; dependent variable: post-test).

Parameters	Sum of Squares	df	Mean Square	F	Sig.	Partial η2	Pairwise Comparisons
DV：Engagement							
O-VOR	0.012	2.000	0.006	0.783	0.457	0.001	
N-VOR	0.029	2.000	0.015	1.900	0.150	0.003	
O-VOR * N-VOR	0.002	3.000	0.001	0.092	0.965	0.000	
Engagement_Base	0.609	1.000	0.609	79.138	0.000**	0.065	
Error	8.823	1146.000	0.008				
R^2 = 0.078（Adj. R^2 = 0.071）							
DV：Excitement							
O-VOR	0.412	2.000	0.206	4.554	0.011*	0.008	Lo > Ho > Mo
N-VOR	0.009	2.000	0.004	0.098	0.907	0.000	
O-VOR * N-VOR	0.180	3.000	0.060	1.331	0.263	0.003	
Excitement_Base	6.056	1.000	6.056	133.998	0.000**	0.105	
Error	51.794	1146.000	0.045				
R^2 = 0.121（Adj. R^2 = 0.115）							
DV：Focus							
O-VOR	0.202	2.000	0.101	5.803	0.003**	0.010	Lo > Ho > Mo
N-VOR	0.030	2.000	0.015	0.848	0.429	0.001	
O-VOR * N-VOR	0.184	3.000	0.061	3.515	0.015*	0.009	
Focus_Base	1.869	1.000	1.869	107.166	0.000**	0.086	
Error	19.986	1146.000	0.017				
R^2 = 0.103（Adj. R^2 = 0.097）							
DV：Interest							
O-VOR	0.055	2.000	0.028	1.133	0.322	0.002	

N-VOR	0.001	2.000	0.001	0.022	0.978	0.000	
O-VOR * N-VOR	0.149	3.000	0.050	2.031	0.108	0.005	
Interest_Base	3.264	1.000	3.264	133.567	0.000**	0.104	
Error	28.005	1146.000	0.024				
R^2 = 0.112（Adj. R^2 = 0.106）							
DV：Relaxation							
O-VOR	0.137	2.000	0.069	3.002	0.049*	0.005	Lo > Mo > Ho
N-VOR	0.141	2.000	0.071	3.039	0.048*	0.005	Hn > Ln > Mn
O-VOR * N-VOR	0.244	3.000	0.081	3.552	0.014*	0.009	
Relaxation_Base	2.394	1.000	2.394	104.552	0.000**	0.084	
Error	26.242	1146.000	0.023				
R^2 = 0.103（Adj. R^2 = 0.096）							
DV：Stress							
O-VOR	0.091	2.000	0.046	1.174	0.310	0.002	
N-VOR	0.005	2.000	0.003	0.066	0.936	0.000	
O-VOR * N-VOR	0.289	3.000	0.096	2.476	0.060*	0.006	
Stress_Base	0.560	1.000	0.560	14.413	0.000**	0.012	
Error	44.862	1151.000	0.039				
R^2 = 0.022（Adj. R^2 = 0.015）							

Note: O-VOR refers to the Visual Occupancy Rate of historical buildings. N-VOR refers to the Visual Occupancy Rate of modern buildings. Ho and Hn represent high visual occupancy rates for historical and modern buildings (above 40%). Mo and Mn represent medium visual occupancy rates for historical and modern buildings (40%-10%). Lo and Ln represent low visual occupancy rates for historical and modern buildings (below 10%). * $p < 0.05$; ** $p < 0.01$.

Table 2. Simple effects analysis of the parameters that have significant interaction effects (O-VOR × N-VOR) and significant pre-test and post-test differences.

Parameters	Sum of Squares	df	Mean Square	F	Sig.	Partial η2	Pairwise Comparisons

DV: Focus							
N-VOR(O-VOR=Ho)	0.016	1	0.016	0.845	0.358	0.001	
Error	21.855	1147	0.019				
N-VOR(O-VOR=Mo)	0.167	2	0.084	4.386	0.013*	0.008	Ln > Hn
Error	21.855	1147	0.019				
N-VOR(O-VOR=Lo)	0.063	2	0.031	1.653	0.192	0.003	
Error	21.855	1147	0.019				
O-VOR (N-VOR =Hn)	0.233	1	0.233	12.239	0.000**	0.011	Lo > Mo
Error	21.855	1147	0.019				
O-VOR (N-VOR =Mn)	0.152	2	0.076	3.977	0.019*	0.007	Lo > Mo
Error	21.855	1147	0.019				
O-VOR (N-VOR =Ln)	0.024	2	0.012	0.628	0.534	0.001	
Error	21.855	1147	0.019				
DV: Relaxation							
N-VOR(O-VOR =Ho)	0.008	1	0.008	0.346	0.556	0	
Error	26.242	1146	0.023				
N-VOR (O-VOR =Mo)	0.28	2	0.14	6.116	0.002**	0.011	Ln > Hn , Ln > Mn
Error	26.242	1146	0.023				
N-VOR (O-VOR =Lo)	0.096	2	0.048	2.104	0.122	0.004	
Error	26.242	1146	0.023				
O-VOR (N-VOR=Hn)	0.135	1	0.135	5.908	0.055	0.005	
Error	26.242	1146	0.023				
O-VOR (N-VOR =Mn)	0.043	2	0.022	0.948	0.388	0.002	
Error	26.242	1146	0.023				
O-VOR(N-VOR =Ln)	0.355	2	0.177	7.745	0.000**	0.013	Lo > Ho
误差	26.242	1146	0.023				

DV: Stress							
N-VOR(O-VOR =Ho)	0.006	1	0.006	0.151	0.697	0	
Error	45.097	1147	0.039				
N-VOR (O-VOR =Mo)	0.116	2	0.058	1.469	0.231	0.003	
Error	45.097	1147	0.039				
N-VOR (O-VOR =Lo)	0.189	2	0.094	2.397	0.091	0.004	
Error	45.097	1147	0.039				
O-VOR(N-VOR =Hn)	0.229	1	0.229	5.82	0.016*	0.005	Lo > Mo
Error	45.097	1147	0.039				
O-VOR (N-VOR =Mn)	0.051	2	0.025	0.644	0.525	0.001	
Error	45.097	1147	0.039				
O-VOR (N-VOR =Ln)	0.06	2	0.03	0.766	0.465	0.001	
Error	45.097	1147	0.039				

Note: O-VOR refers to the Visual Occupancy Rate of historical buildings. N-VOR refers to the Visual Occupancy Rate of modern buildings. Ho and Hn represent high visual occupancy rates for historical and modern buildings (above 40%). Mo and Mn represent medium visual occupancy rates for historical and modern buildings (40%-10%). Lo and Ln represent low visual occupancy rates for historical and modern buildings (below 10%). * $p < 0.05$; ** $p < 0.01$.

Table 3. Visual change rate clustering statistics based on k-means.

Engagement	
Cluster1	LnLo-MnLo;MoLn-MoLn;MoLn-LoLn;HoLn-HoLn;HoLn-HoMn;HoMn-HoLn;LoHn-LoMn;LoMn-LoHn;LoHn-LoHn;HoMn-MoMn;MoMn-MoMn;MoMn-MoHn;MoMn-HoLn
Cluster2	MoLn-LoMn;LoMn-LoMn;MoLn-MoMn; HoLn-MoMn

Cluster3	HoLn-MoLn;LoMn-MoMn
Cluster4	MoMn-MoLn;MoLn-HoLn;LoNn-LoMn;MoMn-HoMn;HoLn-HoMn;LoHn-MoMn
Cluster5	HoMn-HoMn
Excitement	
Cluster1	HoLn-MoLn;LoHn-LoMn;HoMn-MoMn;MoMn-HoLn
Cluster2	MoLn-LoMn;LoMn-MoMn
Cluster3	LoMn-LoMn;HoLn-HoLn;MoLn-HoLn;MoMn-HoMn;MoMn-MoHn;HoLn-MoMn
Cluster4	LnLo-MnLo
Cluster5	MoMn-MoLn;MoLn-MoLn;MoLn-MoMn;MoLn-LoLn;HoLn-HoMn;HoMn-HoLn;LoNn-LoMn;LoMn-LoHn;LoHn-LoHn;HoMn-HoMn;MoMn-MoMn; HoLn-HoMn;LoHn-MoMn
Focus	
Cluster1	LoNn-LoMn;HoLn-MoMn;HoLn-HoMn
Cluster2	MoLn-LoMn;HoMn-HoMn
Cluster3	HoLn-HoMn;MoLn-HoLn;HoLn-MoLn;LoMn-LoHn;MoMn-HoMn;LoMn-MoMn
Cluster4	LnLo-Mn;LoHoMn-MoMn;MoMn-MoHn
Cluster5	LoMn-LoMn;MoMn-MoLn;MoLn-MoLn;MoLn-MoMn;MoLn-LoLn;HoLn-HoLn;HoMn-HoLn; LoHn-LoMn;LoHn-LoHn;MoMn-MoMn; LoHn-MoMn;MoMn-HoLn
Interest	
Cluster1	LoMn-LoHn;HoLn-MoMn;HoLn-HoMn
Cluster2	LoMn-LoMn;HoLn-HoMn;HoMn-HoLn; LoHn-MoMn
Cluster3	LoHn-LoMn;HoMn-MoMn;
Cluster4	LnLo-MnLo;MoLn-LoMn;MoMn-MoLn;MoLn-MoLn;MoLn-MoMn;MoLn-LoLn;HoLn-HoLn;MoLn-HoLn;LoNn-LoMn;LoHn-LoHn;MoMn-HoMn;HoMn-HoMn;MoMn-MoMn;MoMn-MoHn;MoMn-HoLn
Cluster5	HoLn-MoLn;LoMn-MoMn
Relaxation	

Cluster1	LnLo-MnLo;MoMn-MoLn;LoMn-LoMn;MoLn-MoLn;MoLn-MoMn;MoLn-LoLn;HoLn-HoLn;HoLn-HoMn; MoLn-HoLn;LoHn-LoMn;LoNn-LoMn;LoHn-LoHn;MoMn-MoMn;HoMn-MoMn;HoLn-HoMn;LoMn-MoMn;MoMn-HoLn
Cluster2	LoMn-LoHn
Cluster3	MoLn-LoMn;HoMn-HoLn;HoMn-HoMn
Cluster4	HoLn-MoLn
Cluster5	MoMn-HoMn; MoMn-MoHn;HoLn-MoMn;LoHn-MoMn
Stress	
Cluster1	LnLo-MnLo;HoMn-HoLn;LoHn-LoMn;HoLn-HoMn;LoMn-MoMn
Cluster2	MoLn-LoMn;MoLn-MoLn;MoLn-MoMn;LoNn-LoMn;LoMn-LoHn;LoHn-LoHn;HoMn-MoMn;MoMn-HoLn
Cluster3	LoMn-LoMn;MoLn-LoLn;HoLn-HoLn;HoLn-HoMn; MoLn-HoLn;MoMn-HoMn;MoMn-MoMn;MoMn-MoHn;HoLn-MoMn;LoHn-MoMn
Cluster4	MoMn-MoLn;HoMn-HoMn
Cluster5	HoLn-MoLn

Note: Ho and Hn represent high visual occupancy rates for historical and modern buildings (above 40%). Mo and Mn represent medium visual occupancy rates for historical and modern buildings (40%-10%). Lo and Ln represent low visual occupancy rates for historical and modern buildings (below 10%). "-" indicates a transition from one type to another.

References

Cheng, L., Chu, S., Zong, W., Li, S., Wu, J., & Li, M. (2017). Use of tencent street view imagery for visual perception of streets. *ISPRS International Journal of Geo-Information*, *6*(9), 265. https://doi.org/10.3390/ijgi6090265

Deghati Najd, M., Ismail, N. A., Maulan, S., Mohd Yunos, M. Y., & Dabbagh Niya, M. (2015). Visual preference dimensions of historic urban areas: the determinants for urban heritage conservation. *Habitat International*, *49*, 115–125. https://doi.org/10.1016/j.habitatint.2015.05.003

Foltête, J.-C., Ingensand, J., & Blanc, N. (2020). Coupling crowd-sourced imagery and visibility modelling to identify landscape preferences at the panorama level. *Landscape and Urban Planning*, *197*, 103756. https://doi.org/10.1016/j.landurbplan.2020.103756

Gobster, P. H., Ribe, R. G., & Palmer, J. F. (2019). Themes and trends in visual assessment research: introduction to the landscape and urban planning special collection on the visual assessment of landscapes. *Landscape and Urban Planning*, *191*, 103635. https://doi.org/10.1016/j.landurbplan.2019.103635

Guo, Z., & Sun, L. (2016). The planning, development and management of tourism: the case of dangjia, an ancient village in china. *Tourism Management*, *56*, 52–62. https://doi.org/10.1016/j.tourman.2016.03.017

Jiang, B., Larsen, L., Deal, B., & Sullivan, W. C. (2015). A dose–response curve describing the relationship between tree cover density and landscape preference. *Landscape and Urban Planning*, *139*, 16–25. https://doi.org/10.1016/j.landurbplan.2015.02.018

Li, Z., & Kang, J. (2019). Sensitivity analysis of changes in human physiological indicators observed in soundscapes. *Landscape and Urban Planning*, *190*, 103593. https://doi.org/10.1016/j.landurbplan.2019.103593

Liu, C., & Xu, M. (2021). Characteristics and influencing factors on the hollowing of traditional villages—taking 2645 villages from the chinese traditional village catalogue (batch 5) as an example. *International Journal of Environmental Research and Public Health*, *18*(23), 12759. https://doi.org/10.3390/ijerph182312759

Liu, L., Silva, E. A., Wu, C., & Wang, H. (2017). A machine learning-based method for the large-scale evaluation of the qualities of the urban environment. *Computers, Environment and Urban Systems*, *65*, 113–125. https://doi.org/10.1016/j.compenvurbsys.2017.06.003

Sektani, H. H. J., Khayat, M., Mohammadi, M., & Roders, A. P. (2021). Erbil city built heritage and wellbeing: an assessment of local perceptions using the semantic differential scale. *Sustainability*, *13*(7), 3763. https://doi.org/10.3390/su13073763

Wagtendonk, A. J., & Vermaat, J. E. (2014). Visual perception of cluttering in landscapes: developing a low resolution gis-evaluation method. *Landscape and Urban Planning*, *124*, 85–92. https://doi.org/10.1016/j.landurbplan.2014.01.006

Yang, H., Qiu, L., & Fu, X. (2021). Toward cultural heritage sustainability through participatory planning based on investigation of the value perceptions and preservation attitudes: qing mu chuan, china. *Sustainability*, *13*(3), 1171. https://doi.org/10.3390/su13031171

Yin, L., & Wang, Z. (2016). Measuring visual enclosure for street walkability: using machine learning algorithms and google street view imagery. *Applied Geography*, *76*, 147–153.

https://doi.org/10.1016/j.apgeog.2016.09.024

Zhang, H., & Lin, S.-H. (2011). Affective appraisal of residents and visual elements in the neighborhood: a case study in an established suburban community. *Landscape and Urban Planning*, *101*(1), 11–21. https://doi.org/10.1016/j.landurbplan.2010.12.010

Zhao, J., Xing, L., Li, R., & Sun, T. (2016). Assessing the visual quality of rural villages in china, compared to urban residential areas. *International Journal of Environmental Studies*, *73*(5), 806–818. https://doi.org/10.1080/00207233.2016.1199418

STRATEGIES AND EVALUATION OF URBAN REGENERATION OF HISTORIC INDUSTRIAL DISTRICTS FROM A LIFE CYCLE MANAGEMENT (LCM) PERSPECTIVE: A CASE STUDY OF YANGPU RIVERFRONT IN SHANGHAI (1075)

Tong Chu[1,2*], Minghao Zhou[1,2]

[1] College of Architecture and Urban Planning, Tongji University; 2 Research Institute of Elaberate Urban Governance at Tongji University, China; [*]2210003@tongji.edu.cn

Abstract. As developing countries have embraced rapid urbanisation and deindustrialisation since the end of last century, massive historic industrial districts sitting idle, due to industrial restructuring and land resource scarcity, have undergone spatial regeneration and industrial upgrading in large scale, as part of important efforts to improve urban spatial quality and functional capacity. However, regeneration of historic industrial districts is often impacted by the complicated relationship among stakeholders, burdensome red tape, and high requirements for historical preservation. Therefore, it will inevitably lead to a raft of consequences, such as dissension among different parties, divided planning, construction, and management, and mismatch between inputs and earnings. In this context, a regeneration management system featuring multiple parties, whole process, and whole elements underpins the sustainable regeneration of urban historic industrial districts. This coincides with the idea and content of LCM, which provides a possible solution to the sustainable regeneration of urban historic industrial districts. By drawing on the theory and methods of LCM and corresponding to its 'Plan-Do-Check-Adjust' theoretical approach, this study an LCM framework for the regeneration of historic industrial districts. The framework includes 'institution formulation, stake-holder organisation, resource introduction, right transfer, planning and construction, operation and management, supervision and evaluation, feedback and adjustment'. This study also systematically reviews the strategies, experiences, and challenges of each stage in the regeneration of the Yangpu Riverfront Historic Industrial District in Shanghai, which is a key area for upgrading the city's overall strength. The effectiveness of the LCM system is also evaluated, with a view to contributing to the theoretical and practical aspects of urban regeneration planning and management, and beefing up the city's ability to respond to challenges and uncertainties.

Keywords: Life Cycle Management (LCM); Urban Regeneration; Historic Industrial Districts; Yangpu Riverfront in Shanghai

1. Introduction

1.1 Systematic and Sustainable Urban Regeneration in a Global Political and Economic Context

With deepening global urbanisation, overconsumption of resources, and rapid and dramatic changes in international political and economic relations, people are grappling with compound problems as a result of pandemics, climate change, loss of history and culture, and urban inequalities. In the face of the dual challenges of short-term shocks and long-term pressures, cities should be well-positioned to improve their resilience, sustainability and inclusiveness. Global cities are areas where the majority of the population lives, and the share of their population will climb from 56 percent in 2021 to 68 percent by 2050, with more conflicts and lesser development potential there. Actually, cities should be the focus of our efforts to alleviate value and cultural conflicts and diminish environmental and social problems, and the leading players who take specific actions to realise comprehensive development goals.

Urban regeneration is not only a key stage to intensively present achievements of urban development, but also will serve as an ongoing effort in the development of a city [1]. It is a process of continuously reconstructing geographical space and social economy, which can effectively reinforce the value of production factors, reshape subject relationships, and redistribute interests. It is an important path to respond to conflicts and challenges and achieve the strategic objectives of cities. Urban regeneration is also faced with challenges. Due to its long cycle and wide span of expertise, truly sustainable urban regeneration cannot just be achieved by efficiently completing some parts of the process, but inevitably requires a life cycle of systematic upgrading and integrated management.

1.2 Necessity and Complexity of Regeneration of Historic Industrial Districts

Regeneration of historic industrial districts is an important part of urban regeneration, with preservation and reuse of these districts being a common issue in cities worldwide [2]. Since the end of the last century, developing countries have seen rapid urbanisation and deindustrialisation. In China, the industrial land makes up about 20 percent of the country's construction land, while the share of manufacturing in GDP has fallen from 40 percent in the 1980s to 26 percent in 2020. Industrial restructuring has led to massive historic industrial districts sitting idle. In addition, the urban development model has shifted from expansion to stock-based regeneration, due to limited land resources. Massive historic industrial districts sitting idle have undergone large-scale spatial regeneration and industrial upgrading, as part of important efforts for the improvement of urban spatial quality and functional capacity [3]. The regeneration of historic industrial districts is often impacted by the complicated relationship among stake-holders, burdensome red tape, and high requirements for historical preservation. Therefore, it will inevitably lead to a raft of consequences, such as dissension among different parties, divided planning, construction, and management, and mismatch between inputs and earnings [4]. It has evolved into one of the major obstacles to fulfilling the objective of historical and cultural preservation and sustainable regeneration.

1.3 Concept and Methods of LCM

In recent years, cities in China have carried out regeneration of historic industrial districts in large scale by introducing the LCM concept and methods for research evaluation and practical guidance on their urban regeneration and management. LCM, derived from Life Cycle Thinking (LCT) [5], can be generally understood as the entire process 'from cradle to grave', which originated from biology and were later applied in many fields such as politics, economics, environment, technology, and society. Aiming to broaden the perspective and improve the defect of the traditional focus on a single and fixed process, LCM offers ideas and strategies to optimise all stages of a product's life cycle.

LCM is a concrete application of LCT. The United Nations Environment Programme (UNEP) and Society of Environmental Toxicology and Chemistry (SETAC) define it as 'a product or organisation management system aiming to minimise the environmental and socio-economic burdens associated with product or product portfolio throughout its entire life cycle and value chain'. Keeping tabs on the continuous improvement in the product or organisation management system, LCM is more than a single tool or methodology. It is a management system collecting, structuring, and disseminating product or organisation-related information throughout its entire life cycle from various programs, concepts and tools [6], so as to realise the systematic upgrading. At present, LCM is mainly applied in four fields, i.e., product, enterprise, industry, and solid waste. Cities, as giant complex systems, also need to plan, build, and manage their regeneration and development process in a coordinated way from the perspective and approach of LCM, in a bid to achieve sustainable enhancement of their social, economic and environmental elements.

By drawing on the theory and methods of LCM and corresponding to its 'Plan-Do-Check-Adjust' theoretical approach, this study develops an LCM framework for the regeneration of historic industrial districts. The framework includes 'institution formulation, stake-holder organisation, resource introduction, right transfer, planning and construction, operation and management, supervision and evaluation, feedback and adjustment'. As a key area helping achieve the city's strategic objectives and the case elaborated in this study, the Yangpu Riverfront Historic Industrial District in Shanghai is regenerated by a consortium composed by government, developers, and social organisations to carry out overall management of the institution, construction, operation, and adjustment of the regeneration. By systematically reviewing the key strategies and achievements in each part of the case, this study also summarises the experiences and difficulties in regenerating and managing the Yangpu Riverfront Historic Industrial District. In addition, the effectiveness of the LCM concept and system framework is also evaluated, with a view to contributing to the theoretical and practical aspects of urban regeneration planning and management.

2. Methodology--Case Study

2.1 Plan

2.1.1 Institution Formulation

Efforts were made to explore and implement urban regeneration policies such as land transfer premium sharing. As some industrial land has been owned by enterprises, collectives, or individuals historically, urban regeneration is predicated on the transfer of land ownership, which, however, is impeded by mounting land prices. In response to this, Shanghai introduced some incentive policies such as the *Implementation Measures of Shanghai on Putting Its Stock Industrial Land into Good Use*, stipulating that the original land owners were allowed to participate in the premium sharing and share the benefits after their land ownerships were transferred. The policy fully mobilised the enthusiasm of factory owners, and accelerated the transfer of land ownerships. It also helped print an encouraging picture of 'government-enterprise cooperation, benefit-sharing, and responsibility-sharing', gradually resolved the historical land ownership problems, and laid a good foundation for the city's large-scale urban regeneration.

The development strategy in synergy with the planning of 'One River, One Creek' was formulated to create a world-class waterfront. 'One River, One Creek' refers to the Huangpu River and the Suzhou Creek respectively in Shanghai. Banks of the Huangpu River were set to be the central showcase of Shanghai's international metropolitan development capabilities while banks of the Suzhou Creek were positioned as a typical demonstration area for livable life in a megacity. The planning of 'One River, One Creek', driven by the city's development strategy since the end of the 20th century, has become the focus of Shanghai's march towards an excellent global city. The functional capacity and environmental quality of banks of the Huangpu River saw significant improvement before and after the Expo 2010 Shanghai China. Subsequently, Shanghai also embarked on the historical resource survey and area planning for the Yangpu Riverfront section. By the end of 2017, the 45-kilometre core section along the Huangpu River was basically upgraded from an abandoned and closed factory area to an open and interconnected urban public waterfront. Shanghai proposed to develop the waterfront areas of 'One River, One Creek' into a world-class area built, governed, and shared by the people, and to enable the development along the Huangpu River to enter a new stage with more attention paid to its quality, charm and humanistic care, during the '14th Five-Year Plan' period. Yangpu Riverfront, as the 'world's largest remaining industrial heritage exposition belt', is located in the seat of 'a Science and Technology Innovation District'. Thanks to its rich historical and cultural heritage and strong development potential, it has become a critical impetus to help realise the 'One River, One Creek' development strategy [7].

Positive development planning was made to boost the transformation of 'Rust Belt' to 'Living Corridor' and 'Innovation Hub'. In September 2020, the National Cultural Heritage Administration announced the list of the first batch of demonstration zones for the protection and use of cultural heritage resources, in which Yangpu Riverfront was included. In March 2021, the *Implementation Plan for the Construction of Shanghai Yangpu Living Corridor Demonstration Zone for the Protection and Use of Cultural Heritage Resources (2021-2023)* was released, which specifically guided the area to transform itself into a living service functional area. The construction of the demonstration zone was also included in the Yangpu District's '14th Five-year' development plan. Nowadays, the completed first round of urban regeneration has achieved the transformation of Yangpu Riverfront into a living service area.

Specifically, the industrial heritage was combined with ecological greenbelt to create a centre for leisure services, and exhibition and performance activities, and to form a large-scale interconnected thematic sightseeing route. The remaining outbuildings, equipment, and facilities of previous factories were fully utilised and transformed into sports stations and cafés to provide convenient services for citizens and visitors. Art exhibitions, performances, cycling and recreational activities are often organised to create a refreshed 'Living Corridor' where natural and humanistic landscapes coexist in harmony.

In the second round of ongoing urban regeneration, Yangpu Riverfront will be largely driven by the functional transformation and spatial transformation of the riverfront hinterland, to help build the Yangpu District into a 'Science and Technology Innovation District' and Shanghai into 'an Innovation City'. At the beginning of 2021, the 'Changyang Hub' Shanghai Online New Economy Ecological Park was officially inaugurated in Yangpu Riverfront, marking the official start of construction of a world-class innovation landmark featuring the online new economy. At present, a number of leading Internet enterprises such as Meituan, Bilibili, and Douyin have settled here and started their projects. Yangpu Riverfront is planned to be built into an innovation landmark to represent Shanghai in international competition and cooperation.

Figure 1. Regulatory Detailed Planning of the Southern Section of Yangpu Riverfront in Shanghai (December 2021 version, re-drawn by the author)

2.1.2 Organisational Structure

A 'government-developers-social organisations' joint mechanism led by the government was developed. A special working mechanism led by the vice mayor in charge of relevant matters was established to hold regular working meetings. A demonstration zone construction leading group closely aligning the Shanghai Municipal Administration of Cultural Heritage with the Yangpu District was established to guide the work with clear division of labour. The Yangpu Riverfront Comprehensive Development and Management Command, established by the Yangpu District Government, Shanghai Yangpu Riverfront Investment and Development (Group) Co., Ltd. (hereinafter referred to as 'Riverfront Company'), and some industrial enterprises with own property rights, formed a three-party urban regeneration consortium. It was designed to combine government and market forces to complete specific comprehensive development and management work.

Land acquisition and reserve were combined with cooperative investment to explore multi-level collaborative implementation methods. The city and district governments jointly carried out land acquisition and reserve, with support from the city level in terms of capital investment, financing, and balance. Development funds were shared between the financial department and Riverfront Company, with district-level financial funds used for the renovation of the historic buildings and funds allocated for Riverfront Company used for the plumbing, electricity and heating connections and interior decoration to match the new functions at later stages. Such a collaborative approach to urban regeneration made it possible for historic buildings to be properly preserved, while facilitating early determination of functions, and avoiding redecoration problems caused by the incompatibility between repair and renovation and subsequent functional use requirements.

A team of experts was introduced to provide decision-making support, with a government-society multi-party supervision mechanism. Yangpu Riverfront Comprehensive Development Management Decision-making Advisory Committee was a decision-making advisory body under the leadership of Yangpu Riverfront Comprehensive Development Management Command, whose expert members were divided into three groups, namely Planning and Construction Group, Industry Group, and Governance Group. It was established to make more scientific decisions by virtue of the comprehensive advantages and decision-making advisory role of multi-disciplinary and cross-disciplinary experts. Yangpu Riverfront Governance Consortium was jointly initiated and established by four units involved in the planning and design, development and construction, management and operation of the area's regeneration, and has received positive response and participation from 43 enterprises, units, social organisations, and other players in the area, covering wide fields such as real estate development, traditional industry, financial investment, architectural design, social undertakings, social services, and professional services. The organisation will focus on five major professional fields including riverfront development planning, urban construction, industrial operation, digital transformation, and social services, to promote the urban regeneration and urban governance level of the historic industry district. Furthermore, it will continue to render more channels available for collecting people's suggestions, and build the citizen service station in the public space into a construction platform to promote the whole process of people's democracy, so as to provide citizens with reliable channels to participate in the city’s regeneration.

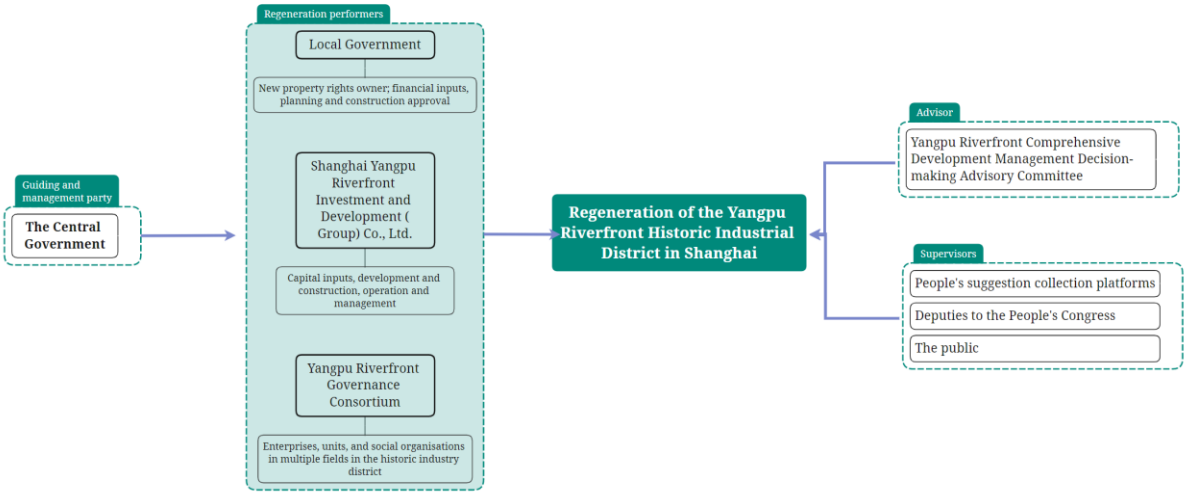


Figure 2. Structure Diagram of Stake-holder Organisations (Drawn by the authors)

2.1.3 Resource Introduction

More and better resources were put into cultural and artistic events and sports activities, to bolster the high-quality regeneration in the area. Cultural and artistic events and sports activities were held to help improve the quality of district regeneration. In the past five years, the previously closed Yangpu Riverfront area was gradually opened up to the public. The former factories have been transformed into public spaces providing leisure services for citizens, and a large number of world-class cultural and artistic activities and sports events were held in the area. For example, the World Cities Day-Shanghai Forum 2018, the Third Shanghai Urban Space Art Season 2019, and the 2021 FIS Cross-country Skiing China City Tour were staged here. Each large cultural activity and sports event has contributed to the significant enhancement in the space quality, cultural influence, and brand image of the area.

Figure 3. Before and after urban regeneration comparison photos of Yangpu Riverfront

2.2 Do

2.2.1 Planning and Construction

Systematic assessment of the historic industrial district and heritage value tapping was carried out, with the scope of industrial heritage preservation and protection extending. Since 2003, a team of experts had been conducting research on existing problems and preservation and regeneration strategies of the Yangpu Riverfront. After 2013, the relevant departments began to organise a systematic and comprehensive mapping study and value determination of heritage resources in the area. On the basis of the original regulatory plan, 18 preservation objects were expanded to preserve and protect the industrial heritage of 66 buildings in Yangpu Riverfront with a total area of over 260,000 square meters. In addition, the

workers' new village north of the Riverfront and other workers' living support areas are preserved and retained as part of the overall appearance.

While planning the spatial layout, the industrial historical features were preserved and continued to the greatest extent. The regulatory planning was adjusted in synergy with architectural protection, and innovative approaches were adopted to mediate the conflicts between newly planned roads and historic buildings under preservation. Taking the planning and construction of Anpu Road as an example, in order to adapt to the new planning of regional positioning, this road was planned to cross general historical buildings such as the Machine Repairing Warehouse of the Tobacco Company and the Finance Building of Andersen, Meyer & Co., Ltd.; thanks to the coordination of multiple departments, the boundary lines of this road were innovatively adjusted so that it could run parallel to the column grid from the ground floor of the building. In this way, only the ground floor of the building needed to be emptied, without affecting the use of space above the second floor. The impact on road capacity was minimised while safeguarding the preservation of historic buildings in situ.

According to the classification system, the preservation and utilisation strategy was formulated in a targeted and systematic manner. As the 'world's largest remaining riverfront industrial heritage exposition belt', Yangpu Riverfront abounds with industrial heritage sites and thus is faced with a complex situation. In spite of this, the specific preservation and regeneration strategy was formulated for each of them. Depending on the degree of intervention, there were three types of measures taken including continuity-oriented preservation, adaptive reuse, and public space shaping. Continuity-oriented preservation applies to the industrial heritage with a high preservation level, important historical, cultural, and socio-economic values, and whose production functions can still meet the current needs, such as Yangshupu Water Plant (Figure 3) and the Sacred Heart Hospital. These industrial heritage sites can still be used after they are properly restored and preserved. Adaptive reuse applies to the industrial heritage that has lost its original function but has distinctive architectural style, building structure, and cultural history. They can be reused without changing their original architectural structures. This type of measure attaches great importance to the infusion of new spatial elements and functional activities into the industrial heritage, while retaining and preserving its character and historical information as much as possible, so that it can be integrated into contemporary urban life [8] [9]. The Shanghai Fashion Center (SFC) is a striking example of this type. Public space shaping applies to the buildings and landscape sketches without outstanding values. They can be transformed into public space elements by changing their structures to continue the integrity of the historic industrial landscape. Typical examples of this type include but not limited to the Green Hill (an urban riverfront complex) (Figure 4), the Rain Garden transformed from a polluted puddle, the abstracted and symbolised tube-like streetlights, and high-pressure container-like garbage cans [10].

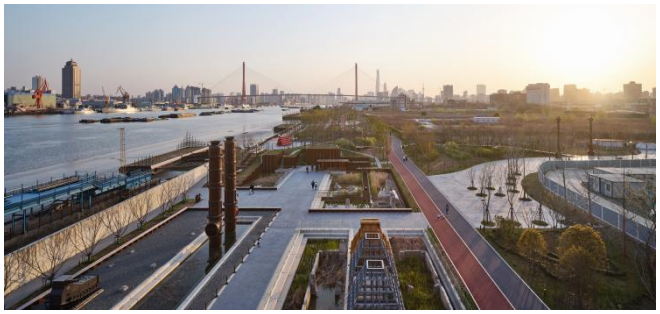


Figure 4. Yangpu Riverfront Cycling and Jogging Belt

Figure 5. Aerial View of the Buildings at Yangshupu Water Plant

Figure 6. Green Hill (Photo by Tian Fangfang)

2.2.2 Operation and Management

The planning, construction, and management were coordinated to build an overall regional coordination and implementation platform for the whole life cycle. In view of the inevitable discrepancies between the regulatory planning and the project construction and implementation, and given the long period of adjusting the planning, it is a tough task to coordinate the planning and implementation. To solve this problem, Shanghai has innovatively launched the 'Construction Project Planning and Implementation Platform', which is led by the

Shanghai Urban Planning and Natural Resources Bureau, supported by the review of regional master plans and construction project design plans, and brings agencies in planning, architecture, structure, flood control, transportation, and other fields together to integrate development, design, construction, operation, management, and other aspects to manage construction projects throughout their whole life cycle. As a key area of 'One River, One Creek' development planning, Yangpu Riverfront was given the chance to be the first to use this platform, benefiting from which its regeneration has received favourable coordination in terms of building construction boundary, fire protection organisation, and afforestation balance. Additionally, while implementing the renovation projects, the issue of business format introduction was considered in advance, and the planning and design were carried out in combination with the new functional requirements. The actual use scenarios of the owners were taken into full consideration to avoid the mismatch between the repair and renovation and the new business formats, thus leading to redecoration. The requirements of subsequent management and utilisation were put into the planning and design process for early consideration.

Efforts were made to explore the dynamic balancing of funds through 'branded' and 'market-oriented' building. The transformed Yangpu Riverfront has created a brand image intermingling industrial technology with modern art, thus being a preferred place for large cultural and artistic events and commercial activities in the city. During the Shanghai Tourism Festival, Yangpu Riverfront was selected as one of the six 'Shanghai Cultural and Tourism Promotion Windows in 2020' by virtue of 'the most warm-hearted living corridor'. In June 2021, the fourth Yangpu District Parent-Child Carnival and the third Yangpu District Parent-Child Reading Competition were held at the SFC. The ninth Shanghai Citizen Art Exhibition and the 2022 Shanghai International Photography Festival (SHIPF 2022) and the 16th Shanghai International Photography Art Exhibition were held at the Maoma Warehouse. In addition to the city's public art and cultural activities, some leading international commercial brands were also attracted by the 'non-standardised venues' in the area, such as the LV show at the Ruirong Shipyard Dock with an investment of Rmb100 million, and the YSL new product launch at the Ash Gallery of Yangshupu Power Plant. Besides, the BMW XM series new product recommendation meeting, the Genesis G70 new car launch, the Tiffany fine jewellery appreciation meeting, and other commercial activities were also held in the area. The income from commercial activities will not only cover the maintenance cost of the old buildings, but also support the operation of other non-profit spaces of the Yangpu Riverfront. What's more, the improvement in the area's brand benefits and influence will bring about a more vibrant regional economy.

Figure 7. Fashion events and civic leisure activities

2.3 Check

The supervision and assessment mechanism of the management departments was improved. Implementation plans were formulated to clarify objectives and responsibilities and strengthen assessment at various stages. Performance assessment methods for different work objectives and responsibilities were separately developed, and both assessment at different stages and annual assessment were implemented, with assessment results included into the scope of political performance assessment of leaders at all levels, so as to guarantee the conscientiousness of leaders and the effectiveness of urban regeneration.

Paths and effects of public supervision were strengthened. Public opinions were highly valued, as evidenced by the wider scope of work processes open to the public and more public opinions accepted. For example, Shanghai Yangpu District Urban Planning and Land Administration Bureau released the *Regulatory Detailed Planning Revision of Yangpu Riverfront (Draft)* for public view. A total of 102 comments and suggestions were received in one month, which were carefully reviewed and responded by relevant government departments. Moreover, thanks to China's unique system of People's Congress, some public opinions can be conveyed to government departments and relevant responsible units through deputies to the People's Congress. In addition, the mayor's hotline, as the most convenient way for the public to provide feedbacks, has established a smooth channel for communication. Feedbacks on rectification were regarded as a basic requirement and evaluation indicator, to ensure the effectiveness of public feedbacks.

2.4 Adjust

The public's comments on the utilisation were valued, to continuously update and improve the quality. As a riverside park open to the public, its facilities and equipment are constantly updated and upgraded based on the public's feedbacks on the utilisation. For example, by virtue of the People's Congress system, the deputies made specific suggestions on the height of the slide and the depth of the women's toilet seat in Shanghai Yangshupu Power Plant Heritage Park, for which Riverfront Company, responsible for the park's management, made positive responses and rectification. The Company also took moves to identify other defects in the park area to meet the needs of different groups of people, especially children, thereby

making the park more accessible, safe, and comfortable.

Regeneration measures were taken in batches with timely adjustments. The urban regeneration of Yangpu Riverfront was not done overnight, but was carried out in batches according to different zones and types over a longer period of time, in order to monitor the deficiencies and demands of the completed parts, absorb feedback and suggestions about them, and make timely supplements and adjustments subsequently. Yangpu Riverfront has a total length of 15.5 kilometres, and covers a total area of 12.93 square kilometres, with a vast hinterland area. The urban regeneration of Yangpu Riverfront is to finished in two rounds. The first round aims to update its riverfront public spaces. The 5.5-kilometre core area of the southern section was fully opened in 2019, while the scientific and technological development orientation in the central and northern sections is separated from the living service functions of the southern section and complements each other. Currently, these two sections have entered the urban design phase and are expected to be fully opened in 2025. In the hinterland area, the 'Changyang Hub' online new economy ecological park has been established to attract industries, capital, and people. This not only supplements the functions and funds of the riverfront public spaces but also provides more channels to help public resources in the area play their full role.

Figure 8. facilities adapted to the needs of the users after adjustment.

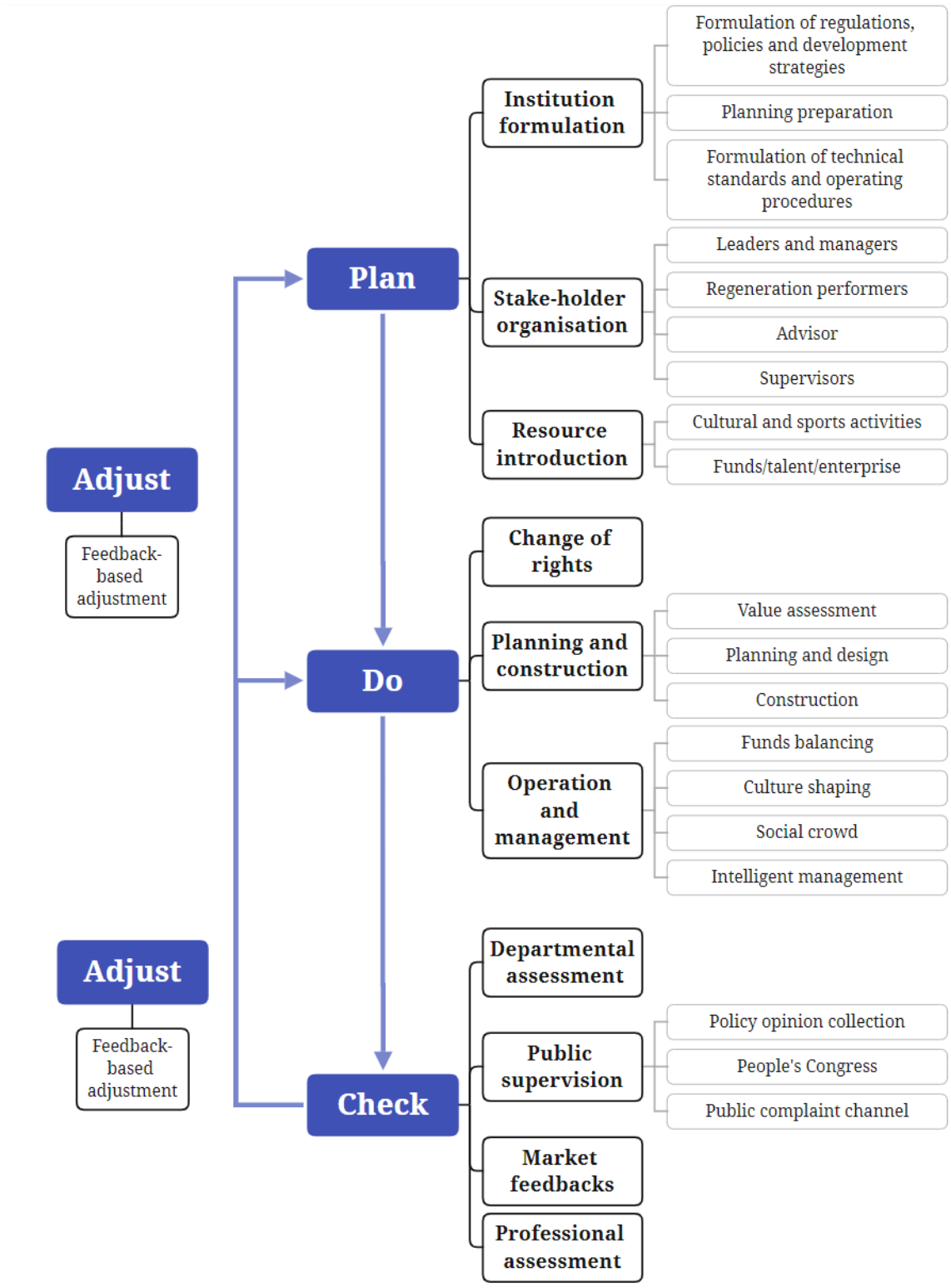


Figure 9. LCM Framework for the Regeneration of the Yangpu Riverfront Historic Industrial District (drawn by the authors)

3. Results And Discussions

3.1 Evaluation of the Effectiveness of LCM

Relying on its advantages such as being holistic, synergistic, and systematic, LCM can provide overall guidance for the complex process of urban regeneration.

Previous urban regeneration measures often tended to focus solely on spatial regeneration, while the LCM approach can break through such a limitation by focusing on overall effectiveness, to effectively improve the sustainability of urban regeneration. Urban regeneration is a complex process involving the value enhancement of production factors, redistribution of interests, and coordination of stake-holder relations. The historic industrial districts, due to their diverse ownerships, complex historical legacies, and numerous conflicting value elements, particularly call for LCM ideas during their regeneration process. It is advisable to consider all aspects of the regeneration as a whole and form an integrated management approach to avoid unsustainable regeneration due to segmented and unconnected processes. It will also shape a complete, effective, and sustainable closed loop for regeneration to get an overall effect.

LCM can promote regional coordination and professional collaboration, providing a platform for communication and cooperation of multiple stake-holders. As an important public affair, urban regeneration involves a wide range of stake-holders and regions, which often act on their own due to the lack of cooperation mechanism. The LCM concept provides a platform for information exchange and an overall management approach, which boosts a high degree of synergy between different departments and a cooperative alliance between different regions. By virtue of this concept, a cross-region cooperation and multi-party coordination mechanism for urban regeneration will be effectively established.

The LCM concept summarises the regeneration process into a complex system with rich layers. In this system, there is top-level system design, mid-scope mechanism organisation, and the micro implementation and execution. Throughout the process, urban regeneration challenges and development needs are fully considered, while taking into account the logic of interaction between multiple stake-holders and the composition of socio-cultural relationships in specific cases. The LCM system, with its advantage of hierarchical management, takes local relevance and flexibility into full consideration.

3.2 Experience of Yangpu Riverfront Life Cycle Regeneration Management

Sustainable regeneration and use are predicated on a mechanism established for mutual benefits and supervision among multiple stake-holders. There are multiple stake-holders involved in the urban regeneration process, who have complicated relationships. In addition to the regeneration performers composed of the local government, developers, and governance consortium, the public and social organisations are also involved to monitor the regeneration process and the decision-making advisory committee gets involved to serve as the advisor. Multiple stake-holders such as the government, private enterprises, experts and

scholars, and local communities are involved and pool their efforts to combine spatial regeneration with broader social and economic issues such as social services, commercial investment, and environmental improvement. The paths and ways to share responsibilities and benefits among market and social players are explored [11][12], which ensures that the needs of users are met while enhancing the sense of access and identity of various social groups.

Under the government-led public-private partnership model, the strong institutional, financial, and public resource support from the government is the footstone and impetus for the efficient regeneration of complex and critical areas. For regeneration projects that are large in scale, difficult to implement, and have outstanding value for preservation, the government is capable of providing strong policies and implementation guarantees to effectively safeguard public rights and interests, and ensure that the regeneration of core areas tallies with the direction of the whole city's strategic objectives. The National Cultural Heritage Administration set up the Shanghai Yangpu Living Corridor Demonstration Zone for the Protection and Use of Cultural Heritage Resources in this area. The local government established a working group headed by a deputy mayor, to organise regular working meetings. The government's heightened attention brought about a series of innovative policies and preferential resources, which attracted high-quality enterprises and activities and further stimulated the revitalisation of abandoned historic industrial districts.

The synergy of the city's strategic objectives, regional development planning, and district implementation strategies is an effective driver for efficient regeneration. The efficient regeneration of the Yangpu Riverfront Historic Industrial District is credited with the top-down design, implementation, and check, and all these aspects are linked with each other and support each other. The *Shanghai Master Plan (2017-2035)* proposes to build Shanghai into an excellent global city, an admirable city of innovation, humanity and sustainability as well as a modern socialist international metropolis. The city also sets up the construction goal of creating a world-class waterfront area in the core area along the 'One River, One Creek', which will be jointly built, governed, and shared by the people. Efforts will be made to promote the development process of historical and cultural preservation, spatial quality improvement, and industrial structure upgrading along the Huangpu River. The planning of the Yangpu Riverfront section will follow the principles of industrial history preservation, ecological restoration, returning the river to the people, and industrial capacity upgrading. The implementation strategies for the regeneration process, such as graded preservation, prioritised connection of public spaces, and the establishment of an online new economy industrial park, will put the aforementioned guiding principles into practice. Thanks to the continuity of urban regeneration performers, leaders, and managers, the government-backed management platform and state-owned development companies effectively responded to the requirements and objectives of the urban development in the regeneration of the Yangpu Riverfront Historic Industrial District. By doing so, the regeneration of the district and urban development can complement each other, enabling the district to gain more resources from the city and in return provide a driving force for the achievement of the city's comprehensive development objectives.

3.2 Deficiencies of Yangpu Riverfront Life Cycle Regeneration Management

The institutions formulated in the early period were not so sound that practical problems such as ownership transfer and new business format introduction at the implementation phase were not comprehensively covered. Due to China's complex institutional background and the dramatic changes in the political and economic environment over the past hundred years, the urban regeneration system is inevitably insufficient to meet the current complicated demand for regeneration. For example, the administrative measures set up to avoid the loss of state-owned assets and featured by strict control of property rights by government departments, resulted in land use attributes and housing functions restricted to green space and public welfare functions, thus making it difficult for commercial brands to settle in. Besides, it is difficult for the land designated for purely public welfare functions to meet the demand for land use, and the huge volume and capital investment is also a serious challenge confronting the management unit. Currently, Yangpu Riverfront is managed by the state-owned enterprise Shanghai Yangpu Riverfront Urban Operation and Management Co., Ltd (the Company). The buildings, green spaces, squares, and other public spaces in the area, maintained and operated by the Company, are mostly for public welfare purposes. Such a situation has two aspects of drawbacks. On the one hand, it is difficult to manage the area, accompanied by a lack of profit-making methods, and there are also problems such as a lack of commercial activities and supporting services in the green spaces. On the other hand, due to the limitations of the ownership system, it is difficult to introduce market entities, posing a dilemma[1].

A smoother connection between each process is needed, with the demand for more synergistic efforts among stake-holders. Although a multi-party consortium has been formed, there is still inadequate collaboration mechanism and inter-process coherence mechanism. Despite the policy and financial support from government departments, as the main participants, it is difficult to avoid the disadvantages of limited participation of market and social entities and the inability to connect different funding links, which hinders the high-quality and sustainable regeneration. For example, the transfer of property rights of some historical buildings needs to be approved by the government functional departments which, as the construction side of the project, wholly invest financial funds to repair these buildings, and then transfer them to Riverfront Company to introduce the functions, and accordingly carry out the second interior decoration and mechanical and electrical engineering construction. These buildings may even be decorated for the third time after being transferred to the owners. According to the current administrative measures, financial funds are restricted to be used for the renovation of public service historic buildings, and Riverfront Company is not allowed to invest funds and make decisions in the government-led projects. This avoids the loss of state-owned assets such as hidden debts, but the same project can only be rigidly carried out by different entities in various steps, which greatly affects the quality and efficiency

[1] The information is sourced from the author's interview with Shanghai Yangpu Riverfront Investment and Development (Group) Co., Ltd.

of the regeneration.

The strategy mechanism of check and adjust in the LCM system needs to be improved. In the process of urban regeneration, more attention is often paid to planning, construction, and operation, as opposed to insufficient attention to the in-process check and the subsequent adjust. More specifically, there is a lack of a testing system and indicator system for the comprehensive spatial, economic, and social benefits of urban regeneration, as well as specialised organisations and convenient feedback channels. Efforts are still needed to explore more channels for check and adjust, expand the coverage of stake-holders involved in check and adjust, and enhance the integrity and sustainability of the LCM system.

4. Conclusions

Due to increasing resource depletion and dramatic changes in the political and economic landscape, cities worldwide are beset with numerous social, environmental, and economic challenges that necessitate urban regeneration to meet the growing new requirements. The regeneration of historic industrial districts, as an important part of urban generation, is a complex system with intertwined multi-dimensions. It involves coordinating efforts and interests of multiple stake-holders, expanding funding sources and maintaining sustainable profitability, balancing historic heritage preservation and future development, and perpetuating the appearance of historic buildings, and maintaining their long-term availability. In view of the complexity and continuity of urban regeneration, this paper proposes the LCM theoretical framework, and makes a case study of the Yangpu Riverfront Historic Industrial District by reviewing its regeneration strategies and dilemmas. The Yangpu Riverfront Historic Industrial District is an important development hub of Yangpu District and even of Shanghai, and innovative LCM concepts and methods will be explored under high standards to build it into a ‘world-class waterfront area’.

The process of its regeneration is marked by a relationship of multiple stake-holders offering mutual benefits and checks, the model of strong government participation to guarantee the efficient regeneration of complex critical areas, and the principle of synergistic objectives, planning, and strategies at all levels to enhance the effectiveness of regeneration. However, some problems have still been revealed, the unsound institutions formulated in the early stage are hard to be implemented in the later stage; a smoother connection between each process is needed; and the strategy mechanism of check and adjust needs to be improved. The core dilemma lies in the still imperfect institutional system and still obstructed interconnection between stake-holders. This creates a cascade of impediments to multiple processes in the regeneration cycle, which cannot be fundamentally improved by relying solely on the efforts of a single party or the optimisation of one aspect. Such a situation arises from the profound and complex institutional mechanism in the context of the country's socio-economic development. Therefore, more attention and higher level of regulation and guidance are needed to essentially improve the life cycle governance for the regeneration of historic districts.

Moreover, the effectiveness of the LCM concept and methods is tested. Unfortunately, this study still has some issues to be perfected. For example, experiences and dilemmas of more international cases need to be collected to enrich the case system so that the case characteristics can be summarised and evaluated more accurately and objectively. These will be the direction of future research.

References

[1] Wu Jiang. Organic Urban Regeneration and Refined Management [J]. Time Architecture, 2021, (04): 6-11.

[2] Ding Fan and Wu Jiang. Research on Urban Regeneration Guided by Large Cultural Events in the Context of Globalisation [J]. Urban Development Studies, 2020, 27(08): 81-88.

[3] Chu Tong, Zhao Yuxing, and Sun Miao. Research on the Influence of Industrial Change on Material Authenticity in the Transformation of Industrial Heritage [J]. Industrial Construction, 2022, 09.

[4] Zhang Song. An Introduction to Integrated Conservation, 3rd edition [M]. Shanghai: Tongji University Press, 2022.

[5] UNEP. UNEP Guide to life cycle management. a bridge to sustainable products [R]. 2006. 8-65.

[6] Sonnemann G W, Solgaard A, Saur K, De Haes H A U, Christiansen K, Jensen A. Life cycle management: UNEP-Workshop. sharing experiences on LCM [J]. The International Journal of Life Cycle Assessment, 2001, 6(6): 325-333.

[7] Zheng Shiling and Xu Ying. The Past and Present Yangpu Riverfront [J]. Architectural Practice, 2020, (S1): 28-31.

[8] Zhang Song. An Introduction to Integrated Conservation, 3rd edition [M]. Shanghai: Tongji University Press, 2022.

[9] Shi Yi. Research and Strategies for Adaptive Reuse of Old Buildings [D]. Beijing: Tsinghua University, 2002.

[10] Zhang Ming, Zhang Zi, and Zhang Jie, et al. Baptized Revitalization: Regenerating the Public Space of Southern Yangpu Waterfront, Shanghai [J]. Architectural Journal, 2019, (8).

[11] Li Yuhong and Liu Cuicui. From ‘Government Power Constraint’ to ‘Partnership Model’: a Study on the Development of Implementation Strategies for Sustainable Urban Community Regeneration in the United Kingdom [J]. Zhuangshi, 2021, (11): 12-19.

[12] Wang Zhenzhen. The Community of Shared Interests Model of Urban Regeneration [J]. *Urban Problems*, 2010, (06): 85-90.

THE SIMPLIFIED COURTYARD AND ITS PUBLIC SPACE IN NORTH CHINA'S SMALL CITIES: SIGNIFICANCE, THREATS, AND OPPORTUNITIES (1082)

Qian Liu[1], Laura Pezzetti[1*]

[1] Department of Architecture, Built Environment and Construction Engineering, Politecnico di Milano, Milano, Italy; [*]laura.pezzetti@polimi.it

Abstract. This study defined as 'Simplified Courtyard' a type of urban house widely built in the 1970s-1990s in small cities in North China. Together with their public and semi-public spaces, Simplified Courtyards constituted the urban landscape characteristic of the early socialist era in small cities. In the rapid urban transformation of the past few decades, a large part of them was demolished and replaced with a *tabula rasa* approach. Taking the small city *Zhengding* as an example, this study investigated the Simplified Courtyard with respect to its public space, analysing its urban significance, threats, and opportunities for regeneration, to draw adequate attention to this unique but long-neglected urban component and contribute to their sustainable subsistence in the future.

Keywords: Simplified Courtyard, public space, urban regeneration

1. Introduction

Urban houses in small cities in North China in the late Qing Dynasty (late 19th century) followed the traditional courtyard type. The *Ma Family Courtyard* (马家大院, hereinafter called *Ma Courtyard*) in *Zhengding*, Hebei Province, was an example (Figure 1-a). It was in a north-south layout with three courtyards or three *jin* (进, one courtyard counts as one *jin* in Chinese architecture). On the south street frontage, beside the gate, two shops were facing the street. It can be generally categorised as a *Siheyuan*, meaning a courtyard (or a series of courtyards) surrounded by buildings on all four sides.

Ma Courtyard belonged to one of the wealthiest families back then, so it was one of the complete models of traditional courtyard houses in the region, and other models were its simplified variants (Figure 1-b). This simplification process already commenced in the Chinese imperial dynasties. First, the three *jin* of *Ma Courtyard* were cut by one or two *jin,* with the remaining courtyard(s) still in the layout of *Siheyuan*. Further simplification cut the buildings on the south, and one of or both the east and west wings, leaving the courtyard as *Sanheyuan* or *Qiangyuan* (三合院, 墙院, meaning courtyards with buildings surrounding on three or only one side). This simplification also happened to the buildings' structure and construction. *Ma Courtyard* was constructed in a mixed wood-brick structure supporting traditional gable roofs with complicated wooden trusses. But the simplified variants usually used less expensive and easier-to-construct flat roofs, brick or

raw earth walls, and rough wooden beams.

After the People's Republic of China was founded in 1949, another simplification process took place in an effort to provide equal and economical housing for each family, which was part of the socialist ideal. Compared to the above-mentioned simplified variations that already happened in the imperial dynasties, this socialist simplification was more planned and unified. The new courtyard houses built in small cities in North China since the 1960s were all uniformly constructed with standard designs and easy-to-build techniques, ensuring only the most basic living conditions and leaving aside aesthetics or recreation purposes (Figure 1-c). The outcome was standardised courtyard houses with masonry structures, flat roofs, and little decoration, significantly simplified compared to the traditional models like the *Ma Courtyard*. Each of them consisted of only one small courtyard and one row of principal rooms on the north side. They were widely built in the 1970s–1990s and became the most common type of residence in small cities in North China. Here this paper refers to this new socialist type of courtyard house as *Simplified Courtyards*.

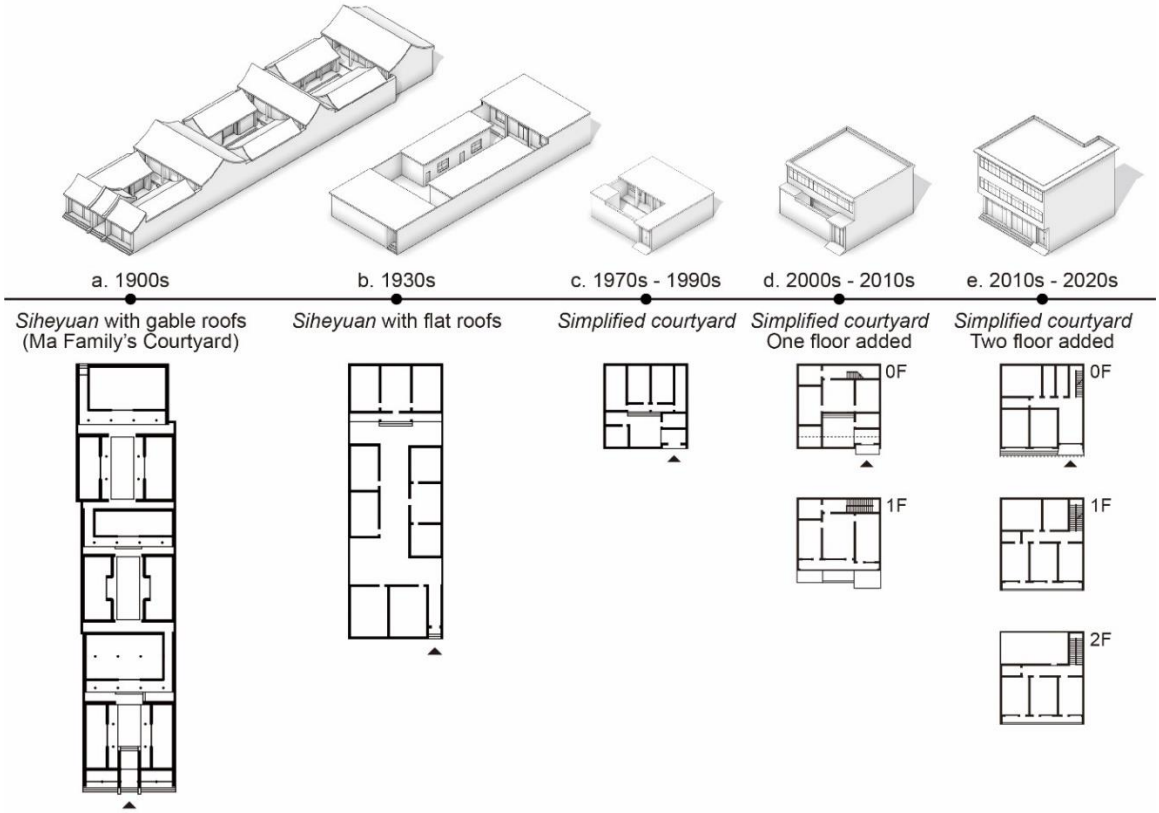


Figure 1. The evolution of courtyard houses in *Zhengding*; phase c is the Simplified Courtyard

Despite being simplified, these new houses stuck to basic *Fengshui* principles[1] conforming to local living habits. So, they were all oriented orthogonally north-south, with all the main rooms' entrances always facing the south. This uniform orientation created a back-to-front pattern and a unique, neat, high-density urban texture (Figure 2).

2. The Public Space of the Simplified Courtyard Community and Its Significance

2.1 The Hierarchical Space System

Figure 2. The hierarchy of urban spaces in *Taipingjie* Community in *Zhengding*, the situation of 2020

[1] *Fengshui* (风水), also called Chinese Geomancy, is a set of principles derived from the ancient Chinese understanding of the relationship between human beings and the natural environment. It would be referenced for determining the sites, orientations, heights, etc., for settlements, residences, palaces, temples, and all other human dwellings, based on observing the area's geographical and meteorological situation, particularly on the composition of nearby mountains and waters.

Like in the traditional *hutong* (胡同) neighbourhoods[2], the urban spaces in the Simplified Courtyards community also presented a hierarchical structure, from public to semi-public and finally to private spaces of courtyards. Take the *Taipingjie* community in *Zhengding* as an example. As is shown in Figure 2, each row of the Simplified Courtyards opens its gates directly to one narrowest alley, which then connects to wider perpendicular alleys of a higher level. To be clear, the narrowest alleys will be denoted as *rib alleys* and the wider ones as *backbone alleys*. There is an even higher level of alleys, broader and longer, which directly connect the urban roads peripheral to the community. These widest alleys will be called *axis alleys* here.

Generally, the *rib alley* is less used for public activities; some were even closed by residents with fences and gates because it is psychologically regarded as semi-public or collective spaces shared exclusively by the families living along it. The *backbone alleys* are more commonly used for public activities since they are psychologically seen as collectively shared by all the families within the community. *Axis alleys* are the most public ones, where community events like *Lahui* (腊会)[3] take place (Zhang and Zhang, 2011). In everyday situations, these axis alleys would even be used as urban roads through the community.

2.2 Significance of the Simplified Courtyard and Its Public Space

Despite the fact that many of them have been demolished today, Simplified Courtyards in small cities have unique and irreplaceable significance. On the typo-morphological aspects, the Simplified Courtyard community inherited the *hutong*'s urban structure consisting of orthogonal and fishbone-like alleys that connect rows of courtyard houses. This structure endows Simplified Courtyard communities with a relationship between private courtyard spaces, semi-public alley spaces, and public spaces that is identical to that of *hutong* neighbourhoods, where all these categories of spaces are associated in an osmotic and fluid way (Collotti, 2019). This unique urban form preserved a precious piece of historical layered morphology (Pezzetti, 2019) in the increasingly monotonous urban landscape of contemporary China (Liu and Pezzetti, 2022), which usually consists of constant high-rise apartment buildings in gated communities. If all Simplified Courtyards were erased or replaced, the small cities would have nothing physically local and historical left, except for a few monuments lonely scattered among the intimidating high-rises.

Concerning the social and cultural aspects, Simplified Courtyards' significance is even

[2] *Hutong* (胡同) is a type of urban neighbourhood commonly found in North China cities. They were especially typical in the Ming and Qing Dynasties (14th–19th centuries). It is characterized by its hierarchical alley system, consisting of *hutong* (the narrowest alleys), minor streets and major streets.

[3] *Lahui* (腊会) is a celebration event that take place on the Chinese New Year (in some regions it happen in the 15th day after the New Year) in North China cities.

more prominent and valuable. In gated apartment communities, the stack of apartments in high-rise buildings deprived the residents of chances of frequent communication, resulting in an indifferent acquaintanceship between neighbours. In contrast, the Simplified Courtyard community, with its compact layout and the osmotic relationship between the private and the public, encourages communication and interaction. It is capable of creating a cooperative and self-governing social structure within each community. Today, such a social structure is retained, at least partly, in the remaining Simplified Courtyard communities, which is utterly significant in preserving the collective memory and sustaining a robust local identity of the residents, and further helping to preserve the identity of the whole city.

Wars, social unrest, and poverty in 20th-century China, as well as the subsequent dramatic urban transformation in the economic boom, have erased too much unique urban fabric, leaving cities nowadays increasingly homogeneous to each other. Under such circumstances, the Simplified Courtyard community, with its morphological, social, and cultural significance, becomes even more valuable and deserves to be studied and saved.

3. The Weakness and Threats of Simplified Courtyard Community

Simplified Courtyards were widely constructed in the 1970s–1990s. Taking *Zhengding* as an example, by the end of the 20th century, almost all residences in *Zhengding* were Simplified Courtyards. Now, although partly replaced by gated apartment communities, the Simplified Courtyard remains the primary type of residence in small North China cities like *Zhengding* (Figure 3). Another small city in the region, *Dingzhou*, is currently in the same situation. In other smaller cities or towns with less real estate development in the past decades, like *Yuxian* and *Shengfang*[4], the Simplified Courtyard still covers almost the whole urban central areas.

[4] *Dingzhou*, *Yuxian* and *Shengfang* are all located in the northern part of Hebei Province in North China, the same province where Zhengding is.

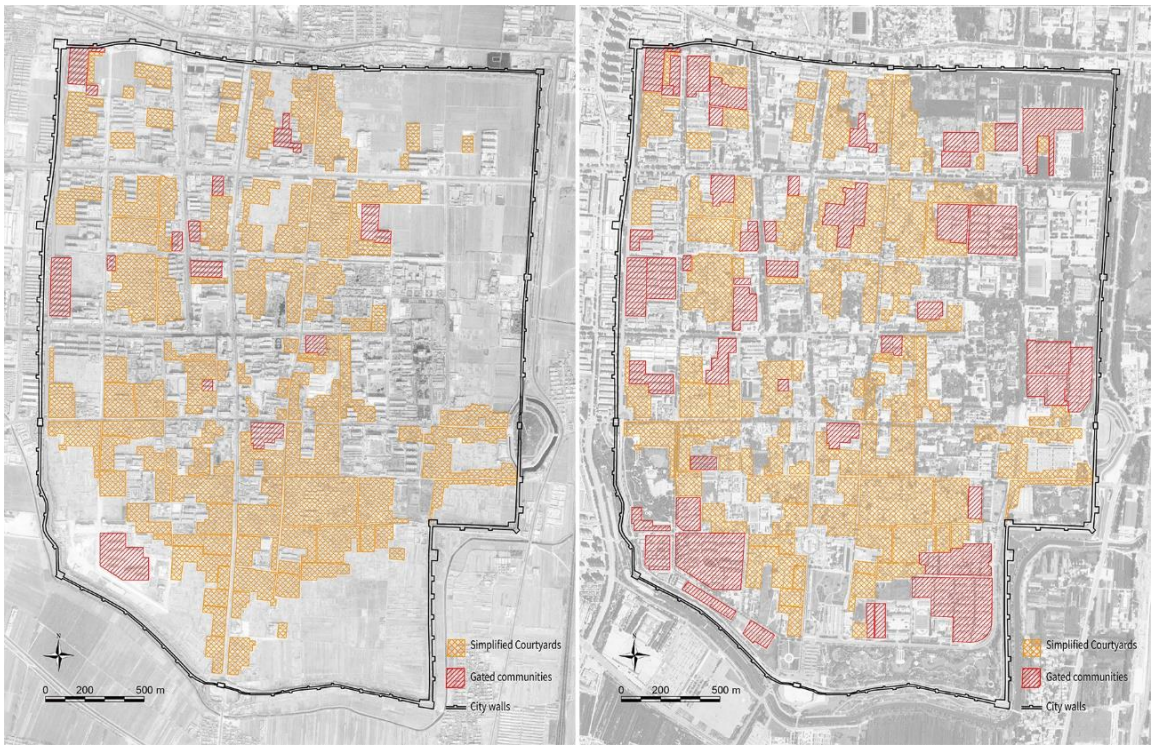


Figure 3. Simplified Courtyard community (orange hatch) and gated community (red hatch) in *Zhengding*, a comparison between the situation of 2002 (left) and 2022 (right).

Nevertheless, the Simplified Courtyard was never the perfect urban house since they were products in a very poor era of China with the purpose of only meeting the very basic living demands. Due to the limited funding and resources back then, these residences were not of high quality and were subject to easy deterioration if not properly maintained. In recent decades, especially in the 21st century, these early-built Simplified Courtyards were enclosed in the city centre as the city grew. Several factors proposed new demands on these old and average-quality buildings, the first of which was the ever-growing urban population (Chen et al., 2009). Their initial composition and construction had to be altered, significantly impacting the public spaces between these courtyards.

3.1 The Densification of Simplified Courtyards

A densification process thus took place. It first happened on the urban scale during the last few decades of the 20th century. Taking the central blocks of *Zhengding* as an example, the comparison between the built-up area in 1966 and 2002 clearly illustrates that (Figure 4) Simplified Courtyards filled up almost all the initial farmlands and vacant spaces. The meandering pedestrian lanes between farmlands were straightened and widened to facilitate vehicular traffic, significantly altering the overall urban structure.

Figure 4. The open spaces in the central area of *Zhengding*, a comparison between the situation in 1966 (top left), 2002 (top right), and 2020 (bottom).

Later, between 2002 and 2020, the densification turned to the volume of the single building. As shown in Figure 4, the urban structure remained roughly unchanged in this period, but a closer observation would unfold that the volume of each Simplified Courtyard house increased after residents added extra floors to their old houses to accommodate more family members. These houses were initially designed for 3-6 people; now, they could fit doubled, even tripled, inhabitants.

Figure 1-c and 1-d illustrate this second phase of densification on the building volume. Since the homestead of each courtyard house was fixed, residents had to turn to the vertical dimension for more living space. Usually, one or two storeys were added (Figure 1-d), with the front (southern) part protruding and covering half of the courtyard. But the traditional layout where major rooms all facing south were kept, and the main entrance

remained on the southeast corner, the same as the traditional models in North China. In some cases, residents would have a terrace on the top storey to keep an open space for private outdoor activities like drying clothes or daily leisure.

Later in the 2010s, further densification happened to those Simplified Courtyards along the axis alleys, in which a front store was added (Figure 1-e). They left nearly half of their ground floors dedicated to potential commercial activities, occupying the initial courtyard. The gate for the family members remained on the southeast as always. The added storeys usually protruded and cantilevered over the alleys to gain more living spaces. These houses would also leave an open terrace on the top floor, generally taking half the floor or only the northwest corner. Although they no longer have any real courtyards, this paper will keep referring to them as Simplified Courtyards to describe them better.

3.2 Impacts of Densification on Outdoor Spaces

The densification process increased the indoor living spaces of these houses, but meanwhile, it significantly affected the outdoor spaces in Simplified Courtyard communities. On the one hand, private outdoor spaces *per capita* decreased significantly, even down to zero in many cases, leaving little possibility for private outdoor activities. On the other hand, however, the quality of semi-public spaces in the rib alleys also deteriorated, where the 'overflowing' private life (Genovese and Li, 2017) used to take place. The rib alleys were designed in a comfortable proportion defined by single-floor façades. But they now become deep and suffocating 'valleys' with no adequate sunlight and vision as the height of façades doubled or even tripled (Figure 5), making it uncomfortable and unsafe for many daily activities.

Figure 5. Comparison between the alley section before (left) and after (right) the densification of Simplified Courtyards

Therefore, with both the former private and semi-public spaces deteriorated, residents' daily outdoor activities are 'squeezed' out of the Simplified Courtyard community to the large public squares or parks. But the squares and parks are not enough. After all, though modern entertainment and leisure activities in urban China would demand some large-scale public spaces, there is still an essential part of daily outdoor activities that requires a certain sense of privacy and security (Dong, 2017; Zhuang, 2020), such as children's

playing, gossiping, board games, resting, etc. The Simplified Courtyard community at present apparently is not able to provide such spaces, and the residents have to go to the large public spaces and compromise their needs for privacy and security.

Such facts have made these residences less appealing, especially compared to gated communities that can ensure a certain degree of privacy and security. So, the remaining Simplified Courtyards are exposed to the threats of the real estate industry, which has been attempting to replace Simplified Courtyards with gated communities. Such a replacement happened in the central blocks of *Zhengding*: the gated community called *Hengfeng Cuiting* replaced dozens of Simplified Courtyards between 2002 and 2020 (Figure 4).

It is undeniable that the Simplified Courtyard community is not all inferior to gated communities. For example, the Simplified Courtyards can provide much larger *per capita* living space; the house exclusively belonging to one family can disturbances like noises from neighbours; the remaining pieces of private open spaces (the half-covered courtyard or the rooftop terrace), though tiny, are unattainable in gated communities. However, despite all these advantages, their public space, which is deteriorated and not able to accommodate residents' outdoor life, still constitutes a fatal weakness and exposes these significant communities to the threats of demolition and replacement.

4. Opportunities

The typical approach to old residences, including Simplified Courtyards, in the past two decades in China was to define them as 'urban villages' and replace them with new apartment-building communities. Such unsustainable practices have inevitably erased any possible historical traces and led to enormous waste. It should not be imposed again on the Simplified Courtyard communities. But on the other hand, it is not wise to advocate any static, rigid conservation of such old residences, for it will be simply the other extreme and isolate the old communities from the dynamically developing city. What is urgently needed is a sustainable enhancement that could endow the Simplified Courtyard communities with better living conditions while preserving their cultural and historical features.

As concluded above, public space is the most urgent and crucial issue for enhancing Simplified Courtyard communities. As long as the public space is properly enhanced, these old communities could become even more desirable than new apartment communities, thus ensuring their sustainable and dynamic existence in the living city.

In fact, the local governments of small North China cities have been trying to improve the Simplified Courtyard communities, but mostly focusing the deficiencies on functional aspects. Lots of investments have been made in recent years to upgrade the infrastructure of these communities, such as electricity, drainage, pavement, and other facilities. However, the significant issue of producing adequate public space remained neglected.

Professional planners have been aware of the significance of Simplified Courtyards in the small cities. Taking *Zhengding* as the example, in the *Urban and Rural Master Plan of Zhengding, Hebei Province (2014-2030)* (河北省正定县城乡总体规划(2014-2030))[5], the residential areas within the ancient city walls of *Zhengding* were designated as 'Old-city Residential Land', which is identified with a higher value than the ordinary 'Class II Residential Land' (Figure 6). This categorisation recognised the morphological and cultural significance of the residences within the old city but was too generic. A few years later, the *Zhengding Historical and Cultural City Preservation Plan (2019-2035)* (正定历史文化名城保护规划(2019-2035))[6] recognised the value of different residence types much more in detail. This specific plan classified most of the Simplified Courtyards as 'General Landscape Buildings Cat. II' (Figure 7). Some of them, which have not been overly modified or densified, were even classified as 'Traditional Landscape Buildings', meaning that they were critical for preserving the historic urban landscape of the city.

Figure 6. (left) *Urban and Rural Master Plan of Zhengding, Hebei Province (2014-2030)*, showing the area within the city walls

Figure 7. (right) *Zhengding Historical and Cultural City Preservation Plan (2019-2035)*, showing the central area of *Zhengding*

Although this recognition and efforts from the professionals and the government have

[5] Compiled by *China Academy of Urban Planning and Design* in November, 2014.

[6] Compiled by *Shanghai Tongji Urban Planning and Design Institute Co., Ltd.* in 2020.

provided a good foundation and opportunity for enhancing the public space in Simplified Courtyard communities, the above beautiful envision is still restrained by the tough reality: in a small city like *Zhengding*, the lack of funding and professional design is preventing the urban planning authority from making effective and proper plans on public space. In major metropolitan cities, such as *Wuhan*, the municipal government has sufficient funds to invite professional teams to do detailed planning regarding public space, such as the *Plan of Micro Public Space* in *Wuhan* (Dong et al., 2018), which undoubtedly contributes to the systematic enhancement of urban public spaces there. However, in *Zhengding*, the limited funding is only enough to compile more macroscopic master plans. Currently, among the various urban planning documents officially published by the *Zhengding* local government, there is no specific planning concerning public space. Considering that *Zhengding*'s economic conditions are better than most other small cities in the region, other small cities are even less likely to plan and design urban public spaces in a detailed and professional manner.

In the face of such restrains, the regeneration project of *Xiaoxihu* (小西湖) in *Nanjing* has provided some valuable inspiration. This project did not adopt the approach of large-scale demolition and construction like the urban projects of the past decades in China. Instead, the design teams proposed a 'small-scale, incremental' model (Dong and Han, 2022; Li et al., 2022), which meant dividing the entire *Xiaoxihu* community into several 'planning control units' (规划管控单元) based on the property parcels, each of which was further divided into several 'micro-regeneration implementation units' (微更新实施单元). Accordingly, the whole regeneration project was divided into multiple small sub-projects, each of which would not require a large investment or long duration. Private sector investment was also encouraged to take part. On top of this division, the project established some overall design principles and guidelines for the entire community and then some specific strategies targeting each planning control unit, involving their boundaries, traffic routes, open spaces, public facilities, etc.

This 'small-scale, incremental' model ensured a unified design goal for the entire project while reducing the difficulty of implementing each sub-project and improving the overall feasibility. But this model inevitably lengthens the entire project's duration, which seems inconsistent with China's urban construction habits of the past decades, in which the government and professionals were more concerned with efficiency and preferred to regard existing urban areas as a *tabula rasa* in a demolition-construction approach.

But now, after two decades of miraculous economic growth, Chinese society has entered a so-called 'New Normal'[7] characterised by lower speed and the pursuit of quality. Some

[7] The concept of 'New Normal' was first proposed by Xi Jinping, general secretary of the CPC Central Committee, in 2014 to describe China's socio-economic development goals in the coming decades, i.e., to shift from pursuing high speed to high quality. The shift from high to medium economic growth rates is considered the most important feature of the 'new normal'. China's annual GDP growth rate remained above 9 percent for almost all of the 20 years from 1991 to 2011, reaching a peak of 14 percent in 2007. After the 'new normal' was proposed, the annual GDP

socio-economic tendencies in the 'New Normal' offer opportunities to enhance the quantity and quality of public spaces in small historic cities by drawing on the slow regeneration model of 'small-scale, incremental'.

First, China's urban population growth is slowing down. This is the inevitable result of China's urbanisation rate reaching a certain level[8]. According to World Bank data, China's urban population growth rate has declined from a high level of 4–5.5 percent per year in the 1980s–1990s to only 1.8 percent in 2021. And the urban population growth rate in North China is lower than that in the southern areas. The problems of overcrowding and inadequate urban facilities caused by excessive urban population growth in previous decades have subsided. Cities no longer need high rates of urban construction to meet the rapidly increasing urban population.

Second, the slower economic growth in the New Normal has also reduced and slowed real estate development and construction projects. The large-scale demolition-construction model associated with high economic growth has thus lost its support. On the contrary, 'stock planning' (存量规划) has become the keyword in China's urban sector, which refers to 'planning for urban development mainly by re-vitalising, optimising, and upgrading the stock of land while keeping the total area of construction land unchanged and urban space unexpanded'. The 'small-scale, incremental' urban regeneration model is clearly in line with the needs of 'stock planning'.

Third, in terms of policies, at the 20th National Congress of the Communist Party of China in October 2022, a key national policy conference held every five years, identified urban regeneration as one of the key tasks for China's urban development in the next five years[9], which will drive urban regeneration to replace the demolition-construction as the primary development approach in China's cities in the future.

In addition, in recent years, Chinese society has been paying more and more attention to the revival of traditional Chinese urban cultures. Suppose the era of dramatic change and the rupture of cultural traditions in 20th-century China can be compared to the Dark Ages in Medieval Europe; Then today's China seems to have just entered a Chinese version of

growth rate gradually decreased to about 5 percent in 2019. (Date source: World Bank Open Data, https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=CN)

[8] The percentage of urban population in China has grown from 16 percent in 1960 to over 63 percent in 2021, which was higher than the world average and the East Asian average. (Data source: World Bank Open Data, https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS?locations=1W-CN-Z4)

[9] Original texts in the *Report to the 20th National Congress of the Communist Party of China*: '…we will improve urban planning, construction, and governance and move faster to change the development models of super-large and mega cities. We will carry out urban renewal projects and improve urban infrastructure to build livable, resilient, and smart cities.' See: http://wb.beijing.gov.cn/home/zwxx/djgz/202210/t20221027_2846141.html

the Renaissance. Old traditions have been broken, and new features are still to be established. In the process of establishing the new features, the potential of the old tradition is increasingly recognised and will inevitably be interpreted in contemporary society. Simplified Courtyards, as an embodiment of traditional urban culture in North China, is likely to enjoy more attention in this Chinese version of the Renaissance and get the opportunity to be enhanced.

5. Summary and Outlook

The Simplified Courtyard is a type of residential building widely built in small North China cities in the 1970s–1990s. It is a simplified variant of the Chinese traditional courtyard houses, characterised by their standardised design and easy-to-construct building techniques that are able to equally provide each family with a place to live in the poor economic conditions back then. Most of them remained today. The Simplified Courtyard communities have retained the hierarchical system and the osmotic relationship between public and private spaces, which helps these communities to preserve a traditional cooperative and self-governing social structure. Their unique and characteristic urban form and social structure are of great significance in small North China cities today.

But due to the rapid urban growth in the past two decades, the Simplified Courtyards were significantly densified with extra storeys by the residents. This transformation has deprived the alley space of its comfortable spatial proportions and forced residents to conduct their daily outdoor activities outside the community in the large parks or squares. The Simplified Courtyard communities thus lost vitality and appeal and were exposed to threats by the real estate industry to replace them with gated apartment communities.

To ensure the sustainable existence of the Simplified Courtyard communities in contemporary small North China cities, enhancing the public space within them is key. To this end, the ‘small scale, incremental’ model proposed in the *Xiaoxihu* project has offered valuable inspiration. The recognition from the local government and the professionals, as well as many socio-economic tendencies in the so-called ‘New Normal’, provide opportunities for the enhancement of these old communities.

As for the specific enhancement strategies in the future, the historical models of public spaces in Chinese courtyard communities should be a necessary reference. Historical public space types and qualities are naturally endowed with local characteristics and cultural identities through the long process of interacting with the natural and human environment of the city. Interpreting them in the public spaces of contemporary Simplified Courtyard communities can potentially increase the vitality by bringing residents’ outdoor activities back while not sabotaging the morphological, social and cultural significance of the Simplified Courtyard community. The qualities of traditional hutong in North China cities, as well as its evolution in socialist China, might contain some useful aspects for Simplified Courtyard communities. The specific strategies and approaches call for further detailed research, for which this paper expects to draw more attention and lay a solid

basis.

Acknowledgement. This work is possible thanks to the financial support from the Chinese Scholarship Council (CSC)

References

Chen, Mingxing, Lu, Dadao and Zhang, Hua (2009) 'Comprehensive Evaluation and the Driving Factors of China's Urbanization', *Acta Geographica Sinica*, vol. 64, no. 4, pp. 387–398. DOI: 10.3321/j.issn:0375-5444.2009.04.001.

Collotti, Francesco (2019) 'Tipi originari e città cinesi', *Firenze Architettura*, vol. 23, no. 2, pp. 110–115. DOI: 10.13128/FiA-11088.

Dong, Hexuan, Liu, Qian and Wang, Fang (2018) 'Miniature Public Space Planning: A Case Study of Hanyang District in Wuhan', *City Planning Review*, vol. 42, no. 4, pp. 33–43. DOI: 10.11819/cpr20180407a.

Dong, Wenjing (2017) 'Situational Conversation in Urban Space—Analysis of the conversation between public space and private space', *Architecture & Culture*, no. 7, pp. 49–50. Available at https://d-wanfangdata-com-cn-s-zafu.vpn.xue338.com/periodical/ChlQZXJpb2RpY2FsQ0hJTmV3UzIwMjMwMTEyEg5qenl3aDIwMTcwNzAxMRoIemtheGRodjU%3D.

Dong, Yinan and Han, Dongqing (2022) 'Plot Division in the Historic Area Conservation and Regeneration Practice: Nanjing Xiaoxihu Block as an Example', *The Architect*, no. 2, pp. 55–61. DOI: 10.12285/jzs.20220331013.

Genovese, Paolo V. and Li, Pengfei (2017) 'The identity of Chinese public space from Ancient times to Contemporary Society. The sociology of public behaviours in Chinese cities', *L'architettura delle città - The Journal of the Scientific Society Ludovico Quaroni*, vol. 7, no. 2. Available at http://architetturadellecitta.it/index.php/adc/article/view/175.

Li, Hua, Ye, Bin, Fan, Ning, Wang, Xiaoan, Cui, Kai, Wang, Jianguo, Li, Xinggang, Ju, Dedong, Ding, Wowo and Chen, Wei (2022) 'The Historic Southern City of Nanjing:A Symposium on the Conservation and Regeneration of Xiaoxihu Block', *Architectural Journal*, no. 01, pp. 60–69. DOI: 10.19819/j.cnki.ISSN0529-1399.202201012.

Liu, Qian and Pezzetti, Laura (2022) 'Role of Public Spaces Between Built Heritage and Living City: the case of Changle Gate in Zhengding, China', *Book of Proceedings: AESOP 2022 Congress 'Space for Species: Redefining Spatial Justice'.* Tartu, pp. 217–225. Available at https://proceedings.aesop-planning.eu/index.php/aesopro/article/view/27.

Pezzetti, Laura A. (2019) *Layered Morphologies and Latent Structures: Reading, Decoding and Rewriting to Enhance Historic Rurban Landscape*, Shanghai, Tongji University Press.

Zhang, Ruixian and Zhang, Ganglu (2011) 'Lahui in Zhengding: An Eternal Memory of the Residents in the Ancient City (Zheng Ding La Hui, Gu Cheng Ren Yong Yuan De Ji Yi)', *Xiang Yin*, no. 1, pp. 35–36. Available at https://d.wanfangdata.com.cn/periodical/

ChlQZXJpb2RpY2FsQ0hJTmV3UzIwMjMwNDI2Eg5RSzIwMTEwMjk5MzY4NBoIZWs0bnhpaGs%3D.
Zhuang, Shen (2020) ‘The Sense of Privacy and Territory of Open Space in Urban Communities Design Strategies of Lane 309 Pocket Plaza on Yongjia Road, Shanghai’, *Architectural Journal*, no. 10, pp. 22–28. DOI: 10.19819/j.cnki.ISSN0529-1399.202010004.

EMERGING AGENCIES WITHIN ARTISTIC METHODS OF CO-CREATION THAT INFORM PLACE NARRATIVES (1099)

Güzin Yeliz Kâhya

Erciyes University, City and Regional Planning Department, Kayseri, Türkiye; yelizkahya@gmail.com

Abstract. This paper explores the ways to frame participatory and co-creative methodologies within urban design and planning actions through benefiting from art-based experiments on sensorial understandings of urban environments. It presents the reflections from the workshop series based on idea of creating a dialogue of urban planning, design and architecture disciplines with visual and fine arts disciplines dealing with ceramics and video-making by exploring artistic mediums of narrative and spatial storytelling. Based on reflections and learnings from the workshop, the paper argues on the role of arts and artistic apparatus within urban research and design. The aim is to add on the theoretical and practical discussion on place-making as a category in understanding and expanding participatory and co-creative practices in the disciplines of spatial design and planning.

Keywords: art-based methods, walking as urban exploration, place engagement, embodied experience of urban space

1. Introduction

Taking place is not a sole human experience. Indeed, it always extends beyond a specific human activity. It includes the ways of participating in an environment and of engaging to other matters. Senses, emotions and intellect play essential role in the reciprocity of this interaction. As is well known, Heidegger's phenomenological and existential accounts of action (2012), in virtue of taking place through senses, emotions and intellect, true agency emerges through networks of relations among entities we encounter in action. Other non-human and human things of environment in turn suggest pathways of formal development of creation. That means, the core features of agency that is obtained in an individual subject are dependent to social relations to others. This mode of action often gives creative access to concepts of sociality and the ways in which everyday life might be utilized as a part of a creative affect. At its core, by participating in place not only individual subject but also other entangled subjects explore new grounds for bodily sensing difference, constituting, negotiating and mobilizing differences as part of social practices and cultural processes at places of

everyday life. Critically, taking place in this context of "act of embodying" can be considered as a situated activity both human and non-human forms of agents are involved.

Viewed from the perspective of nuanced understanding of agency arising with participating in environment through senses, this paper's focus is emergent agencies with act of walking and explores their reflections on expanding the understandings/readings of urban space by operationalising artistic mediums of deep mapping. The paper further asks for if apprehension of urban space through senses, emotions and intellect can provide a framing for urban design and planning approaches concerned with participatory and co-creative methodologies.

In doing so, this paper evaluates the offerings and learnings from the recently organized and conducted workshop series through which each participant was encouraged to experience the city centre of Kayseri at existentially-sensing level by walking. Then, the workshops has continued to explore the perceptions of urban space through alternate ways of mapping and though experimenting with mediums of arts, including drawings, moving-images and ceramics. These mediums are used both to bring depth to place experience during walking and to express and convey the senses and emotions attached that experience. The result output is a collaboratively created urban narrative as form of map that graphically re-arranged and displayed in the studio space of city museum.

Specifically, this paper asks for the methods of evoking an emergence of agency of single day walking in the city centre and make use of its offerings for critically and creatively re-reading and re-understanding of urban environment. It further asks if urban planning and design practice benefit from art-based methods in which sensorial practice of participating in place can be activated. Tapping into the rich knowledge within the participating in place by the practices of artistic creation, the paper conceptualizes emergent agency of each participant's existentially grounded experience of walking in the city as a process offering ways of improvising and inventing in everyday life and explores alternate ways of mapping which tend to fall outside the realm of conventional discursive and visual representations of urban space.

2. Artfully Participating in Place through Walking

Practices of art, as a particular form of action, features particular relation with an environment that determines the specific character of art. What differs these practices from any other ordinary action is a way of creatively participating in world materiality. They can operate by means of creative material engagement. The materiality of world matters for artistic creation. This view in principle extends creative agency to all material phenomena and builds a bridge between embodied cognition and material culture. In this sense, act of creation through practices of art always extends beyond an isolated self-

oriented activity. However, it connotes an emergent process of relatedness within a situated production and consummation (Vabalaite, 2017). It includes ways of participating in an environment and of engaging to other matters. Other non-human and human things of environment in turn suggest pathways of formal development of creation. Heidegger's (2002) approach to art also highlights the relatedness between artistic practice and environment makes works of art to emerge. There is no creator but a true agent determining conditions of the adequate perceptions of artwork. This mode of creation often gives creative access to concepts of sociality and the ways in which everyday life might be utilized as a part of a creative affect. At its core, by act of creation not only individual subject but also other entangled other subjects explore new grounds for bodily sensing difference, constituting, negotiating and mobilizing differences as part of social practices and cultural processes at places of everyday life.

Critically, participating in a place, seen in this context of "act of embodying", can be considered as a profoundly demanding thing that requires one to be in relation with its environment with forcing all its senses, not only just bringing the sense of vision to the fore but also sound, tactile, smell and etc. Practices of art, in this sense, have potential to create effects on both human and non-human forms of agents that are involved in act of creation actively or passively through building systems of forms allowing them to make sense their environment. Viewed from the perspective of nuanced understanding of participating in place, walking, as Solnit (2006) implies, is one of way to expand our perceptions of place that depends on our experience, the emotions we attach to that experience and the memory it provides us with. As Wylie's (2005) narrative and descriptive writing illustrates, different configurations of self and his surrounding environment, the varied affinities and distanciations of self and landscape, can emerge within the performative milieu of walking. Hence, each walking can be a source of individual narratives of lived experiences, memories and personal identities overlapped. Each narrative of walking can then tell us the story of interaction of subject with its environment and the transformation of this interaction into form of participation and dialogue.

3. Narrating Places with Emotions, Senses and Intellect

As a workshop format, our collaboration from different disciplines with the inclusion of 16 participants has created a dialogue between urban planning and design, architecture with fine and visual arts disciplines, namely ceramics and video-art. This explorational process aids to render some of the disciplinary distinctions less relevant whist at the same time raises new questions about the role of arts and artistic apparatus within urban research

and design. Fundamentally, the workshop has initiated by a fieldwork that was built on an idea in which walking is conceived as an embodied technique to creatively participate in a place. And it testified the engagement of walking subject with the city centre of Kayseri in Turkey.

The city of Kayseri is a mid-size Anatolian city with rich historical layers juxtaposed. The walking site scrolls for some 5km along Train Station to Bürüngüz Mosque, from there to Meryem Ana Church (see in Figure 1). It runs through several neighbourhoods in transition, commercial bazaar, central public utilities and a city park. The users of route vary, including small businesses, artisans, recreational users; the area is partly residential, mostly immigrants temporary residing urban fabric under urban transformation processes; and the area is walked for different reasons. The vast majority walkers take paths for purpose for instance, shopping, transportation, going to work. Some specific places, like park, squares are used for spending a day in open air. By walking through our own route in the site, the aim is to position ourselves in this specific site in the city and engage walking experience in the continuum of physical and mental, the outer and inner realms in terms of our capacities to reach mental images of site. And, we have experimented with different mediums of art from cartography to video and ceramics for both exploring the ways of creatively participating in and engaging with place along with representing urban space we have walked along by exploring boundaries between cartography and artistic expression.

Figure 1. City centre of Kayseri from Train Station to Bürüngüz Mosque and to Meryem Ana Church

Our states of sensorial being on site as one-day walking on site are provoked by different methods:

4. Walking and drawing

The group of 16 participants walk their own routes in the city centre. Each participant has sketchbook of their walking experience on site. Drawing as walking allows participants expand their dialogue with the site. When we draw, we are asked to consciously look; and previously inaccessible details of place open themselves to us. As confronting with the innocuous and irrelevant details of places, each participant experiments on making sense of the banal and raw reality of everyday life of site. Besides that, anonymous encounters

along with some confrontations with memories are documented by drawings. Each individual walking brings the attention some inaccessible points to capture while they together reflect the disarray of site.

Figure 2. Examples of participants' drawings

5. Walking with moving camera

The walking subject captures photographic and moving-images by camera, acts on and documents the present in motion and embracing their engagement with site with this artistic and technical device. Each participant makes their visual essays about their walking experience. As such, the moving images not only allow us seeing the scenes of one's walking experience, but also feel the rhythm of each walking, observe how each participant are naturally led from one place to another. This profoundly allow to closer look in the ways of one's dwelling in the streets of the city. In this way, we recognize how each participant differently experiences the rhythm of site by walking.

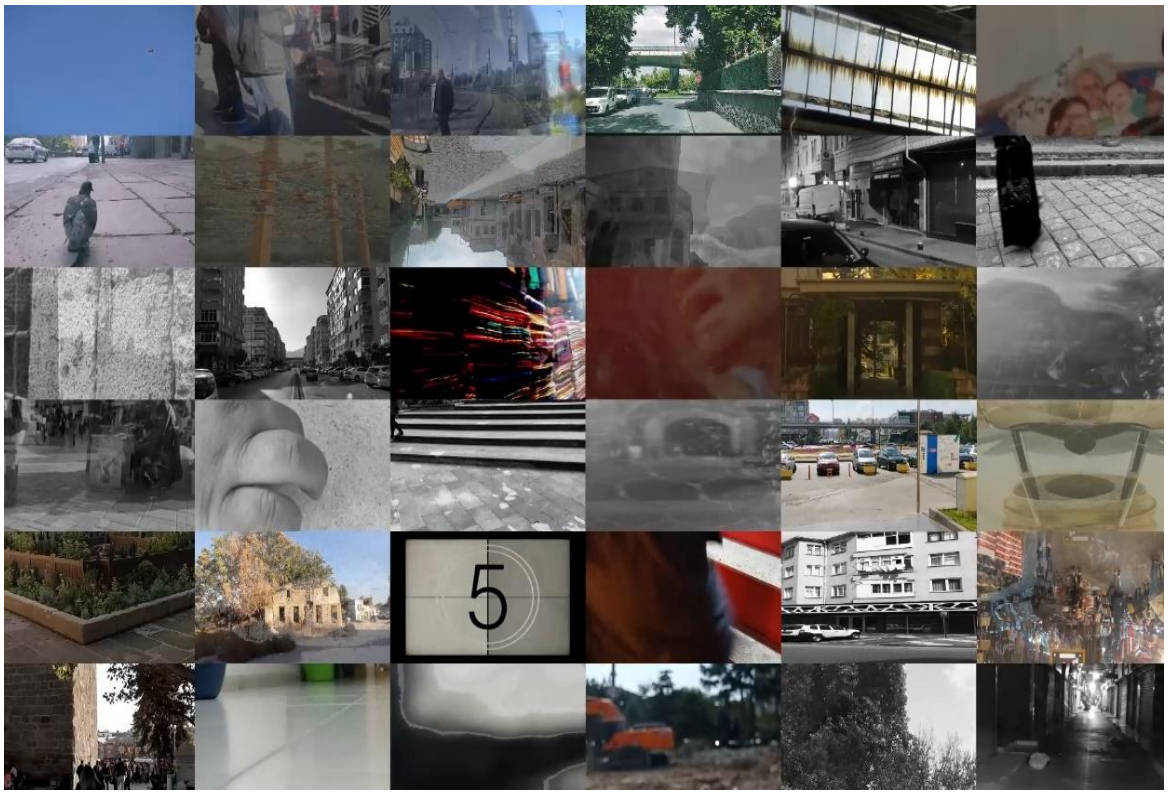


Figure 3. Each participant's visual essay about their walking experince

6. Discovering our memories and feeling through ceramics

In the ceramic studio space, each participant has an opportunity to play with mud and fully engage their senses to reflect the tacit dimensions of their walking experience. Following what Polanyi (1966) addresses as saying 'we can know more than we tell', the practice of ceramics gives us opportunity to concentrate our embodied aspects of more in-depth feelings about site. This practice has provided participants a medium to reflect haptic dimensions of their sensual experiences of place and to find new insights about our

interaction with site. A such, this practice takes some light on more effective expressions of senses and feelings through doing. Expressing the feelings that cannot be conveyed by drawings and moving images in the form of ceramic works expand the visual-based representation of place towards multi-sensory understandings.

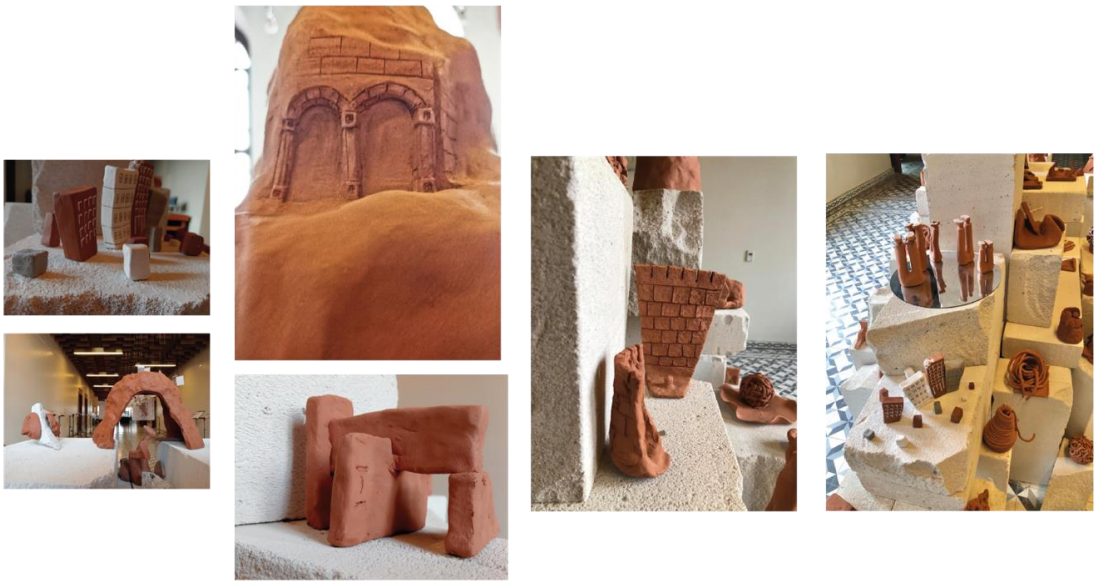


Figure 4. Participants' ceramic works

7. Creating dialogue through collective mapping

The performativity of place that accompany each participant's walking experience can be out and flesh in the way the walking participants inhabits and dwells within the space by mapping exercise. Mapping, in this sense, functions as an apparatus of reconstructing individual experiences of walking by giving locational references. However, a fundamental creativity at work during mapping is that it is in some way knowledgeable, polyvocal and passionate engagement with urban space (Biggs, 2010). It opens way to walk through each participant's route and stop by a statute or a tree she highlights on her map. Each individual critical and reflexive gaze over urban space leaves lasting traces on the map, and inevitably effects the other's relationship with place where her experience took place. Hence, the overlapping of these lived experiences of walking, the memories and the personal identities constitute a map of collective narrative. It is through mapping that participants share their walking experience on site with each other. In this respect, the practice of mapping provides collective ways of engagement with site that allows us to think collectively, navigate through shared experiences, proposing new expectations

about site and simultaneously revealing the strategies of its future.

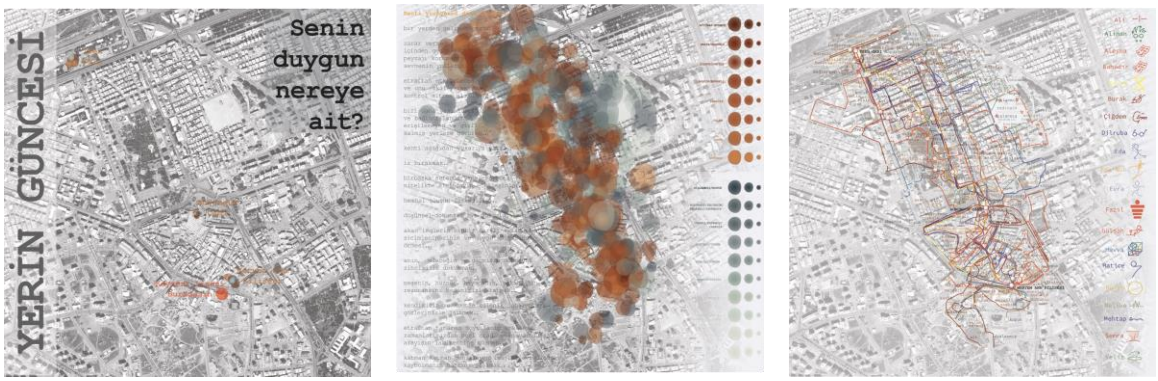


Figure 5. Collective maps of emotions, feelings and memories about place

8. Embodied Research Methods in Urban Planning and Design

The importance of built and natural environment on designated our mental, physical, cultural and social evolution has been affirmed jointly by experts from various disciplines (Robinson, 2015). The possibility of embodied research is increasingly prevalent in humanities and social research with wide range of theoretical frameworks from phenomenology to cognitive studies and qualitative research and making reference to artistic research (Spatz, 2017). The workshop that this paper presents is characterized by fading boundaries between self and environment by enabling a dialogue between arts and spatial practices. It is an exercise to think of the place of sensing body _walking subjects through city centre, paying much attention to their surroundings_ in urban exploration. Specifically, the aim of all actions that were programmed in the workshop is to layer on self-environment interactions by enriching affective and performative milieu of walking through mediums of arts.

While the vision often came to fore and dominantly affected our spatial experience, it is not only important one to creatively participate in our environment but also directed by smells, sounds and haptic impetus. All mediums of arts examined in the workshops have pointed out the role of different dimensions of sensory capacities of body along with sensory qualities of space so that the practice of walking, as an ordinary everyday activity, is expected to be enhanced by the mediums of arts in order to all other multiplicity of senses need to be interrogated.

First, walking by itself can be a distinctive action of participating in and engaging with environment in the way that art do. We have experienced that when participants consciously make this ordinary task as a multi-sensory task, it principally becomes as creative engagement method to expand our perceptions of place. This method, walking-

as-art has proposed as a radical method of re-conceptualizing the way in which the image in and of public space are produced in the art works, for instance, Dedord's Naked City, Acconci's Following piece, Long's A line made by walking, Abramovic and Ulay's Great Wall Walk, Wodiczko's Alien staff, Muller's Border crossings, Alys's Paradox of Practice, Cardiff's missing voice, Tiravanija's Untitled (Phillips, 2005).

Drawing as walking, in this sense, is one maker of art that evokes manner of knowing space intimately through vision. Undoubtedly, the drawings of participants are main evidences showing that built environment in all of the walking experiences integrates sociocultural experiences with architectural experiences. The architectural space stands as interaction platform in the meaning of experiences. Other artistic mediums, such as moving images and ceramics, are used to add on this engagement by reaching out the emotions that we attach this experience and the memories it provides us with. As expanding our sensual engagement in different levels aid to think on other senses. Experimenting with varied mediums of art can turn bodies as participants and insiders of urban environment that we wish to explore. Variety of perceptions can easily reveal memory and imagination directly through different mediums of arts to constitute our participation and engagement with meaning and temporal duration.

Even though spatial interventions in architecture and planning differ from any other arts in terms of being more direct and extensive in re-shaping of subsequent experience (Dewey, 1934, p.13), similar to art, architectural practices as a form of action distinguishes others forms of action as it requires to adopt creatively participating in and engaging with place. This holistic understanding of architectural practice points out the extension of any spatial intervention reaching beyond itself. Accordingly, participatory and collaborative methodologies in architectural, design and planning practices are used as creative and critical means of operating this conceptualization of co-creative framework with spatial planning and design disciplines in general. And the possibility of embodied research methodologies is increasingly prevalent in urban research.

In particular the theoretical and practical discussion on place-making as a category in understanding and expanding participatory and co-creative practices direct the attention and thinking towards the idea that the disciplines of spatial design and planning is reliant on subjective knowledge and ultimately unconscious relations to that knowledge. Hence any spatial intervention at any scale should be collaborative and process-based and co-creative in essence. Parallel to Cousins's (2004) description of architecture as weak discipline, the concern of that weakness positively challenges the position of creative subject in close relationship with other subjects. Urban design and planning, in this sense, cannot be seen a discipline that experience object of study outside and that is authorized by formal knowledge. Particularly, the fieldworks as a part of design and planning practice that are concerned with crossing divide between geographical research and artistic

creation suggests alternative ways of knowing that can agent ordinary everyday action into vehicles of knowing and apprehending urban space.

With this regard, exploring alternate ways of mapping layered by art-based methods could offer whether a sharply-observed or experimentally immersive descriptions of a given socio-cultural urban landscape. Urban design and planning practice have long utilized mapping to effectively and efficiently communicate spatial information. Not just simply present information, the role of map is to construct meaningful order. However, the concept of deep mapping falls into interdisciplinary field of spatial humanities domain offering rich pickings of qualitative and humanistic forays into the representation of place and the map finally presented is multifaceted, open-ended and irreducible to formal and programmatic design (Roberts, 2016). In similar terms to those endeavours of deeply configured spatial knowledge, linking cartographic specifications and artistic imagination extends into spatial knowledge into a form of narrative with voluminous, polyvocal and open-ended insights about place experience. In this respect, mediums of art can add on mapping as a medium of discursive construction of place to be rendered critically and playfully. Whether these be photographic or moving images, drawings or texts, the combability of different medias and artworks lead to create seamless and fluid interplay between meanings and to overcome representational constraints attached to conventional maps.

9. Conclusion

The intentions that lie behind this workshop have forced to think us on embodied methodologies as a part of urban space research and artistic expression – how to cross divide between research and artistic creation. It is essential to see the emergent agencies with walking as practices of participating in surrounding environment and to testify how to frame these layers of walking experiences as a map in order to narrate the sensible dimension of this environment in the forms of texts, drawings photographic or moving images and ceramic works. The output of process shows that artful initiatives of participating in place can allow collaboratively written new urban narratives to emerge and let to argue on if these narrative-writing process function as creation of multiplicity of forms that are succeed to affect our perception about urban space.

This explorative workshop and exhibition process, on the other side, allow to operationalise the arts-based research methods for exploring urban space's poetic, sensual and post-humanistic dimensions, and to testify the potentiality of different mediums of arts to open varied ways of multi-sensual modes of engagement with the urban space. This exploration has allowed to appear an experimental arena for artistic practices of fieldwork in which sensorial engagement and relatedness to place generated through mediums of art refer to new urban narratives that aid to grasp

richness of urban perspectives. Likewise, when experimental arenas are provided for our spatial practices operating as practices of art that have capacity to reframe our perceptions in alternative ways, not only we discover new ways of participating in and engaging the complexity of urban environment, but also there appears new potentialities for knowing and re-reading of urban space we live.

References

Cousins, Mark (2004) Architecture, Experience and Thought. London: AA Publications.

Dewey, John (1934) *Art as Experience.* New York: Capricorn Books.

Heidegger, Martin (2002) The Origin of the Work of Art, In … (eds) *Off the Beaten Track*. Cambridge: Cambridge University Press, pp. 1–56.

Iain Biggs (2020) The Spaces of 'Deep Mapping: A Partial Account, *Journal of Arts and Communities* 2, pp. 5–25.

Phillips, Andrea (2005) Walking and Looking Cultural Geographies

Polayni, Michael (1966) The Tacit Dimension. Garden City, NY: Doubleday and Co.

Roberts, Les (2016). Deep Mapping and Spatial Anthropology. Humanities (5): 5.

Robinson, Sarah (2015) Introduction: Survival through Design, in eds. Sarah Robinson and Juhani Pallasmaa *Mind in Architecture: Neuroscience, Embodiment, and the Future of Design*, MIT Press, pp. 4 -15.

Spatz Ben (2017) Embodied Research: A Methodology. Liminalities: A Journal of Performance Studeis Vol. 13 (2): pp. 2-14.

Solnit Rebecca. (2006). Fieldguide to Getting Lost. Penguin Books.

Vabalaite R. M (2017). Activity and Passivity in the Creation of Art: Heidegger and Later Philiosophy. Filosofija Sociologija 28:1, pp. 3-10.

Wylie John (2005). A single day's walking: narrating self and landscape on the South West Coast Path. Transactions of the Institute of British Geographers 30:2, pp. 234-247.

THE SIGNIFICANCE AND PRACTICE OF ECOLOGICAL AGRICULTURAL COMPLEX CONSTRUCTION IN THE PROTECTION OF TRADITIONAL VILLAGES AND CULTURAL INHERITANCE (1115)

Qian Zhao[1*], Xiaowen Huang

[1]Shanghai Tongji Urban Planning & Design Institute Co. Ltd., China; [*]zq2003gd@hotmail.com

Abstract. The development of China's ancient agricultural civilization formed traditional villages and unique agricultural culture. Traditional villages carry China's long history and extensive regional culture. With the development of China's economy and cultural level, the protection of traditional villages and the inheritance of agricultural culture have been increasingly valued by society, and various regions are exploring traditional village protection practices based on the reality of traditional villages. Due to the complexity of the geographic environment, ethnic diversity, and cultural fusion and evolution, traditional villages in Yunnan Province, China have distinct regional and ethnic characteristics, forming world cultural heritage sites such as the Yuanyang Hani Rice Terraces and the Jianshui Ancient City. The protection of traditional villages in Yunnan should be based on the actual development needs of traditional villages, comprehensively considering the restoration and development of traditional village agricultural ecological environments, relying on innovative planning ideas and advanced technological support, in order to effectively protect traditional village spaces and inherit agricultural culture.

First of all, an eco-agricultural complex can revive the agricultural ecological environment by combining traditional agricultural practices with modern technology, enhance the level of the agricultural industry, help revitalize the rural economy, create new job opportunities, retain rural populations, and thereby ensure the complete protection and inheritance of local cultural heritage and traditions. Secondly, by combining agricultural production with cultural tourism and carrying out various activities such as ethnic festival celebrations, traditional skills workshop experiences, and so on, an eco-agricultural complex can build a platform for cultural exchange and educational innovation, enhance the local residents' and tourists' understanding and appreciation of rural historical and cultural heritage, thereby enhancing the influence and social value of traditional agricultural culture and realizing its inheritance and development. In addition, the construction of supporting facilities for eco-agricultural complexes and related derivative industries, such as the construction of village cultural museums, cultural activity centers, and commercial service facilities for public services and activities, can improve the living environment quality in rural areas from the hardware infrastructure level, enhance the

living standards of rural residents, help to improve the overall quality of the original rural population, and benefit the protection and inheritance of rural historical and cultural heritage.

In conclusion, the ecological agricultural complex can not only improve the rural ecological environment, expand the path of rural industrial development, and enhance the level of rural economy and industrial development but also help to improve the overall social and cultural level of rural areas, enhance the cohesion and attractiveness of rural society, and thus achieve the effective protection of traditional villages and the continuation and inheritance of distinctive agricultural culture.

Keywords: ecological agricultural complex; traditional villages; cultural heritage Planning practice.

1. Introduction

China is a country with multiple ethnicities and diverse cultures, and traditional villages across the country showcase the diversity and uniqueness of regional cultures. Each traditional village has its own distinct architectural style, customs, and festive activities, reflecting the historical and cultural characteristics of different regions [1]. Protecting traditional villages contributes to the preservation of regional cultural diversity and promotes cultural exchange and understanding among different ethnicities and regions.

Traditional villages are important bearers of China's agricultural culture. Agricultural culture is the cornerstone of ancient Chinese civilization, encompassing agricultural production techniques, farming customs, the spirit of farmers, and values. The traditional agricultural cultural heritage in these villages not only holds academic value but also provides valuable agricultural experiences and sustainable development insights for modern society. Protecting traditional villages helps preserve and inherit agricultural culture, offering references and guidance for agricultural development and the construction of an ecological civilization. Traditional villages serve as important carriers of community life, where residents live, work, and celebrate festivals together, forming close social relationships and a sense of community. Protecting traditional villages enhances community cohesion, promotes residents' sense of identity and belonging, and cultivates the foundation for social harmony and stability.

Many traditional villages possess unique natural landscapes and cultural attractions, making them important tourism resources. Protecting traditional villages not only attracts tourists and promotes the development of the tourism industry but also stimulates local economic activities and employment opportunities, thereby improving the living standards of residents.

2. Characteristics and Current Issues of Traditional Villages in Yunnan Province

2.1 Characteristics of Traditional Villages in Yunnan Province

Traditional villages in Yunnan Province are renowned for their complex geographical environment, ethnic diversity, and the blending and evolution of cultures, showcasing rich regional and ethnic features.

Complex Geographical Environment: Yunnan Province is located in the southwestern border of China and possesses diverse topographical features, including mountains, hills, basins, river valleys, and more. This geographical environment provides unique agricultural ecological conditions and landscape features for traditional villages in Yunnan, such as terraced fields, basins, lakes, and so on. Traditional villages in different geographical environments have their own agricultural production methods and cultural characteristics.

Ethnic Diversity: Yunnan Province is one of the provinces in China with the highest concentration of ethnic minorities, with 25 different ethnic groups residing there. Each ethnic group has its unique cultural traditions and customs. Traditional villages often serve as settlements for these ethnic minorities, preserving distinct architectural styles, folk activities, and handicrafts that reflect their ethnic characteristics. The ethnic diversity contributes to the diverse and rich cultural landscapes of traditional villages in Yunnan Province.

Richness of Agricultural Culture: Traditional villages in Yunnan Province are important bearers of agricultural culture. Within these villages, farmers have cultivated the land for generations, developing unique agricultural production techniques and farming customs. For example, the Hani ethnic group's terraced landscapes showcase the wisdom of farmers and embody the concept of harmonious coexistence with nature. Traditional villages also preserve a wealth of traditional festivals, folk arts, and handicrafts, all of which are integral parts of agricultural culture.

2.2 Difficulties and Challenges in the Preservation of Traditional Villages

Impact of Urbanization and Modernization: With the advancement of urbanization, some traditional villages face threats from urban expansion and the impact of modernization. Urbanization brings issues such as land development and infrastructure construction, exerting pressure on the natural environment and traditional culture of traditional villages.

Population Decline and Aging: Due to economic development and increased job opportunities, some young people choose to leave traditional villages and seek better lives in cities [2]. This results in population decline and aging in traditional villages, posing challenges to the preservation of traditional culture and craftsmanship.

Environmental Degradation: Human activities and long-standing inefficient agricultural practices have led to environmental degradation in some traditional villages. Problems such as vegetation deterioration and soil erosion become increasingly prominent, posing threats to agricultural ecological environments and landscape features.

Challenges in Cultural Inheritance and Preservation: Traditional villages face challenges in cultural inheritance and preservation under the impact of modernization. Many traditional craftsmanship techniques, folk activities, and traditional festivals are gradually losing their successors, putting traditional knowledge and skills at risk of being lost.

3. Concept and Characteristics of Ecological Agricultural Complex

The ecological agricultural complex is a development model in agriculture that takes into consideration the ecological, economic, and social benefits. It aims to achieve sustainable agricultural development, protect the ecological environment, increase farmers' income, and improve the quality of rural residents' lives [3].

The ecological agricultural complex emphasizes reducing the negative impact of agricultural activities on the environment and adopts ecologically friendly agricultural production methods. Through scientific and rational land use and water resource management, the complex controls the use of pesticides and fertilizers, reduces soil erosion and water pollution, and preserves the stability and diversity of ecosystems. Additionally, the complex emphasizes ecological restoration of farmland through measures that enhance soil fertility and water conservation.

Sustainability is a key focus of the ecological agricultural complex, which aims to maintain long-term stability and development of the agricultural industry while meeting the food demands of the population. This is achieved through scientific farming techniques, rational allocation of agricultural resources, and diversified agricultural production, which improve agricultural productivity and the quality of agricultural products. Furthermore, the complex encourages farmers to adopt resource-efficient and low-carbon emission agricultural practices, promoting green agricultural development.

By increasing farmers' income and improving the quality of rural residents' lives, the ecological agricultural complex facilitates comprehensive development of farmers. Measures such as providing agricultural technology training, agricultural science and technology support, and market development enhance farmers' production skills and increase the added value of agricultural products, thus expanding their income sources. Simultaneously, the complex focuses on improving rural infrastructure, enhancing living environments, education, and healthcare conditions, and elevating the living standards and social welfare of rural residents.

The ecological agricultural complex also emphasizes the preservation of the spatial

pattern and cultural heritage of traditional villages while developing agriculture. Through appropriate planning and layout, it integrates agricultural production with the landscape and cultural elements of traditional villages, preserving and restoring their architectural styles, traditional farming culture, and local characteristics. Furthermore, measures such as cultural activities, tourism promotion, and cultural education are undertaken to enhance the cultural value and attractiveness of traditional villages, fostering the inheritance and development of traditional culture [4].

In conclusion, the ecological agricultural complex not only focuses on the economic benefits of agricultural production but also emphasizes environmental protection, increased farmers' income, and improved quality of life for rural residents. By promoting sustainable agricultural development and integrating with the preservation and cultural inheritance of traditional villages, the ecological agricultural complex provides an important pathway and model for sustainable development in rural areas.

4. Strategies and Approaches of Ecological Agricultural Complex in the Protection and Cultural Inheritance of Traditional Villages in Yunnan

4.1 Restoring Agricultural Ecological Environment

Restoring the agricultural ecological environment is one of the key strategies for protecting traditional villages and preserving agricultural culture. By implementing sustainable agricultural practices and restoring cultivated land and ecosystems, it is possible to achieve ecological agriculture, enhance the level of the agricultural industry, protect and restore farmland ecosystems, and promote biodiversity conservation.

Sustainable agricultural practices involve emphasizing environmental protection, resource utilization efficiency, and the improvement of agricultural product quality in the agricultural production process. For example, adopting organic farming methods can avoid the use of chemical pesticides and fertilizers, thereby reducing soil and water pollution. Organic agriculture focuses on natural cycles, optimizing crop planting structures, utilizing organic fertilizers, and implementing biological pest control methods to maintain soil health and fertility.

Additionally, restoring cultivated land and ecosystems is also an important measure. In the vicinity of traditional villages, cultivated land often faces challenges such as excessive cultivation and soil degradation. By implementing land reclamation and soil conservation measures, it is possible to restore degraded cultivated land and revive its agricultural productivity. Furthermore, protecting and restoring agricultural ecosystem elements such as wetlands and forests can enhance biodiversity, provide ecological services, and maintain the stability and productivity of farmland.

The Honghe Hani Rice Terraces in Yunnan Province, China, are a traditional village and

agricultural cultural heritage site. The agricultural culture in this area is based on the terraced farming system. However, long-term cultivation and land erosion have caused environmental issues. To protect the terraced ecosystem and preserve agricultural culture, local governments and social organizations have implemented a series of measures.

Firstly, ecological agricultural technologies have been introduced. By promoting organic farming and biodiversity conservation measures, the use of pesticides and fertilizers is reduced, improving soil quality and crop quality while protecting the agricultural ecosystem. Additionally, ecological engineering techniques are utilized to restore soil erosion and prevent soil loss. Secondly, water resource management is strengthened. For the terraced irrigation system, improved irrigation methods are implemented to enhance water resource utilization efficiency and reduce soil erosion. In some terraced areas, techniques such as rainwater collection and water diversion are employed to ensure a stable water supply, maintaining the stability of the terraced fields.

Thirdly, eco-tourism and agricultural product processing are developed. By promoting eco-tourism, attracting visitors to explore and experience the terraced culture, local residents' income sources are increased, reducing reliance on agricultural production and alleviating the pressure of excessive land cultivation. Simultaneously, the development of agricultural product processing enhances product value-added and increases farmers' income.

4.2 Integrating Agricultural Production with Cultural Tourism

Combining agricultural production with cultural tourism is an effective strategy that can facilitate the preservation of agricultural cultural heritage and the development of rural economies. By organizing activities such as farm tours, folk experiences, agricultural tasks, and cultural exhibitions, visitors are attracted to rural areas to explore, experience, and learn about agricultural culture, thereby increasing farmers' income and enhancing the social and cultural level of rural communities.

Taking Honghe Prefecture in Yunnan Province, China, as an example, this region possesses abundant ethnic and agricultural cultural resources, which have been effectively utilized in conjunction with cultural tourism to achieve positive outcomes.

The traditional villages and agricultural landscapes of Honghe Prefecture have attracted a large number of tourists. By establishing farm tour routes and points of interest, visitors can personally experience the agricultural production process, gain insights into the agricultural ecosystem and the labor practices of farmers. Additionally, with the presence of guides and interpreters, tourists are introduced to local agricultural culture, crop cultivation techniques, and traditional farming tools, thereby increasing their understanding and appreciation of agricultural culture.

The ethnic culture and traditional customs of Honghe Prefecture provide rich resources for the integration of agricultural production and cultural tourism. By organizing ethnic festivals, traditional handicraft production, and folk performances, visitors can delve deeper into the unique charm of local ethnic culture [5]. Yuanyang County in Honghe Prefecture holds traditional Hani ethnic harvest festival celebrations in its traditional villages, allowing tourists to actively participate in the festive rituals, experience the traditional culture, and enhance their experiential connection and emotional resonance with agricultural culture.

To encourage greater visitor participation in agricultural production, the village of Xizhuang in Jianshui County, Honghe Prefecture, offers various agricultural activities, such as farmer experience programs and orchard picking. Tourists can actively engage in farming activities such as plowing, sowing, and harvesting, experiencing the hard work of farmers and the joys of traditional farming. Simultaneously, demonstration activities showcasing the processing and production of agricultural products are organized to demonstrate the local expertise in processing distinctive agricultural products, promoting the development of rural industries.

Furthermore, cultural facilities such as Agricultural Cultural Exhibition Halls and Farmers' Art Exhibitions are established in rural areas to showcase the history of agricultural culture, traditional craftsmanship, and artistic achievements. These exhibitions and showcases provide platforms for visitors to understand agricultural culture and also offer opportunities for farmers to display their talents and increase their income.

Through the integration of agricultural production and cultural tourism, Honghe Prefecture has achieved diversified rural economic development and the preservation of agricultural cultural heritage. Farmers have gained additional income by participating in tourism activities, while also adding value to agricultural products. Visitors, through active participation and immersive experiences, gain in-depth knowledge of agricultural culture, enhance their understanding and interest in rural areas, and contribute to the development of rural tourism industry.

4.3 Infrastructure Development

Infrastructure development is an integral part of an agricultural eco-complex, as it enhances the quality of living environment in rural areas and promotes the preservation and inheritance of rural historical and cultural heritage. These facilities include village cultural museums, cultural activity centers, themed commercial services, and other public service and activity facilities.

Village Cultural Museums: Establishing village cultural museums allows for the exhibition of local historical and cultural heritage, including agricultural culture, ethnic culture,

traditional craftsmanship, and more. Through exhibitions, artifact displays, and cultural preservation efforts, visitors can be introduced to the rich historical culture of rural areas, enhancing their awareness and understanding of agricultural culture. In some traditional villages in Jianshui County, Honghe Prefecture, agricultural cultural museums have been established, showcasing the evolution of agricultural tools, farming practices, and everyday items used by farmers, providing insights into local farming traditions and history.

Cultural Activity Centers: Constructing cultural activity centers enables various cultural exchanges, performances, and educational activities, providing a venue for gatherings and interactions [6]. These centers can host ethnic festivals, traditional art performances, handicraft workshops, and other activities, attracting tourists and local residents to participate and fostering the inheritance and innovation of agricultural culture. In some villages in Xizhuang Town, Jianshui County, Honghe Prefecture, cultural activity centers have been established, hosting annual celebrations of local traditional festivals, attracting a large number of visitors and locals to enjoy and take part in the festivities.

Themed Commercial Services: Developing themed commercial service facilities caters to the daily needs of tourists and residents, providing services such as dining, accommodation, and shopping. These facilities can be themed around agricultural culture, promoting local agricultural products and distinctive goods, driving rural industrial development, and increasing farmers' sources of income. In certain rural areas of Xizhuang Town, Jianshui County, Honghe Prefecture, themed commercial service facilities centered around agricultural product processing and the sale of rural handicrafts have been established, offering visitors the opportunity to purchase agricultural products and souvenirs while also boosting the local rural economy.

Through the development of supporting facilities, Honghe Prefecture has improved the quality of living environment in rural areas and promoted the preservation and inheritance of agricultural culture. These facilities provide visitors with places to understand and experience agricultural culture, while offering farmers opportunities to showcase agricultural products and unique handicrafts, thereby driving diversified rural economic development. Combined with the supporting facilities of other agricultural eco-complexes, the rural areas of Honghe Prefecture have become a unique and appealing tourist destination, further promoting the development of rural areas and the inheritance of agricultural culture.

5. Key Points for Planning and Implementation of Ecological Agricultural Complexes

The key points for planning and implementing ecological agricultural complexes include formulating comprehensive plans, integrating with the local community, establishing policy support, introducing technological support, and strengthening publicity and promotion. The following provides a detailed discussion of these points:

5.1 Formulating comprehensive plans

Developing comprehensive plans tailored to the specific conditions of each traditional village is crucial for ensuring protection and development. The plans should consider factors such as the historical and cultural characteristics, natural environment, and socio-economic conditions of the traditional villages, while clearly defining protection goals and development directions. The planning content should encompass village landscapes, farmland layout, restoration of agricultural ecosystems, and also take into account principles of sustainable development, aiming to enhance rural economy and ecological environment while preserving cultural heritage.

5.2 Integrating with the local community

Valuing the participation and opinions of local residents is vital for the sustainability of protection and development efforts. During the planning and implementation process, active communication and cooperation with the local community should be fostered, respecting their wishes and needs. Building consensus can enhance residents' engagement in conservation work, making them active stakeholders in protection and inheritance. Additionally, community residents possess rich traditional knowledge and skills, and their involvement can effectively contribute to the preservation of agricultural culture.

5.3 Establishing policy support

Developing relevant policies and regulations is an important means to support the protection and inheritance of ecological agricultural complexes. Policies can provide support in terms of economy, technology, and management, encouraging private capital and social organizations to participate in conservation and inheritance work. Government departments should increase investment efforts, provide financial support, tax incentives, and reward measures, encouraging farmers to participate in the preservation of traditional villages and the inheritance of agricultural culture.

5.4 Introducing technological support

The application of modern technological methods can assist in conservation efforts and the restoration of agricultural ecological environments within ecological agricultural complexes. For example, remote sensing technology can provide monitoring and assessment data on farmland and ecosystems, facilitating informed decision-making and planning. Digital technology can provide information management and communication platforms, promoting the inheritance and promotion of agricultural culture. Technological

support can improve work efficiency and conservation levels, while also providing innovative agricultural production methods and value-added services for farmers.

5.5 Strengthening publicity and promotion

Promoting the cultural value of traditional villages through media, online channels, and other means can attract more people to participate in conservation and inheritance work. Publicity activities can include organizing agricultural cultural festivals, exhibitions, and lectures, enabling more individuals to understand and appreciate the charm of traditional villages. Furthermore, utilizing social media and internet platforms for publicity and promotion can expand influence, attract tourists and investors, and provide greater support for the inheritance of agricultural culture.

6. Conclusion and Future Research Directions

6.1 Research Conclusions

In the protection and cultural inheritance of traditional villages in Yunnan, ecological agricultural complexes can adopt the following strategies:

Developing protection plans: Formulating plans specifically for the protection and development of traditional villages, clarifying protection goals and measures, and planning agricultural land and ecological conservation areas in a coordinated manner to ensure the harmony between agricultural development and environmental protection.

Promoting ecological agricultural technologies: Popularizing ecological agricultural technologies such as organic farming and ecological restoration agriculture to reduce the use of chemical pesticides and fertilizers, improve the quality and safety of agricultural products, and protect the health of soil and water resources.

Establishing agricultural cooperatives and farmer professional cooperatives: Organizing farmers to establish cooperatives and improving their economic benefits and bargaining power through centralized procurement, production, processing, and sales, thus increasing farmers' income.

Introducing technological support: Introducing advanced agricultural technology and management practices to enhance farmers' production skills and management capabilities, promoting agricultural modernization and sustainable development.

Developing agricultural eco-tourism: Utilizing traditional villages and agricultural culture as tourism resources, developing agricultural eco-tourism projects to attract tourists, increase the economic income of villages, and promote the inheritance and development

of traditional culture.

Strengthening education and training: Conducting education and training on traditional techniques and knowledge of agricultural culture, cultivating young people's interest and identification with agricultural culture, and increasing the number of inheritors of traditional culture.

Enhancing community participation: Encouraging local residents in traditional villages to participate in protection and management work, enhancing their environmental awareness and cultural pride, and forming a collaborative force for protection through collective efforts.

By comprehensively implementing the above strategies, ecological agricultural complexes can play an active role in the protection and cultural inheritance of traditional villages in Yunnan. They can promote sustainable agricultural development, protect the ecological environment, increase farmers' income, and contribute to the sustainable development and prosperity of traditional villages in Yunnan.

6.2 Future Development Directions

The future development directions for ecological agricultural complexes involve further enhancing their sustainability, innovation, and social benefits to meet the demands of socioeconomic development and environmental changes.

Promoting technological innovation and intelligence: Introducing advanced agricultural technology and information technology such as the Internet of Things, big data, and artificial intelligence to achieve precise management and intelligent decision-making in agricultural production. Through techniques like precision fertilization, intelligent irrigation, and drone inspections, production efficiency can be improved, resource consumption reduced, and product quality and safety ensured.

Developing circular economy and comprehensive resource utilization: Advocating for the resource utilization and energy recovery of agricultural waste, establishing agricultural product processing and utilization systems to minimize waste and pollution. Developing agricultural circular economy practices will promote the comprehensive utilization of agricultural products, increase added value, and enhance economic benefits.

Advancing agricultural branding and marketing networks: Strengthening agricultural product branding and market development, enhancing the added value and competitiveness of agricultural products. Developing forms of agricultural cooperatives and agricultural product cooperatives, constructing integrated industry chains for agricultural production, processing, and sales, expanding sales channels and market share for agricultural products.

By advancing these development directions, ecological agricultural complexes will better adapt to societal needs and environmental changes, achieve sustainable agricultural development, promote increased income for farmers, protect the ecological environment, and drive the prosperity of rural economies and rural revitalization.

References

Wu Xingzhi, Xu Li. Cultural Cognitive Study on the Protection of Traditional Villages[J]. Journal of Northeast Agricultural University (Social Science Edition), 2021, 19(06): 1-6.

Wang Yan. Dilemmas and Breakthroughs in the Protection of Ethnic Traditional Villages[J]. Chinese National Education, 2021(05): 63-64. DOI: 10.16855/j.cnki.zgmzjy.2021.05.026.

Cao Wenlong, Mi Zhiqiang. Analysis of Innovative Development Models for Agricultural Complexes[J]. Modern Horticulture, 2022, 45(09): 113-115. DOI: 10.14051/j.cnki.xdyy.2022.09.041.

Zhang Zhenrui, Qin Yan. Design Analysis of Urban Agricultural Complex Based on Agricultural Experience: A Case Study of "FICO Eataly World"[J]. Landscape Architecture, 2019, 26(05): 105-108. DOI: 10.14085/j.fjyl.2019.05.0105.04.

Primitive Ancient Village Among Terrace Fields: Protection and Utilization of Azeke Village, Xinjie Town, Honghe Prefecture, Yunnan Province[J]. Urban and Rural Construction, 2023(02): 72-73.

Planning and Design for the Demonstration and Utilization of Tuanshan Village, Jianshui County, Yunnan Province[J]. Urban Architecture, 2017(18): 104-109. DOI: 10.19892/j.cnki.csjz.2017.18.018.

REFLECTIONS ON TIRANA'S URBAN IDENTITY (1146)

Jonila Prifti

Department of Urbanism, Faculty of Architecture and Urbanisme, Polytechnic University of Tirana, Tirana, Albania; jonila.prifti@fau.edu.al

Abstract. This article examines the concept of identity related to public places. In post socialist cities, the rush of urban development signed the loss of peculiar characters of places and of what Pierre Nora called *lieux de mémoire*. The Albanian concept and perception of urban public space have undergone through radical transformations which have affected the identity of the place – neglecting and sometimes canceling it – and the process of place-making. The paper discusses the effect that recent projects have had on the memory and the tradition of public places. The aim is to look at the local level for various forms and manifestations of elements of urban identities. In this perspective, the paper tries to rebuild the evolution of public places of Tirana to understand the past transformation phenomena and the ones in progress, identifying the specific features of places such as morphological identity, uses and culture. It argues that development of amnesia in urban space was intentional and proposes guidelines for future developments.

Keywords: memory, place, amnesia, identity, tradition.

1. Introduction

The importance of public spaces as vital places in the urban life of the contemporary city is undiscussed. They constitute the foundation of public life (Dogan, 2021) and play an important role in sustaining the city (Mehta, 2014). From a social and economic point of view, public spaces improve the quality of life, and the urban image. They also encourage economic development. Public Space Charter states that the community must recognize itself in public space. These open spaces represent an opportunity for social interactions, community events, and recreational activities. To be successful and liveable they must produce a sense of identity and belonging to users and enrich the lives of those who use them (Gaventa, 2006). The Public Space Charter defines public space as accessible and usable all for free or non-profit purpose. The improvement and transformation of the urban structure and the creation of new public spaces have influenced the lives of citizens through provision of opportunities for entertainment and thus stimulating new forms and institutions of urban life and culture. The opening of new wide streets and avenues, as well as private activities close to the main roads of the city has created the most appropriate public space and a safer environment to also increase the presence of women

in the public realm.

The urban identity of Tirana has been shaped by its turbulent history and rapid transformation over the last century. Tirana was founded in 1614 by Sulejman Pashe Bargjini and it exhibited the urban patterns of an Ottoman town until it became the capital of Albania in 1920. Since then, Tirana has undergone several phases of urban development and change, influenced by different regimes and ideologies, such as fascism, communism, democracy, and neoliberalism. These phases have left their traces on the physical component of the city, creating a diverse and eclectic urban fabric that reflects the cultural and political diversity of Albania.

Tirana is a city in constant transformation. This transformation is reflected in the urban form as much as in the spatial configuration and perception of the public spaces. It is important to measure the performance of public spaces, but it is also important to avoid on-size-fits-all as Carmona states while pointing out principles for public space design (Carmona, 2018). When public spaces have no quality, the activities that can be carried out are limited and they are transformed into connection spaces. Quality spaces invite people to stop, sit, etc., transforming the public space into a livable, usable space (Gehl, 2011, p.13).

Another aspect of public space in Tirana is the occupation and privatization of space by various actors, such as informal vendors, cafes, restaurants, parking lots and construction companies. This phenomenon has been criticized as it reduces the accessibility and quality of public space for the citizens, especially for low-income groups, women, children. The city of Tirana is facing a challenge to balance the interests of private development and public welfare, and to create more inclusive and democratic spaces for its inhabitants.

2. Methodology

The aim of the research is to investigate at a local level for various forms and manifestations of elements of urban identities. In this perspective, the paper tries to rebuild the evolution of public places of Tirana to understand the past transformation phenomena and the ones in progress, identifying the specific features of places such as morphological identity, uses and culture.

This research investigates how public spaces succeed in creating a sense of belonging and creating places. This approach shows the bond that is established between the individual and the public spaces. To address this research question, we can highlight the qualities of Tirana's public space, through a thematic approach. It argues that development of amnesia in urban space was intentional and proposes guidelines for future developments. The investigation is based on direct observations on sites and literature review.

3. Memory and Identity of Public Space

The Global Public Space toolkit represents an outcome of a consultative process. It was organized by UN-Habitat and INU with representatives of different countries and disciplines, to draft this toolkit, in 2015. The aim is to support local governments in creating and promoting inclusive, integrated, connected, sustainable, and safe public spaces. The term space/place alludes to the quality that all public spaces must have. This toolkit identifies the qualitative aspects of public space. The study of hundreds of public spaces, located throughout the world, noted that the most successful public spaces had these qualities: they are accessible, the users may conduct various activities, the space is comfortable, it is a social space, and people meet.

On the other hand, the 2030 Agenda seeks to reach the SDGs. Target 11.7 aim to provide inclusive and accessible green and public spaces by implementing policies toward inclusion, resource efficiency, adaptation to climate change ect. The New Urban Agenda envisages human settlements that 'engender a sense of belonging, prioritize safe, inclusive, accessible, green and quality public spaces that are friendly for families, enhance social and intergenerational interactions, cultural expressions and political participation, as appropriate, and foster social cohesion, inclusion and safety…' (UN, 2017).

Carr et. Al (1992) suggests that good public spaces are responsive, democratic and meaningful. Mehta (2014) while assessing the quality of public spaces in different case studies located in the US, Tampa examines empirically inclusiveness, meaningfulness, safety, comfort and pleasurably. He claims that societies need to shift from town squares to good public spaces that fulfill the needs of modern communities. The focus remains on the usability of spaces and how much people engage (Mehta, 2007).

Public space identity is a concept that relates to how people perceive, experience, and interact with public spaces. Public spaces are areas that are open and accessible to everyone, regardless of their background, identity, or interests. Public spaces can serve as places for social interaction, expression, recreation, learning and civic participation (Kent, 2016). Public space identity can be influenced by various factors, such as the physical characteristics of the space, the social characteristics of the users, the cultural meanings and values associated with the space, and the personal experiences and memories of the users. Public space identity can affect how people feel attached to a place, how they identify with a place, and how they behave in a place.

Public space may have great significance to people depending on events that happened throughout human history. They become part of collective memories and images. Every transformative intervention in public spaces may affect the perception of the space. Smith (2006) affirms that heritage is a tool for building memories and developing identities. Identity and memory are two fundamental concepts on the contemporary city widely discussed in literature. Memory loss and identity crisis are threatening the city and our

behavior in public spaces.

The memory arises from societies and is always open to dialectics, being in continuous evolution. If, on the one hand, history represents a reconstruction, the memory warps unconsciously, it is vulnerable to manipulation. Memory is not part of the past because it is perpetuated in the present (Nora, 1989:8). 'The identity of a place and the sense of belonging which manages to general can be said to be effective when the place feels really right, when you manage to establish a non-inhibitory relationship with subjects and with spaces, when possible, to participate together with the first and to reinvent the latter' (Brugellis P., Pezzulli F., 2006).

As Crinson (2005) affirms, there are two approaches to memory: memory as a heritage of pas experiences and the ability to collect and recall past events. He also claims that 'Urban memory can be an anthropomorphism (the city having a memory) but more commonly it indicates the city as a physical landscape and collection of objects and practices that enable recollections of the past and that embody the past through traces of the city's sequential building and rebuilding' (Crinson, 2005, xii).

4. Development of Tirana's urban structure

The Albanian architect and Mayor of Tirana during 1935-1936, Qemal Butka points out on a daily newspaper, that in Albanian cities one cannot speak of one tradition in urban planning, since the birth and growth of cities has always been spontaneous and characterized by the desire to always be in a hurry. The result is all chaotic works with divergent directions that they could not aim for a common vision. There was no street, square or complex of buildings of which you could be fascinated by the harmony of the project same (Butka, 1938).

The urban structure is chaotic due to the dispersion of houses that do not follow ordering principles but adapt to the orography of the territory with forms open to the good sunshine. An extensive typology that opposes the Mediterranean organizational mode (Cerasi, 1998). The public spaces generally did not have the shape and composition of European public spaces. The square did not exist as a concept and as a way of external space configuration. It was about open spaces like widening of main arteries or vacant lots bordered by roads, not from buildings, at least public, without precise shape and size (Aliaj B.,et. al., 2003).

After the Second World War, under communism, the new way of doing urban planning followed indications from the Soviet Union. It started with interventions of major interest aiming the industrialization of the country. A first example of the application of socialist ideology was town planning as a tool to grow the economy. The housing units were born as needed to accommodate workers and laborers. Since internal immigration was

controlled and private property did not exist, the government, referring to the Party brought workers from other cities and settled them in the residential area built near the industrial buildings. Over the years, this nucleus has marked a housing growth and was equipped with all services needed by a city.

The city was designed on an orthogonal network, with a main street of connection with other cities and other secondary roads that cross it. The compositional unit, the block, had the shape of a rectangle and large size, the buildings within floated free. The proposed building typology was linear. Almost all the buildings were arranged on the territory in such a way that create a continuous alignment with the main road or those secondary. The poor development of building technologies did not allow the construction of several levels above the ground. The central square plaza was located at the entrance to the industrial complex to highlight the architecture of the buildings.

Architectures were produced from amount, architectures strained with ideological violence and the voice of the architect, according to Kolevica, it was a vox ciamans in desert. The use of capitals, frames and decorations were external to the tradition of the country (Kolevica P.,1997).

In Tirana, the anti-sprawl "movement" was born spontaneously, after 1990. After an initial period in search of free land in the city limits, the interest of the builders is directed to the land near the center, to take advantage of the differences in the land rent. This long process was triggered by both privatization of publicly owned lots and the re-appropriation of private properties. The lack of programming document territory has favored the expansion of legitimized urban planning practices. The result of this process is the overwriting of existing fabrics without principles e rules.

5. Investigating Urban Identities in Public Spaces

The Scanderbeg Square was designed in an empty area near Ethem Bej Mosque in 1926. The Italian architect Armando Brasini wanted to preserve the existing structure of the city and developed the expansion of Tirana towards the west and south. Il was called Ministry square because of the new governmental building facing it. Il became the main piazza of the Capital. The recent project for Scanderbeg Square was completed in 2017 with multi-coloured paving made with stones from different parts of the country. The square is surrounded by several emblematic buildings, such as the National History Museum, the Palace of Culture, the Et'hem Bey Mosque and the equestrian statue of Skanderbeg, the national hero. The square is also a symbol of Albania's complex and convulsive history, as it reflects the influences of different regimes and ideologies that have ruled the country. The renovation of the square aimed to create a generous pedestrian area and a local ecosystem that fosters urban biodiversity and microclimate control.

The Mother Teresa square was completed in 1940 and designed by the Italian architect Gerardo Bosio. The square has a rectangular shape and the area occupied is almost 14 thousand square meters. It represents an extension of the main boulevard that connects Scanderbeg square with the Casa del Fascio. The shape of the square, the use of the stairways, the continuity of the facade, the rhythm, and the sculptural projects are clear references to monumentality as an expression of political power. The square and the buildings are subject to protective restrictions. In the center of the square, there was a fountain but after its removal, the space is occupied by “Tirana sixhade”. It is a colored painting on the surface representing the traditional texture of Shengjergj area near the capital. The buildings facing the piazza have only public functions.

Piazza Italia was built as part of the Litorian complex, between the stadium and ODA, connecting the main piazza to the stadium through a colonnade. The square was conceived as an extension of the park with greenery. The space was not well delimited as the other public spaces proposed during that period. The new intervention on the stadium also brought a renewal project for the public space. Archea associate designed the project of the stadium, maintaining a part of the existing façade.

In 1926 two Italian architects, Becciari and Giuliani were called to design a new complex dedicated to trade and retail near the center of Tirana. A few years after, near the sales area, it was also designed a piazza. The tradition of selling meat, fish and vegetables is preserved nowadays. The new Bazaar continues to live thanks to the reconstruction and restoration project of 2015. The reconstruction of the fruit and vegetable market follows traditional motifs. The roof shape is proposed to be in line with existing buildings. Wood represents the material used in the initial project of the 1930s. The pavement of the market square is made of stones shaped like the typical flooring of the Albanian culture *kalldrem*. In the areas of the park, benches were made using traditional materials such as stone and wood. Since 2015 the public space is lived from the morning to late hours for the presence of bar and restaurants.

The Runaway Park is a themed public space strongly desired by the residents and by the local government to recover an abandoned airstrip for several decades. The project proposed by the Athena studio in 2008 deals with two parts of the city, the existing context on one side and the proposed unbuilt structure on the other, by connecting them using greenery. The project approaches two different scales: the urban scale and the human scale. The measurement unit used in the composition of the park is 1 km. The length was divided into 10 creating spaces dedicated to greenery or sports with dimensions of 100m. Every area differs from the others on the base of function, color, and use. It was designed to refer to the human scale. The materials used are different to highlight this concept.

6. Conclusion

Le Febvre and then Harvey (2008) argue about who has rights to the city, pointing out the fact that it is far more than the individual liberty to urban resources. We have the freedom to shape and remake our cities following our values. In a hundred years of interventions in Tirana as a Capital, some architects have neglected the past, considering Tirana a city without an identity. But the urban identity of Tirana is also influenced by its phenomenological component, which is more subjective and dynamic. The phenomenological component reflects how people perceive, experience, and relate to the city, based on their personal and collective memories, emotions, values, beliefs, and identities (Aliaj et.al, 2003). The phenomenological component can vary depending on different factors, such as age, gender, ethnicity, education, income, lifestyle, and preferences (Aliaj et.al, 2003).

Some of the most relevant aspects of the urban identities of Tirana's that should form the basis for future interventions in public spaces are:

The sense of place: This is the feeling of attachment and belonging that people have towards a specific place in the city, such as a street, a square, a park or a neighbourhood. The sense of place can be influenced by factors such as familiarity, history, culture, aesthetics, and social interactions.

The image of the city: This is the mental representation that people have of the city as a whole or of its parts. The image of the city can be influenced by factors such as visibility, legibility, identity, and structure.

The urban culture: This is the set of values, norms, behaviours, and expressions that characterize the way people live in the city (Ziyaee, 2018). The urban culture can be influenced by factors such as history, geography, religion, politics etc.

To avoid risking intentional amnesia, all the three components should be readable in public spaces of Tirana.

References

Aliaj B., Lulo K., Myftiu G., (2003) *Tirana, the challenge of urban development*, Tirane: Sloalba

Apaydin, V. (2020). Heritage, memory and social justice: reclaiming space and identity. In V. Apaydin (Ed.), *Critical Perspectives on Cultural Memory and Heritage: Construction, Transformation and Destruction* (pp. 84–97). UCL Press

Boyer, M. C. (1998) *The City of Collective Memory: Its Historical Imagery and Architectural Entertainments*, The MIT Press: Cambridge

Brugellis P., Pezzulli F. (2006) *Spazi comuni, Reinventare la città,* Bevivino editoreli

Boyer, C. (1998) *The City of Collective Memory: Its Historical Imagery and Architectural Entertainments*, Cambridge, MA: MIT Press

Butka Q. (1938), *Fshati, qyteti, kryeqyteti: dy fjale mbi urbanismen*, in «Perpjekja shqiptare», Viti II, Nr.16, Tirane, p. 173

Carmona, M. Principles for public space design, planning to do better. Urban Des Int 24, 47–59 (2019). https://doi.org/10.1057/s41289-018-0070-3

Carmona, M., et. al. (2003) Public spaces Urban spaces, Oxford: Architectural Press

Cerasi M. (1998) T*he formation of ottoman house types: a comparative study in neighboring cultures, in Muqarnas, Vol.15, p. 116-156*

Cotrufo, P. and Pozzi R. (eds.) (2014) *Identità e processi di identificazione*, Milano: Franco Angeli

Crinson, M. (2005) *Urban memory. History and amnesia in the modern city*, Londra and New York: Routledge

Dogan, U., (2021*) A comparison of space quality in streets in the context of public open space design: The example of Izmir, Barcelona, and Liverpool*

Gehl, J., (2011) Life between buildings (6th ed.). Island Press

Graham, B. J., Howard, P., eds. (2016) *The Ashgate Research Companion to Heritage and Identity.* New York: Routledge

Harvey, D., (2008) *The Right to the City*. New Left Review, 53, 23-40

Kent F., (2016) *Streets as places*, in Karssenberg H. (et al), The city at eye level: lessons for street plinths, Delft: Eburon Academic Publishers

Kolevica P. (1997) Arkitektura dhe diktatura, op. cit., p. 14

Lang J., Marshall N. (2017) *Urban squares. As spaces links and displays*, Routledge: New York

Mehta, V., (2014) Evaluating public space, Journal of Urban Design Volume 19, 2014, pp. 53-88, N*eighboring cultures,* in Muqarnas, Vol.15, 119

Nora P. (1989) *Between memory and history: les lieux de mémoire,* Representations, No. 26, Special Issue: Memory and Counter-Memory,

Sepe, M. (2013) *Planning the city: mapping place identity*, New York: Routledge

Smith, L. (2006). *Uses of Heritage.* London: Routledge

UN (2015) The 2030 Agenda for sustainable development

UN Habitat III. (2017) New Urban Agenda, Quito: United Nations Conference on Housing and Sustainable Urban Development

UN Habitat. (2015) Global Public Space Toolkit From Global Principles to Local Policies and Practice. Nairobi: United Nations Human Settlements Programme

Ziyaee, M, (2018) Assessment of urban identity through a matrix of cultural landscapes, in *Cities*, Vol. 74, pages 21-31.

THE NATIONAL VILLAGE AND THE NATIONALITIES IN VILLAGE: THE IDENTITY OF HUI NATIONALITY AND EVOLUTION OF RESIDENTIAL SPACE IN XIZHOU ANCIENT TOWN, YUNNAN PROVINCE (1147)

Yu Zhang

Politecnico di Milano, Italy; 568830502@qq.com

Abstract. This paper attempts to use the methods of oral history and morphological analysis to sort out the development of residents of Hui nationality in Xizhou Ancient Town since the late of the Qing Dynasty and explore its role in the evolution of the Xiuzhou Ancient Town. Then to summarize the relationship between national identity and the spatial form of daily life through the combination of the two aspects. Taking the lives of the Bai and Hui people in Xizhou under the background of tourism as a slice, this paper also makes considerations and critique on the impact of the cognitive way based on national identity on the traditional towns and villages in Yunnan.

Keywords: national identify, public space, dwellings, traditional town

1. Introduction

China's Yunnan province is home to 26 ethnic minorities, making it one of the provinces with the highest concentration of ethnic minorities. Therefore, ethnic identity is often the starting point for the perception of specific towns and villages. This way of perception not only affects the identity of local residents but also indirectly influences the construction of public spaces and dwellings, and is constantly modified and reinforced by the development of tourism in the present.

The ancient town of Xizhou, located between the Cang Mountains and the Erhai Lake, the core of Dali culture in Yunnan, is a national historical and cultural town. According to the ethnic identification work from 1949 to 1954, most of the residents of Xizhou were classified as Bai, and Xizhou has become a traditional Bai village, with its houses, customs and clothing labeled as Bai. The houses, customs and clothing are all labeled as Bai. However, on the north side of the town, there are Hui residents who make up about 10% of the population of Xizhou. They have been involved in all socio-economic activities in Xizhou since the late Qing Dynasty and have played an important role in the history of the area. In the context of their long-term mixing with the Bai, the Hui residents have maintained their own social and cultural characteristics, including their beliefs and religious activities, on the one hand, but on the other hand, they have changed implicitly

in the context of the modernization of the country and the domination of the Bai elite in the society. These changes reflect the hesitations and oscillations of Hui residents between their own history and the current socio-economic situation regarding their identity and the range of lifestyles attached to it.

Figure 1. Location of Yunnan Province

2. The Historical Origin of The Hui Nationality in Yunnan

After the ethnic identification work in 1949-1954, Dali was changed from Dali Prefecture to Dali Bai Autonomous Prefecture in 1956. The word "Bai" in the administrative name directly indicates the conclusion of the ethnic identification work in Dali. Thus, the close connection between "Dali" and "Bai" has become an official fact. In recent years, tourism, which has become the backbone of Dali's economy, has not only brought a thriving merchandise economy to the region, but also a large number of tourists from other provinces. In the tourists' perspective, Dali is gradually equated with the Bai culture. This *ethnic-regional* cognitive model from the outside also influences the identity of Bai and non-Bai residents in Dali and the transformation of their living environment. This paper discusses how this change in perception has manifested itself in the case of the Hui people of Xizhou, and how it has affected the layout, planning, and housing of settlements.

The ethnic name of the Hui nationality is the first point of entry to understand its development process. The term "Hui-Hui" first appeared in the Northern Song Dynasty in Shen Kuo's *Mengxi Bitan*. Although this term is similar to the current name of Hui

nationaliry, at that time it did not refer to the Hui of today, but to the "Uighur" who lived in the Hexi Corridor and the north and south of the Tianshan Mountains. They were the ancestors of the Uyghurs of today's Xinjiang. The term *Hui-Hui* mentioned several times in the Southern Song Dynasty's "A Brief History of the Black Tartars" by Peng Daya and Xu Ting, is also not the Hui nationality of today, but refers to the various ethnic groups, regions and countries in the east and west of the Onion Ridge that believe in Islam. [1] It can be seen that the term Hui-Hui in the early days implied the geographical scope of the people, rather than a clear ethnic concept.

This situation changed with the unification of the Yuan Dynasty. The Mongol army's conquest across Europe and Asia made the Arabs and Persians in Central and West Asia the target of the Mongol army's plunder, and the plundered people followed the army's migration. According to their type of labor, the plundered people were called Hui-Hui army, Hui-Hui artisans and Hui-Hui merchants, etc. [2] As a result, the term *Hui-Hui* was divorced from its association with a specific geographic region, and became a reference to a fixed group of people. As the Mongolian army fought against the Dali, "Hui-Hui" were stationed and settled in Yunnan, and participated in the writing of Yunnan's history since the Yuan Dynasty. On the other hand, due to the original religious background of Central and West Asia, Islam has gradually been accepted as the mainstream faith within the "Muslim" community. By the early Ming Dynasty, the Hui nationality had developed into a stable and independent nationality, [1] and had the same meaning as "Islamists". The Islamic faith has also become one of the most distinctive features of the "Hui-Hui" nationality.

3. Xizhou and Hui Nationality

Since the Yuan Dynasty, the Hui nationality have developed into a distribution of "large scattered and small concentrated" in Yunnan. [3] Dali is an important area for the "small concentration" of Hui nationality in western Yunnan.

Figure 2. Location of Dali and the Erhai Lake

The cantonment of the “Hui-Hui army” during the Yuan Dynasty was mainly along the transportation routes. After the unification of Yunnan and the establishment of the provincial government, the construction of the "Zhanchi" was strengthened to expand and improve the transportation in the region. Dali, "leaning on the west of the point cang, east of the Er water, the mountains and rivers in the shape of victory, majestic in the southern service"[4], extended in all directions in the western Yunnan, is also an important trade and commerce in successive dynasties, the cantonment of soldiers to choke the location. Its strategic significance is the foundation of the ancestors of Hui nationality settlement in the area. In addition, the Jimi policy of Yuan Dynasty made the original Dali State retain its power in Dali area. In order to check and balance the political families of Meng and Duan in Xizhou, Sai Dianchi[6], who was a Pingzhang administrator, dispatched his eldest son Nasulading to Xizhou on the eve of the move of the Central Secretariat from Dali to Kunming, and stationed troops at the northern and southern ends of Xizhou for control[7]. This initiative established a strong link between Xizhou and its surrounding area, and the Hui nationality.

Figure 3. Aerial view of Xizhou Ancient Town

During the process of overthrowing the Mongo empire and the governance of Yunnan, the Ming dynasty made two large armies into Yunnan. [8] But due to the continuation of the post-war strategy of transport construction and military cantonment, and the belief in Islam of the leading generals, [9] the population of Hui nationality in western Yunnan increased rather than decreased, and the absorption effect of the original Hui nationality settlements was strengthened. Xizhou was no exception.

The Qing Dynasty's strategy of ruling the Hui nationality in the southwest went through a change from loose to tight, and the frequent Hui nationality rebellions in northwest Gansu and other areas were a direct factor in the tightening of Hui policy in the southwest. [10] In addition, the policy of bureaucratisation of native officers in Yunnan carried out by Ertai (鄂尔泰) in 1726 led to a great reduction in the power of the Tusi in Yunnan, and a great change in the local power structure. The accumulation of conflicts led to the outbreak of the Dali-centered Hui rebellion in 1856, which is known as the "Du Wenxiu Uprising of Hui Nationaliry". Although the uprising ultimately failed, the Hui rebellion briefly took control of most of western Yunnan, [11] with Dali as its core, and established a regional regime in

the city between 1856 and 1872. The Hui population was drastically reduced by the Qing siege. Just 18 kilometers from Dali, Xizhou played an important role before the uprising and after the establishment of the regime, and the Hui nationality and Islamic culture continued to influence the inhabitants of Xizhou, and was reflected in the development of the town and its architecture.

4. Distribution of Hui Nationality Around Xizhou

Xizhou is located in the backland of the Dali Dam, is an important trade town on the west coast of the Erhai Lake since the Qing Dynasty to the Republic of China, and is an important transit area for merchants from southern Yunnan to Tibetan areas. Thus, Xizhou has become an important place for population and cultural exchange. The Dragon's Head Pass and Dragon's Tail Pass at the two ends of the Dali Dam area control the entry and exit of merchants and goods. And beyond the two gates, Eryuan and Weishan are the largest areas of Hui nationality settlement in the Dali region. Weishan, known as Menghua in the Qing Dynasty, was the starting point for the establishment of the Nanzhao regime. Now Weishan is Hui autonomous county. In contrast, Eryuan County is located in the upper basin of the Er Sea, is a typical river alluvial plain, very suitable for settlement. In Eryuan County, 65% of the Hui are concentrated in the villages of Shibang, Jieming and Sanmei, all of which are located in the northern part of the Cang Mountain Range. So from the perspective of the dam area as a whole, Xizhou falls right in between the Hui settlements.

Looking at the relationship between Xizhou and Hui settlements from within the dam area on a village-by-village basis, the same conclusion was come. There are Hui settlements to the south and north of Xizhou. Before the Hui Uprising, there were three large Hui settlements in the southern part of Xizhou, namely Shangzuoyi, Moyong and Koryozhuang. The ones that still exist today are Sosok-eup and Korijo. It is located one kilometer south of Xizhou, and was named "Keli" because of its proximity to Xizhou and its historical name of "Dali City", which later evolved into "Keli". The village was once a place where Tang Chunpei, the governor of Dali Prefecture, and Lin Tingxi, the Winding Road, held a regimental training program against the Muslim uprising, but the village no longer exists because it was severely damaged after the defeat of Du Wenxiu's Muslim uprising.

Xizhou to the north of the distribution of E used, Meiba and on the three Hui villages, all along the G214 (West - View Line) on both sides of the distribution, which is the highest altitude is located in the Cang Mountain Cang Longfeng peak foothills on the Xingzhuang, the village still stands in the mosque, as shown in Figure 3.

Figure 4. Mosque of Shangxingzhuang Village

Although the location of Hui villages today will be different compared to before the uprising, under the influence of the Hui uprising at the end of the Qing Dynasty and the siege and post-war migration of the Hui by the Qing army, this does not affect the fact that Hsi Chau and Hui have coexisted spatially for a long time. Our study of the evolution of the layout of the ancient town of Xizhou cannot be separated from this perspective of coexistence.

5. Boundary and Inner Boundary of Xizhou

The area between Cang Mountain and the Erhai Lake is called Haixi by the locals because it is located on the western shore of the Erhai Lake. The Haixi dam is long and narrow from north to south, and the 18 streams flowing down from the snowy top of Cang Mountain divide it into 19 flat dams. Due to the importance of water sources, most of the villages in the hinterland of the Haixi region are distributed along both sides of these 18 streams, while the side of the villages not facing the streams is often surrounded by cultivated land.

From an administrative point of view, the border between the town and the village of Xizhou is the official boundary[12]; from the tourist's point of view, Xizhou is a "special town" made up of many attractions; and from the perspective of a tourism development company, "Xizhou" means the area within the administrative boundary where maximum benefits can be achieved. So how do the White and Hui residents living within the above-mentioned boundaries view the boundaries of their own environment?

As mentioned at the beginning of this article, Xizhou is a historical and cultural town within the Bai Autonomous Prefecture, and "Bai" is the identity of most of the residents of Xizhou, as well as a cultural label and a promotional gimmick for Xizhou as a "special town". The Bai is like a supreme concept that encompasses all aspects of Xizhou, from its inhabitants to its material life, into a holistic order that appears to have only external boundaries. The establishment of the "fortress gate" and the widening of the outer road have strengthened the whole. On the other hand, according to the Dali Statistical Yearbook (2022 edition), Dali City, of which Xizhou is a part, has 18,924 Hui inhabitants[13], the

largest number among the county-level administrative units in Dali Prefecture. For the Hui residents of Xizhou, where is the boundary they perceive? Therefore, this paper proposes the concept of "inner boundary" to point out that there is a division between the White and Hui settlements within Hsi Chau, and that the "inner boundary" has been adjusted, weakened or strengthened at different historical periods.

6. Layout Expansion of Xizhou Ancient Town

In the ancient town of Xizhou, there is an east-west road called Qingzhen Road, which roughly outlines the scope of the Hui settlement: north of the road is the Xizhou Mosque as the core of the Hui residential area, and most of the streets along the south side are Hui homes, but the closer to the city street the more white residents. So where did this road come from? And what role did it play in the layout of the ancient town of Xizhou? The author obtained the following materials through visits to the Hui residents of Xizhou and a survey of Xizhou historical documents.

The *Survey of the Social History of the Hui People in Yunnan* contains an account of a posthumous account by Imam Ma Yuwen of Shangxingzhuang:

> *Passed the Xizhou again, Hui and Han people lived together, but there are hundreds of Hui families, also divided into two mosques, one belongs to the Family Zhang, the other belongs to Family Ma, both under the Shaanxi School, after the failure (Du Wenxiu Muslim Uprising), Mosque of Family Zhang turned into a temple of Wealth God, that is, the existing temple.* [0]

A similar passage is recorded in the *Cultural History of Dali Xizhou*:

> *Xiuzhou City, the former garrison place of Shishang Street and the place called Houhe evolved into the Hui residents. On the eve of the Xianfeng Incident, there were hundreds of Hui families, each family Zhang and family Ma had a mosque.* [0]

The two records corroborate each other, and it seems that a preliminary conclusion can be drawn: the ancient town of Xizhou today had two mosques before the defeat of the Du Wenxiu uprising in the late Qing Dynasty, and because the Hui follow the tradition of gathering in the center of the mosque, the ancient town of Xizhou's Hui settlement should be concentrated in the vicinity of the city's Upper Street. But where exactly are these two mosques located?

The location of the mosque of family Zhang mosque can be confirmed through conversations with Zhang Xuelian, a resident of Caiyun Street in Xizhou (southeast of Baocheng House), and with the descendants of the Yang Yunheng family at No. 22 Shiping Street.

Conversation with Zhang Seulian (hereinafter referred to as Zhang) (excerpt):

Author: Was this mansion handed down to you from your ancestors?

Zhang: Yes, but I only occupy three rooms on this side (three rooms in the north room).

Author: Are all the residents here now surnamed Zhang?

Zhang: No, the opposite surname is Sun.

Author: Are you a Hui nationality?

Zhang: Yes. The Hui nationality is very bumpy in Xizhou. My grandfather was sent to work in a mine in Chuxiong when he was young, and later ran back, but there is no more Hui land in Xizhou. Then he and some other Muslims asked the Yan family lord for land to build a house and a mosque.

Author: Is this the current mosque?

Zhang: Yes. It used to be a mud flat. No one farmed there. The Yan family lord was okay and gave the land to my grandfather.

Author: Was there a mosque before this?

Zhang: According to my grandfather, the old mosque was turned into the hall of the God of Wealth.

Author: Where is the hall of God of wealth?

Zhang: The hall of the God of wealth was demolished, in the parking lot. You see the stage, together with that senior center.

Author: Is the family tree still there?

Zhang: There was a family tree, but it was taken to Guizhou by my uncle.

(End)

Figure 5. Zhang Xulian and his courtyard in Xizhou Ancient Town

Conversation with descendants of the Yang Yunheng family (hereinafter referred to as Yang) (excerpt):

Author: I heard that there used to be a temple next to your house?

Yang: Yes, it was a hall of the God of Wealth, which was later torn down.

Author: Will the land remain empty after the demolition?

Yang: This land has been converted into a grain depot, which is a place to store and manage grain.

(End)

Through these two interviews, it is basically possible to determine the authenticity and specific location of the Zhang's Mosque as recorded in the "Historical Examination of the Culture of Dali Xizhou" and the "Survey of the Social History of the Hui in Yunnan. By comparing the location of Zhang's mosque today and in the past, we can clearly know: the new mosque than the original temple to the northwest direction. It was the inauguration of the new mosque that created the "inner boundary" of Xizhou, separating the White and Muslim communities, which later developed into the Halal Road. The layout of Xizhou Ancient Town has thus been expanded.

7. The Generating Process of Inner Boundary

If we make a simple investigation on the construction time of mosques in Hui settlements around Xizhou, we will find a fact: the peak period of mosque construction and reconstruction was around 1910-1920.

Table 1. Mosques in Hui villages around Xizhou

Kelizhuang Village	2.4km to Xizhou Village	1908 (Rebuilt)
Sanmei Village	27.9km to Xizhou Village	1908 (Built)
Shangxinzhuang Village	5.3km to Xizhou Village	1921 (Rebuilt)
E'lang Village	3.3km to Xizhou Village	1886 (Built)

Why does this happen? According to the statement of the history of Xizhou before and after Du Wenxiu's uprising, we can know that during this period, the Hui people in Dali area experienced the process from the establishment of an independent regional regime to the collapse of it, and the Hui residents suffered the massacre and displacement after the failure of the uprising. Most of the Hui residents' original means of production, such as houses and land, were distributed as *property forfeited* to local gentry and officials in charge of youth league training who had done good work in suppressing the uprising[16], and *Excluding the Hui People* became politically correct. From Zhang Xulian's grandfather's work experience in Chuxiong, we can know that Xizhou residents, who were at the center of the Hui regime, could not escape the fate of being "excluded". Therefore, the

relationship between Bai and Hui also experienced a process from coexistence to mutual exclusion. The demolition and renovation of the mosque also confirmed such a transformation of the relationship.

However, from the end of the 19th century to the beginning of the 20th century, frequent social revolution and the entry of western colonial forces made the Qing government gradually lose its control over the southwest region, greatly loosening the original social order and policies, making it possible for the Hui people to return to their hometowns. Therefore, there was a small upsurge of striving for land, building mosques and housing on their native land.[17]

This process of "reconstruction" has invariably reinforced the Hui people's sense of their own ethnic identity, and their loyalty to the Islamic faith has forced them to behave in a very different way from other ethnic groups in their actual productive lives. Historical and religious factors made the reconstruction of the mosque and the houses surrounding it inevitable, and this mentality was projected into the construction of the village, resulting in the "inner boundary" of Xizhou.

8. Caravan Career and The Breakthrough of "Inner Boundary"

From the *War-Ready* cavalries to the displaced *Rebels* finally to the expatriates returning to one's homeland, the Muslims in the Dali region are constantly positioning themselves in their social roles through the perception of their own identity.

There is a proverb in Yunnan folklore: "Pendulum barbarian fields, Han Chinese land, Hui sons drive horses to do business". A large number of Hui people who returned to their hometowns did not have land to cultivate as horse helpers, and this situation is very common in the Dali area. A 1951 survey report of Weishan Yongjian Township showed that there were more than 100 horse gangs in 15 Hui villages in Yongjian Township, with more than 5,000 mules and horses. Before the founding of the People's Republic of China, more than 190 of the 380 households in Yong Sheng village Huihuideng were completely operating horse gang transportation, accounting for about 50%.[0]

The Hui people of Xizhou do horse transport, in addition to the advantages of geographical location there are several key factors:
One, Xi Chau in the late Qing Dynasty to the Republic of China during the rise of the "four families" are the main business content of the sale and resale of goods in other places, so the absolute demand for the horse gang; two, the horse gang transport long distances, so the members of the horse gang is generally outside the year;
Second, the horse gang transport long distances, so the horse gang members are generally wandering outside all year round. And the Hui of Xizhou have almost no land to cultivate at the early stage of returning to their hometown, and the land cannot bring any stable income to the Hui, so the horse gang transportation in turn provides an opportunity for

the independence of the Hui;
Third, the Islamic faith does not have idol worship, the Hui can perform pilgrimage at any time during the process of transportation, and some Hui take the opportunity to reach the holy land of Mecca to perform the hajj by horse gang transportation out.[0]

As a result of these major factors, the Hui of Xizhou became synonymous with the horse gang, finding their new social niche in the late Qing and Republican eras. At the same time, they also broke through the "inner boundaries" between the internal and the white inhabitants of Xizhou in the course of their operations.

Returning Hui usually lived on the outskirts of their original village sites, which made it easier for the gangs to travel. The long history of horsemen's transport provided enough experience for some families to grow into merchants, which laid the foundation for the integration of the elite Hui into the Bai community of Xizhou.

From the distribution of Hui houses in Xizhou, we can see that there are also large houses belonging to the Hui in the Bai settlements south of Shishang Street and Shiping Street. Among them, Ma Wansheng's house on Shi Shang Street and Ma Xingpu's house on Caiyun Street are the most remarkable.

Ma Wansheng was born in 1869 and worked in a brick kiln in Binchuan from the age of 12 to 18. After the defeat of the Du Wenxiu uprising, he was forced to leave his original residence in Xizhou and flee to Dachongxiang in Zhoucheng. After returning to Xizhou, he relied on the business of horse gang transportation to and from the Dali-Heqing route, mainly dealing with earthen paper, white cotton paper and burning money paper in Songgui Town, Heqing County. After accumulating a certain amount of wealth, a mansion was built on the present site in 1897, 1920 and 1946 respectively. A courtyard was enclosed on the east side as a stable.

And Ma Xingpu, who built the mansion on the southeast side of Baocheng House, mainly operated the copper business in Lijiang during the Republican period and opened his own workshop to export copper to Tibet and resell Tibetan herbs to Dali for sale. Through his early horse gang business, he gradually became one of the models of merchants in Xiuzhou and built his own mansion while establishing his own business name "Li Xing Chang".

As we can see from the above examples of Hui horsemen and merchants, the stable social environment provided new opportunities for the Hui to coexist with other ethnic groups. In the commercial trade, the Hui were deeply involved in the tea and horse trade and transportation in western Yunnan as the main force of the Xizhou horse gang. For themselves and the other residents of Xizhou, Hui identity was no longer equated with displaced returnees, a marginal role in the settlement, but gradually became the "horse pot head" who independently assumed an important social division of labor. Even as the

wealth and social status of the elite Hui merchants increased, Hui culture gained a higher level of recognition in Xizhou society. While dissolving the inner boundaries of Xizhou, the culture of the Bai, Hui, and Han peoples was combined to form the "Xizhou Culture" as a whole.

9. Rethinking Identity of Nationality and the Emergence of New Residential Groupings

On the north side of Xizhou, in the area adjacent to the mosque, there is a cluster of residences built in the early 1990s. In this area, each household is of the same layout and size, forming several rows of rows of houses. Through interviews, we learned that this area is still used as a Hui settlement, and that in the early 1990s, in order to solve the housing problem in the core area of Xizhou ancient town, the government concentrated on building these two-story, L-shaped houses for Hui residents only. The selection of homes was decided by lottery, and no group selection or sale was allowed.

The emergence of this group reinforced the border between the White and Hui communities, and in the context of Xizhou ancient town's near transformation into a *theme park of Bai cultural*, it gradually became a marginal building that neither belonged to the White culture nor had Hui characteristics. The core building, the Xizhou Bai residential complex, which is the antithesis of such marginal architecture, has become a popular attraction for tourists and has become the supreme form of Xizhou society and a benchmark for marginal architecture to emulate and transform, with the "new tradition" of Xizhou being shaped in tourism. The "new tradition" of Xizhou has been shaped by tourism, and the "inner boundary" has become clear again.

In this context, the division of life and social production of the Hui residents is once again integrated into the development of tourism. They participate in the restaurant and souvenir business by renting stores in the Ancient Town or converting residential rooms into stores, shaping themselves as well as the bustling streets of Xizhou.

In terms of religious life, although the Hui residents remain faithful to the Islamic faith, in the context of tourism development, tourists are introduced to the mosques, the public attributes of the public space are further opened up, and Islam is transformed from a necessity of religious life to a manifestation of ritual.

Figure 6. Hui People's Wedding in Xizhou Ancient Town

10. Conclusion

Although the post-1954 ethnic identification work and the *ethnic-regional* cognition strengthened under its influence have, to some extent, demystified the multi-ethnic mix in the southwest, this approach has simplified the rich connotations and complexities of the cognitive objects. This approach simplifies the rich connotation and complex historical details of the cognitive object. At the same time, in villages such as Xizhou, where tourism is the mainstay, there are profound influences on how local residents perceive their ethnic identity, which will eventually be reflected in the ethnic distribution of the settlement. At the same time, this perception tries to shape the village into a cultural unity with internal order and clear external boundaries, which inadvertently conceals the problem of "internal boundaries".

The tensions created by the complex relationships within a community, large or small, often drive its own development. It is true that the communities in which different ethnic groups are located always show some characteristics of their own, but such characteristics need to be understood in the context of the relationships between different ethnic groups or groups within the community.

References

Yang, Zhaojun, Ma Chaoqun and Ma Weiliang (1994) History of ethnic group in Yunan. Kunming: The Nationalities Publishing House of Yunnan.

Li, Zhengqing (1998) History of Xizhou culture. Kunming: The Nationalities Publishing House of Yunnan.

Ma, Xingdong (1989) Exploring the origins of the Hui ethnic group in Yunnan. Journal of Yunnan Minzu University (Philosophy and Social Sciences Edition), 7(01), pp. 50-56.

Gu Zuyu (1955) Essentials of geography for reading history.

Bai, Shouyi (eds) (1988) Records of Hui Ethnic Figures (Ming Dynasty). Yinchuan: Ningxia

People's Publishing House.
He, Yuchou, Wang Yingxi (1989) On the Policies of the Qing Dynasty towards the Hui Ethnic Group. Gansu Social Sciences, 11(02), pp. 61-65.
Dali Prefecture Bureau of Statistics (2022) Dali statistical yearbook. Beijing: China Statistics Press.
Yunnan Provincial Editing Group (2009) Social history survey of Yunnan Hui (2). Beijing: Nationalities Publishing House.
Gao Fayuan, ed. (1992) A Survey of the Hui Villages in Yunnan - A Study of the Current Situation and Development. Kunming: Yunnan Ethnic Publishing House.
Zhang Xilu, ed. (2015) The figure in the ancient house of Xizhou. Kunming: Yunnan Science and Technology Press.

TRACK 09: PLANNING FOR INCLUSIVE, MULTICULTURAL AND JUST CITIES

PARK SEGREGATION AND PARK ACCESS: AN ENVIRONMENTAL JUSTICE INQUIRY OF URBAN PARKS IN MONTGOMERY, ALABAMA (1073)

Binita Mahato

Community Planning Program, Deptartment of Political Science, College of Liberal Arts, Auburn University, Auburn, USA, binita.mahato@auburn.edu

Abstract. The study connects the issues of park access from an environmental justice point of view in cities with a history of a segregated park system. The aim is to understand the tacit and contemporary connotations of park segregation as a by-product of historical practices. Using an environmental justice inquiry, the study conducts quantitative and qualitative assessments to scrutinize park access in sixty-two urban parks in Montgomery, Alabama. The studied parks are categorized into African American and white parks based on the demography of residents living within a half-mile area of the parks. The study finds that historical practices and policies of park segregation influence modern planning and contribute to contemporary disparities in park access. Park access is often conceptualized quantitatively only, while forms of quality-based inequalities are rather critical for environmental justice. The study also finds that cities tend to invest in larger community parks, while small neighbourhood parks are often in disrepair and need the most attention from a racial perspective. For environmental justice, the study emphasizes the value of a holistic assessment of park access that can inform both quantity and quality-based access needs for future park plans.

Keywords: Urban Parks; Park Access; Park Segregation; Environmental Justice; Montgomery, Alabama.

1. Introduction:

1.1 Park Segregation in Montgomery, Alabama

Segregation of urban parks by race has been a legacy of racial biases in urban planning in the South. As the birthplace of the American Civil Rights Movement, Montgomery, Alabama, has experienced a long history of racial segregation of urban parks protected by

city officials and white Southerners (Byrne & Wolch, 2009). Although with the commission of the Civil Rights Act in 1964, parks were eventually desegregated officially, park segregation remained informally and tacitly in the city (Rabkin, 1954; Byrne et al., 2007). This paper attempts to investigate such tacit and contemporary connotations of racial segregation in urban parks in the context of Montgomery. The aim is to connect the issues of park access from environmental justice (EJ) point of view in cities with the history of a segregated park system and its by-products.

Racial segregation of urban parks in Montgomery has been a key yet less discussed component of the civil rights movement. In the Jim Crow era, city officials and southern whites segregated access to urban parks with a fear of racial mixing. Even after the 1964 Civil Rights Act and several other laws against segregated public facilities, the government was reluctant to desegregate urban parks in Montgomery (Retzlaff, 2019). In the 1950s, there were only four parks that African Americans were allowed to use among fourteen city parks, although almost 44 percent of the city's population was African American in 1949 (Mahato et al., 2022). These parks were Washington Park, Mobile Heights, Trenholm Court, and King Hill Park, marked in blue in figure 1. The African American-only parks were not only a few but also were of inferior quality compared to their white counterparts (Byrne & Wolch, 2009; Meyer, 1942; McKay, 1954; Shearer, 1999) and placed on undevelopable lands (Baldwin, 1999; Foster, 1999; Shearer, 1999). Often the white-only parks were located in or near African American neighbourhoods, such as Oak Park (figure 1), but were strictly prohibited to them by law (Retzlaff, 2019). This limited access to any parks for African Americans who lived in those neighbourhoods, evoking not just issues of racial justice but also environmental justice.

Today, parks in Montgomery are no longer segregated by race. In 1959, a federal judge ordered the city to integrate the parks and recreational facilities. However, the city chose to close its facilities to all residents for fear of racial mixing until about 1965 (City of Montgomery, 2020). With the desegregation of urban parks, the city witnessed a white flight to the suburbs, leaving the integrated city parks in poor conditions for the African Americans who majorly occupied the city's core areas in the 1970s (Retzlaff, 2019). Even today, the city has lost around 25.3 percent of its white population between 2000 and 2010 and 19.9 between 2010 and 2020 (US Census Bureau, 2000; 2010; 2020). Moreover, planning efforts in the city intended to maintain segregation through other means, such as closing down prime parks, converting parks into recreational facilities, or letting private schools access public parks. The Parks and Recreation Department was renamed the Recreation Department in 1967 to steer funding toward recreational facilities that were easy to restrict access to.

The city, in general, lacked in planning, not to mention the dearth of focus on park improvements. The plans in the city are outdated. The city's comprehensive plan was not

updated since its adoption in 1965 until very recently, in 2020. In that six-decades long period, the initiatives for park development were limited to selective parks, recreational facilities, and neighbourhoods, such as the Montgomery Zoo in 1991 (Trevino & Pastorello, 2007), Montgomery Riverfront Plan in 1975, The Plan for Oak Park and Centennial Hill in 2008 and 2011, and several neighbourhoods plan, such as the Maxwell Boulevard Neighborhood Plan in 2011 and Cypress Creek Neighborhood Plan in 2012. The newly adopted comprehensive plan, *Envision Montgomery 2040*, identifies several such constraints of the city parks, including the lack of connectivity between parks through trails. As part of the plan development process, the city conducted a strategic analysis of its parks and recreation in 2019. The analysis focuses on an inventory of existing parks and recreation types, such as community parks, neighbourhood parks, and urban open spaces, their sizes, and recreational services, such as active and passive. However, the plan fails to conduct a need-based assessment of park quality and user profiles to prioritize park projects. The park plans proposed in the comprehensive plan focus on greenways, nature preserves, and neighbourhood development without proper analysis of the need, neither from quality assessment nor community inputs.

This research intends to fill the gap in a need-based assessment of park access through quantitative and qualitative perspectives in Montgomery, Alabama. The aim is to understand how the legacy of a segregated park system affects park access in the contemporary era. Does park segregation still exist in Montgomery? If yes, in what forms? From an environmental justice point of view, what are the consequences of such contemporary connotations of racial biases in park access? To address the research questions, the study first delves into environmental justice and park access literature to understand what parameters are crucial in evaluating park access. The study uses a proximity-based measure to identify potential users and classify parks as white and African American and conducts quantitative and qualitative surveys. The findings point to issues of inequalities of park quality more than proximity-based inequalities between white and African American parks in Montgomery. As cities tend to prioritize access improvements in parks, the research highlights that such access to parks is secondary when quality-based inequalities are evident and dire for environmental justice.

1.2 Environmental Justice and Park Access

The United States Environmental Protection Agency defines EJ as “the fair treatment and meaningful involvement of all people regardless of race, colour, national origin, or income, concerning the development, implementation, and enforcement of environmental laws, regulations, and policies” (United States Environmental Protection Agency, 2023). In the US, the EJ Movement started along with the Civil Rights Movement in the 1960s, led by individuals, primarily people of colour, to address inequalities regarding environmental

protection in their communities. One of such pioneers of the EJ Movement in this country, Robert Bullard, noted as the father of EJ declares,

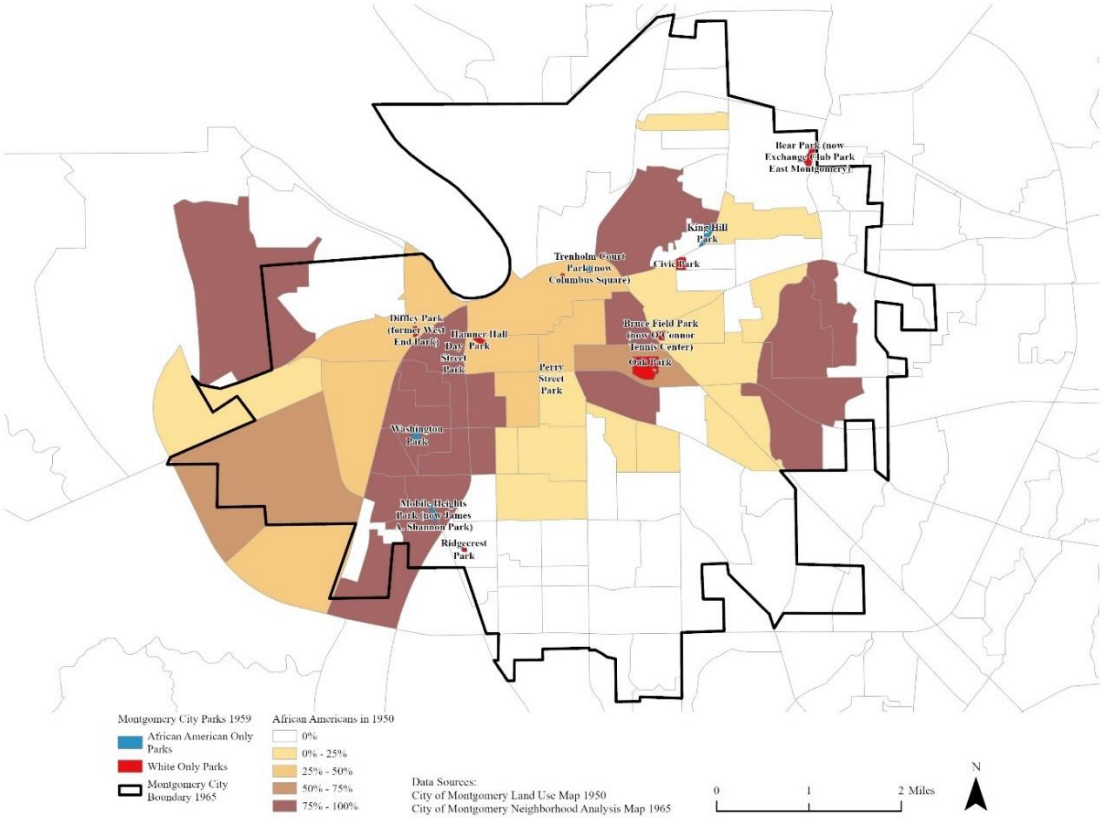


Figure 1. Park Segregation in Montgomery, AL, in 1950

"America is segregated and so is pollution. Race and class still matter and map closely with pollution, unequal protection, and vulnerability. Today, zip code is still the most potent predictor of an individual's health and well-being. Individuals who physically live on the "wrong side of the tracks" are subjected to elevated environmental health threats and more than their fair share of preventable diseases. Still, too many people and communities have the "wrong complexion for protection." Reducing environmental, health, economic and racial disparities is a major priority of the Environmental Justice Movement." (Bullard, 1994)

The issue of race and other socio-economic denominators have been a crucial aspect of EJ, both nationally and globally. Since Bullard's seminal work in 1983, several other scholars have emerged, such as Bryant & Mohai (1992) and Wright (1992), who have advanced the EJ research influencing public policy (Cable et al., 2005). Their work and

other grassroots initiatives gave rise to many national-level investigations, from the United Church of Christ's (UCC) Commission on Racial Justice in 1987 and the First National People of Color Environmental Leadership Summit in 1991 to Environmental Justice Interagency Working Group (EJ IWG) webinar series in 2016. Many journals have also emerged to house the growing literature on this agenda. Environmental Justice, Journal of Global Environmental Justice, and International Journal of Environmental Research and Public Health are some of such notable journals. Other disciplinary journals have included EJ focus and special issues to accommodate the scholarly work on EJ in their respective field of interest.

Ever since, the concepts, definitions, and milieu of EJ have evolved from focusing just on the environmental hazards, such as air pollution, water quality, and waste exposure, to including broader concerns of access and availability of public amenities pertinent to cities and the built environment in general, including green spaces and parks (Hughey et al., 2016). As the intertwining of social and environmental disparities becomes more evident, the spatial dimensions of the EJ concepts have become key indicators of inequalities related to environmental issues (Walker, 2012, p. 2). The authors of *The Routledge Handbook of Environmental Justice* point out that research on EJ has increasingly witnessed key contributions from "geographers, economists, legal scholars, political scientists, urban and regional planners, ecologists and others" looking at the "quantitative and spatial analysis of distributive EJ" (Holifield et al., 2018, p.3). In more recent times, we have seen contributions from other sociologists, political scientists, environmental historians, and many more, highlighting qualitative aspects of EJ, such as ethnography and cultural study methods (Čapek, 1993; Taylor, 2000). In urban and regional planning, environmental planning, and landscape architecture, parks have recently been the centrepiece of EJ concerns and research (Rigolon, 2016; Boone et al., 2009; Schlosberg, 2004; Wolch et al., 2014).

Parks are vital urban commodities and, perhaps, the most contested ones. The concept of publicly owned parks, pioneered by Frederick Law Olmstead, Jr., the father of American Landscape Architecture, was not prevalent before the 1890s. Before that, green spaces were privately owned, used, and maintained. The need for parks in an urban setting became important with the growing health and mental well-being concerns, especially due to the adversities of living in the polluted environment of cities, especially during the industrial revolution and the automobile eras. Forged by the American landscape architects, the American Urban Parks and Recreation Movement, along with the Playground Movement of the 19th century, instigated the nationwide reform of creating and allocating parks for public benefits (Stormann, 1991). Public parks soon became an important asset of city planning and development. However, access to parks was limited to certain groups only, either by the law of racial segregation or through racial designs and practices (Mehta & Mahato, 2021). Historically, parks have observed more pronounced

racial differences than in other public spaces" (McKay, 1954).

The importance of parks grew in EJ research due to the increased rate of urbanization. As most of the world's population now resides in cities, access to urban parks has become vital for physical and mental well-being (Giles-Corti et al., 2005; Chiesura, 2004; Maller et al., 2006). Parks are considered environmental amenities owing to their social, economic, and environmental benefits to people (Boone et al., 2009). People who live closer to parks have more access to public space and community events, greater social ties, enhanced quality of life, and opportunities for social interaction, physical exercise, and leisure (Chiesura, 2004). Parks also provide several ecosystem services, such as accelerating carbon sequestration, purifying air, reducing the urban heat island effect, filtering rainwater, delaying stormwater runoff, supporting biodiversity, and many more (Daily, 1997; Bolund & Hunhammer, 1999; Savard et al., 2000; Gobster, 2001; Farber et al., 2002). From an economic perspective, parks have immense real estate value and potential for city tax revenues (More et al., 1988; Crompton, 2001). Due to the recent COVID-19 pandemic, the value of urban parks has been rediscovered for their benefits during lockdowns and social distancing regulations (Liu & Wang, 2021; Volenec et al., 2021; Heckert & Bristowe, 2021; Levinger et al., 2022; Geng et al., 2020). Such benefits render urban parks a competitive commodity that only a few privileged residents can enjoy.

Disparities in equal access to parks are key EJ concerns of cities. Studies on EJ issues in parks have focused on park access by measuring park proximity, acreage, and quality (Rigolon, 2016). Proximity measures the distance one travels to reach the closest park for different modes of travel (Talen, 2010). As the measure of park access, proximity analyses have shown mixed results. Studies have found that in some cases, low-socioeconomic status (SES) groups live closer to parks (Boone et al., 2009; Smoyer-Tomic et al., 2004; Nicholls, 2001; Wolch et al., 2005), while in other cases, mid and high-SES groups live closer to parks (Willemse, 2013; Dai, 2011; Rigolon & Flohr, 2014; Omer & Or, 2005; Cradock et al., 2005). In terms of race, some studies claim Latinos live closer to parks (Comer & Skraastad-Jurney, 2008; Wen et al., 2013; Johnson-Gaither, 2011), while other studies show whites (Rigolon & Flohr, 2014; Dai, 2011) and African Americans (Boone et al., 2009; Wolch et al., 2005; Wen et al., 2013) live closer to parks. Instead, park acreage and quality measures show much greater disparities in park access. Many studies have found that ethnic and racial minorities and low-SES groups have access to fewer parks or fewer acres of parks compared to whites or mid and high-SES groups (Boone et al., 2009; Wen et al., 2013; Wolch et al., 2005). Similarly, regarding park amenities, maintenance, and safety, park quality is significantly low in low-SES parks and ethnic minority neighbourhoods (Carlson et al., 2010; Cradock et al., 2005; Vaughn et al., 2013). Hence, scrutinizing park access with both quantitative (proximity and acreage) and qualitative (quality) measures is important.

While research with EJ perspectives on park access is plenty, the connection of park segregation history with contemporary issues of park access is less researched. Scholars such as Downey (2007), Mennis & Jordan (2005), Saha & Mohai (2005), and many more have identified the need for historical studies to understand the processes of environmental inequality formation (Boone et al., 2009). Studies have shown that historically marginalized groups, such as people of colour, ethnic minorities, and lower-income groups, are least likely to visit parks (Xiao et al., 2022). In some cases, even though minority groups live closer to parks, they have shown low visitation rates (Lee, 2020). These issues of inclusivity do not always directly relate to the distribution or accessibility of parks. Rather it is connected more to "the circumstances that created more or less equitable park distributions" (Miller, 2019, p. 85). Such circumstances are connected to the historical and modern practices of economic and residential segregation by race, ethnicity, and income that directly or indirectly affect equal access to parks for all (Lee, 2020).

Methods:

2.1 Identifying Potential Park Users

Since parks are not segregated in Montgomery anymore, park access by race in this study has been determined by identifying the potential users of the park. Parks surrounded by the majority of a racial group are assumed to cater to that group predominantly. The study uses American Community Survey 2021 5-year estimates to calculate the racial composition of the residents living within a half-mile walking distance from the park access points. The population of Montgomery is predominantly composed of African Americans and white residents (U.S. Census Bureau, 2020). Other cohorts were ignored for the calculations. To identify the potential park users, the study surveyed each park and identified access points (entrances) which were then used in ArcGIS Online network analysis to calculate the half-mile network buffers. Network buffers for the same parks were consolidated to determine each park's catchment area. To calculate the demography of residents living in individual park catchment areas, the study used ESRI Business Analyst Online. Using a quantile classification, park buffers with more than 54 percent African American residents were considered African American parks, and the rest were white parks. Figure 2 shows the geographic location of the urban parks in Montgomery and their half-mile catchment areas. The parks marked in blue are the parks catering predominantly to African Americans, and the parks marked in red are the ones catering to whites. Of the 65 city parks, we studied 62 parks, of which 36 were identified as African American parks and 26 as white parks. The three parks the study excluded are special-use parks, such as a boat ramp, a planetarium, and an amphitheatre.

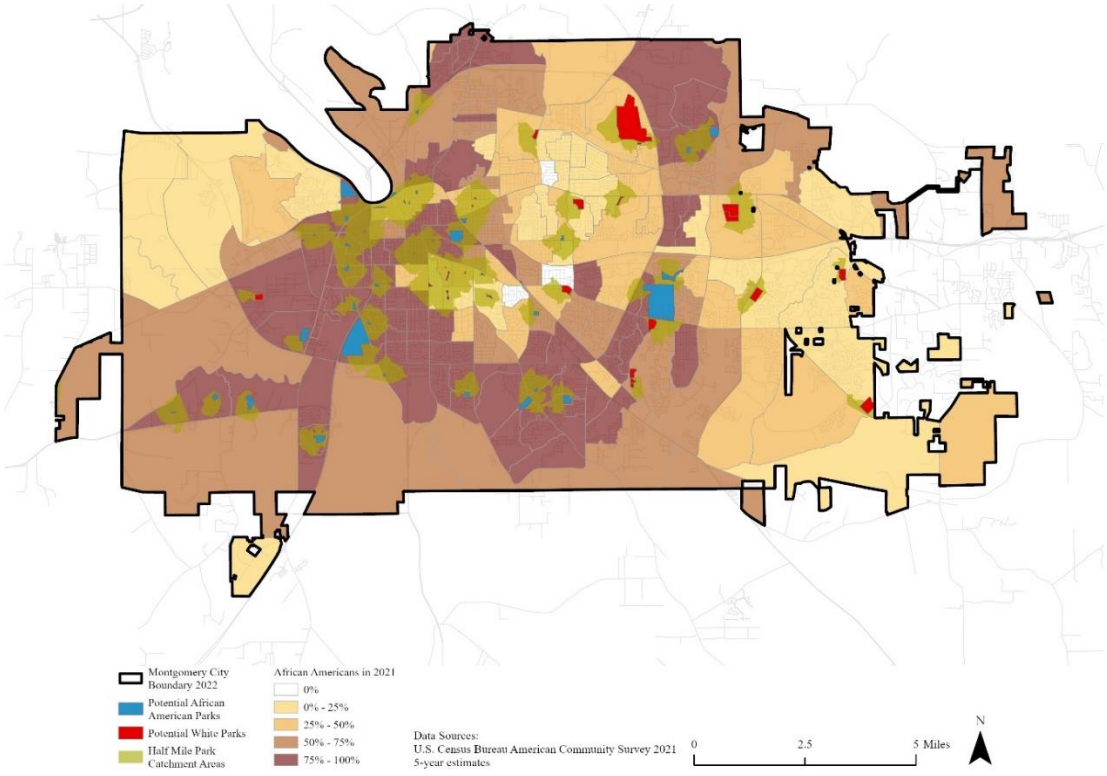


Figure 2. Half-mile Park Catchment Areas and Potential Park Users by Race

2.2 Evaluating Park Access

The study evaluates park access using both quantitative and qualitative methods. First, the study adapts from and adds to the five measures of park access by Gidlow et al. (2012) to survey quantitative measures of park access. The survey procedure uses five measures of park access to calculate an access score for each park. Building on the quantitative access scores, the study uses photo analysis to assess the qualitative access scores of the measured parameters.

2.2.1 Access Measures:

Accessibility:

Accessibility denotes users' ability to physically enter the parks without any hindrance. The study measured accessibility with five parameters – i) the number of entrances – how many entrances does the park have? More entrances ensure increased accessibility; ii) roads around – is the park surrounded by roads on all sides? More roads mean the park can be accessed by more than just one road; iii) pedestrian crossing – are pedestrian crossings near the park entrances? iv) sidewalk – is there sidewalk access to the park?

Pedestrian crossings and sidewalks encourage safe and walkable access to parks; v) the number of parking spaces – how many are there?

Recreation:

Parks are primarily used for recreational activities. The presence of recreational facilities and their qualities influence the usability of parks. Recreation was measured by the presence or absence of the following four parameters – i) play equipment; ii) grass pitches or hard courts; iii) skateboard or bike ramps; iv) open space for informal games, play, or walking.

Amenities:

In addition to recreation, parks are also used for passive and various other activities serving individuals and groups. The presence of basic amenities encourages wider use of parks. Park amenities were measured for the presence or absence of – i) seating areas or benches; ii) picnic tables; iii) litter bins; iv) signage; v) lighting; vi) restrooms. The availability of seating options and picnic tables increases park access to a wider variety of people. Litter bins help with cleanliness, lightings provide safety at night, signages are crucial for wayfinding, especially for the elderly and visitors, and restrooms provide convenience to park users.

Natural Features:

Natural features enhance parks' aesthetics and help attract users. Natural features provide access to green spaces and fresh air amidst polluted urban neighbourhoods. Natural features have been measured by the presence or absence of – i) grasses; ii) trees and shrubs; iii) flower beds; iv) water features in the studied parks and the quality of their maintenance.

Incivilities:

Signs of incivility negatively impact park access. Physical evidence of uncivil or antisocial activities in parks makes them unattractive to users, such as women, children, seniors, and families. Uncivil activities raise safety concerns and reflect the presence of crime in the surrounding area. Incivility is measured by– i) litter or dog mess; ii) evidence of alcohol or drug use; iii) graffiti, broken glasses, or vandalism; iv) noise.

2.2.2 Park Survey

Using the measures above, the study prepared a survey sheet for each park (figure 3). The survey sheets contained a roster of the general amenities and facilities listed on the City of Montgomery's Park and Recreation website and the five measures described earlier. The survey was conducted digitally using Google Street View and then crosschecked through multiple site visits. For ease of visits, parks were grouped by location in 11 groups. The first round of surveys was conducted between February and October of 2021, followed by follow-up surveys between June and September 2022. In addition to filling out the quantifiable parameters, the surveys also recorded the weather and field notes on general observations. Figure 3 shows a sample survey sheet for parks in group A. The parameters number of parking and entrances are measured using exact numbers, while other parameters are given Y or N values for their presence or absence. The site visits also photo-documented the conditions of each surveyed park.

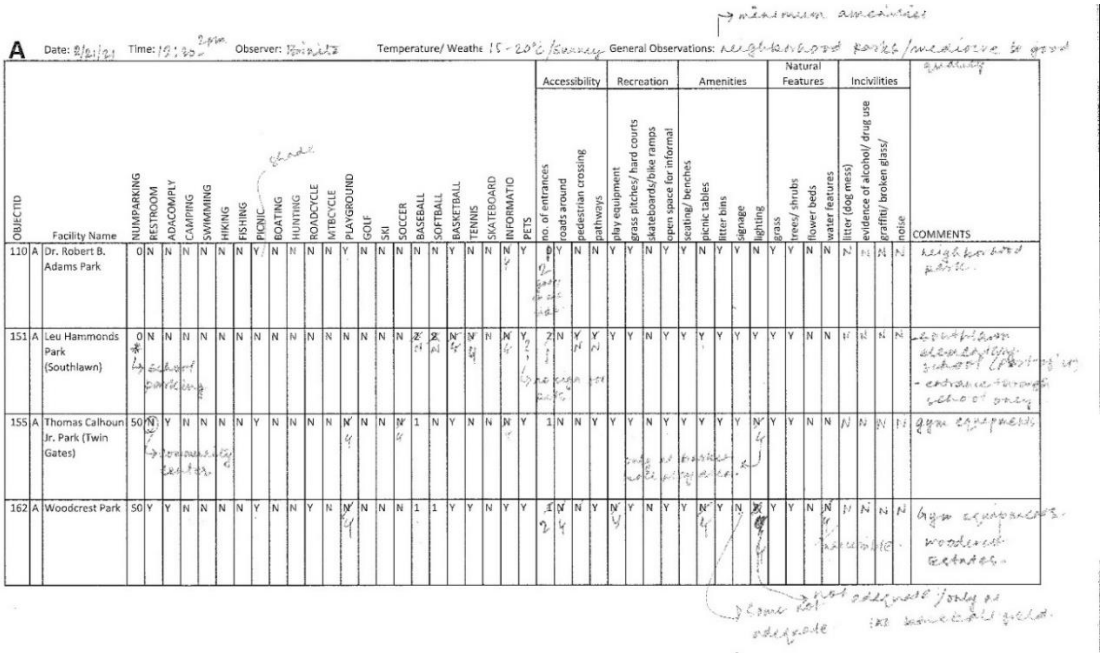


Figure 3. Sample Survey Sheet

2.2.3 Park Access Score:

To measure park access quantitatively, the study used the following scoring system.

Table 7. Park Access Quantitative Scoring System

Measures	**Parameters**					
Accessibility Score (5)	1 for no. parking > 0 0 for no. parking = 0	1 for no. of entrances > 1 0 for no. of entrances = 1	1 for roads around value "Y" 0 for roads around value "N"	1 for pedestrian crossings value "Y" 0 for pedestrian crossings value "N"	1 for pathways value "Y" 0 for pathways value "N"	
Recreation Score (4)	1 for play equipment value "Y" 0 for play equipment value "N"	1 for grass pitches/ hard courts value "Y" 0 for grass pitches/ hard courts value "N"	1 for skateboards/bike ramps value "Y" 0 for skateboards/bike ramps value "N"	1 for open space for informal games/ play/ walking value "Y" 0 for open space for informal games/ play/ walking value "N"		
Amenities Score (6)	1 for restroom value "Y" 0 for restroom value "N"	1 for seating/ benches value "Y" 0 for seating/ benches value "N"	1 for picnic tables value "Y" 0 for picnic tables value "N"	1 for litter bins value "Y" 0 for litter bins value "N"	1 for signage value "Y" 0 for signage value "N"	1 for lighting value "Y" 0 for lighting value "N"
Natural Features Score (4)	1 for grass value "Y" 0 for grass value "N"	1 for trees/ shrubs value "Y" 0 for trees/ shrubs value "N"	1 for flower beds value "Y" 0 for flower beds value "N"	1 for water features value "Y" 0 for water features value "N"		
Incivilities	1 for	1 for	1 for graffiti/	1 for noise		

Score (4)	litter/dog mess value "Y" 0 for litter/dog mess value "N"	evidence of alcohol/ drug use value "Y" 0 for evidence of alcohol/ drug use value "N"	broken glass/ vandalism value "Y" 0 for graffiti/ broken glass/ vandalism value "N"	value "Y" 0 for noise value "N"		

Since accessibility, recreation, amenities, and natural features affect access positively, and incivilities affect it negatively, the following equation has been used to calculate each park's access score.

Total Access Score (19) = Accessibility Score (5) + Recreation Score (4) + Amenities Score (6) + Natural Features Score (4) - Incivilities Score (4)

2.2.4 Photo Analysis:

The park access scores, calculated using the survey data, only measure the parameters quantitatively. The data need to present the quality of the parameters, such as the sidewalks' condition or the landscaping elements' maintenance. To complement the quantitative data, the site visits included photo documentation of each park's observed parameters and conditions. The process involves a systematic cataloguing technique that lists photos by each parameter and analyses their quality on a three-scale rating – good, mediocre, and bad. The ratings are based on a set of criteria that guide the judgment. For example, the study uses four criteria for good quality play equipment. Table 2 lists the good, mediocre, and bad criteria for the measured parameters. Furthermore, the study uses a sample photo template to guide the photo analysis (figure 4).

Table 2. Park Access Qualitative Scoring System

Ac	**parking**	**entrance**	**access roads**	**pedestrian crossing**	**pathways**	

	Good: i) has parking ii) more than 10 iii) no potholes or litter	Good: i) entrance is easily accessible ii) easy to find iii) has proper entrance signs	Good: i) vehicular access road is present ii) good condition iii) has sidewalks	Good: i) pedestrian crossing is present ii) well-paved/ demarcated iii) has pedestrian signal	Good: i) walking pathways present inside parks ii) paved and well maintained	
	Mediocre: i) has parking ii) less than 10 iii) has potholes	Mediocre: i) entrance is not easily accessible ii) entrance is hard to find iii) entrance sign is not legible	Mediocre: i) vehicular access road is present but is in poor condition ii) no sidewalks	Mediocre: i) pedestrian crossing is present ii) not well-paved or demarcated iii) no pedestrian signal	Mediocre: i) walking pathways present ii) not paved or well maintained	
	Bad: i) no parking	Bad: i) entrance is closed or not accessible	Bad: i) no vehicular access road	Bad: i) no pedestrian crossing	Bad: i) no walking pathways	
Recreation	**play equipment**	**grass pitches/ hard courts**	**skateboards/bike ramps**	**open space for informal games/ play/ walking**		
	Good: i) play equipment is present ii) ample number iii) good quality and safe iv) well maintained	Good: i) grass pitches or hard courts are present ii) well maintained or no overgrown	Good: i) skateboard or bike ramps are present ii) well maintained	Good: i) open spaces for informal games, play, or gathering is present ii) well maintained		

	Mediocre: i) play equipment is present ii) fewer number iii) not of good quality or safe iv) not well maintained	Mediocre: i) grass pitches or hard courts are present ii) not well maintained, grasses are overgrown	Mediocre: i) skateboard or bike ramps are present ii) not well maintained	Mediocre: i) open spaces for informal games, play, or gathering is present ii) not well maintained, overgrown		
	Bad: i) no play equipment present	Bad: i) no grass pitches or hard courts	Bad: i) no skateboard or bike ramps	Bad: i) no open spaces for informal games, play, or gathering is present or inaccessible		
Amenities	**Restrooms**	**seating/ benches**	**picnic tables**	**litter bins**	**signage**	**lighting**
	Good: i) restrooms are present ii) easily accessible iii) in good working condition	Good: i) seating areas or benches are present ii) good quality and well maintained iii) multiple in number	Good: i) picnic tables are present ii) multiple in number iii) well-maintained and good quality	Good: i) litter bins are present ii) present in multiple locations iii) well maintained	Good: i) both park information and wayfinding signages are present ii) legible texts and signs	Good: i) lighting present in different parts of the park ii) working properly
	Mediocre:i) restrooms are presentii) inaccessibleiii) out of order	Mediocre:i) seating areas or benches are presentii) poor quality and not well maintainedii i) single number	Mediocre:i) picnic tables are presentii) single numberiii) not well maintained or good quality	Mediocre:i) litter bins are presentii) present in only one locationiii) not well maintained	Mediocre:i) either park information or wayfinding signages are presentii) texts or	Mediocre:i) lighting present in some partsii) poorly working (blinking or low light)

					signs are not legible	
	Bad: i) no restrooms	Bad: i) no seating areas or benches	Bad: i) no picnic tables	Bad: i) no litter bins are present	Bad: i) neither park information nor wayfinding signages are present	Bad: i) no lighting present
Natural Features	**grass**	**trees/ shrubs**	**flower beds**	**water features**		
	Good: i) grass areas are present ii) well maintained iii) not overgrown	Good: i) trees and shrubs are present ii) well maintained iii) ample in numbers	Good: i) flower beds are present ii) well maintained iii) ample in numbers	Good: i) water features are present ii) well maintained		
	Mediocre: i) grass areas are present ii) not well maintained iii) overgrown	Mediocre: i) trees and shrubs are present ii) not well maintained iii) few in numbers	Mediocre: i) flower beds are present ii) not well maintained iii) very few in numbers	Mediocre: i) water features are present ii) not well maintained		
	Bad: i) no grass areas	Bad: i) no trees or shrubs	Bad: i) no flower beds	Bad: i) no water features		
Incivilities	**litter/ dog mess**	**evidence of alcohol/ drug use**	**graffiti/ broken glass/ vandalism**	**noise**		
	Bad: i) litter or dog mess is present ii) at many places	Bad: i) evidence of alcohol or drug use is present ii) present at many places	Bad: i) signs of graffiti, broken glass, or vandalism are present ii) present at multiple	Bad: i) continuous noise pollution from highways, industrial		

			locations	areas, or constructio n		
	Mediocre: i) litter or dog mess is present ii) at fewer places	Mediocre: i) evidence of alcohol or drug use is present ii) at fewer places	Mediocre: i) signs of graffiti, broken glass, or vandalism are present ii) present at fewer locations	Mediocre: i) frequent noise pollution from highways, industrial areas, or constructio n		
	Good: i) no litter or dog mess	Good: i) no evidence of alcohol or drug use	Good: i) no signs of graffiti, broken glass, or vandalism	Good: i) no noise pollution		

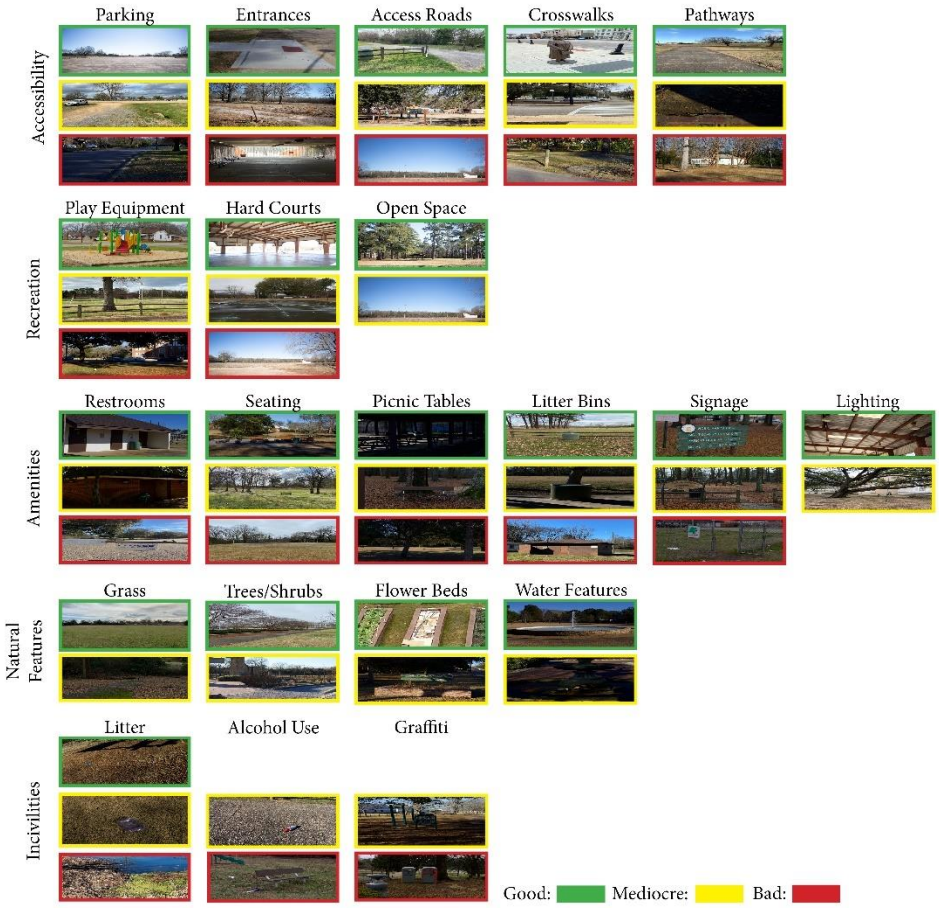


Figure 4. Sample Photo Analysis Template

3. Results

3.1 Quantitative Park Access:

An evaluation of park access scores for each measure shows that, in general, a higher percentage of white parks (37%) have high scores considering all access measures compared to African American parks (28%) (table 3). Individual measures, however, show that white parks score high in amenities (70%), while African American parks score high in recreation (33%), natural features (19%), and accessibility (39%) (table 3). Although, for white and African American parks, the low and high scores for accessibility, recreation, amenities, and natural features are similar. The biggest difference can be seen in the incivilities score. The score for incivilities is significantly low (100%) in white parks, indicating that those parks have little signs of incivilities. African American parks showed more signs of incivilities, with almost 17 percent scoring high scores.

The total park access scores show that, in the case of white parks, 4 percent of the parks

score 0 to 3, 22 percent score 4 to 7, 37 percent score 8 to 11, another 37 percent score 12 to 15, and 0 percent score16 to19. In the case of African American parks, 0 percent of the parks score 0 to 3, 22 percent score 4 to 7, 50 percent score 8 to 11, 25 percent score 12 to 15, and 3 percent score 16 to 19. Cumulatively, 37 percent of white parks have high scores (12 to 19) than African American parks (28%). However, 26 percent of white parks have scored low (1 to 7) compared to 22 percent of African American parks. African American parks (50%) also have more mid-range scores (8 to 11) than white parks (37%). It is also notable that accounting for the major disparities in incivilities scores, the total park scores signify that more white parks (37%) have higher access scores than African American parks (28%). In general, most African American parks show low access scores, 63 percent and 72 percent, suggesting that the parks in Montgomery have poor access in terms of accessibility, recreation, amenities, natural features, and incivilities.

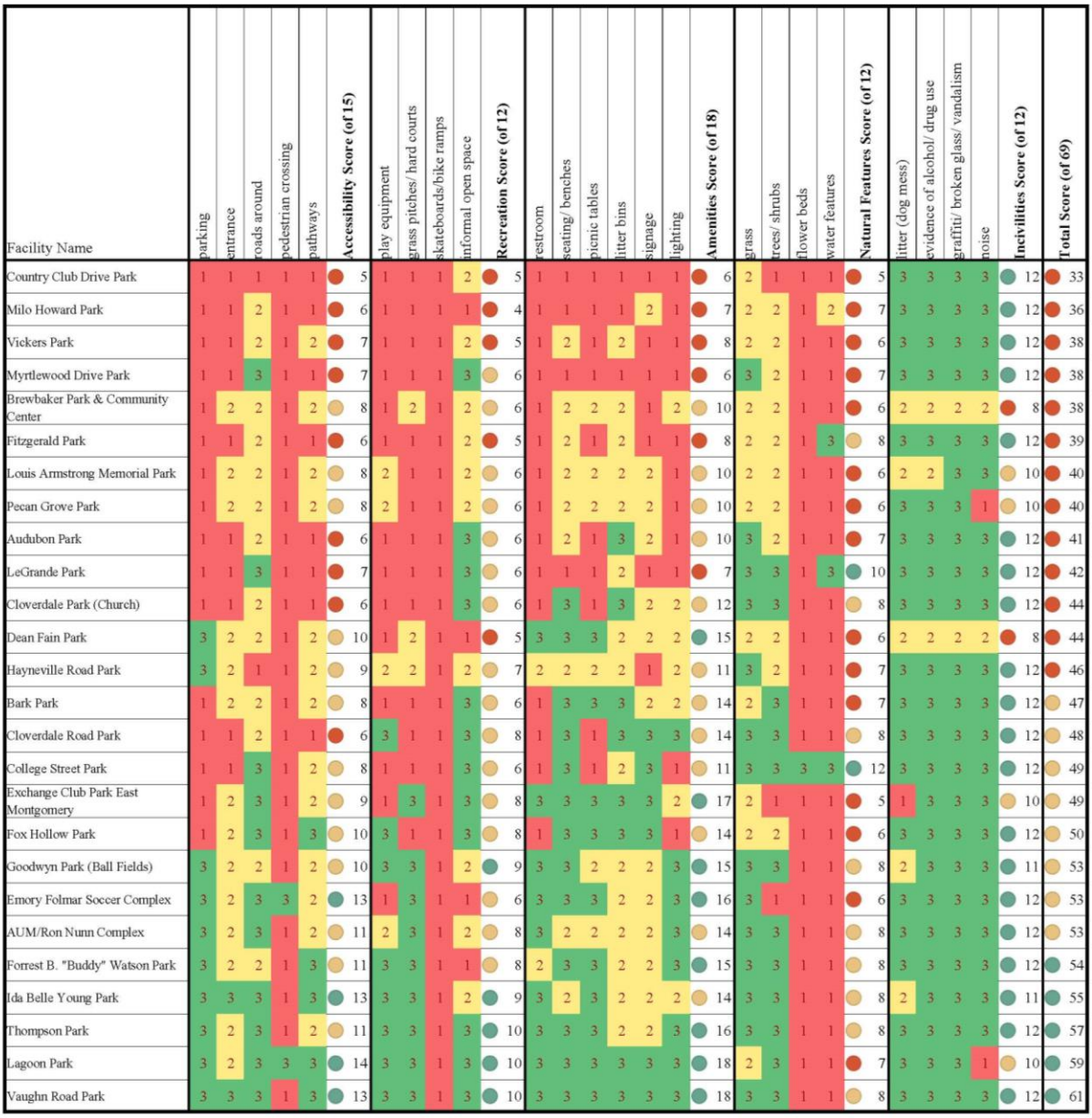
Table 3. Park Access Scores for White and African American Parks (darker shades show high scores, lighter shades show low scores)

Accessibility Score	**0**	**1**	**2**	**3**	**4**	**5**		**low**	**high**
White Parks	4%	30 %	30 %	15 %	15 %	7%		63%	37%
African American Parks	8%	22 %	31 %	19 %	17 %	3%		61%	39 %
Recreation Score	**0**	**1**	**2**	**3**	**4**			**low**	**high**
White Parks	4%	41 %	30 %	26 %	0%			74%	26%
African American Parks	3%	19 %	44 %	33 %	0%			67%	33%
Amenities Score	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**low**	**high**
White Parks	7%	7%	7%	7%	26 %	4%	41 %	30%	70%
African American Parks	0%	6%	3%	28 %	31 %	17 %	17 %	36%	64%
Natural Features Score	**0**	**1**	**2**	**3**	**4**			**low**	**high**
White Parks	0%	11 %	74 %	11 %	4%			85%	15%
African American Parks	0%	3%	78 %	14 %	6%			81%	19%
Incivilities Score	**0**	**1**	**2**	**3**	**4**			**low**	**high**
White Parks	81 %	19 %	0%	0%	0%			100 %	0%
African American	58	25	11	6%	0%			83%	17%

Parks	%	%	%						
Total Access Scores	**0-3**	**4-7**	**8-11**	**12-15**	**16-19**			**low**	**high**
White Parks	4%	22%	37%	37%	0%			63%	37%
African American Parks	0%	22%	50%	25%	3%			72%	28%

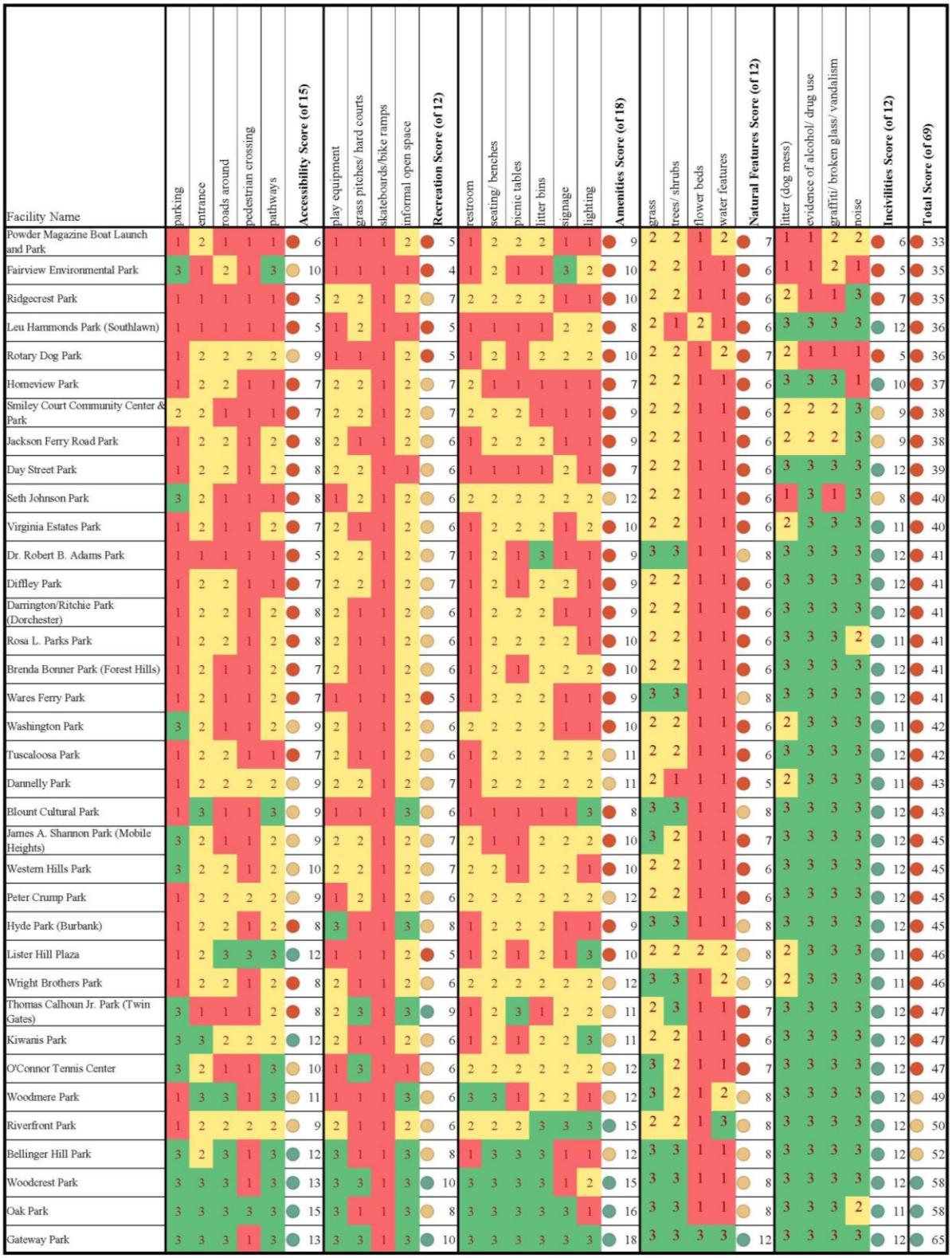
3.2 Qualitative Park Access:

While the quantitative park access scores tell the absence or presence of the five measurable indicators of park access, they do not tell the quality of these measures. The photo analysis complements the park scores by evaluating the conditions of the park access indicators in each park. Figures 5 and 6 show the qualitative analysis of parks catering to white and African American populations. The colours red, yellow, and green represent the park access measures' poor, mediocre, and good quality. The analysis shows that a majority of the parks catering to the African American population have poor quality (30 out of 36 parks), while only three parks have mediocre, and another three parks have good quality. For parks catering to whites, 13 out of 26 parks have poor quality, eight are mediocre quality, and five are good quality. Moreover, although the quantitative analysis shows that African American parks have better accessibility, recreation, and natural features scores, quality-wise, they score poor and mediocre compared to white parks. White parks have superior amenities and fewer natural features and recreational facilities, but their qualities are better than African American parks. Both analyses point out that African American parks have severe signs of incivility, and white parks show almost no signs of incivility. Overall, most African American and white parks show signs of poor qualities.



Facility Name	parking	entrance	roads around	pedestrian crossing	pathways	**Accessibility Score (of 15)**	play equipment	grass pitches/ hard courts	skateboards/bike ramps	informal open space	**Recreation Score (of 12)**	restroom	seating/ benches	picnic tables	litter bins	signage	lighting	**Amenities Score (of 18)**	grass	trees/ shrubs	flower beds	water features	**Natural Features Score (of 12)**	litter (dog mess)	evidence of alcohol/ drug use	graffiti/ broken glass/ vandalism	noise	**Incivilities Score (of 12)**	**Total Score (of 69)**
Country Club Drive Park	1	1	1	1	1	5	1	1	1	2	5	1	1	1	1	1	1	6	2	1	1	1	5	3	3	3	3	12	33
Milo Howard Park	1	1	2	1	1	6	1	1	1	1	4	1	1	1	1	2	1	7	2	2	1	2	7	3	3	3	3	12	36
Vickers Park	1	1	2	1	2	7	1	1	1	2	5	1	2	1	2	1	1	8	2	2	1	1	6	3	3	3	3	12	38
Myrtlewood Drive Park	1	1	3	1	1	7	1	1	1	3	6	1	1	1	1	1	1	6	3	2	1	1	7	3	3	3	3	12	38
Brewbaker Park & Community Center	1	2	2	1	2	8	1	2	1	2	6	1	2	2	2	1	2	10	2	2	1	1	6	2	2	2	2	8	38
Fitzgerald Park	1	1	2	1	1	6	1	1	1	2	5	1	2	1	2	1	1	8	2	2	1	3	8	3	3	3	3	12	39
Louis Armstrong Memorial Park	1	2	2	1	2	8	2	1	1	2	6	1	2	2	2	2	1	10	2	2	1	1	6	2	2	3	3	10	40
Pecan Grove Park	1	2	2	1	2	8	2	1	1	2	6	1	2	2	2	2	1	10	2	2	1	1	6	3	3	3	1	10	40
Audubon Park	1	1	2	1	1	6	1	1	1	3	6	1	2	1	3	2	1	10	3	2	1	1	7	3	3	3	3	12	41
LeGrande Park	1	1	3	1	1	7	1	1	1	3	6	1	1	1	2	1	1	7	3	3	1	3	10	3	3	3	3	12	42
Cloverdale Park (Church)	1	1	2	1	1	6	1	1	1	3	6	1	3	1	3	2	2	12	3	3	1	1	8	3	3	3	3	12	44
Dean Fain Park	3	2	2	1	2	10	1	2	1	1	5	3	3	3	2	2	2	15	2	2	1	1	6	2	2	2	2	8	44
Hayneville Road Park	3	2	1	1	2	9	2	2	1	2	7	2	2	2	2	1	2	11	3	2	1	1	7	3	3	3	3	12	46
Bark Park	1	2	2	1	2	8	1	1	1	3	6	1	3	3	3	2	2	14	2	3	1	1	7	3	3	3	3	12	47
Cloverdale Road Park	1	1	2	1	1	6	3	1	1	3	8	1	3	1	3	3	3	14	3	3	1	1	8	3	3	3	3	12	48
College Street Park	1	1	3	1	2	8	1	1	1	3	6	1	3	1	2	3	1	11	3	3	3	3	12	3	3	3	3	12	49
Exchange Club Park East Montgomery	1	2	3	1	2	9	1	3	1	3	8	3	3	3	3	3	2	17	2	1	1	1	5	1	3	3	3	10	49
Fox Hollow Park	1	2	3	1	3	10	3	1	1	3	8	1	3	3	3	3	1	14	2	2	1	1	6	3	3	3	3	12	50
Goodwyn Park (Ball Fields)	3	2	2	1	2	10	3	3	1	2	9	3	3	2	2	2	3	15	3	3	1	1	8	2	3	3	3	11	53
Emory Folmar Soccer Complex	3	2	3	3	2	13	1	3	1	1	6	3	3	3	2	2	3	16	3	1	1	1	6	3	3	3	3	12	53
AUM/Ron Nunn Complex	3	2	3	1	2	11	2	3	1	2	8	3	2	2	2	2	3	14	3	3	1	1	8	3	3	3	3	12	53
Forrest B. "Buddy" Watson Park	3	2	2	1	3	11	3	3	1	1	8	2	3	3	2	2	3	15	3	3	1	1	8	3	3	3	3	12	54
Ida Belle Young Park	3	3	3	1	3	13	3	3	1	2	9	3	2	3	2	2	2	14	3	3	1	1	8	2	3	3	3	11	55
Thompson Park	3	2	3	1	2	11	3	3	1	3	10	3	3	3	2	2	3	16	3	3	1	1	8	3	3	3	3	12	57
Lagoon Park	3	2	3	3	3	14	3	3	1	3	10	3	3	3	3	3	3	18	2	3	1	1	7	3	3	3	1	10	59
Vaughn Road Park	3	3	3	1	3	13	3	3	1	3	10	3	3	3	3	3	3	18	3	3	1	1	8	3	3	3	3	12	61

Figure 5. Qualitative Park Access Scores of White Parks



Facility Name	parking	entrance	roads around	pedestrian crossing	pathways	**Accessibility Score (of 15)**	play equipment	grass pitches/ hard courts	skateboards/bike ramps	informal open space	**Recreation Score (of 12)**	restroom	seating/ benches	picnic tables	litter bins	signage	lighting	**Amenities Score (of 18)**	grass	trees/ shrubs	flower beds	water features	**Natural Features Score (of 12)**	litter (dog mess)	evidence of alcohol/ drug use	graffiti/ broken glass/ vandalism	noise	**Incivilities Score (of 12)**	**Total Score (of 69)**
Powder Magazine Boat Launch and Park	1	2	1	1	1	6	1	1	1	2	5	1	2	2	2	1	1	9	2	2	1	2	7	1	1	2	2	6	33
Fairview Environmental Park	3	1	2	1	3	10	1	1	1	1	4	1	2	1	1	3	2	10	2	2	1	1	6	1	1	2	1	5	35
Ridgecrest Park	1	1	1	1	1	5	2	2	1	2	7	2	2	2	2	1	1	10	2	2	1	1	6	2	1	1	3	7	35
Leu Hammonds Park (Southlawn)	1	1	1	1	1	5	1	2	1	1	5	1	1	1	1	2	2	8	2	1	2	1	6	3	3	3	3	12	36
Rotary Dog Park	1	2	2	2	2	9	1	1	1	2	5	1	2	1	2	2	2	10	2	2	1	2	7	2	1	1	1	5	36
Homeview Park	1	2	2	1	1	7	2	2	1	2	7	2	1	1	1	1	1	7	2	2	1	1	6	3	3	3	1	10	37
Smiley Court Community Center & Park	2	2	1	1	1	7	2	2	1	2	7	2	2	2	1	1	1	9	2	2	1	1	6	2	2	2	3	9	38
Jackson Ferry Road Park	1	2	2	1	2	8	2	1	1	2	6	1	2	2	2	1	1	9	2	2	1	1	6	2	2	2	3	9	38
Day Street Park	1	2	2	1	2	8	2	2	1	1	6	1	1	1	1	2	1	7	2	2	1	1	6	3	3	3	3	12	39
Seth Johnson Park	3	2	1	1	1	8	1	2	1	2	6	2	2	2	2	2	2	12	2	2	1	1	6	1	3	1	3	8	40
Virginia Estates Park	1	2	1	1	2	7	2	1	1	2	6	1	2	2	2	1	2	10	2	2	1	1	6	2	3	3	3	11	40
Dr. Robert B. Adams Park	1	1	1	1	1	5	2	2	1	2	7	1	2	1	3	1	1	9	3	3	1	1	8	3	3	3	3	12	41
Diffley Park	1	2	2	1	1	7	2	2	1	2	7	1	2	1	2	2	1	9	2	2	1	1	6	3	3	3	3	12	41
Darrington/Ritchie Park (Dorchester)	1	2	2	1	2	8	2	1	1	2	6	1	2	2	2	1	1	9	2	2	1	1	6	3	3	3	3	12	41
Rosa L. Parks Park	1	2	2	1	2	8	2	1	1	2	6	1	2	2	2	2	1	10	2	2	1	1	6	3	3	3	2	11	41
Brenda Bonner Park (Forest Hills)	1	2	1	1	2	7	2	1	1	2	6	1	2	1	2	2	2	10	2	2	1	1	6	3	3	3	3	12	41
Wares Ferry Park	1	2	1	1	2	7	1	1	1	2	5	1	2	2	2	1	1	9	3	3	1	1	8	3	3	3	3	12	41
Washington Park	3	2	1	1	2	9	2	1	1	2	6	2	2	2	2	1	1	10	2	2	1	1	6	2	3	3	3	11	42
Tuscaloosa Park	1	2	2	1	1	7	2	1	1	2	6	1	2	2	2	2	2	11	2	2	1	1	6	3	3	3	3	12	42
Dannelly Park	1	2	2	2	2	9	2	2	1	2	7	1	2	2	2	2	2	11	2	1	1	1	5	2	3	3	3	11	43
Blount Cultural Park	1	3	1	1	3	9	1	1	1	3	6	1	1	1	1	1	3	8	3	3	1	1	8	3	3	3	3	12	43
James A. Shannon Park (Mobile Heights)	3	2	1	1	2	9	2	2	1	2	7	2	1	1	2	2	2	10	3	2	1	1	7	3	3	3	3	12	45
Western Hills Park	3	2	2	1	2	10	2	2	1	2	7	2	2	1	2	2	1	10	2	2	1	1	6	3	3	3	3	12	45
Peter Crump Park	1	2	2	2	2	9	1	2	1	2	6	2	2	2	2	2	2	12	2	2	1	1	6	3	3	3	3	12	45
Hyde Park (Burbank)	1	2	2	1	2	8	3	1	1	3	8	1	2	2	2	1	1	9	3	3	1	1	8	3	3	3	3	12	45
Lister Hill Plaza	1	2	3	3	3	12	1	1	1	2	5	1	2	1	2	1	3	10	2	2	2	2	8	2	3	3	3	11	46
Wright Brothers Park	1	2	2	1	2	8	2	1	1	2	6	2	2	2	2	2	2	12	3	3	1	2	9	2	3	3	3	11	46
Thomas Calhoun Jr. Park (Twin Gates)	3	1	1	1	2	8	2	3	1	3	9	1	2	3	1	2	2	11	2	3	1	1	7	3	3	3	3	12	47
Kiwanis Park	3	3	2	2	2	12	2	1	1	2	6	1	2	1	2	2	3	11	2	2	1	1	6	3	3	3	3	12	47
O'Connor Tennis Center	3	2	1	1	3	10	1	3	1	1	6	2	2	2	2	2	2	12	3	2	1	1	7	3	3	3	3	12	47
Woodmere Park	1	3	3	1	3	11	1	1	1	3	6	3	3	1	2	2	1	12	3	2	1	2	8	3	3	3	3	12	49
Riverfront Park	1	2	2	2	2	9	2	1	1	2	6	2	2	2	3	3	3	15	2	2	1	3	8	3	3	3	3	12	50
Bellinger Hill Park	3	2	3	1	3	12	3	1	1	3	8	1	3	3	3	1	1	12	3	3	1	1	8	3	3	3	3	12	52
Woodcrest Park	3	3	3	1	3	13	3	3	1	3	10	3	3	3	3	1	2	15	3	3	1	1	8	3	3	3	3	12	58
Oak Park	3	3	3	3	3	15	3	1	1	3	8	3	3	3	3	3	1	16	3	3	1	1	8	3	3	3	2	11	58
Gateway Park	3	3	3	1	3	13	3	3	1	3	10	3	3	3	3	3	3	18	3	3	3	3	12	3	3	3	3	12	65

Figure 6. Qualitative Park Access Scores of African American Parks

Discussion

4.1 Quality-based Inequalities:

Park access is often misleading in understanding EJ issues if only viewed quantitatively. Inequalities in park access lie in the factors contributing to disparities in services provided to different racial groups. Especially for cities with a history of segregated park systems, provisions for park facilities are only secondary. It is the quality-based assessment of park facilities that reveals racial biases. The measures of park access, such as accessibility, recreation, amenities, natural features, and incivilities, are predominantly used quantitatively in studies. The quantitative measures in this study pointed out that African American parks have better provisions for accessibility, recreation, and natural features. However, their qualities, such as the condition of the parking spaces, entrances, pedestrian crossings, play equipment, or playgrounds, are worse than white parks, which may have fewer facilities.

The maintenance of existing facilities appears to be the key issue in creating disparities in park access, and a subpar facility discourages park usage and lowers park visitation rates. As said in the broken windows theory by Kelling & Wilson (1982), the disorder in neighbourhood amenities invites uncivil activities, evident in parks catering to African Americans. Evidence of dog mess, alcohol or drug use, and signs of vandalism, broken glasses, or graffiti were more prevalent in the African American parks which had deteriorated park facilities. The quality of the studied parks was also connected to the surrounding neighbourhoods' overall quality and living conditions. The issue of noise coming from highways and industrial areas is evident in African American parks, as many of the poorer neighbourhoods are situated by highways and near industrial areas as a by-product of urban renewal. The few good quality African American parks, such the Woodcrest Park, Oak Park, and Gateway Parks, are amidst some of the well-to-do neighbourhoods of the city and witness a high number of users.

This study finds that racial segregation still exists in Montgomery as disparities in park quality. Forms of quality-based inequalities between park facilities and access are the contemporary denominators of park segregation (Hughey et al., 2016). While studies support the association between park quality and the demography of residents living around the park (Suminski et al., 2013), very few empirically investigate park features, amenities, or incivilities in detail to understand the subtle forms of quality-based inequalities (Macintyre, 2007; Boslaugh et al., 2004; Crawford et al., 2008). Therefore, this study provides insights into empirical methods of analysing park access qualitatively. Cities like Montgomery prioritize access-related initiatives, such as developing trails and greenways, which are secondary, as residents prefer cleaner and good-quality parks for worse-off parks (Smiley et al., 2016). A need-based evaluation of prioritizing park projects is hence more essential from an EJ perspective.

4.2 Legacy of Segregated Planning Practices:

The poor quality of African American parks can also be connected to the remnants of the park and residential segregation policies and the racial biases of planning that existed in the past. Like many other cities in the US, African American neighbourhoods suffered from urban renewal plans in the 1960s. As a result, many parks in such areas are disconnected by highways and have severe noise pollution issues. The 1965 Neighborhood Analysis Plan marked many African American neighbourhoods as blighted, predominantly the home of middle-class, educated African American voters (Mahato et al., 2022), and housed good quality historic African American parks. Many of those African American parks were later demolished for neighbourhood redevelopment purposes. A few of them were reconstructed but with altered access to the public. Trenholm Court Park is now a part of the Columbus Square apartments and a community centre, and King Hill Park is a community centre and is only available through reservations. Hamner Hall Park was rebuilt into softball fields, a pavilion, and a fire station by the Montgomery Parks and Recreation Department. Perry Street Park was demolished to build I-65 but never rebuilt.

The historic African American parks saved from the urban renewal plans have poor accessibility scores (table 4), such as James A. Shannon Park (Mobile Heights) and Washington Park. Both parks are of poor quality (figure 5), lack landscaping elements like flower beds or water features, and have no hard courts or grass pitches for play. Although the parks do not show severe signs of incivilities, the conditions of the amenities and surrounding neighbourhoods have been in disrepair. Two of the five white parks of the 1950s, predominantly used by African Americans today, have slightly better quantitative park access scores (table 4). Only Oak Park is good in quality, while O'Connor Tennis Center but have degraded in quality for constant negligence and poor maintenance (figure 6). Being one of the iconic and notable city parks, Oak Park is well-kept, renovated, and used by diverse users, not just African Americans. On the contrary, although it had good infrastructure, O'Connor Tennis Center is now experiencing a deteriorated quality of its amenities. It is evident that as the residents around parks transform, the quality of parks also changes. As park segregation was uplifted officially and the city experienced white flight, good quality white parks experience degradation as their targeted population changed from white residents to African Americans.

Many historic African American parks lacked recreational facilities and necessary park amenities. When parks were desegregated in the city, white flight (along with their tax money), instigated by the fear of racial mixing, left the city parks, including many white parks, to the African American residents in neglect and poor condition. As the Parks and Recreation Department was renamed Recreation Department in 1967, only parks with recreational facilities benefitted, largely ignoring the historic African American parks. The

legacy of such racial biases in planning is continued even today. Initiatives with parks are very few. Current city plans encompassing a park component are either in white neighbourhoods, such as the Capitol Heights Neighborhood Plan, creek restorations project, such as Cypress Creek Neighborhood Plan and Genetta Park Stream Restoration Project, or located near downtown (figure 7). Only a few plans focusing on African American neighbourhoods, such as the South Montgomery Community Plan and Bellingrath Cloverland Neighbourhood Plan, are neighbourhood redevelopment plans with a limited focus on parks (figure 7). Nevertheless, the focus is on larger parks with recreational facilities, largely ignoring African American neighbourhoods to the west and north of the city with high poverty rates and low vehicle ownership (City of Montgomery, 2020, p. 160). Historical practices and segregation policies remain in the system as the building block of creating environmental inequalities. They create gaps in the system that continually patronize the privileged, ignoring the needs of the deprived.

Table 84. Transformations of Historic African American and White Parks

African American Only in 1959 African American Today	**White Only in 1959 African American Today**	**Accessibility Score (5)**	**Recreation Score (4)**	**Amenities Score (6)**	**Natural Features**	**Incivilities Score (4)**	**Total Scores (19)**
James A. Shannon Park (Mobile Heights)		2	3	4	2	2	9
Washington Park		2	2	4	2	1	9
	Ridgecrest Park	0	3	4	2	2	7
	Day Street Park	2	2	1	2	0	7
	Diffley Park	1	3	3	2	0	9
	Oak Park	4	2	5	2	1	12
	O'Connor Tennis Center	1	1	6	2	0	10

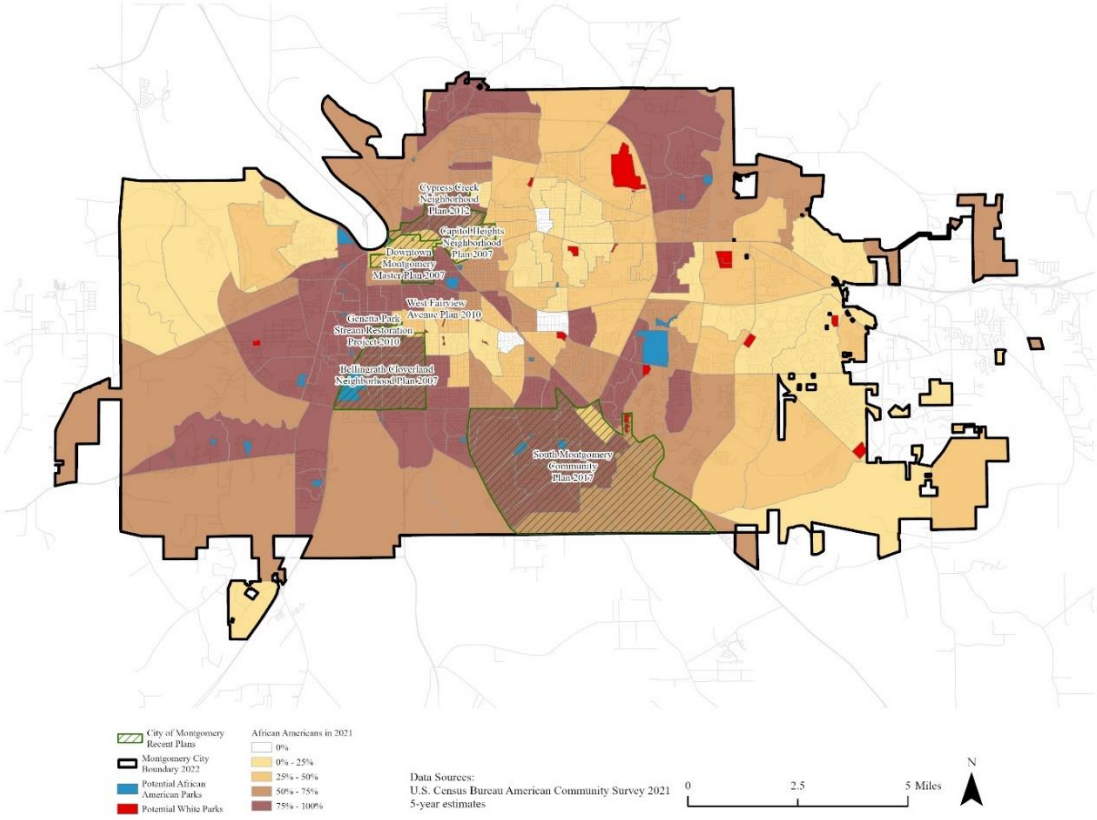


Figure 7. City of Montgomery Recent Plans (2000 onwards)

4.3 Neighbourhood Parks versus Community Parks:

The City of Montgomery's Recreation Department classifies its parks into three categories – community parks, neighbourhood parks, and urban open space parks (City of Montgomery, 2019). Community parks serve multiple neighbourhoods and the city at large. They have a combination of passive, active, and special uses, and their sizes range from 2 to 300 acres. Excluding the special use parks, of the twenty-one community parks, ten serve African Americans, and eleven serve whites. Neighbourhood parks are smaller (30 acres maximum) and serve individual neighbourhoods or small residential areas. Most neighbourhood parks are designed for passive use, while a few have some active recreation. Of the 36 neighbourhood parks, 24 serve African Americans, and 12 serve whites. The urban open spaces are small-scale passive parks with landscaping. Of five such open spaces, four parks serve white residents, and one serves African Americans.

The qualitative analysis reveals that in the case of both African American and white parks, the small neighbourhood parks are in most disrepair, while the good quality parks are typically large community parks. For example, of the three good-quality African American parks, two are community parks, Oak Park and Gateway Park, that cater to the wider community. Oak Park is around 40 acres in area and is notably one of the famous parks in the city. Gateway Park is around 190 acres with both active and passive activities. Of the 24 African American neighbourhood parks, 21 are in poor condition. These small parks mostly have passive facilities; some are associated with schools. For white parks, the good and mediocre-quality parks are large community parks, predominantly with recreational facilities, while small neighbourhood parks are in poor condition.

From an EJ perspective, neighbourhood parks are meant to provide daily social, environmental, and health benefits to their immediate residents and, therefore, are crucial for equal access. While community parks are important, their catchment areas are larger with more specialized and occasional usage. However, cities tend to invest more in community parks as they are more visible to the public and visitors. Today, 61.6 percent of the city's population comprises African Americans (US Census Bureau, 2020), and they use most of the small neighbourhood parks. The community parks are distributed equally among the African American and white residents, but the parks in the white neighbourhoods are of better quality. It is paramount to shift the focus of park development from large community parks to small neighbourhoods for better disbursement of parks' benefits to their residents.

5. Conclusions

This study connected the issues of park access from an EJ point of view with the history of park segregation, taking the City of Montgomery, Alabama, as a case study. Montgomery remains one of many highly segregated cities in the south and the country (Othering & Belonging Institute, 2021). The history of park segregation has its legacy in contemporary disparities of park access, signifying severe quality-based inequalities. The segregated practices and policies remain in the planning system and continue to impact equal access to parks for all racial groups. Parks serving local residents are paramount in terms of providing equal access to all from an EJ perspective. However, the study highlights that cities tend to invest in larger community parks than small neighbourhood parks, which are often in dire need. The study also emphasizes the efficacy of creating a robust quantitative and qualitative assessment of park access that provides a holistic overview of park conditions.

As the study advocates for improving park conditions for African Americans, inferring from the voices of minorities and low socio-economic groups were beyond the scope. A future research scope would be to interview residents to understand their needs and wants from

the parks, especially in the case of neighbourhood parks. With the growing rate of urbanization, parks are one of the most valuable assets for city dwellers. Access to parks has tremendous social, environmental, and economic benefits and is one of the quintessential ingredients for EJ. However, because of the "tragedy of the commons" (Kohn, 2004; Carmona et al., 2010), they are the most contested ones too. Conflicts over park use are more severe in cities that carry the legacy of racial segregation. Historical practices of racial biases remain in park planning and affect the equal distribution of parks' benefits to all its residents. Therefore, a holistic assessment of park access is crucial that can inform both quantity and quality-based needs for future park plans.

The *Envision Montgomery 2040* comprehensive plan recognizes several scopes with urban parks in the city, including rebranding and re-engaging city parks, expanding parks and recreation services and facilities into under-served areas, improving maintenance and prioritizing upgrades for parks and recreation facilities through a facilities condition index, increasing diversity of park programming, and expanding park coverage through rehabbing tax-delinquent parcels (City of Montgomery, 2020, pp. 240). While these initiatives are being conceptualized, this study seeks to provide insights into the nuances of park access that can steer the decision-making process.

References

Baldwin, P. C. (1999). *Domesticating the street: the reform of public space in Hartford, 1850-1930*. Columbus: Ohio State University Press.

Bolund, P. & Hunhammar, S. (1999) Ecosystem services in urban areas. *Ecological Economics, 29*(2), 293-301. http://dx.doi.org/10.1016/S0921-8009(99)00013-0

Boone, C. G., Buckley, G. L., Grove, J. M., & Sister, C. (2009). Parks and people: An environmental justice inquiry in Baltimore, Maryland. *Annals of the Association of American Geographers*, *99*(4), 767–787. https://doi.org/10.1080/00045600903102949

Boslaugh, S. E., Luke, D. A., Brownson, R. C., Naleid, K. S., & Kreuter, M. W. (2004). Perceptions of neighborhood environment for physical activity: Is it "who you are" or "where you live"? *Journal of Urban Health*, *81*(4), 671–681.

Bryant, B. I., & Mohai, P. (1992). *Race and the incidence of environmental hazards: A time for discourse*. Boulder: Westview Press.

Bullard, R. D. (1994). *Dumping in Dixie: race, class, and environmental quality* (2nd ed.). Boulder: Westview Press.

Byrne, J., & Wolch., J. (2009). Nature, race, and parks: Past research and future directions for geographic research. *Progress in Human Geography, 33*(6): 743–765. https://doi.org/10.1177/0309132509103156

Byrne, J., Kendrick, M., & Sroaf, D. (2007). The Park Made of Oil: Towards a Historical Political Ecology of the Kenneth Hahn State Recreation Area. *Local Environment*, *12*(2), 153–181.

https://doi.org/10.1080/13549830601161830
Cable, S., Mix, T., & Hastings, D. (2005). Mission impossible: Environmental justice activists' collaboration with professional environmentalists and with academics. In D. N. Pellow & R. J. Brulle (Eds.), *Power, justice, and the environment: a critical appraisal of the environmental justice movement* (pp. 55-76). Cambridge, MA: MIT Press.
Čapek, S. M. (1993). The "environmental justice" frame: A conceptual discussion and an application. *Social Problems*, *40*(1), 5–24. https://doi.org/10.2307/3097023
Carlson, S. A., Brooks, J. D., Brown, D. R., & Buchner, D. M. (2010). Racial/ethnic differences in perceived access, environmental barriers to use, and use of community parks. *Preventing Chronic Disease, 7*(3), 1–10.
Carmona, M, Tiesdell, S., Heath, T., & Oc, T. (2010). *Public Places, Urban Spaces: The Dimensions of Urban Design* (2nd ed.). Oxford; Boston: Architectural Press.
Chiesura, A. (2004). The role of urban parks for the sustainable city. *Landscape and Urban Planning*, *68*(1), 129–138. https://doi.org/10.1016/j.landurbplan.2003.08.003
City of Montgomery. (2019). *Parks and Recreation Strategic Analysis Memo: Envision Montgomery 2040 Comprehensive Plan.* Retrieved from https://envisionmontgomery2040.org/wp-content/uploads/2019/07/MO_Strategic-Analysis-PARKS-AND-RECREATION_190725.pdf
City of Montgomery. (2020). *Envision Montgomery 2040 Comprehensive Plan.* Retrieved from https://envisionmontgomery2040.org/wp-content/uploads/2022/09/Montgomery_Envision-Montgomery-2040_2020_web.pdf
Comer, J. C., & Skraastad-Jurney, P. D. (2008). Assessing the locational equity of community parks through the application of Geographic Information Systems. *Journal of Park and Recreation Administration, 26*(1), 122–146.
Cradock, A. L., Kawachi, I., Colditz, G. A., Hannon, C., Melly, S. J., Wiecha, J. L., & Gortmaker, S. L. (2005). Playground safety and access in Boston neighborhoods. *American Journal of Preventive Medicine, 28*(4), 357–363. http://doi.org/10.1016/j.amepre.2005.01.012
Crawford, D., Timperio, A., Giles-Corti, B., Ball, K., Hume, C., Roberts, R., Andrianopoulos, N., & Salmon, J. (2008). Do features of public open spaces vary according to neighbourhood socio-economic status? *Health & Place*, *14*(4), 889–893. https://doi.org/10.1016/j.healthplace.2007.11.002
Crompton, J. (2005). The impact of parks on property values: empirical evidence from the past two decades in the United States. *Managing Leisure*, *10*(4), 203–218. https://doi.org/10.1080/13606710500348060
Dai, D. (2011). Racial/ethnic and socioeconomic disparities in urban green space accessibility: where to intervene? *Landscape and Urban Planning, 102*(4), 234–244. http://doi.org/10.1016/j.landurbplan.2011.05.002
Daily, G.C. (1997). Introduction: What Are Ecosystem Services? In: G.C. Daily (Ed.) *Nature's services: Societal dependence on natural ecosystems* (pp. 1-10). Washington DC: Island Press.

Downey, L. (2007). US metropolitan-area variation in environmental inequality outcomes. *Urban Studies*, *44*(5/6), 953–977. https://www.jstor.org/stable/43084810

Farber, S. C., Costanza, R., & Wilson, M. A. (2002). Economic and ecological concepts for valuing ecosystem services. *Ecological Economics*, *41*(3), 375–392. https://doi.org/10.1016/S0921-8009(02)00088-5

Foster, M. S. (1999). In the face of "Jim Crow": Prosperous blacks and vacations, travel and outdoor leisure, 1890-1945. *The Journal of Negro History*, *84*(2), 130–149. https://doi.org/10.2307/2649043

Geng, D. (Christina), Innes, J., Wu, W., & Wang, G. (2021). Impacts of COVID-19 pandemic on urban park visitation: a global analysis. *Journal of Forestry Research*, *32*(2), 553–567. https://doi.org/10.1007/s11676-020-01249-w

Gidlow, C. J., Ellis, N. J. & Bostock, S. (2012). Development of the Neighbourhood Green Space Tool (NGST). *Landscape and Urban Planning, 106*(4): 347-358. https://doi.org/10.1016/j.landurbplan.2012.04.007.

Giles-Corti, B., Broomhall, M. H., Knuiman, M., Collins, C., Douglas, K., Ng, K., Lange, A., & Donovan, R. J. (2005). Increasing walking: How important is distance to, attractiveness, and size of public open space? *American Journal of Preventive Medicine*, *28*(2), 169–176. https://doi.org/10.1016/j.amepre.2004.10.018

Gobster, P. H. (2001). Visions of nature: conflict and compatibility in urban park restoration. *Landscape and Urban Planning*, *56*(1), 35–51. https://doi.org/10.1016/S0169-2046(01)00164-5

Heckert, M. & Bristowe, A. (2021). Parks and the Pandemic: A Scoping Review of Research on Green Infrastructure Use and Health Outcomes during COVID-19. *International Journal of Environmental Research and Public Health*, *18*(24), 13096. https://doi.org/10.3390/ijerph182413096

Holifield, R., Chakraborty, J., & Walker, G. (Eds.). (2017). *The Routledge Handbook of Environmental Justice* (1st ed.). London: Routledge. https://doi.org/10.4324/9781315678986

Hughey, S. M., Walsemann, K. M., Child, S., Powers, A., Reed, J. A., & Kaczynski, A. T. (2016). Using an environmental justice approach to examine the relationships between park availability and quality indicators, neighborhood disadvantage, and racial/ethnic composition. *Landscape and Urban Planning*, *148*, 159–169. https://doi.org/10.1016/j.landurbplan.2015.12.016

Johnson-Gaither, C. (2011). Latino park access: examining environmental equity in New Destination county in the South. *Journal of Park and Recreation Administration, 29*(4), 37–52.

Kelling, G. L. & Wilson, J. Q. (1982, March). Broken windows: The police and neighborhood safety. *The Atlantic.* Retrieved from https://www.theatlantic.com/magazine/archive/1982/03/broken-windows/304465/

Kohn, M. (2004). *Brave New Neighborhoods: The Privatization of Public Space*. New York:

Routledge.
Lee, K. (Jerry). (2020, January 27). Project for public spaces: Public space, park space, and racialized space. Retrieved from https://www.pps.org/article/public-space-park-space-and-racialized-space
Levinger, P., Cerin, E., Milner, C., & Hill, K. D. (2022). Older people and nature: the benefits of outdoors, parks and nature in light of COVID-19 and beyond– where to from here? *International Journal of Environmental Health Research*, *32*(6), 1329–1336. https://doi.org/10.1080/09603123.2021.1879739
Liu, S., & Wang, X. (2021). Reexamine the value of urban pocket parks under the impact of the COVID-19. *Urban Forestry & Urban Greening*, *64,* 127294. https://doi.org/10.1016/j.ufug.2021.127294
Macintyre, S. (2007). Deprivation amplification revisited; or, is it always true that poorer places have poorer access to resources for healthy diets and physical activity? *International Journal of Behavioral Nutrition and Physical Activity*, *4*(1), 32. https://doi.org/10.1186/1479-5868-4-32
Mahato, B., Retzlaff, R., & Chen, X. (2022). Planning, Civil Rights, and African American Voting: The Case of Montgomery, Alabama. *Journal of Planning Education and Research*, *0*(0). https://doi.org/10.1177/0739456X221136503
Maller, C., Townsend, M., Pryor, A., Brown, P., & St. Leger, L. (2006). Healthy nature healthy people: "contact with nature" as an upstream health promotion intervention for populations. *Health Promotion International*, *21*(1), 45–54. https://www.jstor.org/stable/45152850
McKay, R. B. (1954). Segregation and Public Recreation. *Virginia Law Review*, *40*(6), 697–731. https://doi.org/10.2307/1070011
Mehta, V., & Mahato, B. (2021). Designing urban parks for inclusion, equity, and diversity. *Journal of Urbanism*, *14*(4), 457–489. https://doi.org/10.1080/17549175.2020.1816563
Mennis, J. L., & Jordan, L. (2005). The distribution of environmental equity: Exploring spatial nonstationarity in multivariate models of air toxic releases. *Annals of the Association of American Geographers*, *95*(2), 249–268. https://www.jstor.org/stable/3694118
Meyer, H. D. (1942). A preview of community recreation. *Social Forces*, *20*(3), 357–363. https://doi.org/10.2307/3005624
Miller, S. (2019). Park access and equity in a segregated, southern U.S. city: A case study of Tallahassee, FL. *Environmental Justice, 12*(3), 85 -91. https://doi.org/10.1089/env.2018.0026
More, T.A., Stevens, T., & Allen, P.G. (1988). Valuation of urban parks. *Landscape and Urban Planning, 15(1-2),* 139-152. https://doi.org/10.1016/0169-2046(88)90022-9
Nicholls, S. (2001). Measuring the accessibility and equity of public parks: a case study using GIS. *Managing Leisure*, *6*(4), 201–219. http://doi.org/10.1080/13606710126543
Omer, I., & Or, U. (2005). Distributive environmental justice in the city: differential access in

two mixed Israeli cities. *Tijdschrift Voor Economische En SocialeGeografie, 96*(4), 433–443. http://doi.org/10.1111/j.1467-9663.2005.00474.x

Othering & Belonging Institute. (2021, October 11). What the 2020 Census reveals about segregation. Retrieved from https://belonging.berkeley.edu/what-2020-census-reveals-about-segregation

Rabkin, S. (1954). Racial desegregation in places of public accommodation. *The Journal of Negro Education*, *23*(3), 249–261. https://doi.org/10.2307/2293222

Retzlaff, R. (2019). Desegregation of city parks and the Civil Rights Movement: The case of Oak Park in Montgomery, Alabama. *Journal of Urban History, 47*(4), 715-752. https://doi.org/10.1177/0096144219877636

Rigolon, A. & Flohr, T. L. (2014). Access to parks for youth as an environmental justice issue: Access inequalities and possible solutions. *Buildings, 4*(2): 69–94. https://doi.org/10.3390/buildings4020069

Rigolon, A. (2016). A complex landscape of inequity in access to urban parks: A literature review. *Landscape and Urban Planning*, *153*, 160–169. https://doi.org/10.1016/j.landurbplan.2016.05.017

Saha, R., & Mohai, P. (2005). Historical context and hazardous waste facility siting: Understanding temporal patterns in Michigan. *Social Problems*, *52*(4), 618–648. https://doi.org/10.1525/sp.2005.52.4.618

Savard, J. L., Clergeau, P., & Mennechez, G. (2000). Biodiversity concepts and urban ecosystems. *Landscape and Urban Planning. 48*(3-4),131-142. https://doi.org/10.1016/S0169-2046(00)00037-2

Schlosberg, D. (2004). Reconceiving environmental justice: Global movements and political theories. *Environmental Politics*, *13*(3), 517–540. https://doi.org/10.1080/0964401042000229025

Shearer, B.L.J. (1999). *The daily aesthetic: a multimedia exploration of leisure and recreation in Lexington's segregated urban park system* (Master's Thesis). Department of Geography, University of Kentucky.

Smiley, K. T., Sharma, T., Steinberg, A., Hodges-Copple, S., Jacobson, E., & Matveeva, L. (2016). More inclusive parks planning: Park quality and preferences for park access and amenities. *Environmental Justice, 9*(1), 1-7. https://doi.org/10.1089/env.2015.0030

Smoyer-Tomic, K. E., Hewko, J. N., & Hodgson, M. J. (2004). Spatial accessibility and equity of playgrounds in Edmonton, Canada. *Canadian Geographer*, *48*(3), 287–302. https://doi.org/10.1111/j.0008-3658.2004.00061.x

Stormann, W. F. (1991). The ideology of the American urban parks and recreation movement: Past and future. *Leisure Sciences, 13(2),* 137-151. https://doi.org/10.1080/01490409109513132

Suminski, R. R., Connolly, E. K., May, L. E., Wasserman, J., Olvera, N., & Lee, R. E. (2012). Park quality in racial/ethnic minority neighborhoods. *Environmental Justice, 5*(6), 271-278. https://doi.org/10.1089/env.2012.0013

Talen, E. (2010). The spatial logic of parks. *Journal of Urban Design*, *15*(4), 473–491. https://doi.org/10.1080/13574809.2010.502335

Taylor, D. (2000). The rise of the environmental justice paradigm: Injustice framing and the social construction of environmental discourses. *American Behavioral Scientist*, *43*(4), 508–580.

Trevino, H. S., & Pastorello, L. E. (2007). *Oak Park and Montgomery Zoo*. Charleston, SC; Chicago, IL; Portsmouth, NH; San Francisco, CA: Arcadia Publishing.

U.S. Census Bureau. (2000). *Decennial Census: DP1|Profile of General Demographic Charaterristics:2000*. Retrieved from https://data.census.gov/table?t=Race+and+Ethnicity&g=1600000US0151000&y=2000&tid=DECENNIALDPSF42000.DP1

U.S. Census Bureau. (2010). *Decennial Census: P1|Race*. Retrieved from https://data.census.gov/table?g=1600000US0151000&y=2010&tid=DECENNIALPL2010.P1

U.S. Census Bureau. (2020). *Decennial Census: P1|Race*. Retrieved from https://data.census.gov/table?g=1600000US0151000&y=2010&tid=DECENNIALPL2010.P1

United States Environmental Protection Agency. (2023). *Environmental Justice.* Retrieved from https://www.epa.gov/environmentaljustice

Vaughan, K. B., Kaczynski, A. T., Wilhelm Stanis, S. A., Besenyi, G. M., Bergstrom, R., & Heinrich, K. M. (2013). Exploring the distribution of park availability, features, and quality across Kansas City, Missouri by income and race/ethnicity: an environmental justice investigation. *Annals of Behavioral Medicine, 45*(Suppl. 1), S28–S38. http://doi.org/10.1007/s12160-012-9425-y

Volenec, Z. M., Abraham, J. O., Becker, A. D., & Dobson, A. P. (2021). Public parks and the pandemic: How park usage has been affected by COVID-19 policies. *PLoS ONE*, *16*(5), 1–18. https://doi.org/10.1371/journal.pone.0251799

Walker, G. P. (2012). *Environmental justice: concepts, evidence and politics*. London; New York: Routledge.

Wen, M., Zhang, X., Harris, C. D., Holt, J. B., & Croft, J. B. (2013). Spatial disparities in the distribution of parks and green spaces in the USA. *Annals of Behavioral Medicine, 45*(Suppl. 1), S18–S27. http://doi.org/10.1007/s12160-012-9426-x

Willemse, L. (2013). A Flowmap–geographic information systems approach to determine community neighbourhood park proximity in Cape Town. *South African Geographical Journal, 95*(2), 149–164. http://doi.org/10.1080/03736245.2013.847799

Wolch, J. R., Byrne, J., & Newell, J. P. (2014). Urban green space, public health, and environmental justice: The challenge of making cities' just green enough.' *Landscape and Urban Planning*, *125*, 234–244. https://doi.org/10.1016/j.landurbplan.2014.01.017

Wolch, J. R., Wilson, J. P., & Fehrenbach, J. (2005). Parks and park funding in Los Angeles: an equity-mapping analysis. *Urban Geography*, *26*(1), 4–35. http://doi.org/10.2747/0272-

3638.26.1.4
Wright, B.H. (1992). The effects of occupational injury, illness and disease on the health status of black Americans: a review. In B. Bryant & P. Mohai (Eds.), *Race and the incidence of environmental hazard: a time for discourse*. Boulder: Westview Press.
Xiao, X., Lee, K. J., & Larson, L. R. (2022). Who visits U.S. national parks (and who doesn't)? A national study of perceived constraints and vacation preferences across diverse populations. *Journal of Leisure Research*, *53*(3), 404–425. https://doi.org/10.1080/00222216.2021.1899776

LOW-INCOME CLASS'S RESIDENTIAL SEGREGATION AND URBAN REDEVELOPMENT PROJECT BETWEEN 2011 AND 2020 (1086)

Chaeyeon Lee[1], Donghyun Kim[1*]

[1]Department of Urban Planning and Engineering, Pusan National University, Busan, Republic of Korea; [*]cylee@pusan.ac.kr

Abstract. This study aims to analyse the patterns of low-income residential segregation in South Korea from a macro and micro perspective and to determine the net effect of redevelopment policy implementation on low-income residential segregation. By manipulating the National Basic Livelihood Recipients as low-income people, we examine the residential segregation of low-income people measured by the dissimilarity index, isolation index, location quotient, and local Moran's I in seven metropolitan cities representing South Korea between 2011 and 2020. This study analyses the net effect of redevelopment on low-income residential segregation using the propensity score matching (PSM) method, estimating that redevelopment reduces low-income residential segregation by 0.0289. The findings show that low-income residents cluster in urban centres and become less concentrated as they move outwards, and PSM analysis shows that redevelopment mitigates low-income residential segregation. This article provides insight into the need to consult with those responsible for low-income housing policy to ensure redevelopment's positive impact on low-income residential segregation.

Keywords: low-income class, residential segregation, inequality.

1. Introduction

In most countries that have experienced an economic crisis, socioeconomic polarisation intensifies as the economy is revitalised to overcome the crisis (Piketty, 2014). In South Korea, in particular, the income distribution structure, which deteriorated sharply after the 1997 foreign exchange crisis, has become polarised, widening the gap between low-income and high-income earners (Park and Han, 2021). In recent years, regional polarisation has also intensified, with the combined earned income of the greater Seoul region, including Seoul, Gyeonggi, and Incheon, exceeding 60 percent of South Korea's total earned income (Koo, 2019).

People generally feel more secure around people who are similar to them, so even if there are no direct factors at play, people will spontaneously seek to form communities with like-minded people (Shalizi and Thomas, 2011). In a similar vein, a neighbourhood is not a single entity, but is spatially dependent on its geographically close neighbours, meaning

that neighbouring areas influence each other to have similar tendencies (Jun, 2020). In this context, the gap between low-income and non-low-income neighbourhoods appears to be difficult to close. However, we need to pay attention to the phenomenon of low-income residential segregation and devise ways to address it, as several urban studies have shown that the clustering of low-income people in certain neighbourhoods can lead to numerous socioeconomic pathologies (Brooks-Gunn, Duncan, Klebanov, and Sealand, 1993; Jargowsky, 1997; Massey and Eggers, 1990; Sampson, Raudenbush and Earls, 1997; Samposn, Morenoff, and Gannon-Rowley, 2002).

The spatial distribution of poverty plays an important role in understanding place-based structural inequalities, such as income and social class, as well as residential segregation (Lobao, Hooks and Tickamyer, 2008). Relationships at the micro-level of poverty are important, as people interact with their neighbours and act as a key factor in influencing each other's lives and futures (Sampson, 2008). The need for micro-level analysis of low-income residential segregation is highlighted by the view that the vicious cycle of poverty and increasing income inequality is an important cause of political polarisation that destabilises countries (Gu and Wang, 2022).

While the literature on residential segregation has primarily focused on residential segregation by race and ethnicity, there is growing academic interest in residential segregation by income and social class (Owens, 2018). Residential segregation is also a key driver of economic inequality, with government intervention in the housing market leading to extreme racial and economic segregation between neighbourhoods, as well as population-level inequalities along racial and class lines, including wealth inequality, life expectancy gaps, and differences in economic mobility, which persist across generations (Williams and Collins 2001; Oliver and Shaprio 2006; Sharkey and Elwert 2011; Chetty, Hendren, and Katz 2015). The answer to the question of how public policy can reduce spatial inequality is not straightforward, as research has shown that segregation patterns persist over time (Faber, 2021; Sampson, 2012). Therefore, this study analyses the patterns of low-income residential segregation in the rapidly changing socioeconomic structure of South Korea from a macro and micro perspective. It will also contribute to understanding the relationship between public policy and spatial inequality by identifying the net effect of redevelopment policy implementation on low-income residential segregation.

In the early 1960s, South Korea's steady economic growth, coupled with a thriving manufacturing industry, led to large-scale migration from rural to urban areas and a housing shortage in cities (Ha, 2010). In addition, consumer preferences for where to live shifted from single-family homes to apartments based on convenience, creating significant demand for apartments (Lee and Kim, 2020). To meet this demand, the redevelopment of existing low-rise neighbourhoods has involved many private companies,

resulting in profit-oriented housing developments and the loss of affordable housing (Seo, 2016). This has led to an influx of upper-middle and upper-income earners into working-class neighbourhoods, resulting in rents and house prices that low-income earners cannot afford, giving rise to the phenomenon of gentrification (Ha, 2007). The central government has begun to introduce new policies to address the problems arising from profit-driven redevelopment, such as gentrification, but more research is needed on the relationship between low-income residential segregation and redevelopment to see if they are effective.

This study aims to examine the impact of large-scale redevelopment on low-income residential segregation. The first part discusses the theoretical background on residential segregation of the poor and urban redevelopment. The second part describes the variables used and introduces the propensity score matching methodology to construct an index to measure residential segregation and the net effect of redevelopment. The third part will present the results on changes in low-income residential segregation and the impact of large-scale redevelopment on this. Finally, the results will be evaluated, and then a discussion of the implications that the results provide will follow.

2. Literature Review

2.1. Residential Segregation of the Poverty

The theory of residential segregation began to develop from the theory of racial segregation in the United States. The United States has been undergoing rapid industrialisation and urbanisation since the 19th century, creating a gap between those who have been able to adapt and those who have not. Black people, who were less able to accumulate capital than their white counterparts, were pushed into poorer housing conditions, and as poverty groups grew, slums were created. The emergence of slum-like concentrations of poverty and the different spatial patterns of residence between white and black people led scholars to study the phenomenon of residential segregation.

Some studies analysed the causes of residential segregation of the poor and immigrant populations using the Concentric Model (Burgess, 1924), while others analysed the residential segregation of specific ethnic groups in the wake of rapid immigration (Wirth, 1928). In sociology, there was a debate between two major perspectives on the causes of concentrated poverty in American cities, one theory combining deindustrialisation of central cities with class-based migration patterns among African Americans, and the other emphasising the importance of racial residential segregation (Wilson 1987, 1996: Massey and Denton, 1998a). Since then, research has focused less on residential segregation itself and more on the various urban problems that arise from this phenomenon, such as studies that suggest that the concentration of segregated low- and high-income

neighbourhoods can lead to social unrest, riots, increased crime, and distrust between segregated social groups (Reardon & Bischoff, 2011; Malmberg, Andersson and Östh, 2013; Musterd, 2016).

Against the background of these various studies, the causes of spatial segregation of the poor have been categorised into economic segregation, racial and ethnic segregation and segregation due to uneven development (Fong and Shibuya, 2000). Studies arguing that economic segregation is the cause of spatial segregation of the poor suggest that people move to specific neighbourhoods where there are available socioeconomic resources (Tiebout, 1956). It has therefore been suggested that the level of spatial segregation of the poor racial and ethnic groups simply reflects economic disparities within the group. In terms of racial and ethnic segregation as a cause, studies have shown that white low-income neighbourhoods are significantly isolated from white high-income neighbourhoods (Wang, 2018). It has been argued that the segregation of the poor due to uneven development is the most basic concept for understanding the differentiation of any urban space (Harvey, 1973; Hill 1977). Uneven development is an important cause of social stratification and group segregation, as newly redeveloped areas attract residents with socioeconomic resources, while old and neglected areas are left with only low-income people (Fong and Shibuya, 2000). Segregation also reflects socioeconomic status and patterns of social relations (Park et al., 1984; Massey, 1985; Musterd, 2017). Patterns of social relations are divided according to the perceived desirability of others, which results in minority groups being unable to neighbour with other groups, forcing them to live in poor physical and social environments and segregation (Alba and Logan 1991; Graif, 2017).

2.2. Urban Redevelopment and Changes in Residential Segregation

One of the dilemmas associated with urban redevelopment and social equity is that building something new through redevelopment often imposes some form of social cost by replacing something old (Thomas and Hwang, 2003). Housing policies such as redevelopment play a central role in creating urban inequalities (Desmond 2012, 2016). In the United States, residents of neighbourhoods targeted for urban renewal were predominantly black and low-income (Fullilove, 2001), and the public housing that was subsequently built for them was also highly segregated by race and class (Rothstein, 2017).

Other disciplines, such as history and sociology, have also discussed the processes by which housing segregation occurs, such as redlining and exclusive zoning (Massey and Denton, 1998b; Rothstein, 2017). The negative impacts of redevelopment processes contribute to neighbourhood segregation, the concentration of undesirable land uses, and negatively impact the potential for wealth accumulation for low-income people (Whittemore, 2017), further limiting their housing options (Swope and Hernández, 2019).

As South Korea aims for rapid modernisation and economic growth, it has implemented redevelopment projects to stimulate growth. Economic growth and housing policies have had important consequences for economic performance, socio-political stability, and the formation of social welfare structures (Ronald and Kyung, 2013). Urban planning in South Korea has been dominated by the state, which has not distributed urban resources equitably in this process. Property owners in redevelopment areas acted as agents of the state and pushed through redevelopment plans at the will of the state (Lee, 2017). As a result of these redevelopments, low-income groups were forced to relocate to make way for higher-income groups, and the wealth that should have been distributed was concentrated in a few areas. Decisions related to the allocation of public resources become highly contested when redevelopment involves existing low-income housing (Thomas and Hwang, 2003), with groups in favour of redevelopment prioritising the accumulation of wealth from redevelopment over the improvement of living conditions for low-income groups, leading to further sociospatial polarisation (Ha, 2015).

3. Scope and Methodology of the Study

3.1. Scope and Variables

Redevelopment is a policy that changes the living environment and urban aesthetics by building new areas in existing deteriorated areas, and is mainly implemented in large cities that have become deteriorated due to a large number of people living there for a long time. Therefore, the spatial scope of the analysis was set to seven metropolitan cities representing South Korea and their autonomous regions. In South Korea, the sub-administrative divisions of a city are gu, gun, and dong. Dongs come together to become gus or guns, and gus and guns come together to become cities. In this study, dongs are denoted by neighbourhoods and gus by districts. Among the seven metropolitan cities, the area where more than 50% of the total population of South Korea lives is called the greater Seoul area, and Seoul and Incheon are included in this study. The spatial scope of this study includes a total of 74 gus, but 71 gus were excluded due to the lack of data in Ongjin-gun and Ganghwa-gun, Incheon, and Gangseo-gu, Busan.

The time span of this study is from 2011 to 2020, and the degree of residential segregation of low-income residents is measured by National Basic Livelihood Security recipients. The lack of micro-level income data in South Korea limits the ability to measure the spatial concentration of low-income households. The demographic data of the National Basic Livelihood Security recipients is not a direct measure of the poor below the poverty line and does not include the next lowest income group. However, it is the most realistic and appropriate variable for estimating the size of the low-income group at this time, as it identifies those living below the subsistence level who require government protection.

The treatment variable in the propensity score matching analysis is redevelopment status. It is based on redevelopments of 500 units or more that occurred in 71 wards between 2011 and 2020, categorised by year of occupancy. The dependent variable is the low-income neighbourhood segregation index, which is the average of the values of the dissimilarity index, the isolation index, and the Location Quotient (LQ). The Propensity Score Matching (PSM) variables and control variables that affect the mean of the dependent variable, the low-income residential segregation index, are the number of rental apartment units, the number of general apartment units, the average sales price of an apartment, the average rental price of an apartment, and the area of green space per person in each year.

Unlike other policies, redevelopment is implemented in different areas each year rather than simultaneously in a given year. Therefore, unlike other studies, we introduce temporal scope into the spatial scope of the variables, i.e., Gangnam-gu, Seoul in 2011 and Gangnam-gu, Seoul in 2012 as one variable each. The final sample size for the analysis is 710.

Table 1. Variables and References

Variables	**Source**	**Year**
National Basic Security recipients	Statistics Korea	2011-2020
Number of rental apartment for low-income units for sale	Korea Land & Housing Corporation, Metropolitan Corporations	
Number of general apartment units for sale	Korea Housing Association	
Redevelopment or not (500+ units)	Korea Housing Association	
Average sale price of an apartment	Korea Real Estate Board	
Average apartment rental price	Korea Real Estate Board	
Green space area per person	Statistics Korea	

3.2. Research Methodology

3.2.1. Residential Segregation Index

There are two ways to measure residential segregation: a global segregation measure, which has one value for each city and allows for cross-city comparisons, and a local

segregation measure, which allows for comparisons of residential segregation across neighbourhoods within a city. This study uses the index of dissimilarity and the index of isolation as global segregation measures, and the LQ and the local Moran's I (LISA) as local segregation measures to measure the segregation of low-income neighbourhoods.

Residential segregation has five spatial dimensions: evenness, exposure, concentration, clustering, and centralisation (Massey and Denton, 1988a), and the dissimilarity index was used as a measure of evenness, the isolation index as a measure of exposure, LQ as a measure of concentration, and LISA as a measure of clustering.

Duncan and Duncan's (1955) dissimilarity index, which measures how evenly a group of people is distributed across the entire analysis area, has been the most widely used index for the longest time, despite its limitations due to the aspatial nature of the checkerboard problem. No other metric measures equality more efficiently than the dissimilarity index (Wong, 2003). When two groups are completely segregated in terms of where they live, the value of the index is 1, which is the maximum value. The minimum value is 0, at which point the two groups are not separated at all, i.e., the higher the degree of residential segregation, the closer the value to 1.

Equation 1. $\mathrm{D} = \frac{1}{2}\sum_i \left|\frac{X_i}{X} - \frac{Y_i}{Y}\right|$

(X_i: number of people on basic needs living in dong i, X: number of people on basic needs living in the gu to which dong i belongs, Y_i: number of people not on basic needs living in dong i, Y: number of people not on basic needs living in the gu to which dong i belongs)

The dimension of global exposure measures the likelihood of interaction between mainstream and minority groups (Massey and Denton, 1988b). Two indicators of exposure are the interaction index and the isolation index, whose values sum to one. The interaction index measures the extent to which people from minority groups are exposed to people from mainstream groups, while the isolation index measures the extent to which people from minority groups are exposed to each other. In this study, the isolation index is used to measure the degree of segregation in low-income neighbourhoods. The closer the value of the isolation index is to 1, the more segregated the neighbourhood.

Equation 2. ${}_{a}\mathrm{P}_{a} = \left(\frac{a_i}{A}\right)\left(\frac{a_i}{t_i}\right)$

(a_i: number of people on basic needs living in dong i, A: number of people on basic needs living in the gu to which dong i belongs, t_i: total number of people living in the gu to which dong i belongs)

As both a measure of regional equality and a measure of concentration, the LQ has been used in economic geography and regional economics as a measure of the degree of specialisation of a region (Burt and Barber, 1996). It is a measure of the relative

importance of a group in a region to the same group in the rest of the country and is an index of the relative degree of specialisation of the group. If the value of the LQ is greater than 1, it means that the proportion of the study group in region i is greater than the proportion of the study group in all regions. This means that the study population is concentrated in that region. Conversely, a value less than 1 indicates that the population is scarce in the region.

Equation 3. $LQ_i = \left(\frac{a_i}{t_i}\right)\left(\frac{T}{A}\right)$

(a_i: number of people on basic needs living in gu i, A: number of people on basic needs living in the city to which gu i belongs, t_i: total number of people living in gu i, T: total number of people living in the city to which gu i belongs)

Unlike the LQ, which treats individual neighbourhoods independently, LISA is a measure of local spatial autocorrelation and considers each neighbourhood in relation to its neighbours (Anselin, 1995). The value of LISA is interpreted as a positive spatial dependence if the proportion of a particular class is relatively high in the area and the proportion of a particular class in the neighbouring area is also high, forming a cluster. On the other hand, if the proportion of a particular class is relatively low in both the area and the neighbouring area, it is interpreted as a negative spatial dependence, and in this study, the particular class is the National Basic Livelihood Recipient.

There are four patterns of spatial association that emerge from LISA. Areas with high index values are called hot spots in the HH (high-high) pattern and are clusters with positive spatial dependence as described earlier. If regions with low index values are adjacent to each other, they are called cold spots in the LL (low-low) pattern and have a negative spatial dependence. A region with a high-low pattern has a high index value in contrast to the low LISA index of its neighbours, and a low-high pattern is a cluster where the region has a low index value and its neighbours have a high index value.

Equation 4. $I_i = \frac{Z_i}{m_2}\sum_j W_{ij}Z_j, m_2 = \frac{\sum Z_i^2}{N}$

(Z_i: deviation between the value of the variable and the mean value, W_{ij}: spatially weighted matrix, N: sum of observations)

3.2.2. Propensity Score Matching (PSM)

PSM is a statistical method that approximates random selection in a pure experiment by pairing individuals with similar attributes of a common variable represented by a covariate (Rosenbaum and Rubin, 1983). Propensity scores are balancing scores that summarise covariates and have the advantage of reducing the matching dimensions to a single dimension compared to direct matching of covariates. In observational studies, most studies comparing two or more variables are based on non-random sampling, which has

the disadvantage of not being able to control selection bias. Therefore, this study uses PSM, one of the quasi-experimental research methods to control selection bias, to test the effectiveness of redevelopment policies. The propensity score is defined as the conditional probability of being assigned to a given treatment given a vector of covariates. In the equation below, $\mathrm{e}(x_i)$ is the propensity score, x_i represents the covariate vector, and D_i=1 is the treatment group and D_i= 0 is the control group.

Equation 5. $\mathrm{e}(x_i) = Pr(D_i = 1|X_i)$

There are several ways to match the treatment and control cases: 1:1 matching with Nearest Neighbour Matching, 1:N matching, Caliper matching, and Radius matching. Nearest neighbour matching is the method of matching all subjects in the treatment and control groups in the order of the smallest estimated difference in propensity scores. The intuitive way to minimise confounding is to match each participant in the treatment group individually with a participant in the control group, so we used 1:1 nearest neighbour matching in this study (Sainani, 2012). Probit model was used to estimate the propensity score, and the variables used for PSM are as shown in Table 2.

Table 2. Structure of PSM variables

Category	**Variables**	**Definition**
Dependent variable	Low-income residential segregation index	Average of dissimilarity index, isolation index, and LQ values
Independent variable	Large-scale redevelopment or not	Redeveloped areas with 500+ units (1), other (0)
Control variables (PSM variables)	Number of rental apartment for low-income units for sale	Number of units for rental apartment for low-income
	Number of general apartment units for sale	Number of units for general apartment
	Average sale price of an apartment	Average monthly apartment sale price
	Average apartment rental price	Average monthly apartment rental price
	Green space area per person	

4. Analysis Results

4.1. Change in the Residential Segregation Index for the seven Metropolitan Cities

First, this study measures the degree of residential segregation for low-income residents in South Korea using a constant index based on evenness, which is the most central and important dimension of the five dimensions of residential segregation. Table 3 shows the values of the dissimilarity index by city. The top 10 gus with high index values are shown in red as the upper class, and the bottom 10 gus with low index values are shown in blue as the lower class in Table 3. According to the analysis, Seoul Gangnam-gu, followed by Seoul Gangseo-gu, Incheon Yeonsu-gu and Seoul Seocho-gu, showed severe segregation of low-income residents, and more than half of the top groups belonged to the Seoul city. When comparing the values of the index in 2011 and 2020, the values decreased overall. The lowest values were found in Busan Jung-gu, followed by Daegu Nam-gu, Seoul Geumcheon-gu, and Seoul Seodaemun-gu. When examining the changes in ranking within the upper and lower groups, it was found that the changes in ranking were relatively severe among the lower group gus. In addition, the emergence of new gus in the lower group over time was higher than in the upper group.

Table 3. Dissimilarity Index of Low-Income Residential Segregation by City

		Year				Year	
City	**Gu/Gun**	**2011**	**2020**	**City**	**Gu/Gun**	**2011**	**2020**
Seoul	Jongno	0.23026	0.31955	Busan	Yeongdo	0.26324	0.22162
	Jung	0.18022	0.15027		Dong	0.10078	0.14384
	Yongsan	0.31317	0.32799		Seo	0.18762	0.20480
	Seongdong	0.12118	0.14888		Jung	0.04966	0.05804
	Gwangjin	0.18569	0.21003	Daejeon	Daedeok	0.36179	0.25563
	Dongdae-mun	0.14264	0.13354		Yuseong	0.29970	0.21750
	Jungnang	0.17678	0.12259		Seo	0.33052	0.29497
	Seongbuk	0.11568	0.16593		Jung	0.26615	0.24626
	Gangbuk	0.20265	0.13066		Dong	0.27636	0.16487
	Dobong	0.22892	0.25726	Daegu	Dal-seong	0.17923	0.21331
	Nowon	0.32535	0.26870		Dalseo	0.41475	0.40093
	Eunpyeong	0.20425	0.12535		Suseong	0.29169	0.31424
	Seodaemun	0.10447	0.11887		Buk	0.23632	0.29185
	Mapo	0.17789	0.16223		Nam	0.05964	0.10294
	Yangcheon	0.26072	0.27647		Seo	0.12502	0.13662
	Gangseo	0.51923	0.35587		Dong	0.23596	0.21827

	Guro	0.25895	0.20036		Jung	0.10812	0.16205
	Geomcheon	0.07058	0.13542	Gwangju	Gwang-san	0.44755	0.21311
	Yeongdeung-po	0.26287	0.28664		Buk	0.35002	0.29145
	Dongjak	0.15169	0.14324		Nam	0.19432	0.20038
	Gwanak	0.17969	0.13223		Seo	0.31712	0.31226
	Seocho	0.38010	0.34526		Dong	0.13529	0.14563
	Gangnam	0.53844	0.45123	Incheon	Seo	0.24961	0.25424
	Songpa	0.35300	0.31596		Gye-yang	0.19153	0.12627
	Gangdong	0.23609	0.25385		Bu-pyeong	0.23919	0.20547
Busan	Gijang	0.12647	0.11241		Nam-dong	0.22446	0.16065
	Sasang	0.34357	0.33331		Yeonsu	0.43928	0.49956
	Suyeong	0.11256	0.12247		Michuhol	0.14477	0.16230
	Yeonje	0.20647	0.18930		Dong	0.17219	0.22339
	Geumjeong	0.22337	0.25369		Jung	0.27316	0.28477
	Saha	0.32430	0.22978	Ulsan	Ulju	0.24283	0.18762
	Haeundae	0.38796	0.38523		Buk	0.13767	0.11006
	Buk	0.37477	0.36277		Dong	0.34843	0.28255
	Nam	0.17515	0.21294		Jung	0.11428	0.16297
	Dongnae	0.17646	0.15886		Nam	0.30123	0.30118
	Busanjin	0.12247	0.13586				

* : upper group (10 gus with large index values), : lower group (10 gus with smaller index values)

The measure of low-income residential segregation using the isolation index is shown in Table 4. In both 2011 and 2020, Busan Sasang-gu had the highest isolation index among the 71 gus, followed by Busan Yeongdo-gu, Daegu Dalseo-gu, and Busan Buk-gu. Conversely, the least segregated gu, Ulsan Buk-gu, had the lowest isolation index in both years, as did Busan Sasang-gu in the previous top group. Busan accounted for half of the upper half of the isolation index, while the lower half of the index was dominated by the greater Seoul area, which accounted for nine out of 10 gus in 2011.

Table 4. Isolation Index of Low-Income Residential Segregation by City

		Year				Year	
City	**Gu/Gun**	**2011**	**2020**	**City**	**Gu/Gun**	**2011**	**2020**
Seoul	Jongno	0.01879	0.04642	Busan	Yeongdo	0.08969	0.14184
	Jung	0.03228	0.04433		Dong	0.08671	0.10788
	Yongsan	0.03400	0.06050		Seo	0.07232	0.10460
	Seongdong	0.02099	0.03715		Jung	0.05069	0.08643
	Gwangjin	0.01582	0.04027	Daejeon	Daedeok	0.07187	0.07483
	Dongdae-mun	0.02680	0.04647		Yuseong	0.02673	0.02795
	Jungnang	0.02845	0.06577		Seo	0.05240	0.05946
	Seongbuk	0.02076	0.04228		Jung	0.04777	0.07046
	Gangbuk	0.04330	0.07310		Dong	0.08474	0.09339
	Dobong	0.01656	0.05724	Daegu	Dal-seong	0.04584	0.04743
	Nowon	0.05843	0.07846		Dalseo	0.09556	0.10931
	Eunpyeong	0.03201	0.05096		Suseong	0.07346	0.08679
	Seodaemun	0.01873	0.03343		Buk	0.06283	0.06854
	Mapo	0.02007	0.03088		Nam	0.05355	0.09838
	Yangcheon	0.01968	0.04983		Seo	0.04759	0.08859
	Gangseo	0.09522	0.09712		Dong	0.06205	0.06952
	Guro	0.01919	0.03310		Jung	0.05594	0.06418
	Geomcheon	0.02998	0.05015	Gwangju	Gwang-san	0.07954	0.06564
	Yeongdeung-po	0.02659	0.03612		Buk	0.08944	0.10733
	Dongjak	0.01621	0.03400		Nam	0.05215	0.07091
	Gwanak	0.02173	0.04427		Seo	0.05911	0.08053
	Seocho	0.01565	0.02818		Dong	0.06177	0.06930
	Gangnam	0.08171	0.08227	Incheon	Seo	0.02057	0.04793
	Songpa	0.01657	0.03842		Gye-yang	0.01715	0.05310
	Gangdong	0.01765	0.04028		Bu-pyeong	0.03609	0.06715
Busan	Gijang	0.04015	0.05871		Nam-dong	0.03758	0.06352
	Sasang	0.12597	0.17106		Yeonsu	0.05419	0.05717
	Suyeong	0.03224	0.02954		Michuhol	0.02519	0.06172
	Yeonje	0.04139	0.05876		Dong	0.04077	0.07182
	Geumjeong	0.04436	0.07299		Jung	0.04362	0.05327

	Saha	0.06484	0.08035	Ulsan	Ulju	0.01929	0.02911
	Haeundae	0.06745	0.09218		Buk	0.01189	0.02140
	Buk	0.09471	0.11772		Dong	0.02399	0.04615
	Nam	0.02961	0.04963		Jung	0.02296	0.04116
	Dongnae	0.02733	0.04273		Nam	0.02064	0.04154
	Busanjin	0.03901	0.06047				

* : upper group (10 gus with large index values), : lower group (10 gus with smaller index values)

The measurement of low-income residential segregation through LQ is shown in Table 5. The LQ values of the upper groups are all greater than 1, so it can be seen that low-income people are concentrated in those areas. Busan Dong-gu is located at the top of the upper group, followed by Busan Yeongdo-gu and Daegu Nam-gu, where the concentration of low-income people is also severe. On the other hand, all the cities and gus in the lower group have LQ values lower than 1, indicating a low concentration of low-income residents. Seoul's Seocho-gu has the lowest degree of segregation, followed by Daejeon's Yuseong-gu and Busan's Gangseo-gu. Interestingly, both the upper and lower groups are dominated by gus in Seoul and Busan. We can see that Seoul and Busan are more segregated than other metropolitan cities.

Table 5. LQ of Low-Income Residential Segregation by City

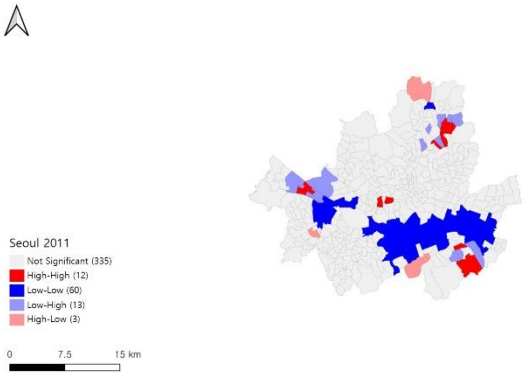
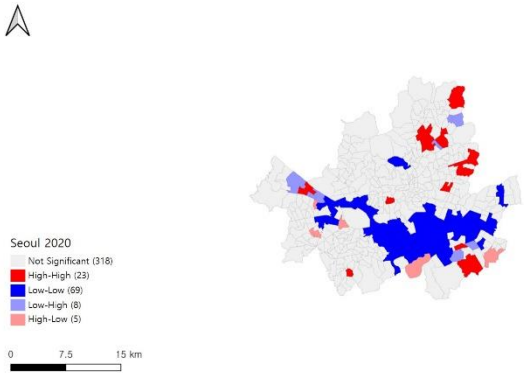
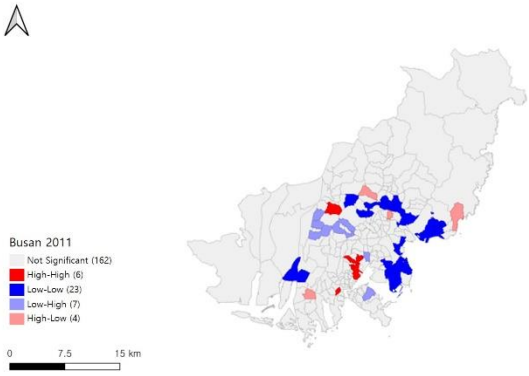
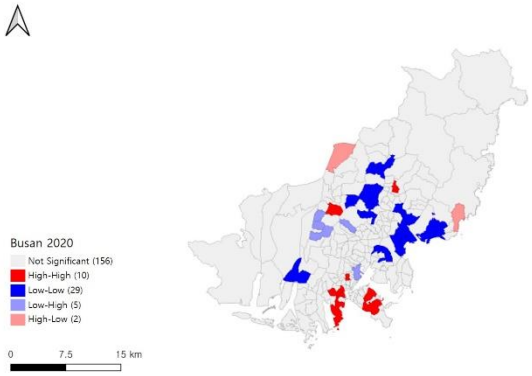
		Year				**Year**	
City	**Gu/Gun**	**2011**	**2020**	**City**	**Gu/Gun**	**2011**	**2020**
Seoul	Jongno	0.85480	0.75831	Busan	Yeongdo	1.46451	1.76436
	Jung	1.28868	1.00727		Dong	1.83397	1.69719
	Yongsan	0.87047	0.85721		Seo	1.52488	1.50058
	Seongdong	0.94077	0.83483		Jung	1.24235	1.45630
	Gwangjin	0.66048	0.85701	Daejeon	Daedeok	1.30974	1.23217
	Dongdae-mun	1.17234	1.08812		Yuseong	0.43261	0.48658
	Jungnang	1.18044	1.59062		Seo	0.68723	0.79551
	Seongbuk	0.94878	0.89108		Jung	1.17679	1.20759
	Gangbuk	1.50585	1.64396		Dong	1.54617	1.49248
	Dobong	0.64587	1.08645	Daegu	Dal-seong	0.95661	0.74048
	Nowon	1.77799	1.50532		Dalseo	0.99786	0.96541
	Eunpyeong	1.21628	1.21289		Suseong	0.88015	0.82178

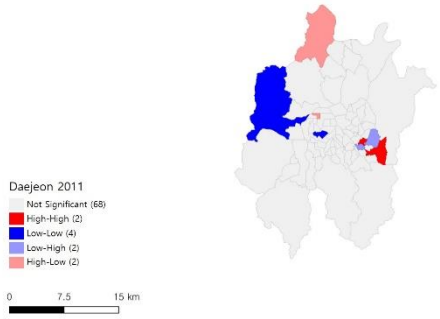
	Seodaemun	0.85995	0.81869		Buk	0.82641	0.73356
	Mapo	0.80417	0.67863		Nam	1.25802	1.69370
	Yangcheon	0.70273	0.90238		Seo	1.05961	1.50786
	Gangseo	1.54043	1.22121		Dong	1.03042	1.01375
	Guro	0.66775	0.71594		Jung	1.25948	1.04380
	Geomcheon	1.43720	1.19352	Gwangju	Gwang-san	0.75366	0.76193
	Yeongdeung-po	0.91127	0.66459		Buk	1.08787	1.15122
	Dongjak	0.70821	0.78240		Nam	1.04425	1.00745
	Gwanak	0.90977	1.03264		Seo	0.88758	0.95237
	Seocho	0.32705	0.40526		Dong	1.32050	1.07267
	Gangnam	0.78554	0.67594	Incheon	Seo	0.61536	0.73503
	Songpa	0.46204	0.60963		Gye-yang	0.57228	1.01120
	Gangdong	0.67978	0.80277		Bu-pyeong	1.09102	1.14578
Busan	Gijang	0.91109	0.94030		Nam-dong	1.03917	1.07526
	Sasang	1.11928	1.12271		Yeonsu	1.05767	0.52791
	Suyeong	0.73691	0.46656		Michuhol	0.88418	1.11621
	Yeonje	0.84721	0.82200		Dong	1.36461	1.16285
	Geumjeong	0.86835	0.92475		Jung	1.20151	0.74571
	Saha	1.04872	1.10094	Ulsan	Ulju	0.89966	0.82127
	Haeundae	0.80903	0.83883		Buk	0.68911	0.68763
	Buk	1.35187	1.22403		Dong	0.78237	1.13856
	Nam	0.63522	0.69771		Jung	1.39681	1.20923
	Dongnae	0.57451	0.69304		Nam	0.82856	0.98015
	Busanjin	0.89727	0.96526				

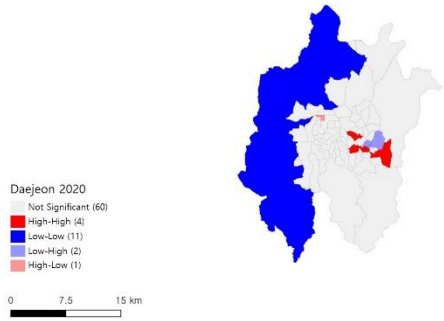
* : upper group (10 gus with large index values), : lower group (10 gus with smaller index values)

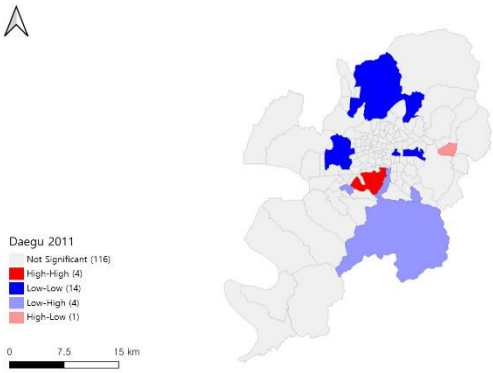
Figure 1 is a map of the LISA analysis of the proportion of the total number of residents in each ward who are recipients of the National Basic Livelihood by ward. In the case of Seoul, the number of wards in the LL, LH, and HL patterns has not changed significantly, but the number of how spot areas in the HH pattern has doubled. This means that the number of clusters with a high proportion of basic living recipients in both the neighbourhood and the surrounding areas has doubled, which means that low-income people are clustered together and residential segregation has intensified. In the case of Busan, the HH pattern increased by about two times, and the LL pattern increased slightly. In Daegu, the number

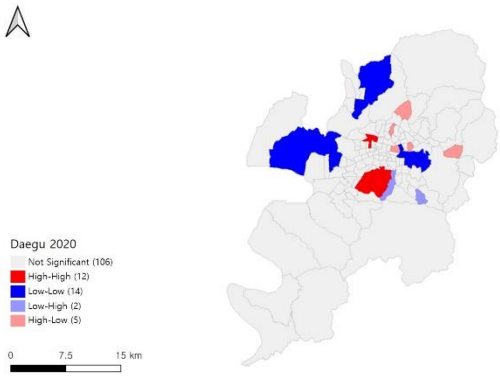
of HH pattern areas tripled, and the HL pattern also increased, in contrast to the low proportion of basic living recipients in the surrounding neighbourhoods. Daejeon and Gwangju have also seen an increase in the number of HH-patterned neighbourhoods, leading to increased segregation of low-income residents, and Ulsan shows similar results over time. However, only Incheon shows a significant decrease in the number of HH pattern neighbourhoods in contrast to the other metropolitan cities, indicating that the segregation of low-income residents is easing.

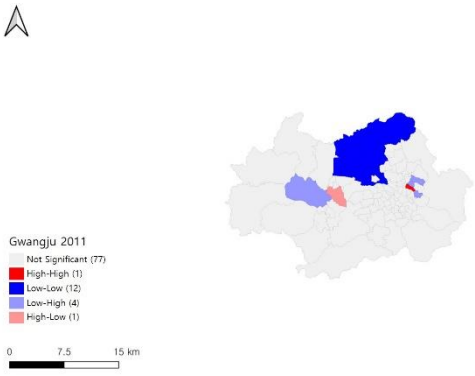
2011	2020
	
	

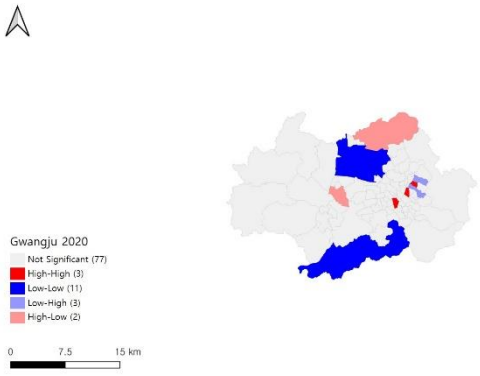

Daejeon 2011
Not Significant (68)
High-High (2)
Low-Low (4)
Low-High (2)
High-Low (2)
0
7.5
15 km


Daejeon 2020
Not Significant (60)
High-High (4)
Low-Low (11)
Low-High (2)
High-Low (1)
0
7.5
15 km


Daegu 2011
Not Significant (116)
High-High (4)
Low-Low (14)
Low-High (4)
High-Low (1)
0
7.5
15 km


Daegu 2020
Not Significant (106)
High-High (12)
Low-Low (14)
Low-High (2)
High-Low (5)
0
7.5
15 km


Gwangju 2011
Not Significant (77)
High-High (1)
Low-Low (12)
Low-High (4)
High-Low (1)
0
7.5
15 km


Gwangju 2020
Not Significant (77)
High-High (3)
Low-Low (11)
Low-High (3)
High-Low (2)
0
7.5
15 km

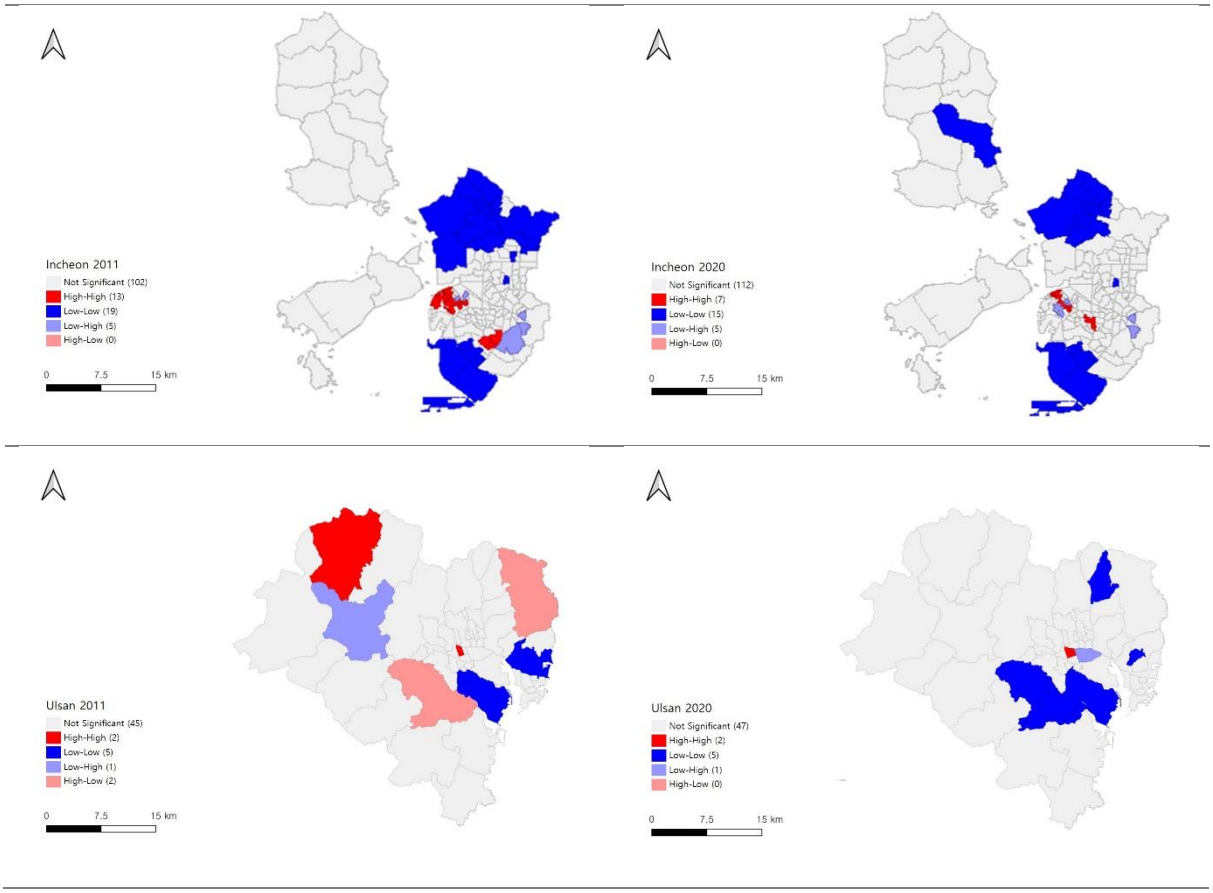


Figure 1. LISA analysis of seven large cities

4.2. Impact of Redevelopment Policies on Low-Income Residential Segregation

For PSM, treatment and control groups were determined by whether or not redevelopment was implemented. The treatment group is the group where redevelopment was implemented, and the basic statistics of the analysed data are shown in Table 6. Of the 710 gus, 181 gus are treatment groups and 529 gus are control groups. The mean of the residential segregation index is about 0.03 lower in the treatment group than in the control group, and the mean of the number of rental and regular apartment units is lower in the control group. Average sales and rental prices are 1.5 times higher in the treatment group. However, the average green space per person in the treatment group is less than half of the average in the control group.

Table 6. Basic Statistics for Control and Treatment Groups

Variables	Control group	Treatment group

	Observation	Mean	Std. Dev.	Observation	Mean	Std. Dev.
Average residential segregation index	529	0.434198	0.110682	181	0.403091	0.099859
Rental apartments	529	149.7278	404.9609	181	180.9613	533.4318
General apartment	529	376.1607	939.4394	181	408.2928	816.6966
Average selling price	529	309268.5	202479.5	181	458088.6	319928.9
Average rental price	529	2558.18	1218.815	181	3498.264	1662.985
Green space per person	529	190.5873	358.7899	181	88.34387	190.707

The average changes in the variables of the control and treatment groups before and after the ultra-proximity neighbourhood matching used in the study are presented in Table 7 as a result of the PSM before estimating the average treatment effect. The propensity score was estimated using the number of rental apartment units, number of general apartment units, average rental price, average sales price, and per person green space as covariates. The PSM resulted in improved homogeneity for all variables. Before matching, there was a statistically significant difference between the mean values of the treatment and control groups, but after matching, all variables were no longer significantly different. This suggests that the attributes of the two groups have become more similar.

Table 7. Changes in Homogeneity of Control and Treatment Groups

Variables	**Un/ Matched**	**Mean**		**% bias**	**% reduct lbiasl**	**T-test**		**V(T) /V(C)**
		Control group	**Treatment group**			**t**	**p>ltl**	
Rental apartment	U	180.96	149.73	6.6		0.82	0.411	1.74*
	M	180.96	202.06	-4.5	32.4	-0.37	0.715	0.89
General apartment	U	408.29	376.16	3.7		0.41	0.682	0.76
	M	408.29	512.94	-11.9	-225.7	-0.98	0.328	0.48*
Average rental price	U	3498.3	2558.2	64.5		8.11	0.000	1.86*
	M	3498.3	3388.1	7.6	88.3	0.65	0.516	1.13
Average sales price	U	460000	310000	55.6		7.26	0.000	2.50*
	M	460000	410000	17.2	69.1	1.59	0.113	2.07*
Green per person	U	88.344	190.59	-35.6		-3.66	0.000	0.28*
	M	88.344	85.046	1.1	96.8	0.17	0.867	1.08*

To examine the effect of redevelopment on the segregation of low-income neighbourhoods, we estimated the average treatment effect (ATT) based on the matching results, and the results are shown in Table 8. The average treatment effect analysis shows an average difference of about 0.0289 between the treatment group with redevelopment and the control group without redevelopment. Therefore, assuming that all conditions are the same, redevelopment of an area without redevelopment reduces the degree of low-income residential segregation by 0.0289.

Table 8. The Effect of Redevelopment on the Low-Income Residential Segregation

Status	Treated	Controls	Difference	S.E.	T-stat
Unmatched	0.403090454	0.434197681	-0.031107227	0.00930296	-3.34
ATT	0.403090454	0.431952413	-0.028861958	0.013362742	-2.16
ATU	0.434197681	0.418813721	-0.01538396		
ATE			-0.018819901		

5. Discussion

South Korea has undergone significant urban restructuring over the past two decades. The early 2000s often saw large-scale demolition of low-rise residential neighbourhoods and redevelopment into high-rise apartments, which generated negative externalities such as the destruction of communities, displacement of existing residents, and loss of affordable housing (Weber et. al., 2006). Redevelopment initiated with the aim of improving low-income neighbourhoods has also had the effect of increasing the segregation of poor neighbourhoods by displacing the poor indigenous people who lived there (Tach and Emory, 2017). However, if the degree of low-income residential segregation is measured by the change in the dissimilarity index value, the results of this study show that the overall dissimilarity index value decreased from 2011 to 2020, suggesting that residential segregation is reduced. These results are likely influenced by a new approach to housing redevelopment called the New Town Exit Strategy, which began in 2012. Instead of demolition and redevelopment, the New Town Exit Strategy pursues a programme of reconstruction and small-scale on-site demolition within older low-rise residential areas (Yang, 2020). This strategy makes it more difficult to refurbish existing neighbourhoods with high-density high-rise developments, resulting in a diversity of residential spaces in urban centres that had become homogenous. The result is that Seoul's boroughs have a significant number of low-income subgroups in the segregation index. Seoul and Busan have higher values than other metropolitan areas, which is consistent with previous research that high financial independence, high proportion of youth population, and high population density increase economic disparity (Park, 2019).

A PSM analysis of the net effect of redevelopment policies shows that neighbourhoods with redevelopment have a lower low-income residential segregation index than neighbourhoods without redevelopment. The conclusion that redevelopment reduces low-income residential segregation can be explained by the phenomenon of gentrification caused by redevelopment. Over the past 40 years, urban redevelopment in South Korea has aimed to maximise housing supply and improve the physical environment, and redevelopment programs have focused on maximising landlord profits rather than improving the residential welfare of low-income residents or revitalising communities. As a result, low-income residents are pushed out of their neighbourhoods and move to the periphery, where they are replaced by middle- and high-income residents (Ha, 2015). Therefore, residential segregation is explained by the dispersal of low-income natives who used to live together due to redevelopment.

The significance of this study is that it analyses the micro-level spatial structure of poverty, which is at the centre of structural inequality, and identifies the net effect of redevelopment projects on residential segregation. On the other hand, there are also limitations. First, although the PSM method was used to reduce selection bias, it is impossible to achieve complete randomisation in social science research. It is not possible to assume that the control group was matched equally and similarly on all other factors. Second, the manipulated variable for the low-income group, the National Basic Livelihood Recipients, does not accurately represent the low-income group as a whole. While it is clear that the group is similar in meaning to the low-income group, it does not include everyone below the absolute or relative poverty line. Finally, there are no clear conclusions to be drawn from the various measures of residential segregation. Continued efforts are needed to develop a single indicator that encompasses all five dimensions of residential segregation.

6. Conclusion

Development to address the housing shortage caused by rapid urbanisation has led to an increase in the value of real estate and other assets, and a rise in income inequality between those who have accumulated wealth and those who have not. Against this context, this study analyses changes in the residential segregation of low-income households in metropolitan areas where there have been many changes in residence. We analysed residential segregation from a macro perspective with the dissimilarity index and isolation index, and from a micro perspective with the LQ and LISA analysis. From a global perspective, the residential segregation of low-income residents has generally eased, and in terms of exposure, the segregation of low-income residents is highest in Busan and lowest in Seoul. Low-income residents clustered in urban centres and became less dense towards the outer periphery. PSM analyses controlling for apartment price and residential

environment showed that redevelopment areas were less segregated than non-redevelopment areas, with implications for urban development policy.

As many high-income earners move to the outer periphery of the city to escape the complexity of urban life and enjoy a life similar to Howard's countryside, low-income residents are concentrated in the centre of the city. In addition, urban development is now slowing down, with many regulations in place to prevent sprawl and allow for meaningful redevelopment. Large cities have extended the timeframe for redevelopment consideration to 20-40 years. In this reality, research on urban renewal and low-income residential segregation can be an important reference for the formulation and implementation of urban planning and housing policies. It can be used in the formulation of low-income housing policies because it addresses changes in the residential segregation of the poor, which is not often addressed due to the lack of alternative indicators, and the conclusion that redevelopment has a positive impact on low-income residential segregation emphasises the need to consult with those responsible for low-income housing policies in the selection of future redevelopment areas for greater effectiveness.

Acknowledgement. This work was supported by Korea Environment Industry & Technology Institute (KEITI) through "Climate Change R&D Project for New Climate Regime", funded by Korea Ministry of Environment (MOE)(2022003570002).

References

Alba, R. and Logan, J. (1991) Variations on two themes: Racial and ethnic patterns in the attainment of suburban residence. *Demography*, 28 (3), pp. 431-453.

Anselin, L. (1995) Local indicators of spatial association - LISA. *Geographical Analysis*, 27 (2), pp. 93-115.

Briggs, X. (ed.) (2005) *The geography of opportunity: Race and housing choice in metropolitan America*. Washington, D.C.: Brookings Institution Press.

Brooks-Gunn, J., Duncan, G., Klebanov, P. and Sealand, N. (1993) Do neighborhoods influence child and adolescent development? *American Journal of Sociology*, 99 (2), pp. 353–395.

Brown, L. and Chung, S. Y. (2006) Spatial segregation, segregation indices and the geographic perspective. *Population Space and Place*, 12 (2), pp. 125-143

Burgess, E. (2008). *The growth of the city: An introduction to a research project. In: et al. Urban Ecology.* Boston: Springer.

Burt, J., G. Barber, and D. Rigby (2009) *Elementary statistics for geographers, Third Edition*. New York: The Guilford Press.

Charles, C. (2003) The dynamics of racial residential segregation. *Annual Review of Sociology*,

29 (1), pp. 167-207.
Chung, S. and Brown, L. (2007) Racial/ethnic residential sorting in spatial context: testing the explanatory frameworks. *Urban Geography*, 28 (4), pp. 312-339
Duncan, D. and Duncan, B. (1955) A methodological analysis of segregation indexes. *American Sociological Review*, 20 (2), pp. 210-217.
Fong, E. and Shibuya, K. (2000) The spatial separation of the poor in Canadian cities. *Demography*, 37 (4), pp. 449-459.
Graif, C., Lungeanu, A. and Yetter, A. (2017) Neighborhood isolation in Chicago: Violent crime effects on structural isolation and homophily in inter-neighborhood commuting networks. *Social Networks*, 51, pp. 40–59.
Gu, Y. and Wang, Z. (2022) Income inequality and global political polarization: The economic origin of political polarization in the world. *Journal of Chinese Political Science*, 27 (6), pp. 375–398.
Guo, S. and Fraser, M. (2015) *Propensity score analysis: Statistical methods and application, First Edition*. Los Angeles, London, New Delhi, Singapore, Washington D.C.: Sage Publications.
Ha, S. (2007) Housing regeneration and building sustainable low-income communities in Korea. *Habitat International*, 31 (1), pp. 116–129.
Ha, S. (2010) Housing crises and policy transformations in South Korea. *European Journal of Housing Policy*, 10 (3), pp. 255–272.
Ha, S. (2015) *The endogenous dynamics of urban renewal and a gentrification process in Seoul. In: Lees L, Shin HB and Lopez-Morales E (eds) Global Gentrifications: Uneven Development and Displacement*. London: Policy Press, pp. 464–477.
Harvey, D. (1973) *Social justice and the city*. Georgia: University of Georgia Press
Hill, E. and Wolman, H. (1997) City-suburban income disparities and metropolitan area employment: Can tightening labor markets reduce the gaps? *Urban Affairs Review*, 32 (4), pp. 558–582.
Jargowsky, P. (1996) Take the money and run: Economic segregation in U.S. metropolitan areas. *American Sociological Review*, 61 (6), pp.984-998.
Jun, H. (2020) Spillover effects in neighborhood housing value change: A spatial analysis. *Housing Studies*, 37 (8), pp. 1–28.
Koo, H. (2019) Rising inequality and shifting class boundaries in South Korea in the neo-liberal era. *Journal of Contemporary Asia*, 51 (1), pp. 1–19.
Lee, J and Kim, G. (2020) A study on preference for shared housing as an alternative to college student housing welfare: Focusing on the Seoul metropolitan area. *Journal of Korea Real Estate Analysis Association*, 26 (3), pp. 81-97.
Lee, S. (2017) Cities for profit: Profit-driven gentrification in Seoul, South Korea. *Urban Studies*, 55 (12), pp. 2603–2617.
Lobao, L., Hooks, G. and Tickamyer, A. (2008) Poverty and inequality across space: Sociological reflections on the missing-middle subnational scale. *Cambridge Journal of*

Regions, Economy and Society, 1 (1), pp. 89–113
Malmberg, B., Andersson, E. and Östh, J. (2013) Segregation and urban unrest in Sweden. *Urban Geography*, 34 (7), pp. 1031–1046.
Massey, D. (1985) Ethnic residential segregation: A theoretical synthesis and empirical review. *Sociology and Social Research*, 69, pp. 315-350.
Massey, D. and Eggers, M. (1990) The ecology of inequality: Minorities and the concentration of poverty, 1970-1980. *American Journal of Sociology*, 95 (5), pp. 1153-1188.
Massey, D. and Denton, N. (1988) The dimensions of residential segregation. *Social Forces*, 67 (2), pp. 281-315.
Massey, D. and Denton, N. (1998) *American apartheid: Segregation and the making of the underclass*. Massachusetts: Harvard University Press.
Musterd, S. (2016) Social and ethnic segregation in Europe: Levels, causes and effects. *Journal of Urban Affairs*, 27 (3), pp. 331–348.
Musterd, S., Marcińczak, S., Van Ham, M. and Tammaru, T. (2017) Socioeconomic segregation in European capital cities. Increasing separation between poor and rich. *Urban Geography*, 38 (7), pp. 1062–1083.
Owens, A. (2018) Income segregation between school districts and inequality in students' achievement. *Sociology of Education*, 91 (1), pp. 1-27.
Park, C. and Han, G. (2021) The financialization of non-financial firms: The case of South Korea, 1997–2015. *Current Sociology*, 70 (7), pp. 1085–1105.
Park, R., Burgess, E. and McKenzie, R. (1984) *The city*. Chicago: University of Chicago Press.
Park, Y. (2019) Determinants of economic segregation and spatial distribution of poverty. *Journal of Distribution Science*, 17 (3), pp. 21-30.
Piketty, T. (2014) *Capital in the twenty-first century*. Massachusetts: Harvard University Press.
Ploegmakers, H. and Beckers, P. (2014) Evaluating urban regeneration: An assessment of the effectiveness of physical regeneration initiatives on run-down industrial sites in the Netherlands. *Urban Studies*, 52 (12), pp. 2151–2169.
Reardon, S. and Bischoff, K. (2011) Income inequality and income segregation. *American Journal of Sociology*, 116 (4), pp. 1092–1153.
Ronald, R. and Kyung, S. (2013) Housing system transformations in Japan and South Korea: Divergent responses to neo-liberal forces. *Journal of Contemporary Asia*, 43 (3), pp. 452-474.
Rosenbaum, P. and Rubin, D. (1983) The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70 (1), pp. 41-55.
Sager, L. (2011) Residential segregation and socioeconomic neighbourhood sorting: Evidence at the micro-neighbourhood level for migrant groups in Germany. *Urban Studies*, 49 (12), pp. 2617–2632.
Sainani, K. (2012) Propensity scores: Uses and limitations. *Physical Medicine and Rehabilitation*, 4 (9), pp. 693–697.
Sampson, R. (2008) Moving to inequality: Neighborhood effects and experiments meet social

structure. *American Journal of Sociology*, 114 (11), pp. 189-231.
Sampson, R. and Wilson, W. (1995) *Toward a theory of race, crime, and urban inequality. In J. Hagan and R. D. Peterson (eds.), Crime and inequality*, pp. 37-54. California: Stanford University Press.
Sampson, R., Raudenbush, S. and Earls, F. (1997) Neighborhoods and violent crime: A multilevel study of collective efficacy. *Science*, 277 (5328), pp. 918-924.
Sampson, Robert, J., Jeffrey, D., Morenoff and Gannon-Rowley, T. (2002) Assessing 'neighborhood effects': Social processes and new directions in research. *Annual Review of Sociology*, 14 (28), pp. 443–478.
Seo, J. (2016) Housing policy and urban sustainable development: Evaluating the process of high-rise apartment development in Korea. *Urban Policy and Research*, 34 (4), pp. 330–342.
Shalizi, C. and Thomas, A. (2011) Homophily and contagion are generically confounded in observational social network studies. *Sociol Methods Res*, 40 (2), pp. 211-239.
Talò, C., Mannarini, T. and Rochira, A. (2013) Sense of community and community participation: A meta-analytic review. *Social Indicators Research*, 117 (1), pp. 1–28.
Thomas, J. and Hwang, H. (2003) Social equity in redevelopment and housing. *Journal of Planning Education and Research*, 23 (1), pp. 8–23.
Tiebout, C (1956) A pure theory of local expenditures. *Journal of Political Economy*, 64 (5), pp. 416-424.
Weber, R., Doussard, M., Bhatta, S. and McGrath, D. (2006) Tearing the city down: Understanding demolition activity in gentrifying neighborhoods. *Journal of Urban Affairs*, 28 (1), pp. 19–41.
White, M. J. (1983) The measurement of spatial segregation. *American Journal of Sociology*, 88 (5), pp. 1008-1018.
Wilson, (1987) *The truly disadvantaged: The inner-city, the underclass, and public policy.* Chicago: University of Chicago Press.
Wirth, L. (1928) *The ghetto*. Chicago: University of Chicago Press.
Wong, D. (2003) Implementing spatial segregation measures in GIS. *Computers, Environment and Urban Systems*, 27 (1), pp. 53-70.
Yang, H. (2020) Spatio-temporal changes of housing features in response to urban renewal initiatives: The case of Seoul. *Sustainability*, 12 (19), pp. 7918.

DOES SOCIAL INFRASTRUCTURE REDUCE SOCIAL ISOLATION FOR URBANITES? : USING A MULTILEVEL LOGISTIC MODEL (1088)

Yeo-Kyeong Kim[1], Donghyun Kim[1*]

[1] Department of Urban Planning and Engineering, Pusan National University, Busan, Republic of Korea; *donghyun-kim@pusan.ac.kr

Abstract. Social isolation is a global problem due to its negative effects, and various efforts are being made to address isolation. As building social infrastructure is important to prevent isolation, this study aims to understand the impact of urban infrastructure on social isolation using social surveys and statistical data from South Korea. A multilevel logistic model was used to identify the characteristics of infrastructure for solving the problem of social isolation by adding regional-level to individual-level. The analysis showed that at the individual level, gender, age, marital status, and household income were significant, while at the regional level, the ratio of single-person households, access to traditional markets, and capital status area were significant. The findings suggest that social infrastructure can have an impact on the problem of social isolation, so it's important to plan urban spaces in ways that can help alleviate social isolation when planning infrastructure.

Keywords: Social Isolation, Multilevel Logistic Model, Social Infrastructure.

1. Introduction

As the number of people experiencing social isolation around the world increases, so do the efforts of governments around the world to respond. Unlike in the past, social isolation has been recognised as an important issue requiring policy intervention, with the UK appointing a Minister for Loneliness in 2018 and Japan also appointing a Minister for Loneliness in 2021 to initiate efforts to address social isolation. Given the risk of social isolation leading to poor health(Chatters et al., 2018) and loneliness deaths, it is important to identify risks and explore what environments can be created to address their risk.

The Ministry of Government Legislation, Republic of Korea, enacted the Act on the Prevention and Management of Lonely Deaths on 1 April 2021. The Act establishes an institutional basis for systematic prevention and management of lonely deaths at the national level and requires the establishment and implementation of a basic plan for the prevention of lonely deaths every five years. The Act also includes matters related to the creation of a social environment. These policies are important in that they recognise the

influence of the social environment on social isolation, rather than just individual factors, although their practical effects cannot yet be seen at this stage. According to Carstensen et al. (2022), organising spaces for urbanites with different functions and activities can help alleviate social and physical isolation.

Social isolation has been studied as an important research issue in many studies. However, most of the studies have been aimed at identifying individual characteristics associated with social isolation and have focused on specific age, gender, and class groups as the unit of analysis. To overcome the limitation of only considering individual characteristics and not environmental influences on social isolation, some studies have considered the influence of the urban environment on the formation of social relationships. However, there is a limitation that the impact of neighbourhood is not considered in a multi-level structure with individual factors.

In order to overcome the limitations of the existing unit of analysis, this study aims to combine individual-level and regional-level factors affecting social isolation in a multi-layered structure, and to determine whether and to what extent regional factors affect social isolation. This study uses a sample of 89,768 respondents to the 2020 Social Survey of South Korea, considering both individual factors that influence social isolation as in previous studies, as well as regional factors in the 59 municipalities where they live. Zavaleta et al. (2017) described social isolation as a state of being deprived of social connectedness, and according to Mouratidis (2021), social relationships are affected by how urban environments are planned. So social isolation is connected to urban planning.

First, this study examines the conceptual definition of social isolation and the theoretical background related to personal and regional characteristics. Second, based on the data, a multi-level logistic model is used to analyse social isolation by considering personal and regional factors. Third, the results of the analysis are used to identify personal and regional characteristics that influence social isolation. Fourth, the reasons for the significant factors in the analysis will be identified, and the final part will discuss the implications of the analysis and the limitations of the study.

2. Literature Review

2.1. Social Isolation

Social isolation is a concept commonly associated with loneliness and refers to a state in which an individual has minimal contact with others or participates less in community life (Grenade and Boldy, 2008), is deprived of social connectedness (Zavaleta et al., 2017), and lacks personal relationships (Eckhard, 2018). A similar concept to social isolation is social exclusion, which, according to Bäckman and Nilsson (2011) is a situation or process in which individuals or groups are unable to participate fully in society due to factors such as

unemployment, poverty, or poor health. The difference with social isolation is that unlike social exclusion, which is concerned with emotional isolation from family and friends by examining the entire network of social relationships, social exclusion focuses on isolation from social activities, with areas such as financial poverty and labour market exclusion being the most central indicators. Previous research suggests that social networks can influence social isolation. Consequently, the social infrastructure of a city is linked to social isolation by whether or not it allows for the formation of social networks.

Several studies have looked at how social isolation can be measured and what factors are associated with social isolation. Chatters et al. (2018) examined the frequency of contact with family and friends to measure objective social isolation, with the question "How often do you see, write or talk on the phone with family or relatives who do not live with you? Would you say almost every day, at least once a week, a few times a month, at least once a month, a few times a year, hardly ever or never?" being asked of family and friends to measure social isolation. There have been studies that have linked social isolation to loneliness and confirmed social isolation by measuring this loneliness. Gyasi et al. (2021) suggests that social isolation was measured by responding to the questions "Do you feel left out," "Do you feel isolated," and "Do you feel a lack of friendships?" with responses such as sometimes or often. In this way, social isolation can be measured in two ways: objectively ascertaining whether a person is isolated from others, based on measures such as contact, and assessing whether the person perceives themselves as isolated.

There are a number of personal characteristics that influence social isolation. Firstly, age has been shown to be significant, with older people being particularly vulnerable, with their risk of social isolation increasing as their opportunities to add new social relationships decrease (Abbott et al., 2015). However, a recent study found that even younger people reported twice as many lonely and isolated days, even with larger social networks(Child and Lawton, 2019), confirming that social isolation is a problem that can be experienced at any age. Next, gender and income were significant. In general, men were found to be more vulnerable to social isolation due to having fewer social resources and limited interaction with others compared to women, while higher income was associated with a lower likelihood of isolation from family (Chatters et al., 2018)

Among cities, metropolitan areas are more vulnerable to social isolation. Warner and Andrews (2019) found that as urban high-rise development increases and more parents and children live in urban centres, they experience physical and social barriers that prevent them from forming deeper social connections with their neighbours. Warner and Andrews (2019) interviewed residents and found that the high density of high-rise living makes it difficult to visit acquaintances and maintain existing social relationships due to the increased cost of parking, and that spaces such as outdoor common areas and indoor walkways are not conducive to forming new relationships. Chile et al. (2014) also found

that in an interview study of social isolation among inner-city high-rise residents in Auckland, New Zealand, 43% of respondents reported feeling isolated in the city centre. In this respect, large cities with dense high-rise residential areas are more vulnerable to social isolation. Therefore, it is necessary to consider the environment of large cities as a factor in the analysis of social isolation.

2.2. Social Infrastructure

According to Popova (2017), the concept of infrastructure is broadly divided into social infrastructure and economic and production infrastructure, and social infrastructure consists of healthcare, education, culture, tourism, etc. Grum and Kobal Grum (2020) refer to social infrastructure as the things that play an important role in people's daily lives, which are important elements that satisfy the needs of individuals and society, contribute to non-social interactions, and contribute to the overall development of individuals and society. These social infrastructures relate to various services, facilities and public spaces for the community, relationships and networks between community members, and create opportunities for social integration and participation (Vaznoniene and Kiaušiene, 2018). Recently, Smith et al. (2020) suggested that as COVID-19 has required physical distancing, which has led to increased social isolation, remote services, and programmes provide an infrastructure to prevent social isolation.

Social infrastructure that supports social interaction also has an impact on reducing social isolation. Ward Thompson et al. (2016) found that parks, open spaces, and so on provide support for neighbourly contact and maintaining connections between communities, which in turn mitigates social isolation, and found a link between the percentage of green space and reduced levels of stress. In other words, social infrastructure can contribute to the formation of social networks, which can mitigate social isolation and have a positive impact on mental health, such as reduced stress. Johansson-Pajala et al. (2022) stated that information and communication technologies (ICTs) are a good means of preventing and addressing social isolation and loneliness among older people, as they can grow social networks, which need to be properly supported. ICT is studied as a new type of infrastructure that contributes to solving the problem of social isolation in modern society. Jiménez et al. (2021) also found that older adults who receive face-to-face ICT training experience reduced social isolation and loneliness, which increases their overall well-being, so considerations should be included to facilitate the implementation of ICT programmes in community settings.

With the increasing awareness of the importance of social infrastructure, South Korea is also trying to introduce infrastructure with the goal of "improving livelihood". Currently, infrastructure is well-distributed in South Korea, but there is a shortage of cultural, sports, and leisure facilities, as well as minimising the distance between facilities and residences (Kim et al., 2020). In South Korea, infrastructure includes traditional markets, which have

long been at the centre of the living environment, performing various socioeconomic functions and influencing small communities (Park and Koo, 2014; Gyasi et al., 2021). Based on previous studies, it can be concluded that cultural and sports centres, leisure facilities, and traditional markets are important social infrastructure in South Korea.

3. Materials and Methods

3.1. Data and Variables

The social survey used in this study is a survey that identifies the social concerns and subjective perceptions of people related to quality of life and is used as a basis for policy formulation and research. The survey items are selected by each city for various indicators such as health, safety, environment, social integration, family, and labour. However, in the case of the Seoul Metropolitan Government, a similar survey is conducted under the name of the Urban Policy Indicators Survey (Seoul Survey), so it was used in the analysis. The scope of the study is 59 municipalities in four cities, Seoul, Busan, Daegu, and Incheon, which are representative metropolitan areas in South Korea and are at risk of social isolation as suggested by previous studies.

Table 1. Data and Variables

	Variables	Definition	Source
Dependent variable	Social Isolation	Whether you have someone to help you in times of need? 1= No, 0= Yes	Social Survey (2020, MDIS) for each area
Independent variables (Individual-level variables)	Sex	1=Male, 0=Female	
	Age	2=20s, 3=30s, 4=40s, 5=50s, 6=60s and above	
	Education	1=Middle school or less	
		2=High school or less	
		3=University or higher	
	Marital status	1=Non married, 0=Married	
	Economic Activity	1=No, 0=Yes	
	Average	1=Less than 1 million won	

	monthly household income	2=Less than 1 million to 2 million won	
		3=Less than 2 million to 3 million won	
		4=Less than 3 million to 4 million won	
		5=Less than 4 million to 5 million won	
		6=More than 5 million won	
Independent variables (Regional-level variables)	The ratio of single-person households	$\frac{Number\ of\ single-person\ household}{Total\ households}$	Census (2020,KOSIS)
	The number of Parks (per 10,000 people)	$\frac{Number\ of\ parks \times 10{,}000}{Total\ population}$	Urban Planning Status (2020, KOSIS)
	The number of Culture and sports Facilities (per 10,000 people)	$\frac{Number\ of\ culspo\ facilities \times 10{,}000}{Total\ population}$	
	The number of Welfare Facilities (per 10,000 people,)	$\frac{Number\ of\ welfare\ facilities \times 10{,}00}{Total\ population}$	
	Access to traditional markets(min)	Travel time to traditional markets (average of car, public transportation, and walking)	Average access time by sales facility type (2020, KOSIS)
	The number of worship places (per 10,000 people)	$\frac{Number\ of\ worship\ places \times 10{,}000}{Total\ population}$	Building Energy Usage (2020, KOSIS)
	Capital area status	1=No 0=Yes	

	The ratio of multifamily units	Total multifamily units divided by Total housing units	Housing Census (2020,KOSIS)

The data and variables in Table 1 are organised as follows. This study focused on adults aged 20 and above who responded to a social survey. They were divided into five age groups: 20s, 30s, 40s, 50s, and over 60s; women and men; and three educational levels: middle school or less, high school or less, and university or more. The three educational levels were divided based on including graduated, attended, completed, dropped out, took a leave of absence, graduate school. Economic activity was divided into those who are economically active and those who are not. In the case of the Seoul Metropolitan Government, only the occupation category was available, so we classified "unemployed," "student," and "housewife" as non-economic activity. Housewives' domestic work can be considered labour, but it is not an activity that triggers interaction with others, which is the core of social isolation research, so it was classified as non-economic activity.

The data for regional influences come from the Korean Statistical Information Service. The cultural and sports facilities variable is the sum of the number of cultural and sports facilities, converted to the number of facilities per 10,000 inhabitants for each, and 0 for no facilities. The parks and welfare facilities variable was also created by dividing the number of facilities in each municipality by the population and turning the number of facilities into facilities per 10,000 people. However, in the case of traditional markets, the data that separates the area of each city and district was not available, so the time taken to access traditional markets was used. For the ratio of multifamily units, the number of multifamily houses was divided by the total number of houses, and for the ratio of single-person households, the total number of single-person households was divided by the total number of households. Seoul and Incheon were classified as capital cities, while Busan and Daegu were classified as non-capital cities.

3.2. Multilevel Logistic Model

As a measure of the dependent variable, social isolation, this study uses the response to the question "Is there anyone you can turn to for help in times of need?" from the social survey. In this question, the response is presented as a binary variable between 'yes' and 'no', with 'yes' indicating that the respondent is not socially isolated. The independent variables are divided into individual variables and regional variables. First of all, studies on individual variables have used variables such as age, gender, residence, marital status, education level, employment status, and monthly income level as covariates that may affect social isolation (Gyasi et al., 2021) and similarly, age, gender, race/ethnicity, family income, education, marital status, and household status have been used as variables for socioeconomic (Merlo et al., 2006). Based on these studies, this research uses age, gender,

household income, education, marital status, and economic activity variables that can be obtained from social survey data. For the regional variables, this study used the social infrastructure variables time to reach a traditional market and the number of parks, culture-sports, welfare facilities, and the places of worship per 10,000 people in the municipality. Also, study used the ratio of multifamily units, single-person households and the capital city status.

The model used in the analysis is the Multilevel Logistic Model. The goal of logistic regression is to predict the probability of a phenomenon occurring for an individual based on the value of a certain variable, and the dependent variable is binary. The multilevel logistic model considers the statistical dependence of the individual's probability on the region of residence (Merlo et al., 2006). Multilevel Logistic Model is appropriate because the dependent variable in this study has a binary nature of 1 and 0, and the analysis aims to identify the characteristics of the social infrastructure in the region of residence that affect social isolation in addition to individual characteristics. The equation used in the study is as follows (Merlo et al., 2006).

Equation 1 : $log(p_i) = log\ odds = log\left(\frac{p_i}{1-p_i}\right) = M + E_A$

Equation 2 : $\mathrm{Logit}(p_i) = M + \beta_1 \mathrm{Sex}_i + \beta_2 \mathrm{Age}_i + \beta_3 \mathrm{Education}_i + \beta_4 \mathrm{Marriage}_i + \beta_5 \mathrm{Economic}_i + \beta_6 \mathrm{Income}_i + E_A$

Equation 3 : $\mathrm{Logit}(p_i) = M + \beta_1 \mathrm{Sex}_i + \beta_2 \mathrm{Age}_i + \beta_3 \mathrm{Education}_i + \beta_4 \mathrm{Marriage}_i + \beta_5 \mathrm{Economic}_i + \beta_6 \mathrm{Income}_i + \beta_7 \mathrm{Singleperson}_A + \beta_8 \mathrm{Religion}_A + \beta_9 \mathrm{Park}_A + \beta_{10} \mathrm{CulSpo}_A + \beta_{11} \mathrm{Welfare}_A + \beta_{12} \mathrm{Market}_A + \beta_{13} \mathrm{Apart}_A + \beta_{14} \mathrm{Capital}_A + E_A$

p_i: probability that a phenomenon occurs for the individual i

M : overall mean probability expressed on the logistic scale

E_A: The area level residual

i : individual level - individual

A : regional level - Municipality

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$: regression coefficients for the individual covariates

$\beta_7, \beta_8, \beta_9, \beta_{10}, \beta_{11}, \beta_{12}, \beta_{13}, \beta_{14}$: regression coefficients for the area level variable

The Stata 16 programme was used for analyses. The analysis sequence was as follows: first, the basic statistical analysis of each variable was performed to identify the

characteristics of the variables, and the Variance Inflation Factor (VIF) value was derived to check for multi-collinearity. Next, the intraclass correlation coefficient (ICC) was calculated to determine the explanatory power of the dependent variable at the regional level. After conducting the multilevel logistic model analysis, the ICC value was re-derived to determine the explanatory power of the regional-level variables, and finally, the marginal effects were obtained.

4. Findings

The VIF values for the variables were found to be a maximum of 3.48 for all variables, so there is no multicollinearity problem as values are not greater than 10.

Table 9. Basic Statistics

	Variable	Obs	Mean	Std.Dev.	Min	Max
Dependent variable	Social Isolation	89,768	0.176	0.381	0	1
Independent variables (Individual-level variables)	Sex	89,768	0.488	0.500	0	1
	Age	89,768	4.482	1.352	2	6
	Education	89,768	2.376	0.751	1	3
	Marital status (Marriage)	89,768	0.331	0.471	0	1
	Economic Activity (Economic)	89,768	0.376	0.484	0	1
	Average monthly household income (Income)	89,768	4.026	1.753	1	6
Independent variables (Regional-level variables)	The ratio of single-person households (singleperson)	59	0.327	0.058	0.234	0.497
	Park (per 10,000 people)	59	2.375	2.040	0	13.033
	Culture and sports Facilities (per 10,000 people) (CulSpo)	59	0.121	0.147	0	1.195
	Welfare Facilities (per 10,000 people)	59	0.246	0.158	0	0.817

	Access to traditional markets (Market)	59	9.044	12.248	4.005	120
	Places of worship (per 10,000 people) (Religion)	59	4.145	2.727	1.225	17.994
	Capital area status	59	0.441	0.497	0	1
	The ratio of multifamily units (Apart)	59	0.835	0.124	0.246	0.970

The basic statistical analysis of the research data is shown in Table 2. The total number of respondents was 89,768, and their personal characteristics showed that women are 51.2%, and people aged 60 and over are 32.5%. In education, 54.1 % have a university degree or higher, and married people were 66.9%. The economic activity rate is 62.4% and the average monthly household income of more than 5 million won was 31.3%. In terms of regional characteristics, the ratio of single-person households was about 0.3, and parks were about 2.3 per 10,000 people, while cultural-sports and welfare facilities were 0.12 and 0.24 per 10,000 people, respectively. There were about 4 worship places per 10,000 people. In addition, there are 44.1 % of people living in non-capital areas, and on average, the multifamily ratio is 0.835.

Table 310. Logit analysis results at the individual level

Individual	Variable	Coef.	Std. Err.	z	P>|z|	[95% CI]	
Independent variables	Sex	0.180	0.018	9.77	0.000	0.144	0.216
	Age	0.051	0.009	5.91	0.000	0.034	0.068
	Education	0.061	0.016	3.79	0.000	0.030	0.093
	Marital status (Marriage)	0.244	0.021	11.65	0.000	0.203	0.285
	Economic Activity (Economic)	-0.020	0.020	-0.96	0.338	-0.059	0.020
	Average monthly household income	-0.092	0.006	-14.56	0.000	-0.104	-0.079

	(Income)						
	Pseudo R_2 = 0.0084						

Table 411. Logit analysis results at the municipality level

Regional	Variable	Coef.	Std. Err.	t	P>|t|	[95% CI]	
Independent variables	Sex	-0.134	0.159	-0.85	0.401	-0.452	0.184
	Age	-0.005	0.060	-0.09	0.929	-0.125	0.114
	Education	0.091	0.108	0.85	0.400	-0.125	0.307
	Marital status (Marriage)	0.459	0.177	2.59	0.012	0.103	0.814
	Economic Activity (Economic)	-0.265	0.184	-1.44	0.157	-0.635	0.105
	Average monthly household income (Income)	-0.005	0.047	-0.11	0.913	-0.099	0.088
	R_2 = 0.3311 / Adj R_2 = 0.2540						

In Table 3, The logit analysis of the variables used at the individual level showed a small coefficient of determination of 0.0084, but this problem should be considered in light of previous research. The OLS regression model conducted in the study by Gyasi, R.M. et al. 2021, which considered variables such as age, gender, education level, and income level along with variables such as urban residence, chronic disease, physical activity, and social activity for social isolation, showed different coefficient values depending on gender and age. While the overall coefficient was 0.274, it was lower for men (0.279), women (0.137), the 50-64 age group (0.170), and the over 65 age group (0.185). The coefficient of determination of this study, using only basic variables, is inevitably low because social isolation cannot be fully explained even when multiple individual factors are taken into account. The regression analysis at the regional level in Table 4 also showed that the region has an impact on social isolation. As social isolation is a complex phenomenon that is affected not only by the individual level but also by the regional level, it is necessary to analyse both factors together, so an analysis was performed using a multilevel logistic model.

Table 512. First-level individual factors and multilevel model analysis

	Variable	Coef.	Robust	z	P>|z|	[95% CI]

			Std. Err.				
Independent variables	Sex	0.237	0.034	6.96	0	0.171	0.304
	Age	0.051	0.019	2.63	0.009	0.013	0.089
	Education	-0.023	0.044	-0.53	0.598	-0.110	0.064
	Marital status (Marriage)	0.199	0.078	2.56	0.01	0.047	0.352
	Economic Activity (Economic)	0.012	0.041	0.29	0.775	-0.069	0.092
	Average monthly household income (Income)	-0.178	0.018	-9.81	0	-0.213	-0.142
Residual Intraclass Correlation	Level	ICC	Std. Err.			[95% CI]	
	By municipality	0.117	0.024			0.077	0.172

Since the multilevel model is analysed by determining whether the level 2 independent variables affect the dependent variable, it is necessary to check the intraclass correlation coefficient (ICC) value. A value close to 0 means that there is no difference between regions, and in Table 5, ICC = 0.117 for this study. This value means that region explains 11.7% of the variance in social isolation.

Table 613. Multilevel Logistic Model Results

	Variable	Coef.	Std. Err.	z	P>|z|	[95% CI]	
Independent variables (Individual-level variables)	Sex	0.238	0.034	6.98	0.000	0.171	0.305
	Age	0.051	0.019	2.64	0.008	0.013	0.090
	Education	-0.024	0.044	-0.55	0.584	-0.111	0.063
	Marital status (Marriage)	0.199	0.078	2.56	0.011	0.046	0.351
	Economic Activity (Economic)	0.012	0.041	0.29	0.775	-0.069	0.092
	Average monthly household	-0.179	0.018	-9.86	0.000	-0.214	-0.143

	income (Income)						
Independent variables (Regional-level variables)	The ratio of single-person households	3.163	1.403	2.25	0.024	0.414	5.913
	Park (per 10,000 people)	0.043	0.025	1.73	0.084	-0.006	0.091
	Culture and sports Facilities (per 10,000 people) (CulSpo)	-0.371	0.597	-0.62	0.534	-1.542	0.800
	Welfare Facilities (per 10,000 people)	-0.353	0.644	-0.55	0.584	-1.614	0.909
	Access to traditional markets (Market)	-0.022	0.005	-4.44	0.000	-0.032	-0.012
	Places of worship (per 10,000 people) (Religion)	-0.015	0.023	-0.65	0.518	-0.059	0.030
	Capital area status	-0.602	0.116	-5.19	0.000	-0.829	-0.374
	The ratio of multifamily units (Apart)	0.840	0.836	1.01	0.315	-0.798	2.478
	Prob > chi2 = 0.0000						
Residual Intraclass Correlation	Level	ICC	Std. Err.			[95% CI]	
	By municipality	0.059	0.018			0.033	0.104

Table 714. Multilevel Logistic Model Marginal Effects Analysis Results

	Variable	dy/dx	Delta-method Std. Err.	z	P>|z|	[95% CI]	
Independent variables (Individual-level variables)	Sex	0.033	0.005	7.15	0.000	0.024	0.041
	Age	0.007	0.003	2.61	0.009	0.002	0.012
	Education	-0.003	0.006	-0.55	0.582	-0.015	0.009
	Marital status (Marriage)	0.027	0.010	2.6	0.009	0.007	0.048
	Economic Activity (Economic)	0.002	0.006	0.29	0.774	-0.009	0.013
	Average monthly household income (Income)	-0.024	0.003	-9.59	0.000	-0.029	-0.019
Independent variables (Regional-level variables)	The ratio of single-person households (singleperson)	0.433	0.188	2.31	0.021	0.065	0.801
	Park (per 10,000 people)	0.006	0.003	1.73	0.084	-0.001	0.012
	Culture and sports Facilities (per 10,000 people) (CulSpo)	-0.051	0.081	-0.62	0.532	-0.210	0.109
	Welfare Facilities (per 10,000 people)	-0.048	0.088	-0.55	0.582	-0.220	0.124
	Access to traditional markets	-0.003	0.001	-4.53	0.000	-0.004	-0.002

	(Market)						
	Places of worship (per 10,000 people) (Religion)	-0.002	0.003	-0.64	0.52	-0.008	0.004
	Capital area status	-0.082	0.016	-5.09	0.000	-0.114	-0.051
	The ratio of multifamily units (Apart)	0.115	0.114	1.01	0.315	-0.109	0.339

The ICC value found after performing the multilevel logistic model as shown in Table 6 is 0.059, which means that the regional factors used in this study explain about 5.8% of the previous 11.7%, and about 5.9% remains, which means that the regional variables in this study explain about half of the regional level influence of social isolation, so the variables are set appropriately. In addition, the analysis of the marginal effects is necessary for the interpretation of the multilevel logistic model, so the marginal effects in Table 7 are derived, and the results are as follows.

The first level of individual variables shows that gender, age, marital status, and average monthly household income are significant. Men were 3.3% more likely to be socially isolated than women (Coef. = 0.238, P>|z|= 0.000, [95% CI]=[0.171, 0.305], dy/dx= 0.033). Increasing age was associated with a 0.7 % higher odds of being socially isolated (Coef. = 0.051, P>|z|= 0.008, [95% CI]=[0.013, 0.090], dy/dx= 0.007) Being non-married compared to married was associated with a 2.7% greater likelihood of being socially isolated. (Coef. = 0.199, P>|z|= 0.011, [95% CI]=[0.046, 0.351], dy/dx= 0.027) Finally, an increase in income was associated with a 2.4% decrease in the odds of being socially isolated. (Coef. = -0.179, P>|z|= 0.000, [95% CI] = [-0.214, -0.143], dy/dx=-0.024).

At the regional level, the ratio of single-person households, access to traditional markets, and capital city status were significant. In the case of the ratio of single-person households, an increase in the ratio of single-person households was associated with a 43% increase in the risk of social isolation. (Coef. = 3.163, P>|z|= 0.024, [95% CI]=[0.414, 5.913], dy/dx= 0.433) In the case of access to traditional markets, a 0.3 % reduction in the probability of being socially isolated was found for each additional hour of travel time. (Coef. = -0.022, P>|z|= 0.000, [95% CI]=[-0.032, -0.012], dy/dx=-0.003) Finally, capital status is associated with an 8.2 % decrease in the probability of being socially isolated in a non-capital city compared to a capital city. (Coef. = -0.602, P>|z|= 0.000, [95% CI]=[-0.829, -0.374],

dy/dx=-0.082).

5. Discussions

The analysis found that the risk of social isolation increased for older people, men, non-married people, and people with low incomes. Similar to previous studies, this study found that men were more likely to be socially isolated than women and that older people were more likely to be socially isolated. This may be because social isolation in older adults can be prevented by promoting communication and mutual help among neighbours (Kono et al., 2012), and according to Chatters et al. (2018), women are more invested in and connected to social networks, including family and friends, which can prevent social isolation even in old age. In contrast, it has been suggested that older men may be vulnerable to social isolation because they have fewer social resources and limited social interaction with others (Chatters et al., 2018). Health factors such as physical discomfort may contribute to limited social interaction, as well as reduced income and anxiety in retirement. As an older society, there will be more seniors who may be at risk of social isolation, so municipal governments need to expand their welfare workforce and foster related industries to provide a variety of services.

The study also found an increased risk of social isolation for unmarried people compared to married people because, unlike married people, they are unable to form new social networks with their spouse and any children they may have, as well as their spouse's family and friends. However, Sarkisian and Gerstel (2016) have shown that being unmarried has a positive impact on social connectedness, with more frequent contact with parents, siblings, neighbours and friends for support and increased social connectedness than being married. So, it is likely that in a modern society with a growing unmarried population, there are more social connections between unmarried people than in the past when married people were the norm. Therefore, rather than simply being unmarried increasing the risk of social isolation, it is likely that other factors have a greater impact on social isolation. Therefore, it is necessary to identify the status and actual situation of the unmarried population to distinguish between people who are actually at risk of social isolation and people who are not, and to establish social isolation reduction strategies tailored to their situation.

When household income is low, the lack of resources to undertake a range of social activities to build social connections limits choices and participation. As a result of these difficulties, their social network of relationships shrinks, increasing the risk of social isolation. Urban planning should endeavour to provide facilities that are accessible to all, so that people with low incomes can naturally form social networks in the city, even if they do not participate in separate activities. For example, when installing facilities such as libraries, it is necessary to maximise the community element, and when organising

operational programs, it is necessary to support things such as discussion groups and reading clubs that allow various people to mingle and talk together.

At the regional level, the variables of parks, culture and sports facilities, welfare facilities, and worship places, which are generally considered to be social infrastructure and contribute to community building, and the ratio of multifamily units were not significant, while the variables of the ratio of single-person households, access to traditional markets, and capital city status were significant. First, this study found that the risk of social isolation increases with a higher proportion of single-person households. In line with the fact that family and friends are the most important primary groups in any society and are expected to fulfil most of the belonging and social needs (Chatters et al., 2018), this research means that single-person households are relatively isolated from their most important social network of family and friends, increasing the risk of social isolation. To counteract this problem, it is important to create a network of interactive relationships among single-person households. This requires organising the social infrastructure of cities in a way that increases opportunities for natural contact and provides spaces for dialogue at the level of the urban areas in which they live.

Shorter travel times to traditional markets were associated with greater social isolation. The formation of traditional markets involves a long historical process, which makes markets more likely to be located in older, less developed areas. On the other hand, the newly formed areas do not have a traditional market, and large-scale commercial facilities are built, distancing them from the existing traditional market. Older neighbourhoods are more likely to be inhabited by socially vulnerable groups such as the elderly living alone, increasing the risk of social isolation. This issue leads to a higher risk of social isolation when there is good access to traditional markets, as in this study. In this respect, the role of traditional markets as a key part of social infrastructure can be reconfigured to maximise their effectiveness. Rather than creating communities by building new facilities in areas of existing deterioration, the use of existing markets can contribute to reducing social isolation by revitalising existing small communities and promoting social interaction.

In terms of capital cities, the results show that capital cities are more prone to social isolation than non-capital cities. Result can be attributed to overcrowding, increased competition, and a decline in quality of life due to increased commuting distances. Overcrowding, caused by increased migration from non-capital cities to capital cities, has led to increased competition in all aspects of life, including education, employment, and income. Those who fall behind in the competition are pushed to the outskirts of the capital city and face longer commutes, which adversely affects their time, reducing the amount of time they have to engage in social interactions. This problem is also linked to a decline in quality of life, contributing to the overall problem of social isolation. In order to solve the fundamental problem, it is necessary to realise regional balanced development

in non-capital areas, so that the population of the capital city can be dispersed to non-capital areas. When the population is dispersed and competition is reduced, more people can have physical and mental space, and space can help to alleviate social isolation by increasing social interaction.

However, in this study, the proportions of parks, culture and sports facilities, welfare facilities, worship places, and multi-family units were not significant. This result may be due to the fact that previous studies have not yet fully considered the distance between facilities and residences when providing facilities in Korea (Kim et al., 2020), so urban residents may not be able to use these facilities due to their inaccessibility, and therefore facilities may not have a significant impact on reducing social isolation. Accessibility is a challenge that needs to be addressed in urban planning, first of all, in order to enhance accessibility, small-scale facilities should be located near the living areas of urban residents. Because smaller facilities in the immediate neighbourhood allow urbanites to have frequent contact with their neighbours and are less intimidating to visit, as opposed to larger facilities located further away. In addition, programmes to promote digital literacy should be included in the provision of various programmes to enable people to take advantage of the new social infrastructure of digital technology. Jiménez et al. (2021) found that face-to-face training was more effective for older people with low digital literacy as ICTs can alleviate social isolation among urbanites, so programmes should be designed to reflect this fact.

Lastly, despite the fact that we thought that having a large number of multifamily housing units would bring more people together and allow for social interaction, it seemed to be a factor that hindered communication and was not significant in resolving social isolation, as in previous studies. This fact was also found in a study by Kang et al. (2022) who found that apartments, the main type of housing in South Korea, are isolated from the rest of the external environment, which strengthens the internal community but isolates it from the outside world. Kang et al. (2022) also found that when apartment complexes increase in scale, social capital, such as cooperation with neighbours, decreases. As a result of this phenomenon, people living in apartments are isolated from the surrounding community by not using external social infrastructure, and their relationship with their neighbours deteriorates as the size of the complex increases, leading to social isolation. To solve these problems, urban planning policies should ensure the openness of apartments. First of all, it is necessary to open up public pathways to provide a space where apartment residents and outsiders can have natural contact. In addition, when installing community facilities inside the apartment, it is necessary to check that they do not duplicate the surrounding infrastructure. This will allow apartment residents to engage in active community activities with the outside world, reducing the risk of social isolation.

Due to the nature of the social survey used in this study, the questions differed by city,

and Ulsan Metropolitan City, Daejeon Metropolitan City, and Gwangju Metropolitan City were not selected as research subjects due to inadequate questions and lack of data. Also, it is a limitation that more control variables could not be used for the target sample. Social isolation has been linked to physical and mental health conditions (Gyasi et al., 2021), so it is necessary to control for these variables, but this study was not possible because the question was not asked in all target cities. In addition, although the municipal ward level was used as the regional level of analysis, a smaller ward level may be more appropriate for the analysis because people tend to use nearby facilities. However, due to the limitations of data collection, it was not possible to conduct a neighbourhood-level analysis, and it is necessary to explore ways to solve this problem in future research.

6. Conclusions

To examine the impact of social infrastructure on the social isolation of urban residents, this study used a multilevel logistic model with individual characteristics as the first level and the region they live in as the second level. The results showed that being male, older, unmarried, and having a lower income increased the risk of social isolation. In terms of regional characteristics, the impact of social infrastructure was found to be greater in areas with more single-person households and better access to traditional markets. In contrast, the presence of parks, culture and sports facilities, social welfare facilities, and multi-family housing were not significantly associated with social isolation.

Findings have several implications. First, this study examined the effects of both factors simultaneously by considering the individual level and the regional level together in a multi-level structure on the issue of social isolation. Previous studies have mainly looked at social isolation and individual or regional characteristics separately based on multinomial models, but this study is significant in that model reflects the complex interaction of various factors affecting social isolation by considering each individual sample and the region where they live simultaneously. Also, the study suggests ways to improve the social infrastructure that exists in South Korea. Parks, cultural and sports facilities, welfare facilities, and worship places are typical social infrastructure that should promote local community and contribute to reducing social isolation, but facilities were not found to be significant. These findings confirm the inadequacy of the current configuration of facilities and indicate the need to plan and lay out future social infrastructure in a way that increases social interaction with local communities.

Acknowledgement. This work was supported by the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea (NRF-2020S1A3A2A01095064)

References

Abbott, K. M., Bettger, J. P., Hampton, K. N., and Kohler, H. P. (2015) The feasibility of measuring social networks among older adults in assisted living and dementia special care units. *Dementia(London)*, 14(2), pp.199–219.

Bäckman, O. and Nilsson, A. (2011) Pathways to social exclusion - A life-course study. *European Sociological Review*, 27(1), pp.107–123.

Carstensen, T. A., Skytt-Larsen, C. B., Busck, A. G., and Søraa, N. G. (2022) Constructing common meeting places: A strategy for mitigating the social isolation of disadvantaged neighbourhoods?. *Urban Planning*, 7(4), pp.486-498. [Online] Available from: doi.org/10.17645/up.v7i4.5821.

Chatters, L. M., Taylor, H. O., Nicklett, E. J., and Taylor, R. J. (2018) Correlates of objective social isolation from family and friends among older adults. *Healthcare(Basel)*, 6(1), 24 [Online] Available from: doi.org/10.3390/healthcare6010024.

Child, S.T. and Lawton, L. (2019) Loneliness and social isolation among young and late middle-age adults: Associations with personal networks and social participation. *Aging & Mental Health*, 23(2), pp.196–204.

Chile, L.M., Black, X.M. and Neill, C. (2014) Experience and expression of social isolation by inner-city high-rise residents. *Housing, Care and Support*, 17(3), pp.151–166.

Eckhard, J. (2018) Indicators of social isolation: A comparison based on survey data from Germany. *Social Indicators Research*, 139, pp.963–988.

Grenade, L. and Boldy, D. (2008) Social isolation and loneliness among older people: issues and future challenges in community and residential settings. *Australian Health Review*, 32(3), pp.468-478.

Grum, B. and Kobal Grum, D. (2020) Concepts of social sustainability based on social infrastructure and quality of life. *Facilities*, 38(11/12), pp.783–800.

Gyasi, R. M., Adu-Gyamfi, S., Obeng, B., Asamoah, E., Kisiangani, I., Ochieng, V., and Appiah, K. (2021) Association between physical activity participation and perceived social isolation at older ages: Do social participation, age and sex differences matter?. *Archives of Gerontology and Geriatrics*, 96, 104441. [Online] Available from: doi.org/10.1016/j.archger.2021.104441.

Jiménez, F. N., Brazier, J. F., Davoodi, N. M., Florence, L. C., Thomas, K. S., and Gadbois, E. A. (2021) A technology training program to alleviate social isolation and loneliness among homebound older adults: A community case study. *Frontiers in Public Health*, 9, 750609. [Online] Available from: doi.org/10.3389/fpubh.2021.750609.

Johansson-Pajala, R. M., Gusdal, A., Eklund, C., Florin, U., and Wågert, P. V. H. (2023) A codesigned web platform for reducing social isolation and loneliness in older people: A feasibility study. *Informatics for Health and Social Care*, 48(2), pp.109-124. [Online] Available from: doi.org/10.1080/17538157.2022.2070068.

Kang, S., Lee, Y. and Koo, J.H. (2022) Spatially neighborhood and socially non-neighborhood: Illustrating social capital perception of neighbors around the apartment complex. *Journal of Asian Architecture and Building Engineering*, 22(3), pp.1284-1299.

[Online] Available from: doi.org/10.1080/13467581.2022.2079646.
Kim, Y., Oh, J. and Kim, S. (2020) The transition from traditional infrastructure to living soc and its effectiveness for community sustainability: The case of South Korea. *Sustainability*, 12(24), 10227
Kono, A., Tadaka, E., Kanaya, Y., Dai, Y., Itoi, W., and Imamatsu, Y. (2012) Development of a community commitment scale with cross-sectional survey validation for preventing social isolation in older Japanese people. *BMC Public Health*, 12, 903. [Online] Available from: doi.org/10.1186/1471-2458-12-903.
Merlo, J., Chaix, B., Ohlsson, H., Beckman, A., Johnell, K., Hjerpe, P., Råstam, L. and Larsen, K. (2006) A brief conceptual tutorial of multilevel analysis in social epidemiology: Using measures of clustering in multilevel logistic regression to investigate contextual phenomena. *Journal of Epidemiology & Community Health*, 60(4), pp.290-297.
Mouratidis, K. (2021) Urban planning and quality of life: A review of pathways linking the built environment to subjective well-being. *Cities*, 115, 103229. [Online] Available from: doi.org/10.1016/j.cities.2021.103229.
Park, C.H. and Koo, J.H. (2014) An analysis of the influential relationship between cultural promotion activities and social capital in the traditional market: A comparative view with routine merchant activities. *Journal of Asian Architecture and Building Engineering*, 13(1), pp.71–78.
Popova, Y. (2017) Relations between wellbeing and transport infrastructure of the country. *Procedia Engineering*, 178, pp.579–588.
Sarkisian, N. and Gerstel, N. (2016) Does singlehood isolate or integrate? Examining the link between marital status and ties to kin, friends, and neighbors. *Journal of Social and Personal Relationships*, 33(3), pp.361–384.
Smith, M.L., Steinman, L.E. and Casey, E.A. (2020) Combatting social isolation among older adults in a time of physical distancing: The COVID-19 social connectivity paradox. *Frontiers in Public Health*, 8, 403. [Online] Available from: doi.org/10.3389/fpubh.2020.00403.
Vaznoniene, G. and Kiaušiene, I. (2018) Social infrastructure services for promoting local community wellbeing in Lithuania. *European Countryside*, 10(2), pp.340-354.
Ward Thompson, C., Aspinall, P., Roe, J., Robertson, L., and Miller, D. (2016) Mitigating stress and supporting health in deprived urban communities: The importance of green space and the social environment. *International Journal of Environmental Research and Public Health*, 13(4), 440. [Online] Available from: doi.org/10.3390/ijerph13040440.
Warner, E. and Andrews, F.J. (2019) "Surface acquaintances": Parents' experiences of social connectedness and social capital in Australian high-rise developments. *Health & Place*, 58, 102165. [Online] Available from: doi.org/10.1016/j.healthplace.2019.102165.
Zavaleta, D., Samuel, K. and Mills, C.T. (2017) Measures of Social Isolation. *Social Indicators Research*, 131, pp.367–391.

Korean Statistical Information Service (KOSIS), [Online] Available from: https://kosis.kr/eng/
MicroData Integrated Service (MDIS), [Online] Available from: https://mdis.kostat.go.kr/eng/index.do

TOWARDS HIGHER-DENSITY COMMUNITIES: A DISRUPTIVE TRANSITION? THE CASE OF NANHUAN NEW RESIDENTIAL COMMUNITY IN SUZHOU, CHINA (1106)

Paola Pellegrini

Xi'an Jiaotong - Liverpool University, Design School, Suzhou, China; paola.pellegrini@xjtlu.edu.cn

Abstract. The Chinese National Government requires a sustainable use of resources since the 13th 5-year Plan. The Plan promotes also the transformation of the residential communities built before 2000. In this transition high-density is increasingly supported.

NanHuan community in Suzhou, Yangtze River Delta, was a pilot action of regeneration of an old community that demolished what existed and increased substantially its FAR. Despite the new urban environment is an upgrading of the existing housing and welfare conditions NanHuan is criticized by its inhabitants and the city officials, and was not repeated as a public-led process elsewhere in the city. This critique and its multiple reasons have been explored with both quantitative and qualitative methods, focusing on the planning process, the money spent and the social sustainability.

Keywords: High-density, regeneration, socially sustainable development, durability, China.

1. The background of the current regeneration attempts: the disruptive transformation of a rural country

The recent development guidelines issued by the Chinese National Government require an efficient use of resources for a sustainable development beyond mere growth. These guidelines promote also the transformation of the "old" residential communities, the ones built before 2000, which often are obsolete and do not offer what can be considered at present a good house in an increasing middle-class society. The indication of the National Government opens up a huge regeneration task in terms of built stock quantities, involving social, ecological and economic aspects.

After the Economic Reform and Opening-up Policy 改革开放 promoted in the early '80s to realize the socialist market economy, China started to address a challenge: how to build large and modern cities quickly. The issue was on dimension, quality and time. The attribute large can be expressed in the percentage of permanent population resident in cities: starting from the urbanization rate of 18 percent in 1978, the year before the opening up, the rate of the Country reached 63 percent in 2021. The increase in the urbanization rate is combined with the concentration of population in large

agglomerations: the number of cities with more than 1 million people in China skyrocketed since 1990 (World Bank, 2023). The plan of the national government is to keep raising the rate because the urbanization and the real estate development – meaning the built environment and mobility infrastructures – have been China's main driver of economic growth and source of revenues both for the public institutions and single citizens: the land is usually owned by the state and land leasing produces fiscal revenue, property prices have constantly increased until 2021, when the real estate sector experienced a serious crisis (The Economist, 2022).

If the idea of a large and quick development is straightforward – in the first stages of the opening up often the larger and quicker was the better – what makes a modern city had to be defined and the role of cities in the modernization of the Country (Roggeveen, 2017; Li, 2014).

In the second half of the '70s Deng Xiaoping promoted the 4 Modernizations to improve agriculture, industry, defence, science and technology in continuity with the spirit of the Communist Revolution, but only the opening up a few years later was a breakthrough in the interpretation of modernity. It implied radical change and an unprecedented role for urbanization in China, but indications on how urbanization had to happen were expressed only 10 years later in the meagre 1989 first City Planning Act of China, which set up a comprehensive urban planning system, but contained only very basic indication on urban forms and dimensions (City Planning Law, 1989; Ng and Wu, 1995).

The reform of China clearly identified industry as the main character of a modern Chinese city and the newly developed urban environment allocated the industrial production sites (Lin and Lin, 2011). As before the opening up the Country was almost completely rural, the industrialization and urbanization process was a radical transformation. After an initial phase of micro adjustments and small production realized where possible in the existing built environment, often it made *tabula rasa* of the existing countryside, villages and land morphology, to expand the existing cities and create new ones where the workforce can concentrate and live.

The starting action of demolition and replacement affirms the idea of the impossible coexistence of what is new and what is old, urban and rural, and is strongly related to the desire to develop as fast as possible: during the first decades of Chinese urbanization there was no will to ponder alternatives to the tabula rasa, no time to select what should be conserved and what should be deleted – approach strongly related to the limited diffusion of a robust theory on urban heritage –, little time to design site-specific solutions, and no appraisal of the layering of urban facts which are produced over the centuries (Benevolo, 1975). These design decisions differ substantially from the discourse on Urbanism carried out in Europe in the same years where the concepts of integration of urban and rural, of limited consumption of fertile land, of variety of urban landscapes and mixed residential

options, of the expanded meaning of heritage were mainstream and due to the shared goal to increase the sustainability of the built environment.

2. The case of Suzhou in the '90s: making an ancient city and its rural land an industrial hub

Suzhou 苏州 is an ancient city 80 km west of Shanghai, with around 12 million people plus the not-registered ones (Suzhou Municipal Bureau of Statistics, 2021). Suzhou is in the Yangtze River Delta Special Economic Zone established in 1985, and experienced a very successful economic growth: according to the local government in 2019 before the Covid crisis the city had a GDP of almost 200 billion yuan, which is higher than the GDP of Austria (Desjardins, 2017; SIPAC, 2015). The wealth of the city grew faster than in the Country: the median per capita disposable income in Suzhou in 2020 was 5.900 RMB a month, while in China 2.683 RMB (National Bureau of Statistics, 2020).

Suzhou was planned to be a *global city* in Factory China, as the Brookings Institution defined the areas able to concentrate economic activities because they house the competitiveness assets required to drive global growth. Suzhou, in fact, developed mostly since the second half of the '90s to be a manufacturing hub of mainly low-added value items (Trujillo, 2016). To accommodate industries the city was expanded over the adjacent rural land; particularly relevant is Suzhou Industrial Park, SIP, 苏州工业园区, a 278 sqkm new town realized making a tabula rasa of the existing rural land with the political and financial support of the national government and the cooperation of the government of Singapore, which exported its governance model to establish a stable business environment and attract foreign money and talents, and its urban design model, i.e. the phases of the implementation, the relevance of the mobility infrastructures in the development, the zoning together with the residential slabs inspired by the Modern Movement, the neighbourhood unit (Shi, Liu, Lin, 2011; Shatkin, 2013, L'Heureux, 2010). SIP offered a built environment as much as possible similar to Singapore and was able to attract over 4,500 enterprises from 96 countries, among which 84 are Fortune 500 enterprises (SIPAC, 2022); foreign enterprises include Bosh, Samsung, Hitachi, Microsoft, Philips, L'Oreal, Zeiss, Panasonic.

In SIP the evolution and ambitions of Chinese industrial development and urbanization are declared in the policies and implemented: the industrial town was built for export-oriented manufacture using mechanical power, result of a capital-intensive urbanization to attract foreign direct investment. This phase was replaced with advanced productions and tertiary activities. In recent years Suzhou has planned to upgrade its industrial structure to reach the highest level of the global industrial value chain: attraction of private high-tech businesses with a focus on biotechnology and innovation-driven development.

SIP declared the ambition to be a Garden City, but realized very little of the original idea of sir Howard; especially the balance urban-rural was never in the agenda and low-density was not a target. The intention was a medium density city and a growing number of inhabitants.

The New Town is designed for car mobility supported by an extended grid of wide orthogonal roads. Of all Chinese cities Suzhou is among the first for car ownership per urban household with an annual car growth of 20 percent in the past booming years; the growing number of cars is causing problems for congestion, pollution and parking.

3. Recent developments in the planning direction: the regeneration of the old communities

The recent development guidelines issued by the Chinese National Government require an efficient use of resources for a sustainable development beyond mere growth. These guidelines promote also the transformation of the "old" residential communities, the ones built cheap and fast before 2000. The indication of the National Government opens up a huge regeneration task in terms of built stock quantities, involving social, ecological and economic aspects, because it refers to millions of units all over the country.

The spatial and environmental qualities the regeneration should achieve are not specified by the national guidelines, but according to our research one element is being changed: high-density urban forms are increasingly supported by some local governments (Su, Wei, Zhao, 2017). In addition to this radical change – attention to what already built, increase in density – some forms of participation of residents into the decision-making process in spatial planning are also introduced.

To investigate the regeneration of the old communities the research studied a residential community in Suzhou, NanHuan new community, that was a pilot action of regeneration and densification that in 2010 demolished one part of a resettlement village and tripled its FAR. This new urban environment – new morphology and building types: no super-blocks, mixed uses, underground parking, high-rises and linear commercial structures – was built as an upgrading of the pre-existing conditions, which were themselves an upgrading of the pre-existing conditions in the old town in the early '80s (Wu et al., 2019).

4. The condition of the old resettlements in Suzhou

When SIP was realized, the Chinese economy was booming, but the new neighborhoods for dispossessed farmers and relocated urban residents from the old town were built cheaply and quickly to provide a decent house and solve the problem of resettlement in compliance with local regulations (Pellegrini, Chen, 2020; Jangsu, 1996). 20-30 years after

their realization, we carried out qualitative research on the current conditions of the resettlement communities in Suzhou through direct observation and fieldwork from a contemporary perspective. The detailed analysis of the spatial features of the resettlement communities built in 1990s and 2000s highlights 3 kinds of obsolescence and allows us to recognize a short-term strategy in their features:

1. Obsolescence of the building structure: some buildings have structural issues and equipment and appliances are outdated: sewage, plumbing, heating and cooling systems, supply and consumption of electricity and water, soundproof installations should be updated, and thermal insulation should be added. When they were realized there was no requirement concerning the duration of the performance of the structures.
2. Obsolescence of the living standards inside the units and in the open space: units have no elevator, no heating, not enough parking space; in general, the units are not small (average minimum gross surface 65 sqm, average maximum 125 sqm), but no unit is designed to have a dishwasher nor a washing machine, nor two bathrooms.
3. Obsolescence of the urban design and image: the “copy-paste” prevails, that is to say, that the same materials, technology, façade design, uses, not site-specific design were used, offering approximately the same condition to everyone and limited privacy. Similar characteristics can be found in over 170 residential communities in Suzhou realized by the local government (Chen *et al.,* 2021).

5. One experiment of regeneration of the old communities: tabula rasa and densification

The first community of Nanhuan Village in Gusu, Suzhou, was built between the late '70s and the early '80s to relocate over 6000 inhabitants of some areas of Suzhou old town which were being demolished because their conditions were not providing a decent living environment (first relocation in the first stage of city modernization). The resettlement community was designed as usual in this kind of operation: a compact sequence of about 150 almost identical 4-6 floors residential buildings oriented east-west with no open space beyond the ones strictly needed between adjacent buildings. In 2010 approximately 80 percent of the community was demolished for its dangerous obsolescence and low living standards - such as foundation subsidence, house tilt, balcony collapse, road damage, and inadequate supporting facilities - and replaced by a completely different urban morphology and building types (second relocation for regeneration in a mature phase of urbanization); the construction of 21 high-rises of 22 to 32 floors increased the Floor Area Ratio (FAR) from 1.5 to 2.6.

In May 2010 the demolition of 118 buildings on a total built area of 325,000 square meters

began; in June 2011 the agreement for resettlement and compensation of 4,778 households was settled; in June 2013 the New Village was completed and 97 percent of the original residents moved back. The New Village required an investment of more than 2.3 billion yuan to build 559,800 square meters for 5,137 households, 2 schools, and one community centre, commercial spaces in one mall, and multi-functional commercial streets (Hua *et al.*, 2012). Now approximately 15000 residents live in the Nanhuan whole community. As the transformation involved only one part of the neighbourhood, Nanhuan Village allows a direct comparison of the original solution and with the high-density one, the New Village.

The Nanhuan case preceded the current national guidelines for regeneration by 10 years and attracted attention for its innovative proposal:

- it is the first regeneration of an existing resettlement neighbourhood planned, financed, and realized by the local government in Suzhou; the project was included in the government's annual list of crucial tasks and it was meant to be exemplary for communities in similar conditions;
- it included densification and residents' relocation in situ;
- it combined high-rises in small compact blocks and mixed uses, an unusual solution where mono-functional superblocks are the most frequent condition.

These new morphology and building types – no super-blocks, mixed uses, underground parking, high-rises and linear commercial structures – was built as an upgrading of the pre-existing conditions, which were themselves an upgrading of the pre-existing conditions in the old town in the early ‘80s (Wu et al., 2019).

Despite improvements in housing, public space and welfare provision, the new version of NanHuan is criticized both by its inhabitants and the city officials who promoted it, was labeled as a failure and – differently from the original intentions –was not repeated in its public-led process elsewhere in the city, even though private real estate companies are replicating similar transformations of replacement and densification (Webster, 2021).

This critique and its multiple reasons have been explored with both quantitative (sensor data, mapping and space syntax) and qualitative methods (surveys, in-depth interviews, questionnaires and meetings), focusing on the planning process, the money spent and the social sustainability of the process.

6. Conclusions

The NanHuan case shows that the radical transition is perceived as disruptive in relation to the advantages obtained from the transformation and that socially sustainable practices must be improved. The case shows as well that a debate about the urban spatial qualities a moderate prosperous society - which is one of the main targets of the Chinese

Communist Party - should have is needed. The demand for quality in all aspects of one's life is increasing while the society is less concerned with basic needs – a hint of this phenomenon is the Engel coefficient (the proportion of food expenditure out of all living expenditure) that decreased to 28.6 percent in urban residents, to 32.7 percent in rural residents in 2022 according to the National Bureau of Statistics of China. The environment where one lives is an essential component of life quality and in China what was built 40 years ago, cheap and fast under the pressure of urgent development, risks to not correspond to the newly acquired standards of a wealthy society.

The NanHuan case shows also how adaptivity is not an option if durability – in every sense: living standards, structural capacity, socio-political demands – is not conceived when the buildings are designed, but in a fast-changing society, as China is, the idea of durability does not seem to hold.

The NanHuan case shows that it is expensive to demolish and rebuild, and it is preferable to maintain the existing buildings and requalify them. The challenge of the renovated old communities is if they will appeal to the moderately prosperous society which is the goal of the national government. The "old" neighborhoods amount to a huge number of residential units, only in Suzhou there are 1,273 old urban communities with almost 600.000 residents (Suzhou, 2021). Will wealthy households keep appreciating these compact and homogeneous conditions? Will they require a less basic design of the building as well as of the open space? Will they require diversified housing types and neighborhoods for diversified lifestyles and households (large families, small families, singles, empty-nest couples, temporary city dwellers, and co-habitants)? Chinese urbanization usually avoids spatial plurality and urban complexity as well as individuality to be quick and deliver the same conditions to the masses, but also because of the simplified copy-paste approach, as an example providing over and over the same housing type and urban morphology.

Funding supporting the research work. This research was funded by Xi'an Jiaotong-Liverpool University, RDF-17-02-25 and SURF 10010/2021.

References

Benevolo L. et al. (1975) *Rapporto sulla pianificazione urbana a Venezia*, International Advisory Committee for the Safeguarding of Venice, Venezia.

Chen, J., Pellegrini, P., Xu, Y., Ma, G. (2022) Evaluating residents' satisfaction before and after regeneration. The case of a high-density resettlement neighborhood in Suzhou, *Cogent Social Sciences*, 8(1). https://doi.org/10.1080/23311886.2022.2144137.

Desjardins J. (2014) *35 Chinese Cities With Economies as Big as Countries*, available from

http://www.visualcapitalist.com/31-chinese-cities-economies-big-countries/ [accessed 3 November 2017].

Hua, Y. *et al.* (2012) Exploration on Renovation Mode of Dilapidated Old House Based on "Neighborhood Renewal" -- Taking Nanhuan New Village Dilapidated Old House Reconstruction Project as an Example, *Jiangsu Urban Planning*, (008), pp.10–14.

Jiangsu provincial government, SIP government (1996) *Sunshine impact analysis rules. Technical regulations for planning and design of residential areas in Suzhou Industrial Park*. CH Available from:
http://sfj.suzhou.gov.cn/sfj/basc/201801/ede1838bdbf842bfb978995511642409.shtml

L'Heureux E. et al. (2010) *1000 Singapores. A Model of the Compact City*, International Architecture Exhibition in Venice, Singapore Pavilion.

Li S. (2014) *Understanding the Chinese City*, SAGE.

Lin Y. and Lin J. (2011) *Demystifying the Chinese Economy*, Cambridge University Press, pp.173–190 https://doi.org/10.1017/CBO9781139026666.

National Bureau of statistics (2020) *Households' Income and Consumption Expenditure in 2020*, available from http://www.stats.gov.cn/english/PressRelease/202101/t20210119_1812523.html [accessed 10 December 2021].

Ng M. K. and Wu F. (1995) *A Critique of the 1989 City Planning Act of the People's Republic of China*, Third World Planning Review 17(3), pp.279–294, https://doi.org/10.3828/twpr.17.3.rk1n81300k6t0g03.

Pellegrini, P., Chen, J. (2020) Hypothesis of densification for a sustainable urbanization in a wealthy Chinese city, *IOP Conference Series: Earth and Environmental Science*, 588 (1.15 – 1.19): 052029. https://doi.org/10.1088/1755-1315/588/5/052029.

President of the People's Republic of China, *City Planning Law of the People's Republic of China*, adopted on 26 December 1989, available from http://www.china.org.cn/english/environment/34354.htm [accessed 21 December 2022].

Roggeveen D. (2017) *Progress & Prosperity: The New Chinese City as Global Urban Model*, nai010 publishers.

Shatkin G. (2013) Reinterpreting the Meaning of the "Singapore Model": State Capitalism and Urban Planning. *International Journal of Urban and Regional Research* 38, pp.116–137, https://doi.org/10.1111/1468-2427.12095

Shi K., Liu H., Lin Z. (2012) *The making of a Chinese model New Town, Planning and development of Suzhou Industrial Park*, 北京：中国建筑工业出版社.

SIPAC - SIP Administrative Committee (2022) Official information about SIP, available from http://www.sipac.gov.cn/english/ [accessed 21 December 2022].

Su Hongjian, Wei Houkai, Zhao Jian (2017) Density effect and optimum density of the urban population in China. *Urban Studies*, 54 (7), pp.1760-1777. https://doi.org/10.1177/0042098015624839

Suzhou Municipal Bureau of Statistics (2021) *Suzhou Statistical Yearbook*.

Suzhou municipal government (2021) Suzhou City promotes the renovation of old neighborhoods. CH Available at: https://www.suzhou.gov.cn/szsrmzf/bmdt/202105/6da5b31022404398b3ec8105b08ae9bb.shtml

The Economist, Only a revived economy can save China's property industry, 17 November 2022, available from www.economist.com/finance-and-economics/2022/11/17/only-a-revived-economy-can-save [accessed 21 December 2022].

The world Bank data, [accessed 10 April 2023] available from https://data.worldbank.org/country/china?name_desc=false [accessed 14 March 2023]

Trujillo J. L. and Parilla J. (2016) *Redefining Global Cities. The Seven Types Of Global Metro Economies*, Global Cities Initiative, A Joint Project of Brookings Institution and JP Morgan Chase.

Webster, Chris (2021) How high can we go? Urban density, infectious versus chronic disease, and the adaptive resilience of cities. *Town Planning Review*, Vol. 92 Issue 1, pp.123-130. https://doi.org/10.3828/tpr.2020.67

Wu, Weiping et al. (2019) Village resettlement and social relations in transition: the case of Suzhou, China. *International Development Planning Review*, Vol. 41 Issue 3, pp.269-291. https://doi.org/10.3828/idpr.2018.27

ASSESSING HOUSING QUALITY FOR LOW- INCOME GROUPS IN THE CENTRAL BUSINESS DISTRICT OF BANGKOK, THAILAND (1111)

Peamsook Sanit[1*], Supapim Gajaseni[1]

[1] Department of Urban and Regional Planning, Faculty of Architecture, Chulalongkorn University, Bangkok, Thailand; [*]nui.peamsook@gmail.com

Abstract. The central business district (CBD) of Bangkok has a significant population of low-income migrants from Thailand and neighboring countries. This research examines their housing situation, focusing on needs, accessibility, and conditions. The study analyzes the balance between housing demand and supply. Three CBD communities were studied using quantitative and qualitative methods, interviewing 235 low-income migrants. Findings reveal poor living conditions, limited amenities, and underutilized space in privately-owned buildings. Government-owned land remains unused. Addressing housing needs for both Thai and non-Thai migrants is crucial to improve their quality of life and enhance economic productivity. Current government policies lack inclusion for these groups, necessitating collaboration between private and government-owned spaces to develop affordable housing. These measures reduce inequality, promote environmental quality, and sustainably strengthen Bangkok's economic competitiveness.

Keywords: Affordable housing, Low-income worker, Central Business District, Bangkok, Thailand.

1. Introduction

1.1 Background and Motivation

Housing units for low-income residents in urban areas are frequently considered substandard due to their inadequate amenities and location in impoverished neighborhoods. These neighborhoods are typically overcrowded and have deteriorated infrastructure, low-quality buildings, limited environmental resources, and insufficient sanitation, as noted by various scholars (Addo, 2013; Arku, 2009; Yeboah, 2005). The government has implemented low-income housing as a policy to provide support for social classes unable to afford suitable housing based on their income. Starting from the late 19th century, numerous countries have introduced distinct policies to safeguard this demographic, including "public housing," "social housing," and "affordable housing" (Ramzanpour & Nourtaghani, 2019).

Affordable housing is a critical issue in many parts of the world, and there is a large body

of literature examining various aspects of the issue. Researchers have investigated the causes and consequences of housing affordability problems, as well as the effectiveness of various policies and programs aimed at addressing the issue. Studies have shown that a lack of affordable housing is linked to a range of negative outcomes, including homelessness, poor health outcomes, reduced economic mobility, and increased social isolation (Desmond et al., 2015; Newman & Holupka, 2018). Low-income households are particularly vulnerable to housing affordability challenges and may be forced to choose between paying for housing and other basic needs such as food and healthcare. (Seo & Park, 2021). Developments focused on affordable housing need to prioritize initial access to employment opportunities and social infrastructure while promoting the development of sustainable communities.

Policymakers have implemented a range of policies and programs aimed at increasing the supply of affordable housing and reducing the cost of housing for low-income households. These include subsidies and tax incentives for developers, inclusionary zoning policies, and rent control measures (Hwang & Quigley, 2006; Agnew, 2010; Calabrese et al., 2021; Baum-Snow & Marion, 2009; Schwartz, 2021). While some of these policies have shown promise, researchers have noted that there are challenges to implementing effective affordable housing policies, including political resistance, lack of funding, and zoning regulations that limit the development of affordable housing (Newman & Holupka, 2018). In addition to traditional policies, researchers have investigated innovative approaches to affordable housing, such as community land trusts, cooperative housing, and shared equity models (Lang & Novy, (2014).). These models can offer affordable housing options that are sustainable and community-driven but require significant investment and support to be effective. Overall, the literature highlights the urgent need for affordable housing solutions that are effective, sustainable, and responsive to the needs of low-income households.

Research on affordable housing can help to evaluate the effectiveness of existing affordable housing policies and programs, identify best practices, and guide the development of new policies and programs that are evidence-based and targeted to the most pressing needs. Moreover, The research can help to raise awareness and mobilize support for affordable housing among policymakers, stakeholders, and the general public. By highlighting the importance of affordable housing for individuals, families, communities, and the economy as a whole, research can help to build political will and support for policies and programs that address the housing affordability crisis.

Affordable housing has not been widely developed in Thailand. This is particularly the case at the lower end of the housing market perhaps owing to deeper structural factors or inaccurate perceptions of sustainable housing. The research gap in affordable housing that needs to be addressed in Thailand is the lack of attention given to the perspectives

and experiences of low-income residents themselves. Many studies focus on housing market dynamics, policy analysis, or quantitative data, but fewer studies engage directly with the lived experiences of low-income households, their coping strategies, and their views on the efficacy of different policies and programs.

Most of the low-income people who live and/or work in the Central Business District (CBD) of Bangkok have migrated from other provinces of Thailand or one of Thailand's lower-income neighbors. All of these low-income people need to find affordable housing that meets their basic needs and offers a reasonable commute to their job or worksite. Low-income migrants tend to look for the cheapest accommodations to maximize their savings; they probably assume they will be able to upgrade their lodging if their financial situation improves. Initially, migrants often stay with a relative or personal contact until they can find a more private domicile. However, because the CBD of Bangkok has some of the highest-priced real estates in the country, migrants often end up in illegal squatter camps or slums on the perimeter of the CBD to stay within the affordable travel range of their job site. Those worker camps are typically densely populated, with poor sanitation and hygiene, and a general lack of amenities. As long as there is demand for low-wage migrant labor, these squatter settlements grow and expand, without an improvement in the environment or quality of life of the residents. Thus, the authorities in Bangkok need to address the issue of standard, affordable housing for low-income migrants since they are fulfilling the economic need of the city and country. That alone would go a long way to improving the quality of life of the lower-income migrants in the CBD of Bangkok.

The goal of this research is to improve the quality of life of low-income people living and working in the CBD of Bangkok. This research aims to study the housing situation and the housing needs of people working in the target area. The expected outcome is recommendations for suitable housing management practices in the CBD of Bangkok to reduce inequality, promote economic development, and build the ability of Bangkok to sustainably compete with other cities in the Southeast Asia region.

1.2 Objectives

1) To study the housing needs of low-income people in the CBD area of Bangkok;
2) To explore the current housing situation in the CBD of Bangkok in terms of quantity, style, and price;
3) To analyze the balance of housing demand and supply in the CBD of Bangkok; and
4) To recommend management guidelines for the integration of housing for low-income people in the CBD of Bangkok, as well as to suggest guidelines for housing management in potential areas.

1.3 Research Scope

The scope of this research is as follows:

1) Areal scope of the research**:** The CBD of Bangkok, comprising Pathumwan, Bangrak, and Sathorn Districts, with a focus on the area around Rama IV Road.

2) Content scope of the research: This consists of the study of the balance of supply and demand for housing of low-income people in the areas around Rama IV Road.

2.1) The study of demand:

- Analysis of the residential behavior of low-income individuals, both Thai and foreign, working in Bangkok's CBD. This will consider factors such as duration of stay, frequency of relocations, number of cohabitants, activities conducted within the residences, and factors influencing housing choices.

- Investigation of price-related housing demand in the CBD, including the affordability of monthly rental and ownership options for low-income individuals. This will encompass an examination of common associated housing expenses and monthly utility bills.

- Exploration of qualitative housing demand trends among low-income individuals in the CBD, focusing on preferences for location, housing size, and amenities.

2.2) The study of the supply:

- Examination of the quantity, design, and pricing of various housing options available for low-income individuals, both existing and under development, in the CBD region surrounding Rama IV Road.

- Assessment of commercial areas and buildings within the CBD that have the potential for redevelopment or conversion into housing specifically designed for low-income individuals in the CBD.

By delving into these aspects, the research aims to provide valuable insights and recommendations to address the housing needs of low-income individuals, promote equity, stimulate economic development, and enhance Bangkok's competitive position within the Southeast Asia region.

1.4 Definition of Terms

1) “Housing” means a place for living in a building of any kind, either in the form of a monthly or yearly lease, or outright sale and ownership of said domicile;

2) “Low-income people” refers to those persons who have an annual income less than 100,000 baht or are eligible to enroll in the state welfare card program;

3) “Migrant” refers to both Thai and non-Thai workers who have moved either temporarily or permanently to work in the CBD area of Bangkok.

2. Concepts and Principles Related to the Development of Housing for Low-income People

This paper presents a conceptual framework for the development of housing aimed at addressing the needs of low-income individuals residing in the Central Business District (CBD) of Bangkok. The framework is based on three key principles: affordable housing development, housing security (security of tenure), and the concept of a new urban lifestyle (New Urbanism).

2.1 Policy for Developing Housing for Low-income People in Thailand

The Development Plan for Housing for Low-income People is implemented by the National Housing Authority (NHA), in collaboration with relevant agencies in both the public and private sectors. The main strategy is to construct buildings with affordable rental units for low-income people who are unable to buy a dwelling of their own, as well as to improve the quality of life for people to have standard housing until their economic situation improves.

The section of the plan to improve the quality of life states that the goal is to develop high-rise buildings with rental units for low-income people. One such initiative is the “Ban Pracharat” Project is operated by the Ministry of Finance through various support measures, and the NHA is the main sponsor.

The Development Plan for Housing for Low-income People is implemented by the Community Organizations Development Institute (CODI) in collaboration with local administrative organizations (LAO) and other stakeholders from the public and private sectors. The primary beneficiaries of this plan are households residing in slum communities and squatter settlements, both in urban and rural areas. Several development initiatives have been undertaken to promote affordable housing, including the Ban Mankong Project, the Canal-side Community Housing Project, and the Homeless People's Quality of Life Plan. These strategies aim to improve living conditions and provide affordable housing options for low-income individuals and families.

2.2 The Concept of New Urbanism

A new urban lifestyle concept was adopted and introduced in the development of cities in many industrialized countries today (Peter, 1994 & Arendt, 2000). An important

strategy of new urbanism is creating a mix and variety of housing (Mixed Housing) in terms of size, architectural style, and price to create accessibility of higher-, middle-, and lower-income earners into the neighborhood. The design calls for a combination of housing types that include single houses, duplexes, row houses, low-rise, medium-rise, and high-rise buildings. The underlying theme of this approach is to promote and support a sustainable diversity of residents in the target community.

2.3 The Concept of Affordable Housing Development

The United Nations Habitat Agenda - Adopted at the United Nations Conference on Human Settlements (Habitat II) in 1996, the Habitat Agenda recognizes the need for a continuum of housing options and outlines a range of housing types, including emergency shelter, transitional housing, supportive housing, affordable housing, and market housing.

An emergency Shelter is an overnight accommodation for the homeless or persons in acute distress, used only in emergencies and short-term stays. Facilities are limited and most occupants do not stay there during the day.

Temporary housing, also known as transitional housing, is a form of accommodation designed to assist individuals experiencing homelessness in their transition to more permanent housing. It serves as an intermediate step between emergency shelters and permanent housing options. Temporary housing provides longer-term stays and greater privacy compared to emergency shelters, allowing individuals to stabilize their living situation and access necessary support services. The primary objective of transitional housing is to prevent homelessness and support individuals in their journey toward securing sustainable housing. The concept of transitional housing acknowledges the need for a supportive and transitional environment for individuals experiencing homelessness. (Canadian Observatory on Homelessness, 2019).

Affordable housing refers to housing that is priced below the market rate and is affordable for low- and moderate-income households. It can be owned or rented and encompasses various housing types, such as apartments, townhouses, and single-family homes. The specific definition of affordable housing may vary depending on the country, region, or context.

In the United States, the Department of Housing and Urban Development (HUD) defines affordable housing as housing that costs no more than 30% of a household's income for rent and utilities. This guideline ensures that housing expenses are kept at a reasonable and manageable level for individuals and families. The policies to promote affordable housing for lower-income groups include the following: (1) Creating housing loan products that are suitable for low-income people so that they have access to credit and can pay rent or pay toward ownership of a domicile; (2) Providing state subsidies to help

low-income earners rent or own affordable, quality housing; (3) Applying diverse estate taxes and mortgage loans, leasing and buying; (4) Reducing property speculation; and (5) Developing energy-efficient housing to reduce housing costs and minimize adverse environmental impact (Sirisan et al., 2019).

2.4 Delivery Mechanisms for Affordable Housing

Kulthonlthip (2009) has compiled guidelines on the affordable housing policy in the UK, and this consists of the following two approaches:

- "Social rented housing" is the provision of rental housing which is owned and managed by the local government, including rental housing that has been agreed upon with the local government organization and the Housing Corporation as the entities to receive subsidies.

- "Intermediate housing" is sub-market-priced housing for a specific group that the housing market normally cannot meet. There are both types of rental housing with the intent to buy at a low price and housing for the owner of a joint mortgage.

The UK has established payable housing policies in its planning policies at the national, regional, and local levels. The UK has established regional assemblies, which are representatives of local governments. Partnership corporations work with government agencies to advise governments on the allocation of investments and types of housing to sub-regions and to develop Regional Spatial Strategies (RSS) to identify the volume and guidelines for housing arrangements that correspond to affordability and respond to the needs of each area as well.

- Operating subsidies and financing (rental and purchase): This refers to below-market interest-rate loans or a subsidy that actually makes housing affordable. The use of financing in this way is to assist in the construction phase or the completion of the project to reduce the cost of a housing project. This allows housing units to be sold or rented at a lower price than in the general market.
- Deed restrictions, restrictive covenants (both rental and purchase): Deed restrictions are legal restrictions applied to all paid housing units to define the characteristics of a tenant or buyer such as income level, set length of stay, affordable housing, etc. Subsequently, restrictive covenants must be used to increase or maintain the number of affordable housing units and, due to deed restrictions, will need to be closely monitored. In particular, long-term residency programs should have agencies that closely monitor them.

- Land regulation (both lease and purchase): Land use stipulations can specify that housing is affordable. Detailed zoning is therefore an important tool, especially in markets where land prices are inflated and where the price can be adjusted by reducing the density in that area.
-

2.5 Security of Housing Tenure

The principle of Security of Tenure is related to two things. The first is the right to housing (right to housing, land, property) which consists of the right to adequate housing, protection from forced eviction, and the ability to access the right to housing without discrimination. Tenure and tenure arrangements are relationships between individuals or groups that can be agreed upon in many forms. These include agreements that can be or not be legally supported. There may be an oral contract or a written contract. This relationship defines various forms of access to housing and specifies controls for residency, length of stay, and various conditions from both elements mentioned above. This reflects the right to live in a dwelling and enjoy "Security of Tenure." Security of Tenure means that a person's right to live in a domicile is protected; it guarantees legal protection against forced eviction and other forms of harassment.

3. Survey and Data Collection

The survey and data collection is divided into surveys of supply and demand for housing for low-income people in the CBD of Bangkok.

3.1 Study Area

The spatial focus of the study is the Rama IV Road area, extending from Hua Lamphong Station to Lumpini Station by dividing housing for low-income people according to 3 types as follows:

1. Ban Man Khong Community, including the Bonkai Community
2. Dormitory/apartments of the private sector, including the Saphan Leuang Community area and the community behind Hua Lamphong railway station.
3. Flats: Ban Kai Flat, Railway Flat

3.2 Survey of Demand for Affordable Housing

To understand housing needs and accessibility of housing for low-income people in the CBD of Bangkok, the survey methodology is as follows:

1) Target population: The researchers identified low-income people employed in the CBD of Bangkok as the target audience for the demand survey. The focus is on urban poor, migrant workers who have moved into the area. This research adheres to the definition by Dr. Supriya Wangphatcharaphol et al (2017), which refers to formal and informal workers moving into the city to earn income. This group of people is not only Thai nationals from rural areas but also includes migrant workers from Thailand's lower-income neighboring countries.

2) Analytical unit: The researchers have defined the unit of analysis as households of low-income people, both Thai and non-Thai. They are grouped according to 3 types: slums, flats, and privately-owned buildings with rented rooms/apartments.

3) Sample size: The researchers used the Central Limit Theorem to prescribe the sample size of the target population, both Thai and non-Thai, in each housing group of not less than 30 households. This makes it possible to determine the minimum sample size in this research or a total of 90 households.

4) Sites for data collection: Interviews in the Rama IV Road area, covering from Hua Lamphong Station to Lumpini Station, were conducted at housing for low-income people according to the following three types:

   - Slum communities, such as Bonkai Community
   - Dormitory/apartment of the private sector, including the Saphan Leuang Community area, Wat Duangkhae Community, the railway flat community, and the stone carving community
   - Flats, including the Ban Kai flats.

5) Questionnaire Interviews: The researchers conducted personal interviews with 235 members of low-income residents in the Rama IV area using a structured questionnaire. The questionnaire was divided into four parts: Household characteristics, residential behavior, work life, and attitudes toward and needs for housing.

6) In-depth interviews: Three persons were selected for in-depth interviews based on being representative of low-income people who need affordable housing, and include both Thais and non-Thais. The discussion guide had questions related to the way of life of low-income people in terms of residential living, work life, and use of public spaces as follows:

7) Data: The analysis of housing needs and accessibility to affordable housing of low-income people explored residential behavior, including length of stay, number of

relocations, reason for relocation, number of co-habitants, activities in the residence, attitudes and factors in housing selection, and housing needs of low-income people.

3.3 Survey of the Supply of Affordable Housing

The supply-side survey explored the patterns and prices of different types of housing for low-income people that are currently available in the Rama IV Road area. Due to limited access to public housing, the survey area was defined as privately-operated residential buildings in the Saphan Leuang Community area and the area behind Hua Lamphong Railway Station. The research team enumerated a total of 265 buildings, including those that presently offer lodging, and buildings that have the potential for development or converted into housing for low-income people, such as the following:

1) Buildings that have the potential for development as affordable housing: These include buildings with space that is not used to its full potential, such as unused or partially-used buildings; and
2) Land with potential for development as an affordable housing complex, e.g., unused land or land that is not being used to its full potential, and land with derelict buildings.

3.4 Data Analysis

Results from the housing supply and demand survey: The data from the study of housing demand and accessibility for low-income people were compared with housing supply data in terms of quantity, style, and price across each housing type. The aim was to assess the balance of demand and supply, housing insecurity, and factors that contribute to the housing loss of low-income people. Those findings helped to formulate recommendations for housing management policies that are consistent with the diverse housing needs of different groups of low-income people.

4. Research Findings

The research findings are based on the survey of supply and demand for affordable housing for low-income people in the CBD area of Bangkok. A survey of 265 buildings in the area, interviews with 235 low-income people in Rama IV area using structured questionnaires, and in-depth interviews with 3 low-income people who migrated from upcountry or abroad have provided information to inform the following observations:

4.1 Housing Characteristics of Low-income People

Building surveys reveal that a significant portion of privately-developed housing for low-income individuals consists of tenements, hostels, and low-rent apartments. These buildings typically have mixed commercial and residential use, where the lower floors are commonly occupied by shops, while the upper floors are subdivided into rental apartments. Unfortunately, a majority of the rented apartments are in dilapidated condition. It is important to note that the quality of rental rooms varies depending on the rental price.

Furthermore, the area also contains buildings that have a relatively low occupancy rate or are underutilized, with only 60 percent of the space being used. These partially occupied buildings present an opportunity for renovation and conversion into affordable housing for low-income residents.

Table 1. Quality and quantity of low-income housing

	Total
number of buildings surveyed	**265 (100 %)**
building condition	
new	10.19 %
old	64.15 %
wane	25.66 %
building type	
residential	32.06 %
commercial	5.73 %
mixed-use	62.21 %
building utilization	
fully use	39.57 %
partially use	59.15 %
abandon	1.28 %

4.2 Work Characteristics of Low-income People

The work characteristics of low-income people in the CBD of Bangkok differ between Thai and non-Thai residents. Most Thais work in the informal sector, including as small entrepreneurs, such as food stall vendors, taxi drivers, and even full-time employees with stable jobs. The foreign migrants generally work in temporary jobs or daily wage labor and, thus, have a high chance of being laid off or having to change work locations and jobs depending on their employer. Due to the nature of their employment, they face a higher risk of experiencing layoffs and job instability. The lack of job and income stability has

become a significant barrier to their ability to own affordable housing provided by the government.

Table 2. Employment of low-income earners by nationality

Work characteristics	**Thai**	**Non-Thai**	**Total**
Number of samplings	**214 (91.06 %)**	**21 (8.94 %)**	**235 (100 %)**
Occupations			
government officials and employees	5.58 %	-	5.05 %
small business owner	49.75 %	-	44.95 %
general staff	16.75 %	-	15.14 %
employee	13.20 %	95.24 %	21.10 %
Motorcycle taxi/Food delivery driver	7.61 %	-	6.88 %
People who work at home/craftsmen	2.54 %	-	2.29 %
housewife/butler	4.06 %	4.76 %	4.13 %
students	0.51 %	-	0.46 %
Monthly income			
Less than 10,000 Baht	40.91 %	28.57 %	39.73 %
10,001-30,000 Baht	57.58 %	71.43 %	58.90 %
More than 30,001 baht	1.01 %	-	0.91 %
pension 700 baht	0.51 %	-	0.46 %
Number of years working			
Less than 1 year	2.03 %	9.52 %	2.75 %
1-5 years	18.78 %	42.86 %	21.10 %
5-10 years	20.30 %	42.86 %	22.48 %
More than 10 years	58.88 %	4.76 %	53.67 %

4.3 Affordability of Housing for Low-income People

The housing accessibility of low-income people can be classified based on the length of their stay in a particular area. There are typically two main groups:

1. Long-time residents: This group consists of individuals who have lived in the area for a significant period. Long-time resident low-income individuals may have better housing accessibility compared to recent arrivals due to their established networks, stability, and familiarity with the local housing market. They may have had more time to secure affordable and suitable housing options, such as owning a house or renting a stable residence.
2. Recent arrivals: This group includes individuals who have recently migrated or moved into the area. Recent arrivals among low-income people may face more challenges in terms of housing accessibility. They may encounter difficulties in finding affordable housing due to limited resources, lack of established networks, and unfamiliarity with the local housing market. As a result, recent arrivals may initially rely on shared housing arrangements or temporary housing options until they can secure more stable and affordable housing for themselves and their families.

New immigrants, both Thai and foreigners, often initially opt to live together with others to save on rent expenses. However, as they establish a stable income, they tend to transition towards living alone or with their families. This shift towards independent or family-based living arrangements is often driven by the desire for increased privacy and the ability to create a more personalized living space. In addition, many new immigrants also aspire to turn their homes into opportunities to run their businesses. By utilizing their living spaces for entrepreneurial purposes, they aim to generate additional income and establish a foundation for their economic stability. This entrepreneurial approach allows them to maximize the potential of their homes and create a dual-purpose space that serves both as a residence and a venue for their business endeavors.

Table 3. Housing accessibility of low-income people classified by length of stay

The ability to access housing	**Thai**		**Non-Thai**	
	New	Established	New	Established

	comers	residents	comers	residents
Housing types				
Townhouse/Twin House/Townhome	1.41 %	-		
Shophouse/Lease house	77.46 %	65.73 %	100 %	100 %
Apartment/Flat/Dormitory	21.13 %	34.27 %		
Ownership				
House ownership	1.52 %	16.42 %	-	-
Leased house	77.27 %	58.21 %	90 %	100 %
House on installment	4.55 %	15.67 %	-	-
Employer-provided accommodation	4.55 %	6.72 %	5 %	-
Shared living	12.12 %	2.99 %	5 %	-
The number of households members				
1 person	14.29 %	5.67 %	5 %	-
1-2 persons	41.43 %	22.70 %	20 %	-
3-5 persons	41.43 %	60.99 %	75 %	100 %
More than 5 persons	2.86 %	10.64 %	-	-
Relocation				
Yes	59.18 %	13.39 %	5.88 %	-
No	40.82 %	86.61 %	94.12 %	100 %

4.4 Housing Demand of Low-income People

The housing needs of low-income people in the CBD area vary between Thai and non-Thai. Foreign migrant workers, due to job insecurity and limited access to government housing programs, often do not prioritize saving for better housing options. Instead, they tend to allocate their disposable income towards remittances to support their families in their home countries and build up savings. While they may desire higher-quality housing, their current financial priorities lead them to prioritize familial obligations and savings accumulation over improving their living conditions.

Table 4. Housing demand of low-income people by nationality

Housing demand	**Thai**	**Non-Thai**	**Total**
Number of samplings	**214 (91.06 %)**	**21 (8.94 %)**	**235 (100**

Housing demand	**Thai**	**Non-Thai**	**Total**
			%)
Reasons for house location			
transportation/convenience	21.12 %	10 %	19.89 %
near the workplace	16.15 %	90 %	24.31 %
location/amenities	45.34 %	-	40.33 %
affordable price	16.15 %	-	14.36 %
other	1.24 %	-	1.10 %
Housing problem issues			
no problem	**93.79 %**	**100 %**	**94.48 %**
environment problems	1.24 %	-	1.10 %
too many family members.	0.62 %	-	0.55 %
cramped condition.	1.86 %	-	1.66 %
other	2.48 %	-	2.21 %
Demand for future housing type			
single house	14.29 %	-	12.71 %
townhouse /townhome	3.11 %	-	2.76 %
condominium/condominium/mansion	0.62 %	-	0.55 %
commercial building	-	-	-
apartment/flat/dormitory	4.97 %	-	4.42 %
not sure/move according to work	-	5 %	0.55 %
no plan to change residence	**77.02 %**	**95 %**	**79.01 %**
Demand for future housing location			
want to be close to the original	78.38 %	-	78.38 %
want to move to another place	21.62 %	-	21.62 %
Demand for future housing ownership			
rent	1.24 %	-	1.10 %
buy	5.59 %	-	4.97 %
build it yourself	4.35 %	-	3.87 %
already have a house	6.83 %	-	6.08 %
live with the employer	3.11 %	-	2.76 %

Housing demand	Thai	Non-Thai	Total
Don't know	**78.88 %**	**100 %**	**81.22 %**

4.5 Ability to Pay for the Housing of Low-income People

All groups of low-income earners have managed to find affordable lodging options, enabling them to work in the CBD. However, a significant number of low-income people, especially foreign migrants, are compelled to share accommodations with co-workers or non-relatives in order to have some disposable income. Housing insecurity is particularly pronounced among foreign migrants, who often face challenges in securing stable and suitable housing arrangements. The need to share housing with others highlights the financial constraints and limited housing options.

Table 5. The ratio of housing rent to the household income of low-income earners by nationality

The ratio of housing rent to household income	Thai	Non-Thai	Total
Less than 10 percent of household income	22.22 %	-	18.18 %
11-20 percent of household income	23.33 %	40 %	26.36 %
21-30 percent of household income	30 %	40 %	31.82 %
31-40 percent of household income	15.56 %	15 %	15.45 %
41-50 percent of household income	4.44 %	5 %	4.55 %
More than 50 percent of household income	4.44 %	-	3.64 %

5. Conclusions and Discussions

This research aims to comprehensively examine the housing situation and identify the housing needs of low-income workers in the CBD of Bangkok. The primary objective is to provide evidence-based recommendations for suitable housing management practices within the CBD area that effectively reduce inequality, promote economic development,

and enhance Bangkok's sustainable competitiveness among other cities in the Southeast Asia region. By analyzing the specific housing challenges faced by CBD workers, this study seeks to contribute to the formulation of strategies that can ensure equitable access to housing, foster inclusive urban development, and strengthen the city's long-term competitive position.

5.1 Housing Quality for Low- income Groups in the Central Business District of Bangkok

1. Quality of residential living of low-income people

Low-income people, especially young migrant workers, have relatively poorer living conditions and quality of life than other workers due to the congestion of their lodging, lack of hygiene, and lack of basic amenities. This situation is compounded by insecurity in work and/or domicile, or the need to be prepared to change jobs and relocate on short notice. Thus, many of these itinerant workers only carry a few days' clothes and any equipment they need to use as part of their job. Their rootless lifestyle means that they have little interaction with the community or neighborhood. Still, many of the low-income workers work in parts of the service industry that are vital to the CBD and Bangkok as a whole to keep functioning smoothly. However, because they sense that they are only temporary residents of the city, they do not have much incentive to invest time or resources in improving the quality of life in their surroundings. Therefore, housing development programs to accommodate migrant workers, both Thai and foreign, need to create a sense of being a stakeholder in the host community to help lift and maintain the quality of life of these neighborhoods and dwellings. That will also help to stimulate the local economy. Unfortunately, current government policy does not adequately address the housing needs of low-income people in cities around the country. This is a policy gap that needs to be addressed in the next cycle of urban development planning.

2. Imbalance in the supply and demand for housing for low-income people

A study of the housing market and housing in the research area explored the affordability and housing demand of low-income people. That study found that the housing supply was out of sync with government housing demand and that imbalance limited access to housing for the underclass. Most government housing policy that includes the lower-income segment of society targets people with a stable career and income security. However, this narrow approach makes it impossible for many low-income people with no fixed income to access state housing. Even though rental units comprise the largest proportion of low-income housing, the supply is not enough to meet the needs and affordability of those in most need. For example, many of the lower-income residents of the inner city require kitchens and space to prepare food that they will sell on the streets or at food stalls. However, most rental units do not provide such culinary amenities.

3. Lack of housing security for low-income people

When looking at housing accessibility and quality of life for low-income people in the study area, housing instability is caused by income instability when a worker cannot qualify for residence in apartment complexes or other housing that is reasonably stable. Also, those who are able to rent need tenure security, meaning that tenants are not at risk of forced eviction and are protected by law against unreasonable treatment. At the time of data collection, many areas that are pending development have become temporary shelters for low-income squatters.

5.2 Recommendations for Affordable Housing Development for Low-income Groups in the Central Business District of Bangkok

In conclusion, this research seeks to investigate the current housing situation and identify the housing needs of low-income workers in the CBD of Bangkok. The following are highlights:

- Some groups of low-income people have a disproportionately lower quality of residential living that is also well below standard.
- Developing public housing for low-income people is not meeting the need; quality standard housing with amenities is either too expensive or exceeds 30% of the average household income of the lower-income group. Thus, most workers without families share lodging in crowded conditions to save on housing costs.
- Low-income people in most of the study areas lacked housing security. Most were either living in a short-term rented room or an extended rental without a lease. The Baan Mankong Bonkai Complex renews the annual lease agreement with the Crown Property Bureau. Some foreign workers live with employer-provided lodging but without employment contracts. In sum, nearly all groups of lower-income workers in the CBD area are not living in stable housing.

The results of the study show that the development of housing for low-income people in Thailand is inconsistent with the New Urbanism concept, which emphasizes the importance of diverse housing combinations in the same neighborhood. Thus, the development of housing for low-income people in the CBD area of Bangkok needs to take into account the diversity of existing and potential dwellers. There needs to be attractive and affordable housing for a range of incomes that meet quality standards. The increased opportunity and accessibility of low-cost housing reduce disparities and promote environmental quality.

Furthermore, within the framework of affordable housing development, it is essential to ensure that housing for low-income individuals does not exceed 30 percent of their total

household income. This includes not only rent but also expenses related to housing maintenance and utilities. To achieve this objective, comprehensive management guidelines are necessary to ensure that housing options within the CBD area truly align with the needs and financial capabilities of all residents.

Particular attention should be given to low-income individuals who lack housing security, including foreign workers, transient groups, individuals affected by the Covid-19 pandemic, and those experiencing homelessness. In the limited area of the Bangkok CBD, these individuals can form a significant sub-population. Therefore, it is crucial to develop housing solutions specifically tailored to their circumstances, enabling them to access safe and affordable housing options that provide security and stability.

By implementing effective management strategies, such as rent control, subsidies, and targeted support programs, the goal of providing suitable and affordable housing for all residents, especially those facing housing insecurity, can be realized within the confines of the Bangkok CBD area. This approach not only addresses the immediate needs of low-income individuals but also contributes to creating a more inclusive and socially sustainable urban environment.

Lastly, the concept of transitional housing development or housing during the transitional period from homelessness holds significant importance in achieving housing security. However, this concept has not received adequate attention in Thailand thus far. Transitional housing refers to housing options that offer temporary support to individuals at risk of homelessness, aiming to prevent such situations. It falls between emergency shelters and permanent housing, providing longer-term stays and more privacy than emergency shelters.

Thailand continues to experience a steady influx of migrants from rural areas of the country, as well as from neighboring regions, towards Bangkok and industrial centers. Within this population, vulnerable and marginalized groups are inevitably present, often facing various stages of crisis. From a humanitarian perspective, it is crucial to support these new migrants, enabling them to pursue a better quality of life and gradually enhance their productivity and contribution to society.

It is recommended that the National Housing Authority (NHA) collaborates with the private sector to establish a rental housing project catering to the needs of low-income individuals. This collaboration should be based on the principles of supporting housing extensions ("Housing Ladder") and implementing a waiting list system, ensuring equal access to affordable housing for low-income individuals from all groups within the commercial center of the city. By incorporating these measures, the NHA can effectively address the housing needs of low-income individuals while fostering inclusivity and equitable housing opportunities.

6. Recommendations for Future Research

This research was mainly focused on the demand side by building an overall understanding of the situation of residential living of low-income workers in the city center on/around Rama IV Road, and their need for housing. However, the key to increasing urban productivity from the perspective of housing for low-income workers is how to provide stable housing and sufficiently meet the needs of those workers in terms of both quality and quantity. A future research project that would be very useful is a supply-side study that examines the issues from the perspective of real estate entrepreneurs, owners of buildings or land, government agencies, financial institutions, etc. That would provide a better understanding of the development conditions, potential, limitations, and how to use tools in terms of finance, organizational operations, and law for making this type of project successful in the future.

Acknowledgement. This article is part of a research project titled "The Increase of Productivity and the Improvement of Living Quality for Low-income Individuals in the Central Business District of Bangkok: Managing Housing Stock for Low-income People in the Central Business District of Bangkok." The project is funded by the Program Management Unit on Area Based Development (PMU A) under The Office of National Higher Education Science Research and Innovation Policy Council.

References

Addo, I.A. (2013). Perceptions and acceptability of multi habitation as an urban low-income housing strategy in Greater Accra Metropolitan Area, Ghana. Urban Forum 24: 543–571.

Agnew, S. (2010). The impact of affordable housing on communities and households. Minnesota Housing Finance Agency.

Arku, G. (2009). Housing policy changes in Ghanain the 1990s: Policy review. Housing Studies 24(2): 261–272.

Arendt, R. (2000). Conservation design for subdivisions: A practical guide for creating open space networks. Island Press.

Baum-Snow, N., & Marion, J. (2009). The effects of low-income housing on neighborhoods. Journal of Public Economics, 93(3-4), 654-666.

Calabrese, T., Beadles, A. and French-Fuller, K. (2021). The Impacts of Affordable Housing: A Literature Review. Weber State University, Center for Community Engaged Learning, Community Research Extension.

Canadian Definition of Homelessness [Internet] Canadian Observatory on Homelessness.

2012. [Last accessed May 13, 2023]. Available from: https://www.homelesshub.ca/sites/default/files/COHhomelessdefinition.pdf.
Desmond, M., Gershenson, C. and Kiviat, B. (2015). Forced relocation and residential instability among urban renters. Social Service Review, 89(2), pp.227-262.
Hwang, M. and Quigley, J.M., (2006). Economic fundamentals in local housing markets: evidence from US metropolitan regions. Journal of regional science, 46(3), pp.425-453.
Katz, P. (1994). The new urbanism: Toward an architecture of community. McGraw-Hill Professional.
Lang, R., & Novy, A. (2014). Cooperative housing and social cohesion: The role of linking social capital. European Planning Studies, 22(8), 1744-1764
Newman, S. and Holupka, S. (2018). The quality of assisted housing in the United States. Cityscape, 20(1), pp.89-112.
Panitchpakdi, K. (2009). Affordable housing. Housing and Finance Journal, Mortgage Loan Association, 135-149.
Ramzanpour, M., and Nourtaghani, A. (2019). Impact of four physical design factors on mixed-income housing. J. Archit. Eng. 25 (1), 05018006.
Schwartz, A. F. (2021). Housing policy in the United States. Routledge.
Seo, B.K. and Park, G.R. (2021). Food insecurity and housing affordability among low-income families: does housing assistance reduce food insecurity?. Public Health Nutrition, 24(13), pp.4339-4345.
Sirisarnt, S.; Panitchpakdi, K. and Vichienpradit, P. (2019). The Housing Development for Low-Income Earners under Ban Thanarak Pracharat Housing Project. NAJUA: Architecture, Design and Built Environment, [S. l.], v. 16, 154-183.
United Nations. (1996). Habitat Agenda. https://www.un.org/en/events/habitatday/background.shtml
United States Department of Housing and Urban Development. (2021). Affordable Housing. https://www.hud.gov/topics/affordable_housing
Yeboah, I.E.A. (2005). Housing the urban poor in twenty-first century Sub-Saharan Africa: Pol-icy mismatch and a way forward for Ghana. GeoJournal 62(1–2): 147–161.

CHANGES IN MULTI-SEGMENTATION OF THE KOREAN LABOUR MARKET AND HETEROGENEOUS GAPS: THE LABYRINTH OF IN-WORK POVERTY (1116)

Jihan Park, Donghyun Kim*

Department of Urban Planning and Engineering, Pusan National University, Busan, Republic of Korea;

Abstract. The purpose of this study is to identify the multi-segmented structure of the labour market based on regional dualism and to empirically examine the heterogeneous forms of gaps between classes and the existence of mobility constraints. Using data from the Korean Labor and Income Panel Study (KLIPS) 2018-2020, we conducted Latent Class Analysis (LCA) to identify the labour market structure between Capital Region (CR) and non-CR, and Latent Transition Analysis (LTA) to examine mobility between segments. We identified three-segments in CR and four in non-CR. Income gaps across segments were heterogeneous and an exclusive position of the top segments. Furthermore, there were significant underlying constraints on mobility across segments, with entry into the top-tier being very limited. These results suggest that the multi-segmentation and heterogeneous gaps can be observed in post-industrial societies, and deeper division may occur in labour market for non-CR with limited opportunities such as personal contact.

Keywords: Working Poor, Labour Market Segmentation, Multi-Segmentation, Mixture Model, Regional Disparities

1. Introduction

Labour market segmentation is a long-standing debate that has been going on for decades. Originating as a critique of Human Capital Theory that assume a single competitive labour market (Becker, 1964), the institutionalist debate has hypothesised segmented labour markets to explain socioeconomic phenomena more adequately (Doeringer and Piore, 1971; Gordon, 1972; Lindbeck and Snower, 1986, 1989). Continuing empirical evidence supports the assumption of divided labour markets (e.g., Rueda, 2005; Yoon and Chung, 2016). However, due to the nature of segmented labour markets, which cannot be directly observed, the number and properties of segments are predetermined.

Empirical studies focus on how to measure segmentation. Scholars have different criteria for this, with the classic ones being factors such as employment contracts, firm size and wages (e.g., Doeringer and Piore, 1971; Osterman, 1975; Gordon et al., 1982; Schwander and Häusermann, 2013). However, there are growing consensus that a single indicator is

inadequate to measure labour market segmentation and that multivariate data should be considered (Hudson, 2007; Chung, 2019). The assumption of a simple dualisation in a complex post-industrial societies also raises many issues. Recent studies have drawn attention to these limitations, building on decades of rich discussion and technological advances (e.g., Yoon and Chung, 2016; Lukac et al., 2019; Seo, 2021). While they address these issues, two challenges (inter-class mobility and regional disparities) need to be highlighted for further discussion.

Making this discussion even more important is the issue of in-work poverty. While there is no clear consensus on its causes, one of the structural factors is labour market segmentation (Peña-Casas and Latta, 2004). The challenge is that economic shocks are becoming more frequent as societies diversify and exposure to risk increases (Hassink, 2010; Fingleton, 2012; Martin, 2012). These shocks can be more damaging to the poor and create a vicious cycle of more poverty. It's therefore necessary to consider the link between in-work poverty and the segmented labour market.

This study aims to observe the patterns of labour market segmentation in Korea. Using the Korean Labor and Income Panel Study (KLIPS) from 2018 to 2020, we conduct a cross-sectional analysis using Latent Class Analysis (LCA). We assume a division based on various dimensions of precariousness, but do not predefine the number of segments to capture the possibility of multi-segmentation. Given the Korean context, i.e., regional dualism (Park, 1993; Lim, 2008; Kim, 2010; Ma et al., 2017), we present the results separately for Capital Region (CR) and non-CR. Finally, we conduct Latent Transition Analysis (LTA) based on the constructed panel data to identify the mobility between classes over time.

Therefore, the main concern of this study can be summarized as the possibility of multi-segments and the gaps between them and the regional disparities. First, in the second section, beginning with the theoretical background, a research gap will be identified through the literature review, and the hypotheses will be presented. The third section provides a brief description of the data, variables, and the research models. The fourth section will report the findings of the cross-sectional and panel analyses, which will be discussed in the fifth section. Finally, some implications will be drawn, along with limitations and directions for future research.

2. Theoretical Background and Literature Review

2.1. Segmented Labour Market Theories

Institutionalist economists refuse the assumption of a homogeneous labour market and view it as a result of the interaction between the institutions (e.g., individuals, firms). Labour market is segmented, with each governed by heterogeneous rules (Kerr, 1977).

This institutionalization leads to structural problems such as low wages and poverty for certain groups. In Dual Labor Market Theory, the labour market is divided into primary market which is summarized as high-quality labour conditions, and secondary market which represents the unstable employment, low pay (Doeringer and Piore, 1971; Reich et al., 1973). The Insider-Outsider Theory provides the foundation for this dualisation theory (Lindbeck and Snower, 1986, 1989). Whereas Labor Market Segmentation Theory is based on the Radical Theory of Neo-Marxism, and the labour market is viewed as being segmented by a domination strategy for capital to control labour (Gordon, 1972). In short, the labour market is a place where class social relations are formed.

From an institutional perspective, labour market is inherently hierarchical with limited mobility, creating systemic forces such as involuntary low-wages, unemployment, and poverty (Doeringer and Piore, 1971; Reich et al., 1973; McDonald and Solow, 1985). In practice, it's unrealistic for employers to measure marginal productivity of workers directly, so it's measured indirectly based on job attributes (Thurow, 1975), and wages are determined based on this (Bulow and Summers, 1985). In addition, wages tend to be determined through collective bargaining between labour and management, and the wage gap between workers is the result of social values being reflected in wages through collective bargaining.

New Economic Sociology, which emphasising human behaviour, including economic behaviour, inherits this view by considering labour matching or assignment. The focus is on the existence of the realm of chance, and information derived from appropriate human contacts in job search is a factor in shaping better wages and labour conditions (Jencks et al., 1972). The role of social networks in the mechanism by which labour is allocated to each job goes beyond the supply-demand side and emphasises the the combination of two factors, i.e., the nature of matching (Granovetter and Tilly, 1988). The possibility of mismatching is another important factor in explaining the labour market.

2.2. How to Measure Labour Market Segmentation

2.2.1. Measuring Labour Market Segmentation

The insider-outsider dichotomy is dominant in measuring labour market segmentation, however, the criteria for distinguishing them varies slightly depending on the underlying theory. There is no clear consensus on the factors that best identify the presence of segmentation (Hudson, 2007), and challenges exist in identifying it and even when segmentation is measured, whether it is measured accurately (Boston, 1990). In addition to classical ones, concepts that have recently gained traction in segmentation measurement include subjective insecurity, mobility constraints, and future insecurity (e.g., Davidsson and Naczyk, 2009; Kalleberg, 2014; Max and Picot, 2020). Nor should we overlook the role of unions, which have recently been reported to play a role in consolidating the exclusive position of insiders and widening the gap (Lee and Frankel,

2004; Rueda, 2005). The development of these concepts is an attempt to capture different aspects of an individual's socioeconomic status in a diversified labour market.

The assumption of upward entry constraints is a key feature of segmented labour market. In a dualised labour market, once a worker enters the external labour market, they are likely to trapped (Doeringer and Piore, 1971; Gordon, 1972). Furthermore, recent studies highlight the widening gap between the segments in many developed countries (Häusermann and Schwander, 2012). These point to the drawbacks of conducting only cross-sectional analysis in segmentation study. Employment contract status is variable (Schwander and Häusermann, 2013), and single-point studies fail to observe in and out (Biegert, 2014). While existing research captures changes in division over time (Yoon and Chung, 2016), iterations of cross-sectional analyses are limited in capturing mobility across classes.

Recent findings on segmented labour market suggest the possibility of multi-division. This is not an inherent problem with the dichotomous assumption itself, but restricting the segments to only two may not capture a wider range of possibilities. At first, the insider-outsider perspective can be further divided (Reich et al., 1973; Osterman, 1975; Edwards, 1979). Seo (2021) adheres to the insider-outsider view, but subdivides it into one insider group and three outsider groups. López-Roldán and Fachelli (2021) also propose subdivisions within a dualistic structure (i.e., upper and lower). Evidence for a triple-segmentation continues to emerge. Jessoula et al. (2010) argue for the existence of 'mid-siders,' a new tier between insiders and outsiders. Yoon and Chung (2016) propose 'future insecure' as the third segment, and Lukac et al. (2019) identify three groups (i.e., managerial, standard, and disadvantage), which comprised by seven subgroups.

It's also essential to understand regional differences in labour market segmentation. At the macro level, patterns of segmentation across countries have been shown to be heterogeneous (e.g., Schwander and Häusermann, 2013; Lukac et al., 2019; López-Roldán and Fachelli, 2021; Seo, 2021). These cumulative findings suggest that division can be influenced by differences in socioeconomic and institutional contexts, from which we can infer heterogeneous patterns of division in regional labour markets.

2.2.2. Dimension of Precariousness

Concepts such as precarious work refer to a type of work which is low-wage, insecure, and often synonymous with poor quality employment (Kalleberg,2014; Olsthoorn, 2014). However, these are clearly broad concepts, and choosing indicators to measure segmentation is not an easy task. We can use a number of dimensions that have been discussed in empirical segmentation research over the past few decades; standard employment contracts, continuity of employment, income, and social protection have

been discussed (Rogers and Rodgers, 1989). Based on cumulative discussions and recent interest, we have identified five dimensions of precariousness.

Employment Insecurity. Outsiders in the labour market can be seen as excluded from employment security (Davidsson and Naczyk, 2009). This dimension is the concept of contingent employment, which can be viewed as consisting of two sub-indicators: casual work and part-time/full-time. Several studies have measured division based on contractual arrangements (e.g., Rueda, 2005; Yoon and Chung, 2016; Lukac et al., 2019; Seo, 2021). The European Foundation and the International Labour Organization have also identified this as a major driver of segmentation (ILO, 2016; Eurofound, 2019). Furthermore, the precariousness of contractual terms may capture an important aspect of post-industrial societies where employment doesn't ensure security (Seo, 2021).

Objective Insecurity. Income level and occupational skills are two key indicators that have been used to measure labour market segmentation along with employment status. Olsthoorn (2014) and Yoon and Chung (2016) used the income insecurity as a key indicator of precariousness. This not only refers to one's current position in the labour market in terms of compensation and social benefits (Hudson, 2007; Olsthoorn, 2014; Kalleberg, 2014), but also extends to the dimension of future insecurity in that current wages determine social security coverage such as pensions (Kalleberg, 2014; Seo, 2021). Occupational skills are another useful indicator that has been used to capture segmentation (e.g., Boston, 1990; Yoon and Chung, 2016). Moreover, it’s worth considering that recent skill-biased technological change has accelerated economic inequality (Acemoglu 2002).

Subjective Insecurity. This recognises another dimension that may be ignored by objective indicators (Chung, 2019). Individual subjective experiences may capture precariousness better than indicators such as employment contracts (Green et al., 2001), and more attention needs to be paid to the psychological dimensions of labour conditions, even if they are closely related to employment contracts (Chung, 2019). Furthermore, in the event of an economic shock, the employment contract itself may not provide stability (Klandermans et al., 2010), and depending on the institutional context, contractual distinctions may become irrelevant (Håkansson and Isidorsson, 2012). Thus, subjective insecurity may help distinguish true outsiders (Marx and Picot, 2020).

Future Insecurity. This concept can be summarized as opportunities for job advancement. Fewer possibilities for advancement may limit ongoing job security, movement to better jobs, or promotion (Kalleberg, 2014), and thus can be used as a predictor of whether a given individual is a temporary outsider or will remain in the external labour market for an indefinite time (Seo, 2021). In turn, it’s worth noting that it's an indicator that can be used to determine a particular individual's potential for upward mobility, which can overcome the limitations of cross-sectional studies (Seo, 2021).

Union Protection. Workers can expect to be empowered by participating in the improvement of their working conditions through unions, such as wage bargaining (Anker et al., 2003; Ghai, 2003). However, contrary to their initial purpose of preventing labour rights abuses, unions have recently been reported to exercise monopoly power in wage bargaining at the firm level (Lee, 2011). By consolidating the status of union members, it widens the gap between labour market segments (Lee and Frankel, 2004; Rueda, 2005).

In segmented labour market, precarious workers can be classified as outsiders (Standing, 2011), victims have been identified as women, youth, low-educated, and Small and Medium-sized Enterprises (SMEs) workers (e.g., Hudson, 2007; Schwander and Hauserman, 2013; Ha and Lee, 2013; Yoon and Jung, 2016).

2.3. Context in Korea

The Korean labour market has undergone two major structural transitions: the Great Labour Movement and the Asian financial crisis. Earlier studies of Korean labour markets paid much attention to union revitalisation and the impact of the Great Labour Movement in 1987 (Song, 1999). This accelerated and expanded the dual system of internal and external labour markets. In addition, the 1997 Asian financial crisis marked the end of rapid and equitable economic growth in Korea since the start of industrialisation in the 1960s (OECD, 2011; Ha and Lee, 2013; Kwon, 2015). Although Korea recovered quickly from the shock, the post-crisis economic growth trend was not the previous one (Kwon, 2015). The flexibilisation of the labour market in the process of neoliberal globalisation required by the World Bank and International Monetary Fund as part of the rescue package led to fundamental structural changes in employment (Ha and Lee, 2013). Income inequality has increased significantly, with a sharp rise in the number of low-wage or/and contingent workers.

About 25 years after two major structural shifts, the interplay of low-skill substitution due to skill-biased technological change and advances in automation, the declining middle class, post-crisis labour market concerns (i.e., widening income gap, growth without employment), and economic shocks that are becoming more frequent in a complex post-industrial society are exacerbating the problem of labour market segmentation. In light of this, it may be premature to conclude that the Korean labour market is dichotomous structure, as Ha and Lee (2013) and Schauer (2018) do, rather than divided (Chung and Jung, 2016; Kwon, 2015). Moreover, in Korea, there's a regional dualism (i.e., CR and non-CR) (Kim, 2010). CR, consists of Seoul capital city, Incheon metropolitan city, and Gyeonggi province, closely linked socioeconomically based on geographical proximity, covers about 10% of the entire nation's territory, is home to more than half of the population (Ma et al., 2017). Aside from political, and cultural concentrations, the persistent trend of human capital concentration has been noted for decades (Park, 1993; Lim, 2008).

Based on these findings, we suggest as follows:

H. 1a. Multi-segmentation will be captured in the Korean labour market.

H. 1b. Regional differences in the labour market will be identified, with more segments observed for non-CR due to limited opportunities.

H. 1c. The characteristics of outsiders, i.e., female, young, low-educated, SMEs, will not be significantly different from those previously reported.

We will also examine mobility and gaps between classes; given the assumption of multi-segmentation, gaps and mobility between classes may not be homogeneous. Given the increasingly entrenched position of the top tier, we hypothesise as follows:

H. 2a. The income gap between classes is widening. Specifically, the gap between the top and the rest of the class is widening.

H. 2b. There will be constraints on upward mobility. Specifically, there will be significant difficulties in entering the top-tier, while more fluid movement will be observed between the lower-tiers.

3. Data and Methods

3.1. Data and Variables

3.1.1. Data

This study uses data from the 21st to 23rd waves (2018-2020) of the KLIPS. It's an annual survey that provides detailed information about workers and is a nationally representative sample built through two-stage cluster systematic sampling using the Population and Housing Census (by Statistics Korea) as the sampling framework. Given the research objectives, the analysis was limited to wage earners aged 18 to 65. We aggregate data by region to identify differences between CR and non-CR.

3.1.2. Indicators

Seven observables that comprise the five concepts of precariousness are used to capture labour market segmentation. Employment Insecurity consists of two variables: employment contract type and part-time work. Each is coded as permanent (1) or non-permanent (0), and full-time (1) or part-time (0). Objective Insecurity is also measured by two variables (i.e., income and skill). Income level were categorized as high-income (2), middle-income (1), or low-income (0), with each cut-off at 3/2 and 2/3 of the median hourly wage for wage earners. Occupational skills were categorized as high-skilled (2), middle-skilled (1), or low-skilled (0) according to the Korean Standard Classification of Occupations compiled by Statistics Korea. Subjective Insecurity was measured through yes (1) or no (0) responses to the question, 'Unless you have done something particularly wrong, could you keep your current job for as long as you want' (Anderson and Pontusson,

2007). Future Insecurity is measured by a yes (1) or no (0) response to whether the company provides education or job training to improve job performance (Kalleberg, 2014). Union Protection is measured by responding yes (1) or no (0) to whether you are a member of a union.

3.1.3. Independent Variables

A conditional model of the independent variable is considered to determine its effect on the latent class distinction to identify the characteristics of the outsider. Age was categorised into young (0), middle-aged (1), and old (2), based on the ages of 35 and 50. Gender was dummy coded as male (0) and female (1). Education refers to final educational attainment and consists of elementary school, middle school, high school, junior college, university, and graduate school graduation. They were coded from (0) to (5) in sequence. To focus on the impact of industry on classification across lower tiers, we used whether they were employed in manufacturing; yes (1) or no (0). Finally, we classified firms as large (1), or SMEs (0) based on their size. In Korea, companies with less than 300 employees are generally classified as SMEs (Ha and Lee, 2013). Tab. 1 presents descriptive statistics of observables; see Appendix 1A for CR and Appendix 1B for non-CR.

Table 1. Descriptive Statistics, Korea

	Concepts	Variables		2018 (N=6,756)	2019 (N=6,647)	2020 (N=6,411)
Indicator	Employment Insecurity	employment contract	non-regular	2,063	2,009	1,854
			regular	4,693	4,638	4,557
		part-time work	part-	589	604	561
			full-	6,167	6,043	5,850
	Objective Insecurity	income	low	1,089	1,055	957
			middle	4,150	4,274	4,081
			high	1,517	1,318	1,373
		skill	low	1,880	1,839	1,710
			middle	3,105	3,078	2,976
			high	1,771	1,730	1,725
	Subjective Insecurity	non-secure		1,039	962	855
		secure		5,717	5,685	5,556
	Future Insecurity	non-secure		6,418	6,299	6,157
		secure		338	348	254
	Union Protection	non-protection		5,770	5,652	5,391
		protection		986	995	1,020

Covariates	Age	young	1,600	1,523	1,394
		medium	3,089	3,038	2,957
		old	2,067	2,086	2,060
	Gender	male	3,960	3,864	3,729
		female	2,796	2,783	2,682
	Education	elementary school	204	177	139
		middle school	424	390	334
		high school	2,591	2,517	2,461
		junior college	1,311	1,304	1,282
		university	1,961	1,985	1,921
		graduate school	265	274	274
	Industry	non-manufacture	5,017	4,980	4,797
		manufacture	1,739	1,667	1,614
	Firm Size	SMEs	6,088	5,981	5,782
		large	668	666	629

.

3.2. Methods: Mixture Model

A mixture model is a statistical model that uses categorical latent variables to identify subgroups within a population of unknown composition. LCA is a type of mixture model used for person-centred classification (Collins and Lanza, 2009; Hickendorff et al., 2018), which groups individuals with similar characteristics into the same class. LTA is a longitudinal extension of LCA that can examine transitions between classes over time. The research model is shown in Fig. 1. Mplus version 8.8 was used for the mixture model, with supplementary use of STATA version 16.0 and SPSS version 23.0.

3.2.1. Latent Class Analysis

LCA is a statistical procedure used to categorise individuals into unobserved latent classes based on differences in responses to observables (Collins and Lanza, 2009). It has the advantage that the number of clusters doesn't need to be predetermined and provides goodness-of-fit statistics for rational decisions. Furthermore, LCA provides posterior probabilities that quantify the uncertainty of class membership, and can handle differently scaled indicators, which provides a significant advantage for handling multivariate data (Schreiber, 2017). For LCA reviews, see Collins and Lanza (2009), Muthén and Muthén (2017, CH.7), Schreiber (2017), Hickendorff et al. (2018), Weller et al. (2020), and Sinha et al. (2021).

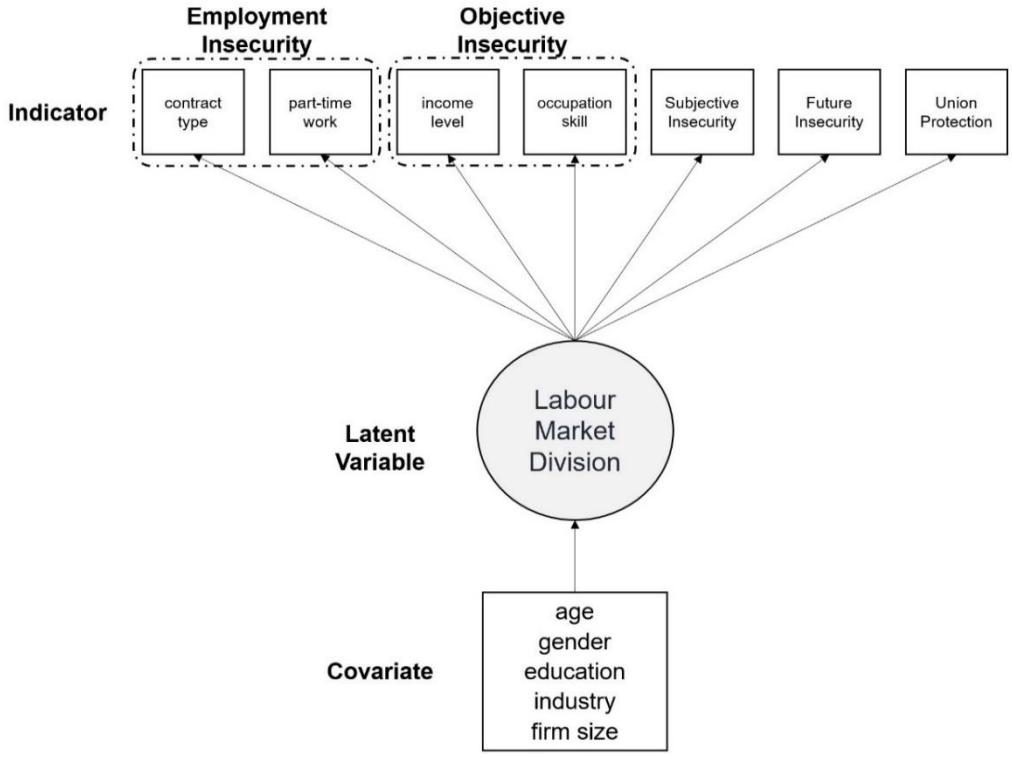
To estimate the optimal model, a maximum likelihood with robust standard errors (MLR) estimator was used, and several initial value sets are iteratively introduced to avoid local maxima, as pointed out by Muthén and Muthén (2017) and Uebersax (2000). The analysis is performed by increasing the number of latent classes by one, and the final model is

selected based on statistical criteria such as information criterion, chi-square test, and entropy. Covariates that may affect classification are controlled using the 'three-step approach' (Vermut, 2010; Asparouhov and Muthén, 2014), specifically the R3STEP (Auxiliary) syntax, which estimates the relationship between independent variables and latent classes using multinomial logit coefficients.

3.2.2. Latent Transition Analysis

LTA estimates transition probabilities, which represent the likelihood that an individual switches from one latent class at time *t* to each latent class at time *t+1*. Thus, it can be useful when trying to capture inter-tier mobility in the labour market over time. When conducting an LTA including indicators and covariates at all time points, a 'three-step approach' is applied, as variables at earlier time-points can influence the formation of latent classes at later time-points (Asparouhov and Muthén, 2014; Nylund-Gibson et al., 2014). The first step involves performing LCA at each time point to determine the optimal number of latent class. Then, each individual is assigned to a class based on the highest probability, introducing some classification error. The final model combines the LCA from each time-point with fixed classification error. For reviews of LTA, see Asparouhov and Muthén (2014), Nylund-Gibson et al. (2014), Muthén and Muthén (2017, CH.8), and Hickendorff et al. (2018).

(A) LCA



(B) LTA

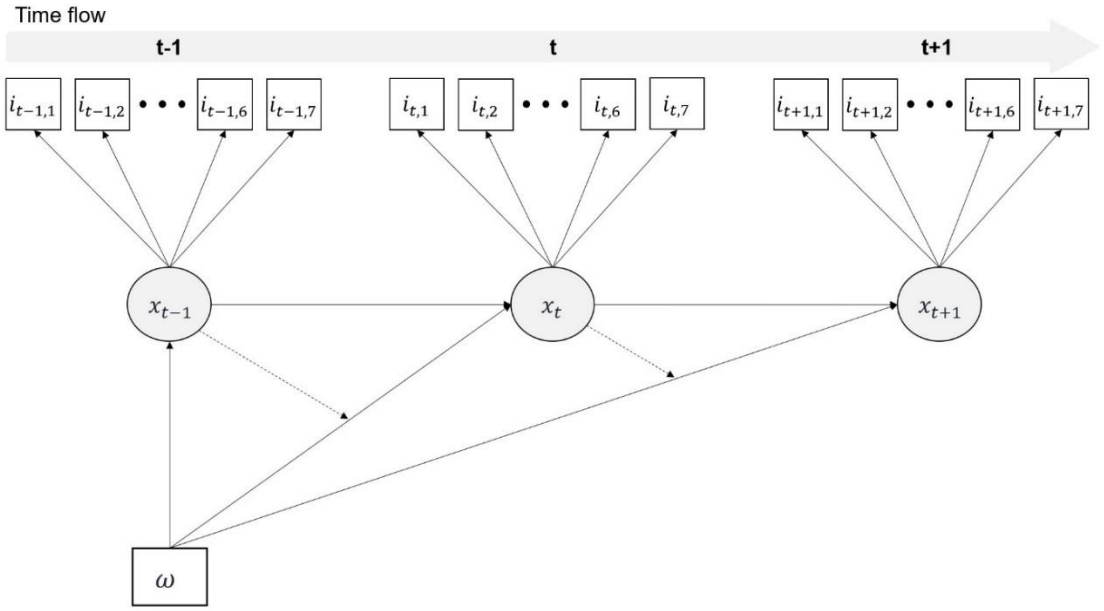


Figure 1. Research Model

4. Empirical Results

4.1. LCA

LCA was performed by year, increasing the number of latent classes from two to six, and compared statistical criteria to determine the optimal number of latent classes (Tab. 2); Appendix 2A for CR and Appendix 2B for non-CR. The information criterion, which used in here, were Akaike Information Criterion (Akaike, 1974), Bayesian Information Criterion (BIC) and Sample-size Adjusted BIC (SABIC) (Schwarz, 1978; Sclove, 1987). For chi-square tests, we utilized the Lo-Mendell-Rubin adjusted Likelihood Ratio Test (LMR LRT), the Vuong-Lo-Mendell-Rubin Test (VLMRT) (Lo et al., 2001), and the parametric Bootstrapped Likelihood Ratio Test (BLRT) (McLachlan and Peel, 2000). Entropy, which measures the quality of classification, has also been reported.

Table 2. Model Fit Statistics, Korea

Year	Class	LL	AIC	BIC	SABIC	VLMRT	LMR LRT	BLRT	Entropy
2018	2	-23602.7	47241.1	47370.6	47310.3	0.000	0.000	0.000	0.876
	3	-23242.5	46542.9	46740.6	46648.5	0.000	0.000	0.000	0.737
	4	-23064.1	46205.0	46470.9	46347.0	0.000	0.000	0.000	0.764
	5	-22985.4	46067.5	46401.6	46245.9	0.000	0.000	0.000	0.729
	6	-22938.2	45994.8	46397.1	46209.6	0.046	0.047	0.000	0.705
2019	2	-23108.8	46254.8	46384.0	46323.6	0.000	0.000	0.000	0.877
	3	-22736.5	45530.8	45728.1	45635.9	0.000	0.000	0.000	0.718
	4	-22555.2	45187.2	45452.4	45328.5	0.000	0.000	0.000	0.756
	5	-22482.3	45062.3	45395.6	45239.9	0.000	0.000	0.000	0.741
	6	-22448.4	45013.9	45415.2	45227.7	0.000	0.000	0.000	0.759
2020	2	-21968.1	43974.3	44102.8	44042.5	0.000	0.000	0.000	0.883
	3	-21617.1	43292.2	43488.4	43396.2	0.000	0.000	0.000	0.708
	4	-21457.6	42993.2	43257.0	43133.1	0.000	0.000	0.000	0.749
	5	-21390.3	42878.6	43210.2	43054.5	0.000	0.000	0.000	0.768
	6	-21360.6	42839.2	43238.4	43050.9	0.507	0.510	0.000	0.751

While there is some consensus that BLRT provides the most accurate assessment of model fit, followed by BIC (Vermut, 2002; Nylund et al., 2007), several studies have emphasised the need to consider multiple criteria, including theoretical interpretability (Nylunde et al., 2007; Hickendorff et al., 2018; Weller et al., 2020). Since it was not possible to assess goodness-of-fit with BLRT, we used BIC as our key criterion. The optimal solution is found at the point where an 'elbow plot' forms by plotting the BIC (Sinha et al., 2021). Fig. 2A-2C shows that an 'elbow plot' is forming in four-class solution. Three segments were observed in CR (Appendix 3A-3C) and four in non-CR (Appendix 3D-3F). The entropy value is generally considered ideal if it's above 0.8, but no clear threshold (Muthén, 2008), a value around 0.75 can be considered good. The average posterior probability represents the average probability that individuals assigned to a particular class actually belong to that class. Thus, a value closer to 1 is more desirable, and 0.8 is considered good (Weden and Zabin, 2005). It is shown as diagonal matrix as in Tab. 3; see Appendix 4A for CR and Appendix 4B for non-CR. Finally, considering the interpretability dimension, we conclude that final model with four-segments for nation and non-CR and three-segments for CR (*H. 1a, H. 1b*).

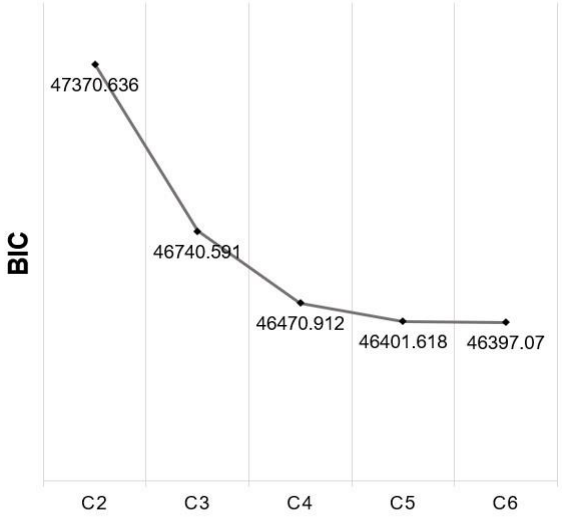
Table 3. Average Latent Class Posterior Probabilities, Korea

		C1	C2	C3	C4
2018	C1	**0.842**	0.156	0.000	0.003
	C2	0.097	**0.899**	0.002	0.002
	C3	0.000	0.004	**0.879**	0.117

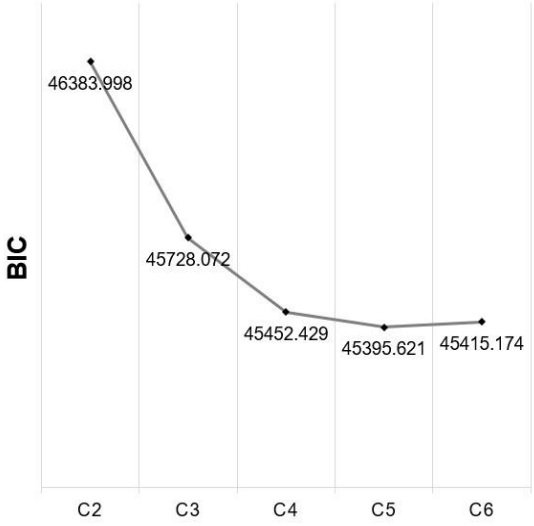
	C4	0.008	0.000	0.146	**0.846**
2019	C1	**0.906**	0.000	0.093	0.001
	C2	0.000	**0.903**	0.000	0.097
	C3	0.140	0.001	**0.858**	0.001
	C4	0.009	0.185	0.000	**0.806**
2020	C1	**0.874**	0.126	0.000	0.000
	C2	0.148	**0.839**	0.000	0.013
	C3	0.002	0.000	**0.869**	0.130
	C4	0.000	0.002	0.124	**0.875**

Note: Bolds are those > 0.8

(A) 2018



(B) 2019



(C) 2020

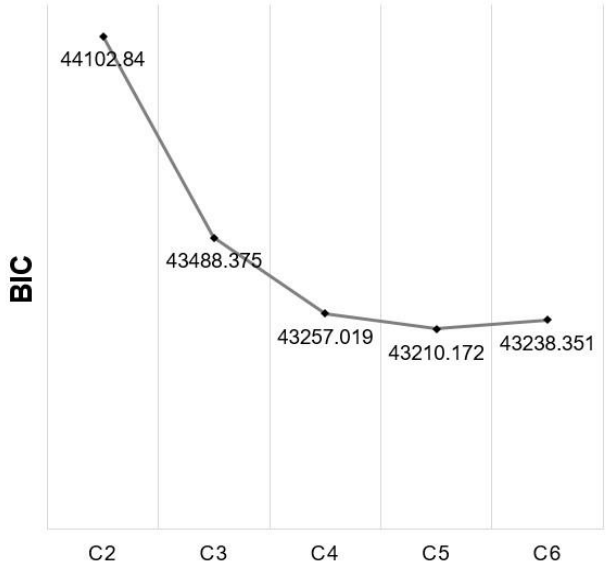


Figure 2. Changes of BIC in Korea

Table 4A. Item Response Probabilities, Korea, 2018

N=6,756	insider (C1)	core-mid (C2)	outsider (C3)	marginal-mid (C4)
Class Size (%)	24.7	44.7	13.1	17.5
Contract Type				
Non-Permanent	0.009	0.000	**0.985**	**0.995**
Permanent	**0.991**	**1.000**	0.015	0.005
Part-time Work				
Part-time	0.000	0.003	0.478	0.133
Full-time	**1.000**	**0.997**	0.522	**0.867**
Income Level				
Low	0.001	0.109	**0.715**	0.107
Middle	0.262	**0.837**	0.285	**0.790**
High	**0.737**	0.054	0.000	0.102
Occupational Skill				
Low	0.045	0.216	**0.861**	0.331
Middle	0.557	0.514	0.085	0.464
High	0.398	0.270	0.055	0.205
Subjective Insecurity				
Non-Secure	0.004	0.023	0.510	0.433
Secure	**0.996**	**0.977**	0.490	0.567
Future Insecurity				
Non-Secure	**0.880**	**0.977**	**0.990**	**0.951**

Secure	0.120	0.023	0.010	0.049
Union Protection				
Non-Protection	0.584	**0.935**	**1.000**	**0.920**
Protection	0.416	0.065	0.000	0.080

Note: Bolds are those > 0.7, which determine the attributes of each tier (Collins and Lanza, 2009).

Based on the set of item (i.e., indicator) response probabilities, each class can be characterised, and in Korea (Tab. 4A), the following hierarchical distinction is possible. First, those aggregated in the leftmost column of Tab. 4A can be identified as regular, full-time, high-income workers, indicating high subjective security. Although the Future Insecurity and Union Protection items do not have a high response rate, they are clearly distinguished from the others and are labelled as insiders based on literature (e.g., Schwander and Häusermann, 2013). Second, workers in the second column of Tab. 4A show a marked difference in income levels from insiders. There are also notable differences in terms of Union Protection and Future Insecurity. Despite low externality, they may struggle in maintaining their status in any economic shock. On this basis, we call them the core-middle class. They are similar to 'future insecure' in Yoon and Chung (2016) and 'dead-end insiders' in Seo (2021). Third, workers grouped in the rightmost column of Tab. 4A are the most distinct from the core-middle in responses to 'non-permanent' and Subjective Insecurity. They are mostly plagued by psychological insecurity stemming from contractual arrangements, and may have a more externalised status even at moderate wages. Thus, we classify them as marginal-middle class. Finally, the rest are the outsiders, who are highly precarious in all indicators. Even a mild shock can get them fired at any time.

Table 4B. Item Response Probabilities, CR and non-CR, 2018

	CR (N=3,542)			non-CR (N=3,214)			
	insider	middle class	outsider	insider	core-mid	marginal-mid	outsider
	C1	C2	C3	C1	C2	C3	C4
Class Size (%)	27.8	46.3	25.9	22.7	45.1	17.5	14.7
Contract Type							
Non-Permanent	0.028	0.065	**0.989**	0.006	0.000	**0.970**	**0.994**
Permanent	**0.972**	**0.932**	0.011	**0.994**	**1.000**	0.030	0.006
Part-time Work							
Part-time	0.002	0.003	0.314	0.000	0.001	0.115	0.481
Full-time	**0.998**	**0.997**	0.686	**1.000**	**0.999**	**0.885**	0.519
Income Level							
Low	0.000	0.107	0.378	0.005	0.110	0.085	**0.752**
Middle	0.214	**0.893**	0.561	0.286	**0.808**	**0.826**	0.246
High	**0.789**	0.000	0.061	**0.709**	0.081	0.090	0.003
Occupational Skill							
Low	0.058	0.215	0.600	0.044	**0.213**	0.310	**0.855**
Middle	0.477	0.498	0.263	0.635	0.547	0.483	0.107
High	0.465	0.288	0.136	0.321	0.239	0.207	0.039
Subjective Insecurity							
Non-Secure	0.008	0.019	0.508	0.000	0.025	0.421	0.553
Secure	**0.992**	**0.981**	0.492	**1.000**	**0.975**	0.579	0.447
Future Insecurity							
Non-Secure	**0.918**	**0.983**	**0.987**	**0.834**	**0.969**	**0.920**	**0.986**
Secure	0.082	0.017	0.013	0.166	0.031	0.080	0.014
Union Protection							
Non-Protection	0.686	**0.920**	**0.962**	0.469	**0.950**	**0.913**	**1.000**
Protection	0.314	0.080	0.038	0.531	0.050	0.087	0.000

Note: Bolds are those > 0.7

Tab. 4B shows the item response probabilities across regions, and for non-CR, four-class solution were derived, which can be classified as above. However, in CR, three-class solution was derived. They were categorised as insider, middle class, and outsider based on Tab. 4B. It should be pointed out that direct comparisons are not meaningful as different numbers of classes have been derived for each region: the middle class in CR is not a simple sum of the core and marginal-middle in non-CR. Same interpretation was possible for each year, see Appendices 5A-5D.

Conditional models with additional covariates can provide more detailed information about the class. Extract and validate the multinominal logit coefficient for the reference class, which is the first-listed group in the cell. We can confirm that the context in Korea is consistent with existing findings that female, the young, and low-educated workers are characterised as outsiders (Tab. 5). It also suggests that the outsiders are not so much represented by blue-collar workers who once made up the middle class. Finally, the response to firm size highlights the difference between insiders and others (*H. 1c*). Similar results were observed by region and year (Appendix 6A-6H).

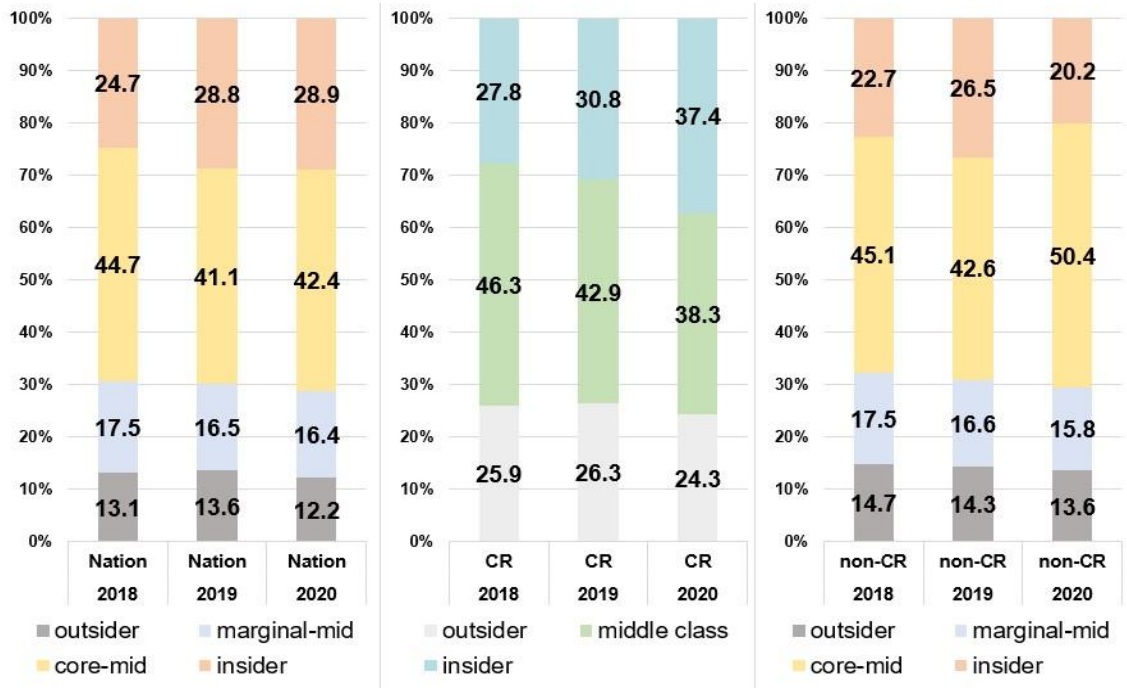
We aim to gain some insights by listing the cross-sectional analyses before the panelised analysis, recognising the need for cautious interpretation due to the short timeline. Changes in the proportions of each class are more pronounced in CR, and we can infer that there is more fluid movement between classes than in non-CR (Fig. 3A-3C). However, this has limitations in clearly capturing the individual interclass movements over time. The average income line for each decile can be used to identify the wage gap (Fig. 4A-4C). Wages in the top tier are overwhelmingly high, which is a clear reflection of the capital concentration. Furthermore, the trend of the income gap is more variable in CR than in non-CR, suggesting that the gap has not widened significantly, but at least it is not shrinking (*H. 2a*).

Table 5. Relationship with Covariate, Korea, 2018

		Age	Gender	Education	Industry	Firm Size
outsider vs. insider	Est. C.	0.626***	-3.796***	1.939***	2.802***	5.100***
	S.E.	0.122	0.217	0.093	0.270	0.721
outsider vs. core-mid	Est. C.	-0.179	-1.542***	1.018***	2.549***	0.974
	S.E.	0.094	0.145	0.075	0.243	0.709
outsider vs. marginal-mid	Est. C.	0.315**	-1.963***	0.809***	1.574***	2.180**
	S.E.	0.121	0.166	0.089	0.275	0.743
marginal-mid vs. core-mid	Est. C.	0.311***	-1.834***	1.130***	1.228***	2.920***
	S.E.	0.085	0.176	0.061	0.127	0.222
marginal-mid vs. insider	Est. C.	-0.494***	0.421***	0.209***	0.975***	-1.205***
	S.E.	0.063	0.084	0.044	0.103	0.292
core-mid vs. insider	Est. C.	0.805***	-2.254***	0.920***	0.253*	4.126***

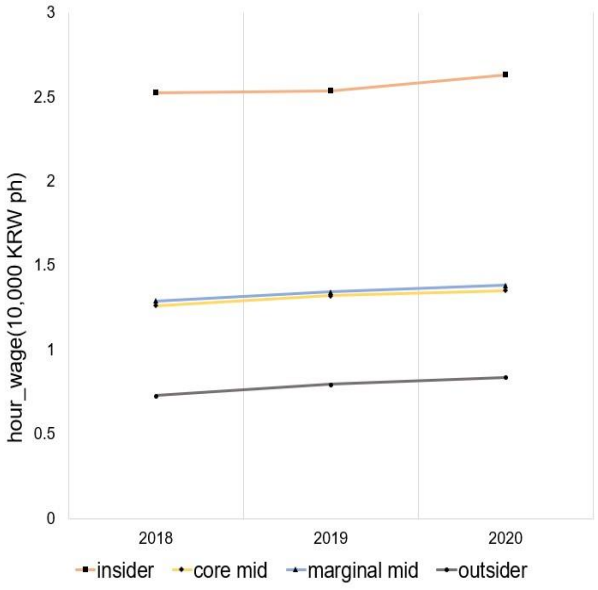
S.E.	0.080	0.177	0.058	0.122	0.295

* $p < .05$, ** $p < .01$, *** $p < .001$



(A) Nation (B) CR (C) non-CR

Figure 3. Changes in estimated labour market share



(A) Korea

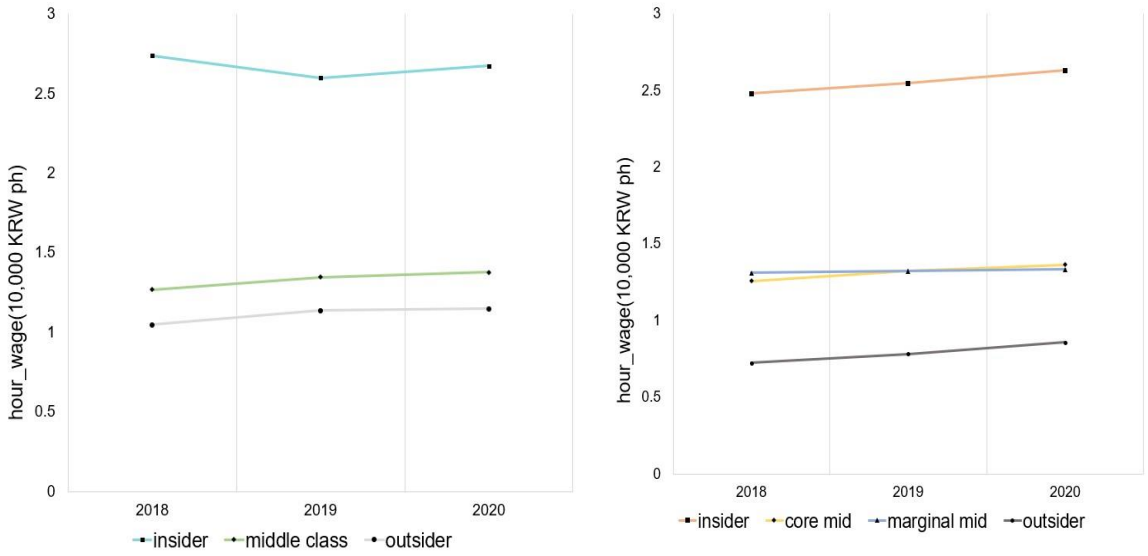
(B) CR (C) non-CR

Figure 4. Changes in average hourly wage by class, 2018-2020

4.2. LTA

To investigate mobility between classes, we conducted LTA with panel data. We studied the transition probabilities up to 2020 for wage earners aged 18-65 in 2018. As each region was analysed separately, difficulties existed in accounting for inter-regional migration; therefore, they were excluded from the analysis along with panel dropouts. First, we performed an LCA for each year to derive the best-fit model and then checked the mobility of each class. Four-class were derived for the nation and non-CR, and three for CR.

Table 7A-7C. show the transition matrices by region, where the value in each cell is the



probability of moving from one class to another over time from 't' to 't+1'. That is, the diagonal matrix in bold is the probability of no movement across classes. However, it's difficult to determine the direction of movement, as the majority of workers remain in their positions and only small amounts of movement are captured. Thus, we can only see rough trends in the coloured areas. Red cells represent less movement, green represents movement between lower-classes, and yellow represents movement in the upper-classes (Table. 7A-7C). This means that it can be characterised by two large clumps: the movement in the yellow area and the movement in the green area. The effect of the independent variables on cross-tier movement can also be validated, but due to the extremely limited cross-tier movement, no significant results were obtained.

Table 7A. Transition Matrix by time-point, Korea (N=4,235)

2018 → 2019		2019				2019 → 2020		2020			
		insider	core -mid	marginal -mid	outsider			insider	core -mid	marginal -mid	outsider
2018	insider	**0.975 (1,105)**	0.021 (24)	0.000 (0)	0.004 (5)	2019	insider	**0.997 (1,101)**	0.003 (3)	0.000 (0)	0.000 (0)
	core -mid	0.006 (9)	**0.977 (1,533)**	0.004 (6)	0.013 (20)		core -mid	0.009 (15)	**0.973 (1573)**	0.005 (8)	0.013 (21)
	marginal -mid	0.009 (4)	0.027 (13)	**0.948 (446)**	0.016 (8)		marginal -mid	0.008 (4)	0.017 (8)	**0.958 (452)**	0.017 (8)
	outsider	0.001 (1)	0.046 (49)	0.013 (14)	**0.94 (999)**		outsider	0.004 (4)	0.015 (16)	0.009 (9)	**0.972 (1,013)**

Note: The value in brackets is the number of people corresponding to the probability

Table 7B. Transition Matrix by time-point, CR (N=2,186)

2018 → 2019		2019			2019 → 2020		2020		
		insider	middle class	outsider			insider	middle class	outsider
2018	insider	**0.990 (601)**	0.006 (4)	0.004 (2)	2019	insider	**0.996 (615)**	0.003 (2)	0.001 (1)
	middle class	0.004 (4)	**0.986 (1,033)**	0.010 (11)		middle class	0.001 (1)	**0.983 (1,040)**	0.016 (17)
	outsider	0.021 (11)	0.047 (25)	**0.932 (495)**		working poor	0.016 (8)	0.011 (6)	**0.973 (497)**

Table 7C. Transition Matrix by time-point, non-CR (N=2,049)

2018 → 2019		2019				2019 → 2020		2020			
		insider	core -mid	marginal -mid	outsider			insider	core -mid	marginal -mid	outsider
2018	insider	**0.831 (325)**	0.079 (31)	0.086 (34)	0.004 (2)	2019	insider	**0.930 (359)**	0.064 (25)	0.004 (2)	0.001 (0)
	core -mid	0.001 (1)	**0.988 (639)**	0.006 (4)	0.005 (3)		core -mid	0.012 (8)	**0.967 (634)**	0.008 (5)	0.014 (9)
	marginal -mid	0.001 (1)	0.004 (2)	**0.976 (458)**	0.019 (9)		marginal -mid	0.012 (6)	0.023 (11)	**0.958 (455)**	0.007 (3)
	outsider	0.017 (9)	0.021 (11)	0.021 (11)	**0.941 (510)**		working poor	0.006 (3)	0.002 (1)	0.024 (13)	**0.967 (515)**

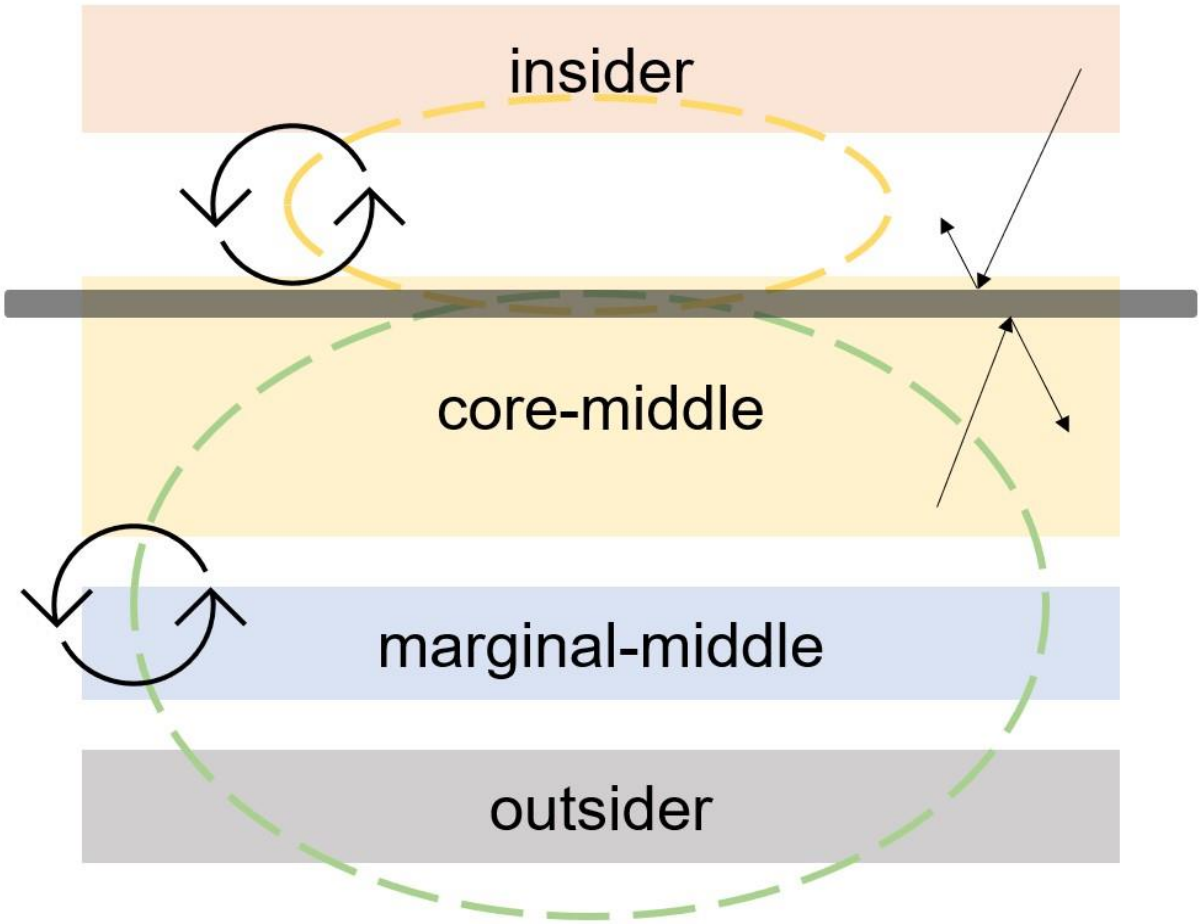


Figure 5. Schematizing Multi-Segmentation and Heterogeneous Gaps

5. Discussions

5.1. Multi-Segmentation and Heterogeneous Gaps

Recent findings suggest the possibility of multi-segmentation (Jessoula et al., 2010; López-Roldán and Fachelli, 2021; Seo, 2021), and this study contributes to the debate. Several findings have proposed subgroups within the framework of dualism (López-Roldán and Fachelli, 2021; Seo, 2021), but this may be a matter of interpretation. In this study, four- or three-segments were identified (Fig. 3A-3C). The interpretation may depend on whether those labelled as 'middle' are seen as a separate group between insiders and outsiders, as in Jessoula et al. (2010), or as a subset of outsiders. Furthermore, a generalised flow of two chunks can be inferred (Tab. 7A-7C), and the dimension of mobility constraints must also be taken into account. If one wants to adhere to the assumption of a dual structure, the line between insiders and outsiders needs to

be clarified. The two generalised mobility clusters identified in this study can be represented as in Fig. 5. This is based on the fact that only the bottom end of the internal labour market is open (Doeringer and Piore, 1971). It's important to note that this may not mean that outsiders can enter the internal labour market through gradual ascent. Those who reach the second tier through a sequence of difficult gateways will face the thickest wall (i.e., translucent grey line in Fig. 5). This actual barrier may be the threshold of the ideal dual structure proposed by Doeringer and Piore (1971). Whether dualisation, multi-segmentation, or sub-segmentation within dual structure is true, the implication of the findings identifying multi-segmentation is the inadequacy of adhering to strict dual structure assumption when studying segmented labour markets in post-industrial societies.

Due to the possibility of multi-segmentation, attention should also be paid to heterogeneous gaps: more than two segments will inevitably create more than one gap. The short period of analysis and the constraints on the interpretation of mobility did not allow us to identify all the gaps between segments in detail, but we were able to confirm the dominant position of the upper segments, even in the context of broader trends. Future research should focus on the gaps between the lower segments. Especially those enjoying median wages. If they show downward movement, even without widening gap with the top segment, it could contribute to the consolidation of the top-tier and lead to broader discussions about the decline of the middle class. It would also shed light on whether they should be viewed as a separate class, such as the midsider, or a sub-sector of the outsider. There’s a need to go beyond assuming the number of class in segmentation studies and consider mobility constraints together to draw more reasonable borderlines.

5.2. Regional Disparities and Labour Market

It’s necessary to understand the differences between regional labor markets. In Korea, regional dualism stands out in the general context (Park, 1993; Lim, 2008; Kim, 2010), and we find significant differences in this study. More segments are observed in non-CR, which may be due to more concentrated opportunities and active inflows and outflows in CR (Park, 1993; Lim, 2008), implying the possibility of a more fixed pattern developing in non-CR. The active movement of the top tier in non-CR is a downward movement (Tab. 7C), which may be part of a self-reinforcing sorting process. These socio-structural differences between regions may stem from the existence of what New Economic Sociology calls the area of chance, whereby individuals may experience involuntary socioeconomic stigma effect based on where they choose to work and live. Moreover, in countries like Korea, where the landmass is relatively small and socio-economic concentration is high in a single region, these differences can be stark.

Regional differences in labour market structure are not unrelated to regional disparities, which have been the subject of much recent debate. Studies on segmented labour market mainly focus on defining precarious work and measuring segmentation. Thus, they fail to explicitly consider dimensions of productivity or spillover effects based on spatial proximity. However, the phenomena do not occur independently. Regions with higher shares of internal labour markets may generate better surpluses. The homogeneity or heterogeneity of labour market structures between geographically adjacent regions will provide a link between the two topics by considering migration dynamics.

5.3. The Labyrinth of Working Poor

The problem with being outsider in a segmented labour market is escape constraints. They work hard, but their status does not move upwards. Here we can indirectly consider another social problem: in-work poverty. Since in-work poverty can be identified at both the individual- and household-level, there is an error in equating the working poor with outsiders. However, the link between working poverty and low-wage work can compensate for this (Brülle et al., 2019). Basically, there are significant constraints on class mobility (Fig. 7A-7C), and while detailed mobility cannot be discussed, two flows of mobility can be used to discuss the stagnation of working poor. Only the top-tier benefits from full-security across all categories (Tab. 4A-4B and Appendix 5A-5B). Whether they remain at the bottom or move along a cycle that spans several lower tiers (Fig. 5), the fact remains that if they cannot enter the internal labour market, they are trapped.

The implication of this segmentation is that the occurrence of an economic shock can completely push the lowest class down, especially given the recent increase in exposure to risk in the general context (Hassink, 2010; Fingleton, 2012; Martin, 2012). Whatever the cause of the shock, outsiders are consumed as a buffer for insiders (Rueda, 2005), which creates further entrenched divisions, and the next external shock leads to a vicious cycle of poverty. Reproducing each other could mean a potential virtuous circle. The blueprint should be drawn by removing the thickest barriers to entering the internal labour market. However, this is not a simple task, and there is a need to find the political clues for at least incremental improvements. For example, very simple but obvious policies such as expanding employment opportunities in manufacturing can be used as steppingstones for upward mobility of outsiders (Tab. 5 and Appendix 6A-6H), and can be a starting point for escaping in-work poverty. If one can show that the downward mobility from the second lowest to the lowest tier is not significant. This again emphasises the importance of focusing on heterogeneous gaps.

6. Conclusions

This study contributes to the limited but valuable discussion on the multi-segmentation and regional heterogeneity of labour markets and the trapping of the working poor. The following should be considered in urban planning. First, opportunities are highly concentrated in the CR, which means that regional differences in labour markets need to be taken into account. Moreover, this division makes it difficult for outsiders to find a way out of the vicious circle. Policymakers who want to address inequality will need to consider the above points collectively, recognising that inequality is not a separate phenomenon - whether at the individual, socio-structural, or regional level - it just has a different focus.

This study has the following limitations. First, the self-employed are not included in the analysis. In Korea, a quarter of the total labour force is self-employed; thus, the labour market estimated in this study is a wage labour market. Furthermore, half of them are vulnerable groups with no employment (Shin, 2013). This obviously poses problems when discussing the proportions, characteristics, and mobility of the lower classes. Second, the study sought to derive the most reasonable hierarchical solution by region, and a different number of segments were observed in CR and non-CR. While the differences between the two regions can be identified, direct comparisons are unavailable. Fortunately, multi-group LCA for intergroup comparisons are being reported (Lukac et al., 2019), and direct comparisons across regions may be possible by fixing the response probabilities and deriving a constant number of solutions. Finally, the time series is not long enough for panel analysis. The dimension of mobility is not limited to one-way movement; patterns such as entry, exit, and re-entry may better explain gaps.

Future research on segmented labour markets will need to revisit these limitations. Furthermore, when considering multi-segmentation, it will be necessary to focus on heterogeneous gaps, especially mobility and gaps in the mid-income group. The link between interregional migration and class mobility may also be an interesting topic, and a comprehensive consideration of these issues will provide better insight for segmentation research.

Acknowledgement. This work was supported by Korea Environment Industry & Technology Institute (KEITI) through “Climate Change R&D Project for New Climate Regime”, funded by Korea Ministry of Environment(MOE)(2022003570002).

References

Acemoglu, D (2002) Technical change, inequality, and the labor market. *Journal of economic literature,* 40(1), pp.7-72.

Akaike, H (1974) A new look at the statistical model identification. *IEEE transactions on automatic control,* 19(6), pp.716-723.

Anderson, CJ and J Pontusson (2007) Workers, worries and welfare states: social protection and job insecurity in 15 OECD countries. *European journal of political research,* 46(2), pp.211-235.

Anker, R, I Chernyshev, P Egger and F Mehran (2003) Measuring decent work with statistical indicators. *International labour review,* 142(2), pp.147-178.

Asparouhov, T and B Muthén (2014) Auxiliary variables in mixture modeling: three-step approaches using Mplus. *Structural equation modeling: A multidisciplinary journal,* 21(3), pp.329-341.

Becker, GS (1964) *Human capital: A theoretical and empirical analysis, with special reference to education*. Chicago: University of Chicago press.

Biegert, T (2014) On the outside looking in? Transitions out of non-employment in the United Kingdom and Germany. *Journal of European social policy,* 24(1), pp.3-18.

Boston, TD (1990) Segmented labor markets: new evidence from a study of four race-gender groups. *International labour review,* 44(1), pp.99-115.

Bulow, JI and LH Summers (1986) A theory of dual labor markets with application to industrial policy, discrimination, and Keynesian unemployment. *Journal of labor economics,* 4(3), pp.376-414.

Brülle, J, M Gangl, A Levanon and E Saburov (2019) Changing labour market risks in the service economy: Low wages, part-time employment and the trend in working poverty risks in Germany. *Journal of european social policy*, 29(1), pp.115-129.

Chung, H (2019) Dualization and subjective employment insecurity: explaining the subjective employment insecurity divide between permanent and tem-porary workers across 23 European countries. *Economic and industrial democracy,* 40(3), pp.700-729.

Chung, S and S Jung (2016) *Testing the labor market dualism in Korea*. Bank of Korea WP, 13.

Collins, LM and ST Lanza (2009) *Latent class and latent transition analysis: With applications in the social, behavioral, and health sciences*. New Jersey: John Wiley & Sons.

Davidsson, J and M Naczyk (2009) *The ins and outs of dualisation: A literature review*. REC-WP Working Paper.

Doeringer, P and M Piore (1971) *Internal labor markets and manpower analysis*. Lexington, MA: Lexington.

Edwards, R (1979) *Contested terrain: The transformation of the workplace in the twentieth century*. New York: Basic Books.

Eurofound (2019) EurWORK: Labour market segmentation. [Online] Available from: https://www.eurofound.europa.eu/observatories/eurwork/industrial-relations-dictionary/labour-market-segmentation, Accessed [03/05/2023].

Fingleton, B, H Garretsen and R Martin (2012) Recessionary shocks and regional employment evidence on the resilience of UK regions. *Journal of regional science,* 52(1), pp.109-133.

Ghai, D (2003) Decent work: Concept and indicators. *International labour review,* 142(2), pp.113-146.

Gordon, DM (1972) *Theories of poverty and underemployment: Orthodox, radical, and dual labor market perspectives*. Lexington Books.

Gordon, DM, R Edwards and M Reich (1982) *Segmented work, divided workers: The historical transformation of labor in the United States*. Cambridge: Cambridge University Press.

Granovetter, M and C Tilly (1988) Inequality and labor processes. In: Smelser, NJ (ed.) *Handbook of sociology. SAGE Publications*, pp. 175-221.

Grren, F, A Dickerson, A Carruth and D Campbell (2001) *An analysis of subjective views of job insecurity*, Department of Economics, University of Kent.

Hassink, R (2010) Regional resilience: a promising concept to explain differences in regional economic adaptability?. *Cambridge Journal of Regions, Economy and Society,* 3*(*1), pp.45–58.

Ha, BJ and S Lee (2013) *Dual dimensions of non-regular work and SMEs in the Republic of Korea*, Geneva: International Labour Office.

Håkansson, K and T Isidorsson (2012) Work organizational outcomes of the use of temporary agency workers. *Organization studies,* 33(4), pp.487-505.

Häusermann, S and H Schwander (2012) Varieties of dualization? Labor market segmentation and insider-outsider divides across regimes. *The age of dualization: The changing face of inequality in deindustrializing societies*, pp.27-51.

Hickendorff, M, PA Edelsbrunner, J McMullen, M Schneider and K Trezise (2018) Informative tools for characterizing individual differences in learning: Latent class, latent profile, and latent transition analysis. *Learning and Individual Differences,* 66, pp.4-15.

Hudson, K (2007) The new labor market segmentation: Labor market dualism in the new economy. *Social science research,* 36(1), pp.286-312.

International Labour Organization (ILO) (2016) Non-standard employment around the world: Understanding challenges, shaping prospects. Geneva, Switzerland: ILO.

Jencks, C (1972) *Inequality: A reassessment of the effect of family and schooling in America*. New York: Basic Books.

Jessoula, M, PR Graziano and I Madama (2010) 'Selective flexicurity' in segmented labour markets: The case of Italian 'mid-siders'. *Journal of Social Policy*, 39(4), pp.561-583.

Kalleberg, AL (2014) *Measuring precarious work*, Chapel Hill: University of North Carolina.

Kerr, C (1977) *Labor markets and wage determination: The balkanization of labor markets and other essays*. Berkeley: University of California Press.

Kim, IK (2010) Socioeconomic concentration in the Seoul metropolitan area and its implications in the urbanization process of Korea. *Korean Journal of Sociology*, 44(3), pp.111-128.

Klandermans, B, JK Hesselink and T Van Vuuren (2010) Employment status and job insecurity: On the subjective appraisal of an objective status. *Economic and Industrial Democracy*, 31(4), pp.557-577.

Korea Labor Institute (KLI) https://www.kli.re.kr/klips_eng.

Kwon, H (2015) Changing industrial relations and labor market inequality in post-crisis Korea. *Development and society*, 44(3), pp.465-494.

Lee, BH and SJ Frenkel (2004) Divided workers: Social relations between contract and regular workers in a Korean auto company. *Work, Employment and Society*, 18(3), pp.507-530.

Lee, J (2011) Between fragmentation and centralization: South Korean industrial relations in transition. *British Journal of Industrial Relations*, 49(4), pp.767-791.

Lim, U (2008) The spatial dimension of human capital segregation: An empirical investigation for Seoul, Korea. *The Social Science Journal*, 45(4), pp.682-690.

Lindbeck, A and DJ Snower (1986) Wage setting, unemployment, and insider-outsider relations. *The American Economic Review*, 76(2), pp.235-239.

Lindbeck, A and DJ Snower (1989) *The insider-outsider theory of employment and unemployment*. The MIT Press.

Lo, Y, NR Mendell and DB Rubin (2001) Testing the number of components in a normal mixture. *Biometrika*, 88(3), pp.767-778.

López-Roldán, P and S Fachelli (2021) Measuring labour market segmentation for a comparative analysis among countries. *Social Indicators Research*, 154(3), pp.857-892.

Lukac, M, N Doerflinger and V Pulignano (2019) Developing a cross-national comparative framework for studying labour market segmentation: Measurement equivalence with latent class analysis. *Social Indicators Research*, 145(1), pp.233-255.

Ma, KR, ET Kang and OK Kwon (2017) Migration behavior of students and graduates under prevailing regional dualism: The case of South Korea. *The Annals of Regional Science*, 58, pp.209-233.

Martin, R (2012) Regional economic resilience, hysteresis, and recessionary shocks. *Journal of Economic Geography*, 12(1), pp.1-32.

Marx, P and G Picot (2020) Three approaches to labor-market vulnerability and political preferences. *Political Science Research and Methods*, 8(2), pp.356-361.

McDonald, IM and RM Solow (1985) Wages and employment in a segmented labor market. *The Quarterly Journal of Economics*, 100(4), pp.1115-1141.

McLachlan, GJ and D Peel (2000) *Finite Mixture Models*. New York: Willey.

Muthén, BO (2008) *What is a good value of entropy*. [Online] Available from: http://www.statmodel.com/discussion/messages/13/2562.html?1237580237. Accessed[02/05/2023].

Muthén, LK and BO Muthén (2017) *Mplus user's guide (8th ed)*. Los Angeles, CA: Muthén & Muthén.

Nylund, KL, T Asparouhov and BO Muthén (2007) Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling: A Multidisciplinary Journal*, 14(4), pp.535-569.

Nylund-Gibson, K, R Grimm, M Quirk and M Furlong (2014) A latent transition mixture model using the three-step specification. *Structural Equation Modeling: A Multidisciplinary Journal*, 21(3), pp.439-454.

Olsthoorn, M (2014) Measuring precarious employment: A proposal for two indicators of precarious employment based on set-theory and tested with Dutch labor market-data. *Social Indicators Research*, 119, pp.421-441.

Organisation for Economic Co-operation and Development (OECD) (2011) *Divided we stand: Why inequality keeps rising*, Paris: OECD Publishing.

Osterman, P (1975) An empirical study of labor market segmentation. *ILR Review*, 28(4), pp.508-523.

Park, SO (1993) Industrial restructuring and the spatial division of labor: The case of the Seoul metropolitan region, the Republic of Korea. *Environment and Planning A*, 25(1), pp.81-93.

Peña-Casas, R and M Latta (2004) *Working poor in the European Union*, Ireland: Eurofound.

Reich, M, DM Gordon and RC Edwards (1973) A theory of labor market segmentation. *The American Economic Review*, 63(2), pp.359-365.

Rodgers, G and J Rodgers (1989) *Precarious jobs in labour market regulation: The growth of atypical employment in Werstern Europe*, Ginebra: International Institute for Labour Studies/Free University of Brussels.

Rueda, D (2005) Insider–outsider politics in industrialized democracies: The challenge to social democratic parties. *American Political Science Review*, 99(1), pp.61-74.

Schauer, J (2018) *Labor market duality in Korea*, International Monetary Fund (IMF) Working Paper.

Schreiber, JB (2017) Latent class analysis: An example for reporting results. *Research in Social and Administrative Pharmacy*, 13(6), pp.1196-1201.

Schwander, H and S Häusermann (2013) Who is in and who is out? A risk-based conceptualization of insiders and outsiders. *Journal of European Social Policy*, 23(3), pp.248-269.

Schwarz, G (1978) Estimating the dimension of a model. *The Annals of Statistics*, 6(2), pp.461-464.

Sclove, SL (1987) Application of model-selection criteria to some problems in multivariate analysis. *Psychometrika*, 52, p.333-343.

Seo, H (2021) 'Dual' labour market? Patterns of segmentation in European labour markets and the varieties of precariousness. *Transfer: European Review of Labour and Research*, 27(4), pp.485-503.

Shin, KY (2013) Economic crisis, neoliberal reforms, and the rise of precarious work in South Korea. *American Behavioral Scientist*, 57(3), pp.335-353.

Sinha, P, CS Calfee and KL Delucchi (2021) Practitioner's guide to latent class analysis: Methodological considerations and common pitfalls. *Critical Care Medicine*, 49(1), e63-79.

Song, HG (1999) *Labour unions in the Republic of Korea: Challenge and choice*. Geneva: ILO.

Statistics Korea (KOSIS) https://kosis.kr/eng/.

Standing, G (2011) *The precariat: The new dangerous class*. London: Bloomsbury.

Thurow, LC (1975) *Generating Inequality: Mechanisms of Distribution in the U.S. Economy*. New York: Basic Books.

Uebersax, J (2000) A brief study of local maximum solutions in latent class analysis. [Online] Available from: https://www.john-uebersax.com/stat/local.htm. Accessed[28/04/2023].

Vermunt, JK (2002) Latent class analysis of complex sample survey data: Application to dietary data. *Journal of the American Statistical Association*, 97(459), pp.736-737.

Vermunt, JK (2010) Latent class modeling with covariates: Two improved three-step approaches. *Political Analysis*, 18(4), pp.450-469.

Weden, MM and LS Zabin (2005) Gender and ethnic differences in the co-occurrence of adolescent risk behaviors. *Ethnicity and Health*, 10(3), pp.213-234.

Weller, BE, NK Bowen and SJ Faubert (2020) Latent class analysis: A guide to best practice. *Journal of Black Psychology*, 46(4), pp.287-311.

Yoon, Y and H Chung (2016) New forms of dualization? Labour market segmentation patterns in the UK from the late 90s until the post-crisis in the late 2000s. *Social Indicators Research*, 128, pp.609-631.

Appendix

Appendix 1A. Descriptive Statistics, CR

	Concepts	Variables		2018 (N=3,542)	2019 (N=3,549)	2020 (N=3,363)
Indicator	Employment Insecurity	employment contract	non-regular	1,042	1,005	952
			regular	2,500	2,494	2,411
		part-time work	part-full-time	295	318	295
				3,247	3,231	3,068
	Objective Insecurity	income	low	522	499	451
			middle	2,190	2,308	2,135
			high	830	742	777
		skill	low	960	960	891
			middle	1,527	1,535	1,461
			high	1,055	1,054	1,011
	Subjective Insecurity	non-secure		505	469	394
		secure		3,037	3,080	2,969
	Future Insecurity	non-secure		3,421	3,448	3,309
		secure		121	101	54
	Union Protection	non-protection		3,066	3,062	2,874
		protection		479	487	489
Covariates	Age	young		869	847	733
		medium		1,659	1,649	1,584
		old		1,014	1,053	1,046
	Gender	male		2,019	2,013	1,891
		female		1,523	1,536	1,472
	Education	elementary school		92	94	70
		middle school		183	174	158
		high school		1,359	1,322	1,285
		junior college		637	655	622
		university		1,111	1,136	1,065
		graduate school		160	168	163
	Industry	non-manufacture		2,730	2,779	2,611
		manufacture		812	770	752
	Firm Size	SMEs		3,173	3,194	2,874
		large		369	355	489

Appendix 1B. Descriptive Statistics, non-CR

	Concepts	Variables		2018 (N=3,214)	2019 (N=3,098)	2020 (N=3,048)
Indicator	Employment	employment	non-	1,021	954	902
	Insecurity	contract	regular	2,193	2,144	2,146
		part-time	part-time	294	286	266
		work	full-time	2,920	2,812	2,782
	Objective	income	low	567	556	506
	Insecurity		middle	1,960	1,966	1,946
			high	687	576	596
		skill	low	920	879	819
			middle	1,578	1,543	1,515
			high	716	676	714
	Subjective		non-secure	534	493	461
	Insecurity		secure	2,680	2,605	2,587
	Future		non-secure	2,997	2,851	2,848
	Insecurity		secure	217	247	200
	Union		non-protection	2,704	2,590	2,517
	Protection		protection	510	508	531
Covariates	Age		young	731	676	1,394
			medium	1,430	1,389	2,957
			old	1,053	1,033	2,060
	Gender		male	1,941	1,851	3,729
			female	1,273	1,247	2,682
	Education		elementary school	112	83	139
			middle school	241	216	334
			high school	1,232	1,195	2,461
			junior college	674	649	1,282
			university	850	849	1,921
			graduate school	105	106	274
	Industry		non-manufacture	2,287	2,201	4,797
			manufacture	927	897	1,614
	Firm		SMEs	2,915	2,787	5,782
	Size		large	299	311	629

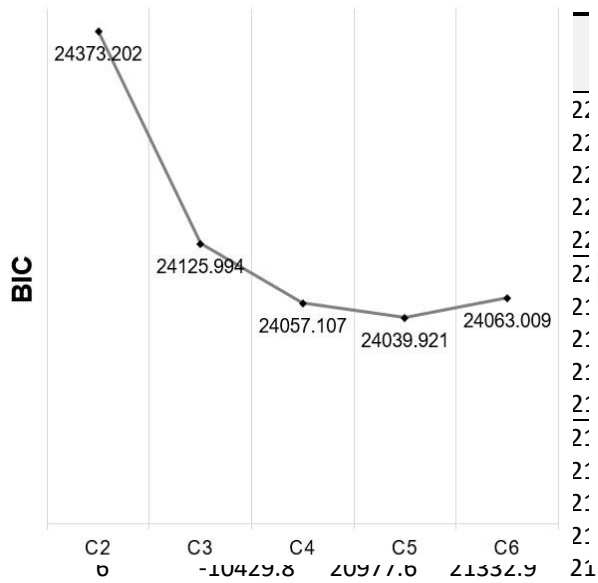
Appendix 2A. Model Fit Statistics, CR

Year	Class	LL	AIC	BIC	SABIC	VLMRT	LMR LRT	BLRT	Entropy
2018	2	-12109.0	24255.9	24373.2	24312.8	0.000	0.000	0.000	0.888
	3	-11944.5	23947.0	24126.0	24033.8	0.000	0.000	0.000	0.787
	4	-11869.2	23816.4	24057.1	23933.2	0.006	0.006	0.000	0.79
	5	-11819.7	23737.5	24039.9	23884.2	0.011	0.012	0.000	0.772
	6	-11790.4	23698.8	24063.0	23875.5	0.217	0.220	0.000	0.778
2019	2	-11962.2	23962.3	24079.7	24019.3	0.000	0.000	0.000	0.888
	3	-11782.8	23623.7	23802.7	23710.6	0.000	0.000	0.000	0.744
	4	-11689.4	23456.9	23697.7	23573.7	0.000	0.000	0.000	0.768
	5	-11636.7	23371.5	23674.0	23518.3	0.001	0.001	0.000	0.757
	6	-11617.8	23353.5	23717.8	23530.3	0.000	0.000	0.000	0.765
2020	2	-11090.0	22218.1	22334.4	22274.0	0.000	0.000	0.000	0.896
	3	-10927.4	21912.7	22090.2	21998.1	0.000	0.000	0.000	0.71
	4	-10850.4	21778.8	22017.5	21893.6	0.000	0.000	0.000	0.75
	5	-10802.4	21702.8	22002.7	21847.0	0.000	0.000	0.000	0.801
	6	-10782.1	21682.2	22043.3	21855.8	0.123	0.123	0.000	0.816

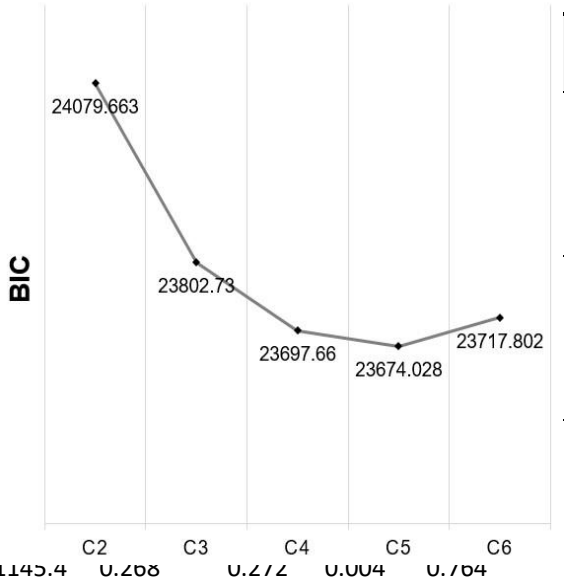
Appendix 3. Changes of BIC in CR and non-CR

Appendix 2B. Model Fit Statistics, non-CR

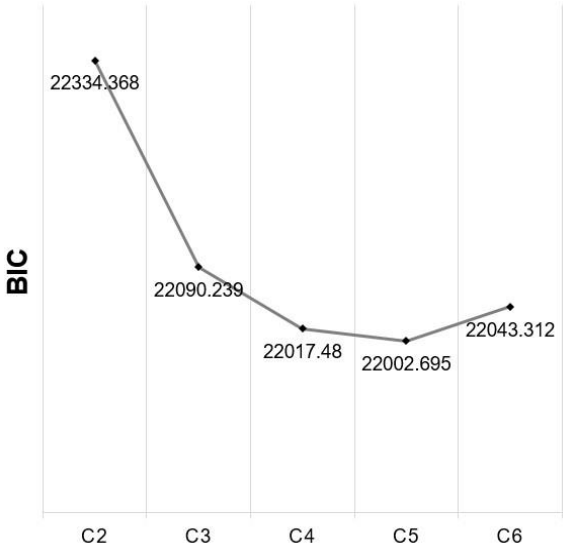
	6	-10429.8	20977.6	21332.9	21145.4	0.268	0.272	0.004	0.764



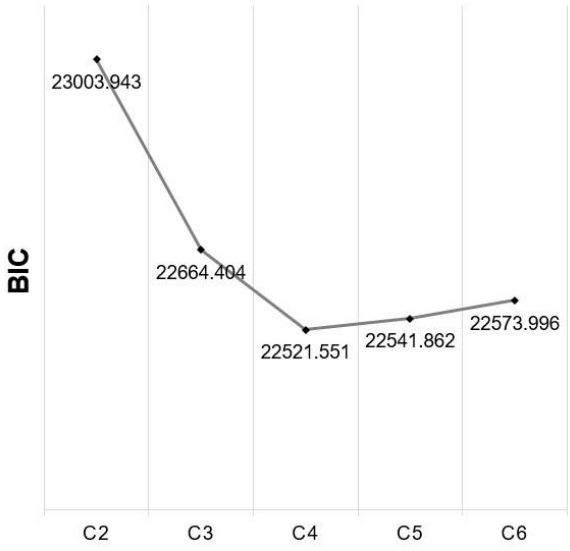
(A) CR, 2018



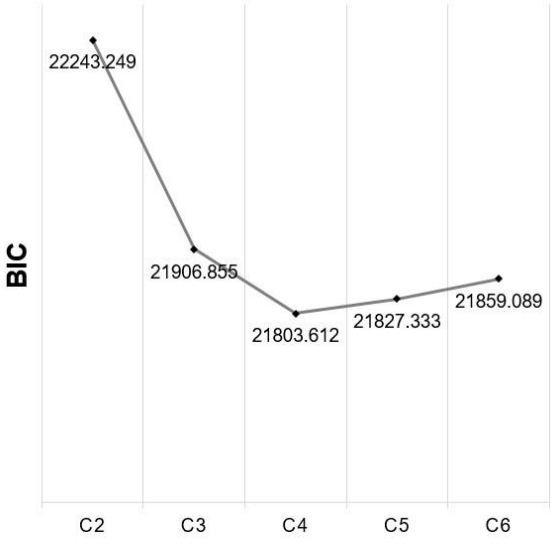
(B) CR, 2019



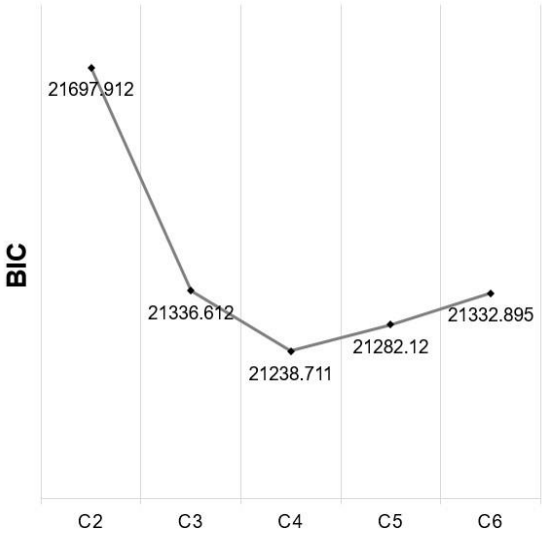
(C) CR, 2020



(D) non-CR, 2018



(E) non-CR, 2019



(D) non-CR, 2020

Appendix 4A. Average Latent Class Posterior Probabilities, CR

		C1	C2	C3
2018	C1	**0.870**	0.113	0.017
	C2	0.003	**0.987**	0.010
	C3	0.083	0.004	**0.913**
2019	C1	**0.904**	0.011	0.085
	C2	0.012	**0.932**	0.056
	C3	0.000	0.155	**0.845**
2020	C1	**0.955**	0.010	0.035
	C2	0.008	**0.934**	0.058
	C3	0.222	0.031	0.747

Note: Bolds are those > 0.8

Appendix 4B. Average Latent Class Posterior Probabilities, non-CR

		C1	C2	C3	C4
2018	C1	**0.814**	0.184	0.002	0.000
	C2	0.081	**0.908**	0.010	0.002
	C3	0.007	0.001	**0.855**	0.138
	C4	0.000	0.000	0.093	**0.907**
2019	C1	**0.822**	0.172	0.006	0.000
	C2	0.102	**0.898**	0.000	0.000
	C3	0.003	0.000	**0.906**	0.091
	C4	0.004	0.000	0.129	**0.867**
2020	C1	0.766	0.232	0.002	0.000
	C2	0.054	**0.944**	0.000	0.002
	C3	0.002	0.000	**0.916**	0.081
	C4	0.000	0.008	0.208	0.784

Note: Bolds are those > 0.8

Appendix 5A. Item Response Probabilities, Korea, 2019

N=6,647	outsider (C1)	marginal-mid (C2)	core-mid (C3)	Insider (C4)
Class Size (%)	12.2	16.4	42.4	28.9
Contract Type				
Non-Permanent	**0.993**	**1.000**	0.000	0.012
Permanent	0.007	0.000	**1.000**	**0.988**
Part-time Work				
Part-time	0.524	0.131	0.005	0.000
Full-time	0.476	**0.869**	**0.995**	**1.000**
Income Level				
Low	0.686	0.109	0.114	0.000
Middle	0.311	**0.837**	**0.847**	0.365
High	0.003	0.054	0.039	0.635
Occupational Skill				
Low	**0.825**	0.331	0.228	0.051
Middle	0.098	0.472	0.501	0.562
High	0.077	0.197	0.271	0.387
Subjective Insecurity				
Non-Secure	0.476	0.401	0.019	0.004
Secure	0.524	0.599	**0.981**	**0.996**
Future Insecurity				
Non-Secure	**0.997**	**0.950**	**0.985**	**0.916**
Secure	0.003	0.050	0.015	0.084
Union Protection				
Non-Protection	**0.997**	**0.924**	**0.953**	0.563
Protection	0.003	0.076	0.047	0.437

Note: Bolds are those > 0.7

Appendix 5B. Item Response Probabilities, Korea, 2020

N=6,411	insider (C1)	outsider (C2)	core-mid (C3)	marginal-mid (C4)
Class Size (%)	28.8	13.6	41.1	16.5
Contract Type				
Non-Permanent	0.007	**0.997**	0.000	**0.998**
Permanent	**0.993**	0.003	**1.000**	0.002
Part-time Work				
Part-time	0.000	0.469	0.005	0.151
Full-time	**1.000**	0.531	**0.995**	**0.849**
Income Level				
Low	0.000	0.667	0.128	0.093
Middle	0.394	0.333	**0.854**	**0.807**
High	0.606	0.000	0.018	0.100
Occupational Skill				
Low	0.057	**0.859**	0.229	0.297
Middle	0.541	0.095	0.500	0.485
High	0.372	0.045	0.270	0.218
Subjective Insecurity				
Non-Secure	0.002	0.491	0.023	0.437
Secure	**0.998**	0.539	**0.977**	0.563
Future Insecurity				
Non-Secure	**0.889**	**0.988**	**0.961**	**0.942**
Secure	0.111	0.012	0.039	0.058
Union Protection				
Non-Protection	0.582	**0.993**	**1.000**	**0.924**
Protection	0.418	0.007	0.000	0.076

Note: Bolds are those > 0.7

Appendix 5C. Item Response Probabilities, CR and non-CR, 2019

	CR (N=3,549)			non-CR (N=3,098)			
	outsider	insider	middle class	marginal - mid	outsider	insider	core -mid
	C1	C2	C3	C1	C2	C3	C4
Class Size (%)	26.3	30.8	42.9	16.63	14.24	26.5	42.63
Contract Type							
Non-Permanent	**1.000**	0.029	0.058	**0.986**	**1.000**	0.006	0.000
Permanent	0.000	**0.971**	**0.942**	0.014	0.000	**0.994**	**1.000**
Part-time Work							
Part-time	0.329	0.000	0.007	0.144	0.474	0.000	0.002
Full-time	0.671	**1.000**	**0.993**	**0.856**	0.526	**1.000**	**0.998**
Income Level							
Low	0.345	0.000	0.116	0.119	**0.713**	0.001	0.136
Middle	0.597	0.370	**0.884**	**0.802**	0.287	0.402	**0.830**
High	0.058	0.630	0.000	0.078	0.000	0.597	0.034
Occupational Skill							
Low	0.588	0.065	0.223	0.302	**0.857**	0.042	0.235
Middle	0.273	0.485	0.493	0.504	0.100	0.669	0.522
High	0.140	0.449	0.284	0.194	0.043	0.290	0.242
Subjective Insecurity							
Non-Secure	0.472	0.003	0.016	0.435	0.517	0.002	0.030
Secure	0.528	**0.997**	**0.984**	0.565	0.483	**0.998**	**0.970**
Future Insecurity							
Non-Secure	**0.986**	**0.926**	**0.995**	**0.893**	**0.986**	**0.845**	**0.956**
Secure	0.014	0.074	0.005	0.107	0.014	0.155	0.044
Union Protection							
Non-Protection	**0.962**	0.650	**0.954**	**0.912**	**0.996**	0.496	**0.964**
Protection	0.038	0.350	0.046	0.088	0.004	0.504	0.036

Note: Bolds are those > 0.7

Appendix 5D. Item Response Probabilities, CR and non-CR, 2020

	CR (N=3,363)			non-CR (N=3,048)			
	insider	outsider	middle class	insider	core-mid	marginal-mid	outsider
	C1	C2	C3	C1	C2	C3	C4
Class Size (%)	37.4	24.3	38.3	20.2	50.4	15.8	13.6
Contract Type							
Non-Permanent	0.028	**0.999**	**0.077**	0.019	**0.000**	**1.000**	**0.990**
Permanent	**0.972**	0.001	0.923	**0.981**	1.000	0.000	0.010
Part-time Work							
Part-time	0.000	0.349	0.007	0.000	0.002	0.096	0.521
Full-time	**1.000**	0.651	**0.993**	**1.000**	**0.998**	**0.904**	0.479
Income Level							
Low	0.000	0.361	0.121	0.000	0.106	0.114	0.696
Middle	0.417	0.585	**0.879**	0.303	**0.808**	**0.827**	0.290
High	0.583	0.054	0.000	0.697	0.086	0.059	0.014
Occupational Skill							
Low	0.058	0.612	0.247	0.028	0.217	0.301	**0.781**
Middle	0.496	0.246	0.494	0.655	0.526	0.524	0.123
High	0.446	0.142	0.259	0.317	0.257	0.175	0.095
Subjective Insecurity							
Non-Secure	0.007	0.455	0.010	0.000	0.026	0.426	0.524
Secure	**0.993**	0.545	**0.990**	**1.000**	**0.974**	0.574	0.476
Future Insecurity							
Non-Secure	**0.963**	**0.990**	**1.000**	**0.842**	**0.963**	**0.908**	**0.996**
Secure	0.037	0.010	0.000	0.158	0.037	0.092	0.004
Union Protection							
Non-Protection	0.672	**0.968**	**0.960**	0.372	**0.936**	**0.905**	**1.000**
Protection	0.328	0.032	0.040	0.628	0.064	0.095	0.000

Note: Bolds are those > 0.7

Appendix 6A. Relationship with Covariate, Korea, 2019

	Age	Gender	Education	Industry	Firm Size

outsider vs. insider	Est. C.	0.410***	-3.288***	1.666***	2.772***	5.328***
	S.E.	0.116	0.187	0.085	0.296	1.087
outsider vs. core-mid	Est. C.	-0.343***	-1.445***	0.897***	2.521***	0.83
	S.E.	0.093	0.143	0.071	0.272	1.152
outsider vs. marginal-mid	Est. C.	0.163	-1.927***	0.705***	1.595***	2.985**
	S.E.	0.125	0.171	0.088	0.316	1.113
marginal-mid vs. core-mid	Est. C.	0.247**	-1.361***	0.961***	1.176***	2.343***
	S.E.	0.081	0.144	0.056	0.121	0.192
marginal-mid vs. insider	Est. C.	-0.506***	0.482***	0.192***	0.926***	-2.155***
	S.E.	0.068	0.09	0.047	0.112	0.456
core-mid vs. insider	Est. C.	0.753***	-1.843***	0.769***	0.250*	4.498***
	S.E.	0.072	0.14	0.051	0.116	0.45

* $p < .05$, ** $p < .01$, *** $p < .001$

Appendix 6B. Relationship with Covariate, Korea, 2020

		Age	Gender	Education	Industry	Firm Size
outsider vs. insider	Est. C.	0.530***	-3.349***	1.851***	2.286***	5.123***
	S.E.	0.126	0.197	0.095	0.271	0.767
outsider vs. core-mid	Est. C.	-0.241*	-1.622***	0.879***	1.904***	1.088
	S.E.	0.098	0.158	0.077	0.24	0.818
outsider vs. marginal-mid	Est. C.	0.249	-1.991***	0.691***	1.124***	2.554**
	S.E.	0.132	0.186	0.097	0.291	0.804
marginal-mid vs. core-mid	Est. C.	0.281**	-1.358***	1.160***	1.162***	2.569***
	S.E.	0.089	0.145	0.066	0.131	0.231
marginal-mid vs. insider	Est. C.	-0.490***	0.369***	0.188***	0.780***	-1.466***
	S.E.	0.07	0.092	0.05	0.116	0.344
core-mid vs. insider	Est. C.	0.771***	-1.726***	0.972***	0.382**	4.034***
	S.E.	0.082	0.138	0.06	0.126	0.314

* $p < .05$, ** $p < .01$, *** $p < .001$

Appendix 6C. Relationship with Covariate, CR, 2018

		Age	Gender	Education	Industry	Firm Size
outsider vs. insider	Est. C.	0.412***	-2.103***	1.537***	1.673***	2.753***
	S.E.	0.106	0.161	0.084	0.178	0.335
	Est. C.	-0.509***	-0.06	0.594***	1.522***	0.347

outsider vs. middle class	S.E.	0.08	0.104	0.062	0.155	0.353
middle class vs. insider	Est. C.	0.922***	-2.042***	0.943***	0.151	2.406***
	S.E.	0.096	0.15	0.07	0.14	0.217

* $p < .05$, ** $p < .01$, *** $p < .001$

Appendix 6D. Relationship with Covariate, CR, 2019

		Age	Gender	Education	Industry	Firm Size
outsider vs. insider	Est. C.	0.249*	-1.585***	1.338***	1.865***	2.443***
	S.E.	0.103	0.153	0.08	0.185	0.305
outsider vs. middle class	Est. C.	-0.554***	-0.125	0.473***	1.533***	-1.257*
	S.E.	0.079	0.102	0.058	0.163	0.492
middle class vs. insider	Est. C.	0.803***	-1.460***	0.865***	0.332*	3.701***
	S.E.	0.095	0.153	0.069	0.153	0.434

* $p < .05$, ** $p < .01$, *** $p < .001$

Appendix 6E. Relationship with Covariate, CR, 2020

		Age	Gender	Education	Industry	Firm Size
outsider vs. insider	Est. C.	0.129	-1.830***	1.476***	1.759***	2.390***
	S.E.	0.115	0.155	0.093	0.192	0.338
outsider vs. middle class	Est. C.	-0.591***	-0.591***	0.379***	1.409***	-1.887*
	S.E.	0.091	0.114	0.067	0.168	0.884
middle class vs. insider	Est. C.	0.719***	-1.238***	1.096***	0.349*	4.277***
	S.E.	0.106	0.15	0.079	0.17	0.825

* $p < .05$, ** $p < .01$, *** $p < .001$

Appendix 6F. Relationship with Covariate, non-CR, 2018

		Age	Gender	Education	Industry	Firm Size
outsider vs. insider	Est. C.	0.562**	-4.053***	1.598***	2.676***	6.65
	S.E.	0.173	0.327	0.129	0.371	3.766
outsider vs. core-mid	Est. C.	-0.206	-1.577***	0.979***	2.624***	1.42
	S.E.	0.134	0.206	0.107	0.335	3.803

outsider vs.	Est. C.	0.303	-1.929***	0.742***	1.711***	3.851
marginal-mid	S.E.	0.178	0.244	0.134	0.381	3.813
marginal-mid vs.	Est. C.	0.258*	-2.124***	0.856***	0.965***	2.799***
core-mid	S.E.	0.122	0.278	0.083	0.173	0.326
marginal-mid vs.	Est. C.	-0.51***	0.352**	0.237**	0.913***	-2.43**
insider	S.E.	0.099	0.132	0.069	0.149	0.786
core-mid vs.	Est. C.	0.768***	-2.476***	0.619***	0.052	5.23***
insider	S.E.	0.111	0.279	0.076	0.169	0.777

* $p < .05$, ** $p < .01$, *** $p < .001$

Appendix 6G. Relationship with Covariate, non-CR, 2019

		Age	Gender	Education	Industry	Firm Size
outsider vs.	Est. C.	0.562**	-4.053***	1.598***	2.676***	6.65
insider	S.E.	0.173	0.327	0.129	0.371	3.766
outsider vs.	Est. C.	-0.206	-1.577***	0.979***	2.624***	1.42
core-mid	S.E.	0.134	0.206	0.107	0.335	3.803
outsider vs.	Est. C.	0.303	-1.929***	0.742***	1.711***	3.851
marginal-mid	S.E.	0.178	0.244	0.134	0.381	3.813
marginal-mid vs.	Est. C.	0.258*	-2.124***	0.856***	0.965***	2.799***
core-mid	S.E.	0.122	0.278	0.083	0.173	0.326
marginal-mid vs.	Est. C.	-0.51***	0.352**	0.237**	0.913***	-2.43**
insider	S.E.	0.099	0.132	0.069	0.149	0.786
core-mid vs.	Est. C.	0.768***	-2.476***	0.619***	0.052	5.23***
insider	S.E.	0.111	0.279	0.076	0.169	0.777

* $p < .05$, ** $p < .01$, *** $p < .001$

Appendix 6H. Relationship with Covariate, non-CR, 2020

		Age	Gender	Education	Industry	Firm Size
outsider vs.	Est. C.	0.812***	-4.021***	1.605***	2.396***	25.228***
insider	S.E.	0.181	0.379	0.142	0.359	0.411
outsider vs.	Est. C.	-0.038	-1.509***	0.801***	1.933***	20.999***
core-mid	S.E.	0.133	0.185	0.104	0.306	0.422
outsider vs.	Est. C.	0.308	-1.766***	0.478**	1.166**	21.908***
marginal-mid	S.E.	0.185	0.238	0.138	0.371	0

marginal-mid vs.	Est. C.	0.504***	-2.255***	1.127***	1.23***	3.32***
core-mid	S.E.	0.141	0.349	0.11	0.208	0.411
marginal-mid vs.	Est. C.	-0.346**	0.256	0.323***	0.767***	-0.908*
insider	S.E.	0.1	0.139	0.073	0.157	0.422
core-mid vs.	Est. C.	0.85***	-2.512***	0.804***	0.463*	4.228***
insider	S.E.	0.124	0.346	0.099	0.193	0.411

* $p < .05$, ** $p < .01$, *** $p < .001$

COMPARING METHODS FOR NEIGHBOURHOOD MAPPING WITH CHILDREN IN THE CONTEXT OF TÜRKIYE (1119)

İlgi ATAY KAYA[1]*, Fatma ŞENOL[2]

[1] Department of City and Regional Planning, Faculty of Architecture, Dokuz Eylül University, İzmir, Türkiye, ilgi.kaya@deu.edu.tr

[2] Department of City and Regional Planning, Faculty of Architecture, Izmir Institute of Technology, İzmir, Türkiye

Abstract. This study focuses on gathering data about children's experiences outside home. The aim is to compare survey methods with writing and drawing activity, and proposed screen-based mapping methods with auxiliary visuals. The study includes 154 children aged nine to twelve from Aliağa and Menemen districts of İzmir metropolitan area in Türkiye. The face-to-face surveys at schools asked children about their neighbourhood attributes, places of likes, dislikes, and where they spend time outside home and school, focusing on their activities, and daily environments. One method requires all children to write or draw. The second method involves GIS-based mapping with researcher guidance. Results compare the two methods. The discussions aim to find ways to encourage young children to talk more about their daily surroundings and how this relates to their spatial orientation and perception of their neighbourhood. The results have the potential to contribute to planning practices for including children in plan-making processes.

Keywords: Children, neighbourhoods, mapping, methods for child studies, geographic information systems.

1. Introduction

It is important to involve children in urban research to serve the overarching purpose of urban planning to produce inclusive policies and create liveable urban spaces for all. Urban policies inclusive of children are only possible by understanding what the children like and dislike in urban environments. Based on the purpose of child-friendly urban environments, this study focuses on how to gather data about children's experiences, perceptions, and views on their everyday places outside the home. Children's daily activities involve both indoor and outdoor environments, which impact their perception of the city. These experiences help them recognize the physical, natural, and social attributes of urban spaces and develop their sense of safety, fear, and comfort for daily survival.

Previous studies on how to gather data about children are various. When collecting data on the urban experiences of children, conventional tools like surveys with children or their parents are typically employed. However, these tools may sometimes lack the ability to compare spatial data. In order to comprehend children's perceptions and experiences in the city and open spaces, research often employs survey-based traditional tools. Nonetheless, the capacity to compare spatial experience data in such studies may be limited. To strengthen the spatial emphasis on the research, methods to direct children to draw their ideal city and write about being the mayor (Manouchehri and Burns, 2023), draw a child-friendly city (Gökmen and Taşçı, 2016), draw or write about their environmental experiences (Çubukçu et al., 2018) are utilized besides interviews and focus group discussions.

Recently, there has been a growing trend toward with research utilizing geographic information systems (GIS) (such as Chen et al., 2011). In some studies, the observations of children in open spaces are recorded during fieldwork, and maps are generated to comprehend children's behaviours, as demonstrated in studies such as Bozkurt et al. (2019), Zhang et al. (2022), and supported by photo-voice approach (Loebach and Gilliland, 2010). An alternative method of utilizing GIS tools is to create space-time path-based clustering patterns, as demonstrated by Chen et al. (2011). Participatory and qualitative GIS studies encompass the involvement of stakeholders in the mapping process via an interactive method (such as Berg et al., 2022; Kyttä et al., 2018; Wridt, 2010). This approach ensures the direct marking of spatial data instead of mere description, thereby allowing participants to express themselves and simplifying the process of automatic data mapping. Such techniques promote dialogues between researchers and residents, offering the potential to intervene and encourage physical activity within communities (Wridt, 2010). Research on children from Helsinki and Tokyo (Kyttä et al., 2018) and Finland (Berg et al., 2022) are examples using soft-GIS methods.

While previous studies suggest that children can express themselves better by drawing rather than answering survey questions, this study investigates and discusses the effects of using screen-based tools (here, GIS) and auxiliary visuals to develop child surveys aiming to map children’s neighbourhood experiences. The aim of the study is to compare the results of the survey methods with writing and drawing activity, and the proposed visually assisted and GIS-based mapping methods. Furthermore, we argue that these methods may have different results between the neighbourhoods with high and low education levels, used as a proxy for income levels in Türkiye. The research involved the spatial mapping of 154 children aged between nine and twelve, residing in Aliağa and Menemen, two districts situated within the İzmir metropolitan area of Türkiye. This study is part of a broader project that examines children's outdoor utilization (see Acknowledgements).

2. Study Site and Methodology

2.1. Study Site

The research was conducted in Izmir, the biggest city on the Aegean coast of Türkiye. Within the scope of the study, a total of 154 children between the ages of nine and twelve living and schooling in Aliağa and Menemen, two districts of İzmir metropolitan area in Türkiye, are included. With the permission from the Ministry of National Education, the study with both methods is conducted face-to-face with children at the classrooms of fourth and fifth grades in local elementary schools. This particular investigation constitutes an integral component of a more extensive endeavour encompassing a total of twelve districts. The two districts, which are the subject of discussion in this current manuscript, are also compared with the comprehensive findings of all twelve districts[1].

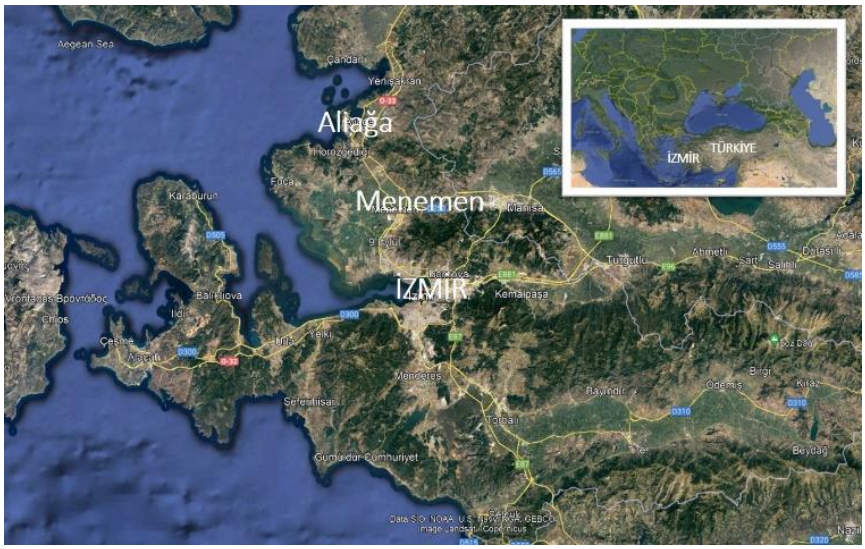


Figure 1. Location of the study sites (Menemen and Aliağa) in İzmir

Aliağa and Menemen are located in the northern part of İzmir (Figure 1). The population in selected neighbourhoods in Aliağa have a higher education and income level than those in Menemen. While the study area in Aliağa is nearby the coast, the neighbourhood in Menemen is inland.

---

[1] This study is part of a research project (Improving Living Environments According to Child Development and Care: Accessibility and Usage of Open Spaces by Children in Izmir, Project No: 119K336) supported by TÜBİTAK, The Scientific and Technological Research Council of Türkiye).

2.2. Data and Methods

Focused on children's activities and daily places at their home and school environments, survey questions directed in two methods ask children about their neighbourhood's (physical, natural, and people) attributes and the places they like, dislike, and spend more time outside home and school. The research conducted was a one-on-one and face-to-face study held within schools and comprised two methods.

The first method – Write/draw responses

The first method requires children to write or draw their responses about what they do after school and where in their neighbourhood (Figure 2), where they like and dislike in their neighbourhood. Drawing provides researchers with a useful method of gathering data about the perspectives of children on their everyday lives (Leonard, 2006). In some classes with younger students, their teacher read the questions one by one. Since it was the first semester after the lockdown of the recent pandemic, their teacher's involvement in conducting the survey encouraged students' research participation.

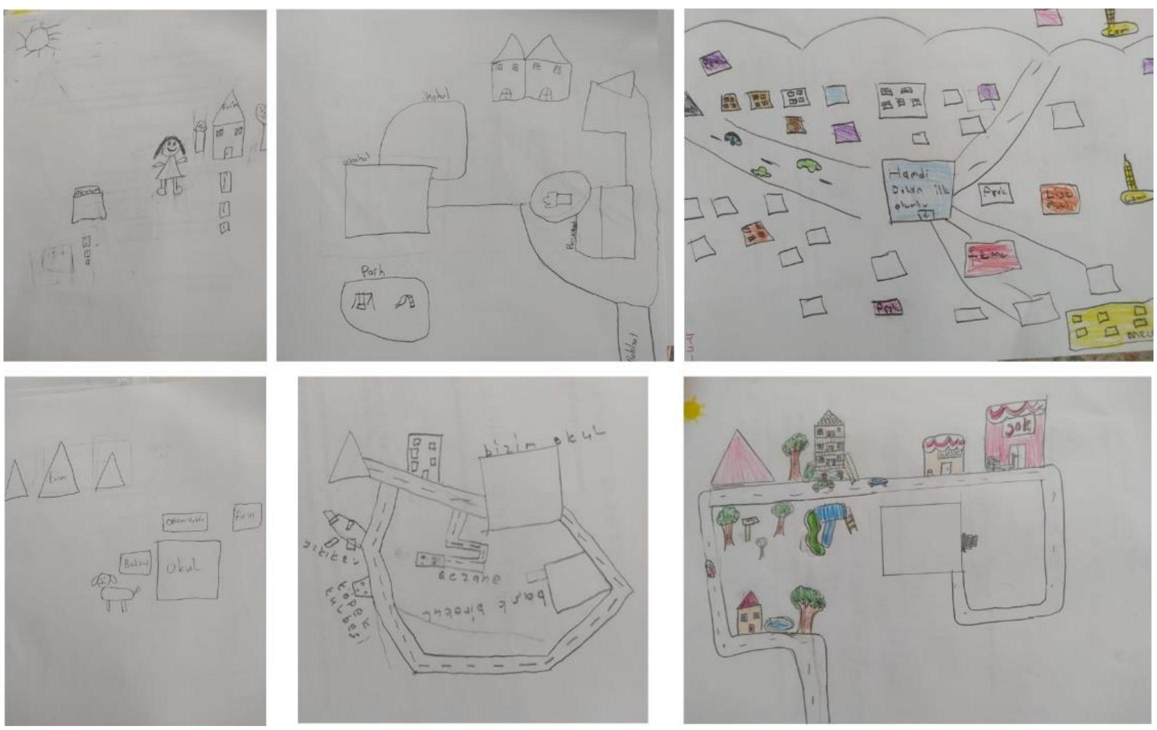


Figure 2. Writing/drawing examples by children in this study (responses with less detail on the left, moderate detail in the middle, and more detail on the right)

The second method – Participatory GIS

In the second method, an example of participatory and qualitative GIS approaches (Berg

et al., 2022; Kyttä et al., 2018), survey process evolved to encourage children to map their neighbourhood environments by using the visually supported tools of GIS environment with the guidance of the researchers. As the research subjects were children, a child-friendly visualization was created for them. The first part of the survey (‘what's around your house?’) used printed and cartographic images that the researchers developed based on the first survey results with drawing and writing. These images are about various neighbourhood features, including the built environment, natural elements, people of various age groups, animals, recreational activities, transportation/vehicles, and reflections/emotions (Figure 3). To facilitate the survey process, visuals were incorporated into the GIS map. While some of these symbols represented tangible items like buses and mosques, others were feature symbols for emoticons related to their enjoyment situations, as depicted in ArcMap.

Figure 3. Visuals to assist the survey questions to be mapped in GIS

At the second part, students were asked about the things and places they like and dislikes in their created map of their home environment including their route to school. The survey requested information regarding their utilization of open spaces, their reasons for enjoying or not enjoying these spaces, and whether and how they spent their daytime

outside of school and home.

None of the children were even slightly familiar with GIS. So when conducting the survey, each student collaborated with a researcher to complete this survey. They needed to give their responses by selecting and then locating a feature among provided visuals (on paper and on-screen) at the appropriate places on their neighbourhood's street map at GIS. The participants were instructed to indicate their responses on a digital GIS map, which displayed their home and school location as well as the surrounding areas. Researchers recorded the responses given by the participants on the map.

The results yielded separate maps for each child, as depicted in Figures 4 and 5. To begin the analysis, a descriptive statistics method was employed in the initial stage to explore potential variations in the children's responses based on their age and gender. Moreover, the students' map data was compared to actual neighbourhood data with land uses and various open spaces.

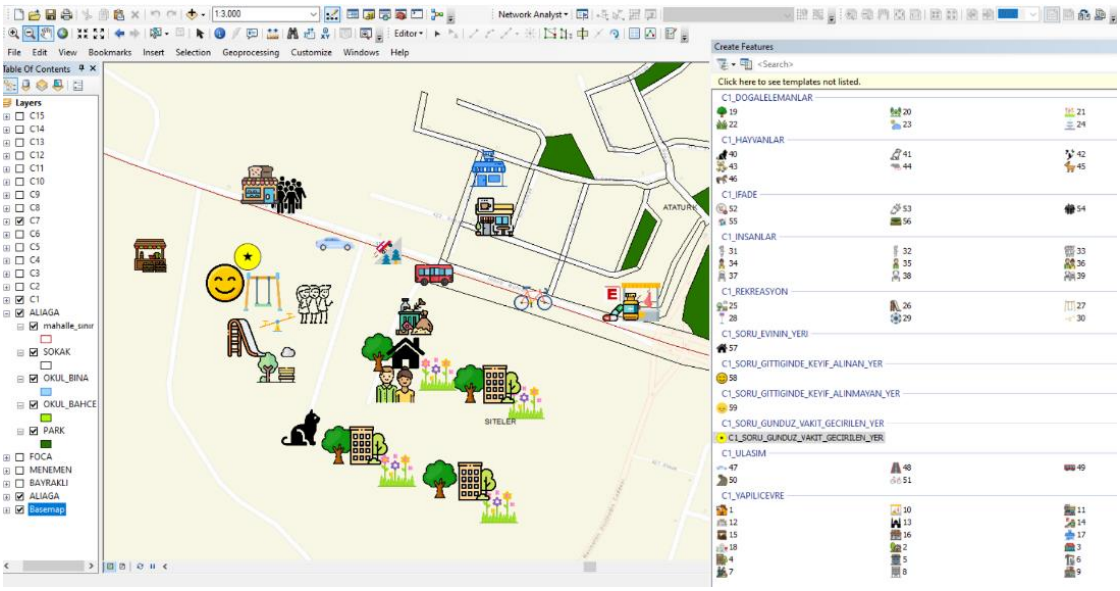


Figure 4. A screen example of spatial mapping at GIS with a sample child (Aliağa)

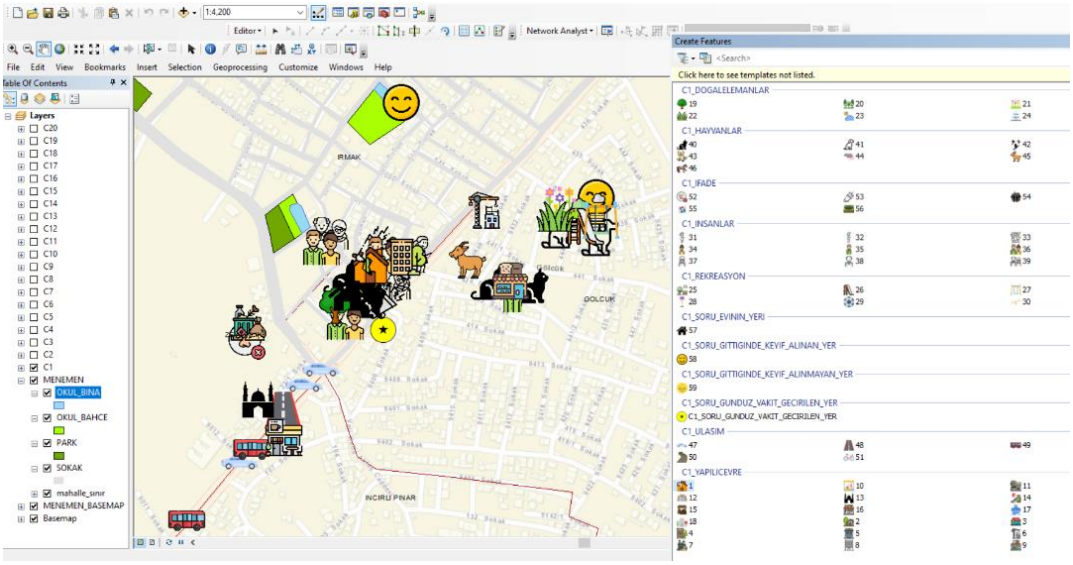


Figure 5. A screen example of spatial mapping at GIS with a sample child (Menemen)

3. Results

3.1. Descriptive Results

As mentioned in the methods part, a total of 154 children between the ages of nine and twelve living and schooling in Aliağa and Menemen are participated in this study. The gender distribution of the participant children is presented in Table 1.

Table 1. The gender distribution of the children participated in the study

	Aliağa			Menemen			Total		
	Girls	**Boys**	**Total**	**Girls**	**Boys**	**Total**	**Girls**	**Boys**	**Total**
Number	36	40	76	47	31	78	83	71	154
Ratio	47%	53%	100%	60%	40%	100%	54%	46%	100%

Different from the GIS-based method, the first method, write-and-draw, asked about the children's likes to do in their spare time whose results reflected some gendered differences presented in Figures 6 and 7. Accordingly, inquiring about children's revealed that more children (over 40%) in Menemen tend to have activities by 'sitting down' than those (5% for both genders) in Aliağa (Figure 6). In Menemen, more girls than boys indicated sitting as their pastime, but in Aliağa, 25-35 percent of children seem to spend their time in front of a screen. The prevalence of screen time among children shows slight

gender differences only in Menemen.

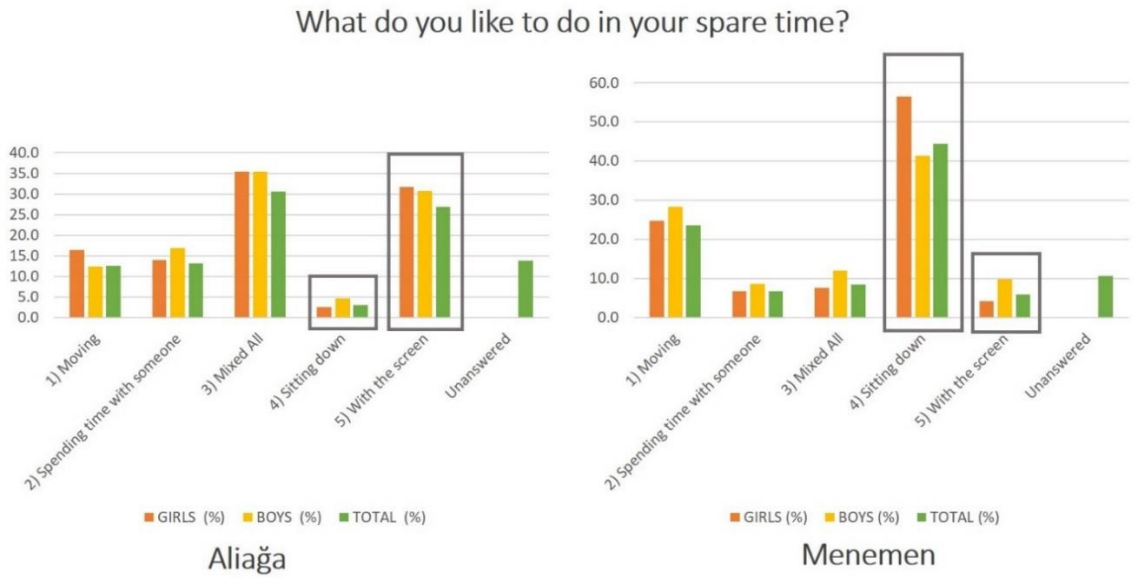


Figure 6. The distribution of responses among gender for the question 'What do you like to do in your spare time?'

In Menemen, children dislike the environment and roads more than in Aliağa according to write/draw responses (Figure 7). Girls in Menemen have the highest rate of this response. In Aliağa, more children, especially boys, talk about disliking animals in the neighbourhood compared to Menemen where no children gave this response.

Besides these descriptive results, a comparison of two districts (Aliağa and Menemen) by according to the common questions of two separate methods are presented as follows. The main questions are 'what's in your neighbourhood?', 'places you spend your time during the day (outside school and home)', 'places you enjoy' and 'places you dislike'. The two districts in this current manuscript are also compared with the comprehensive findings of all twelve districts examined by our on-going research project (see footnote 1).

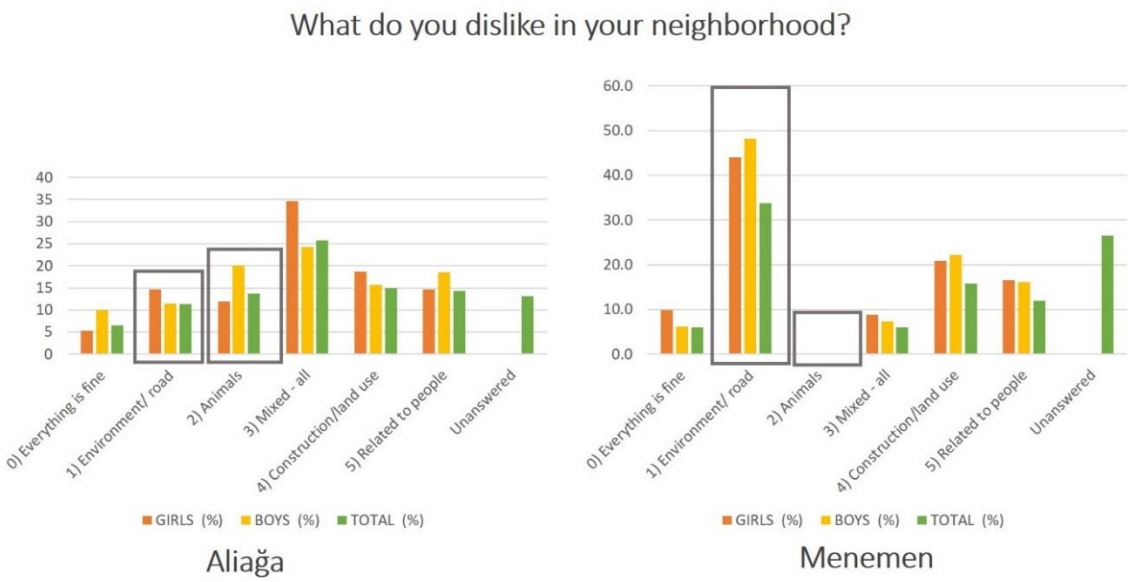


Figure 7. The distribution of responses among gender for the question 'What do you dislike in your neighbourhood?'

3.2. 'What's in your neighbourhood?'

The study categorized neighbourhood features into six groups: built environment, recreation, natural environment, transportation, people, and animals (Figure 8). Examining the answers revealed differences between the two districts, particularly in the categories of grocery stores/market and non-residential uses. Menemen had more answers related to grocery stores/market (nearly 40 percent whereas Aliağa is zero percent) in the built environment category, whereas Aliağa had more answers related to non-residential uses (nearly 30 percent, whereas Menemen is zero percent). Additionally, Aliağa had responses related to gasoline and museum/theatre that were not present in Menemen. Differences in natural environment responses were also observed, with Aliağa having more sea and pool/water elements answers (more than 30 percent).

The responses of the children in Menemen exhibit a higher rate of mosques, vehicles, ball tools and smells compared to the other districts. Children in Aliağa, on the other hand, have a higher percentage of responses expressing the presence of children, animals such as cats and dogs, and the crowd.

Results from the second method indicate similar answers, but with location data (Figure 9). In Aliağa, the percentage of responses including apartments with gardens is greater than that of Menemen, and such is indicated along specific axes, which may likely be a route frequently taken by the respondent. The natural elements map shows more

clustering in Aliağa and spread farther from the school than in Menemen. Negative answers are closer to the school in Menemen and more widespread in Aliağa.

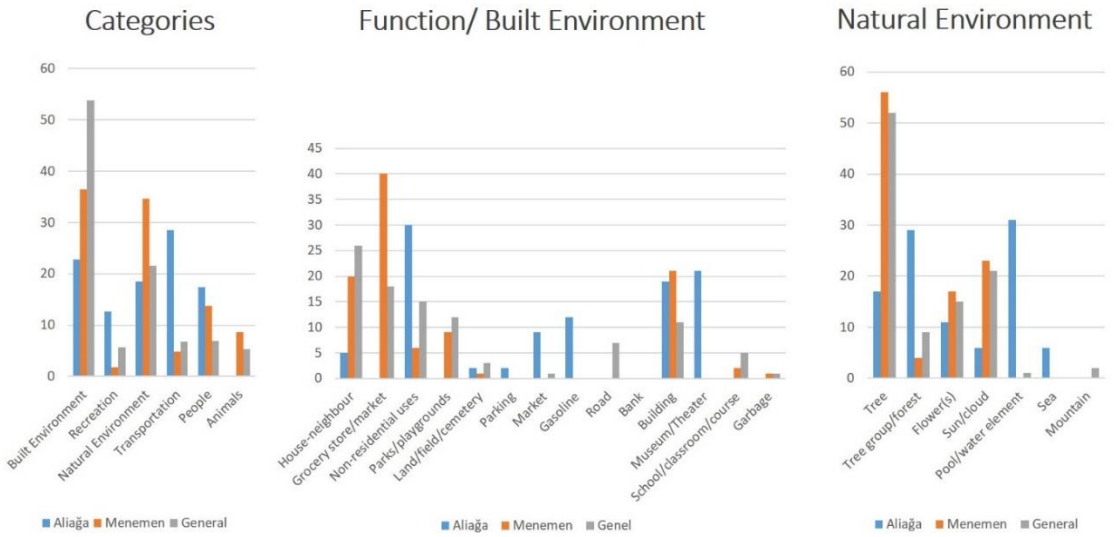


Figure 8. Write/draw responses to 'What's in your neighbourhood?'

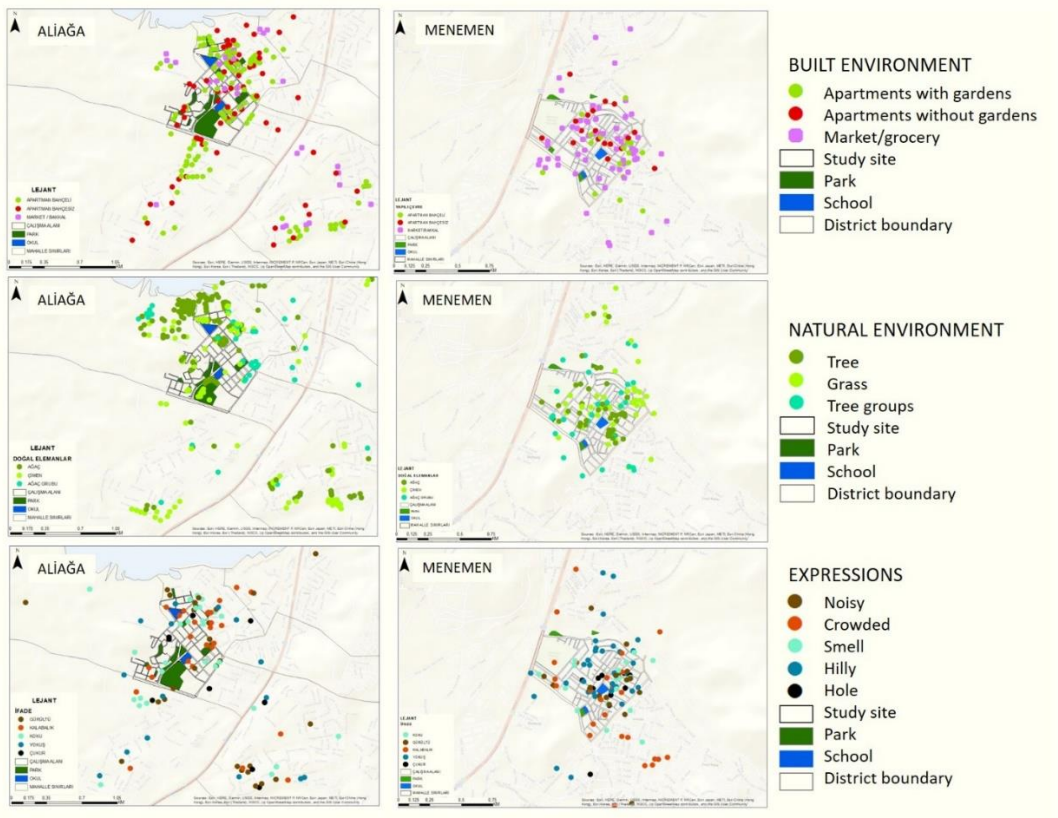


Figure 9. Responses via Participatory GIS method to 'What's in your neighbourhood?'

3.3. Places where children spend time during the day (outside school and home)

The places in which children spend their time outside school and home may occasionally be enclosed areas such as the house of the baby-sitter, an educational institution, or a market, or alternatively, open areas such as parks, gardens, and streets (Figures 10 and 11). Thus, the physical attributes of the neighbourhood may play a vital role in this regard. Moreover, it is discernible from the responses, which may hinge upon the socio-economic standing of the parents, that a greater proportion of children in Aliağa attend courses, utilize pools, and are under the care of a baby-sitter. In Menemen, the rate of answering this question as a park/neighbourhood/friend is over 60 percent in the write/draw method.

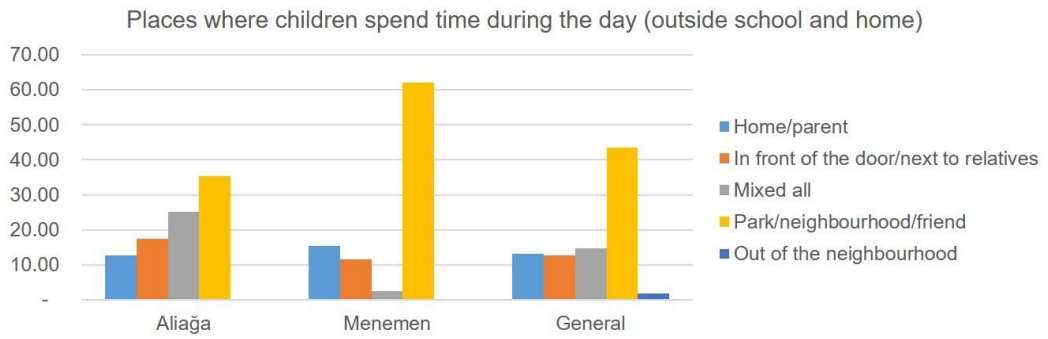


Figure 10. Write/draw responses to places where children spend time during the day (outside school and home)

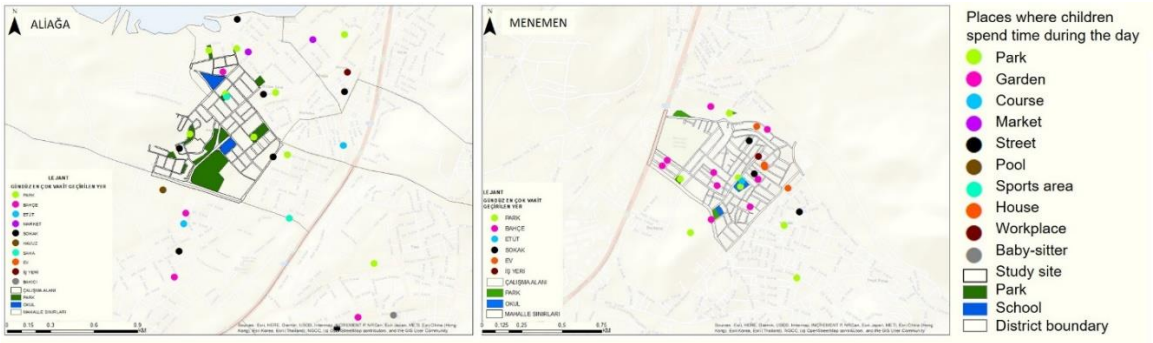


Figure 11. Responses via Participatory GIS method to places where children spend time during the day (outside school and home)

3.4. Places where children enjoy

The ratio of the places children enjoy in front of the door is higher in Menemen (more than 50%), while the ratio of home/parent is relatively higher (20%) in Aliağa (Figure 12). GIS-based mapping provided not only the display of a favourite place in the neighbourhood, but also the opportunity to relate causes and other attributes in the database (Figure 13). In both neighbourhoods, 'play' come first as the reason why children enjoy the places they like in their neighbourhoods.

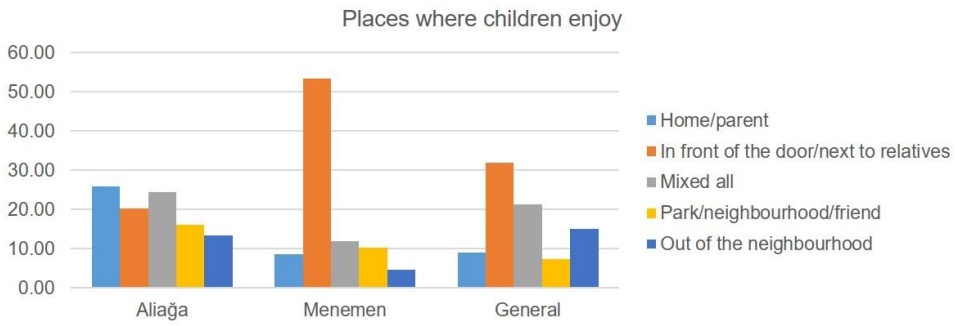


Figure 12. Write/draw responses to places where children enjoy

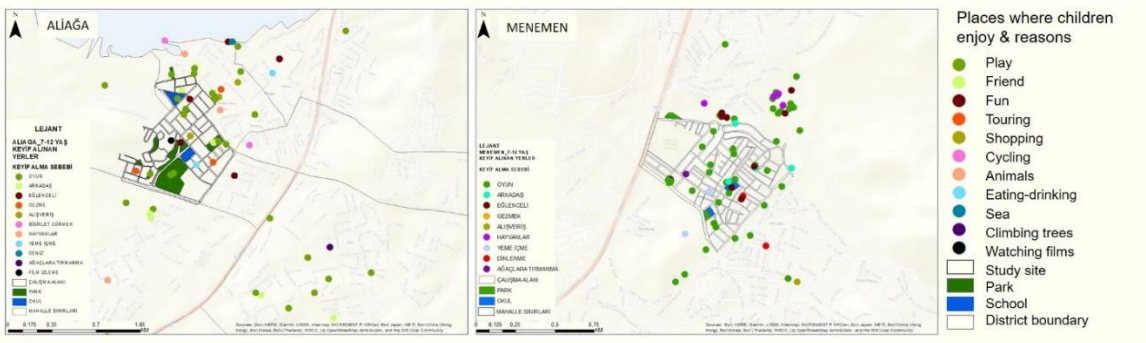


Figure 13. Responses via Participatory GIS method to places where children enjoy

3.5. Places where children dislike

Based on the write-draw responses provided by children, it is evident that the locations they tend to avoid in their neighbourhoods are primarily associated with the environment/road, construction/land use, or people (Figure 14). In Aliağa, animals are also identified as a factor contributing to the unfavourable perception of certain areas. Moreover, the proportion of children expressing 'everything is fine' in their neighbourhood is approximately 5 percent in both localities. Interestingly, responses

pertaining to the environment and road are relatively more prevalent in Menemen. Remarkably, the GIS maps generated by the participants indicate that the disliked places are not proximal to their school in both districts. In Menemen, however, boring areas are more commonly identified. In Aliağa, unsatisfactory locations associated with danger and pollution are situated in close proximity to the coastal part (Figure 15).

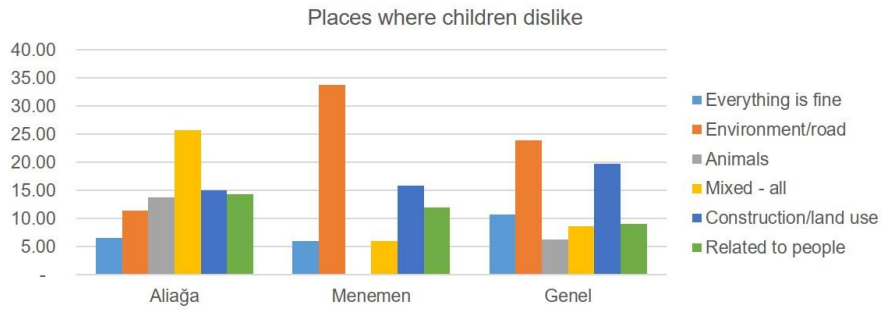


Figure 14. Write/draw responses to places where children dislike

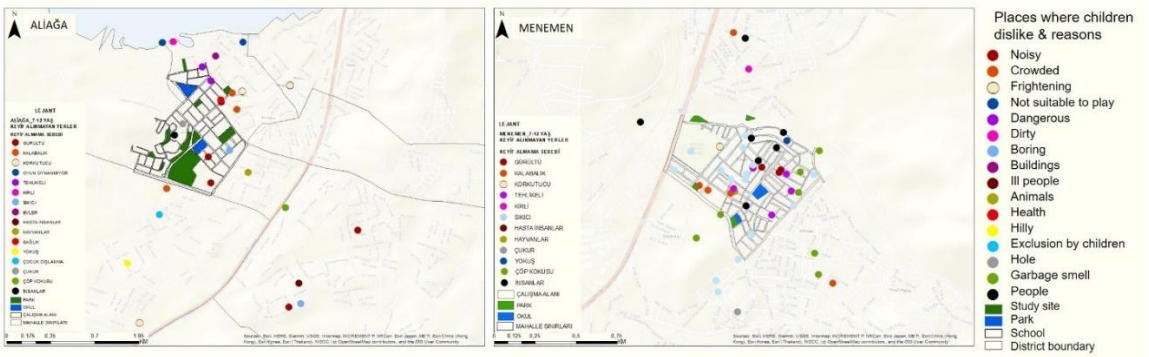


Figure 15. Responses via Participatory GIS method to places where children dislike

3.6. Comparison of the Methods

The present investigation confirms the results that has already been anticipated and acknowledged in existing literature (such as Leonard, 2006 and Manouchehri and Burns, 2023), namely, that the utilization of drawing and mapping actions proves to be more efficacious for children's self-expression about spatial aspects and yields richer outputs than relying solely on verbal expressions. Nonetheless, a particular point of interest to be highlighted is the exploration of disparities between a child's autonomous drawing on a blank sheet of paper versus the utilization of interactive, communicative, technology-based process supported with visual elements and guided by a researcher.

The results of the study firstly present a comparison of these two methods in terms of the

number of items used by children in neighbourhood mapping and the variety of materials on their self-expression. The number and variety of items used in the second method (participatory GIS) are more than those in the first method (manual write/draw). Unanswered questions in the first method are more than those in the second method. No answer or only one answer to the five questions in the first method are more in Menemen (7%) than in Aliağa (2%). The children's lack of response could conceivably be attributed to the temporal alignment of the research with the initial phase following pandemic-imposed restrictions, thereby giving rise to probable anxieties. Furthermore, taking into account the proposition that remote learning diverts children away from the act of composing and sketching with a writing instrument amid the pandemic era, the aforementioned outcome can be construed as comprehensible. Besides, as stated by Leonard (2006) that children with less artistic ability than others are at a disadvantage in the (manual) drawing method, in this research children may be shy to express themselves by drawing. The second method utilizing GIS overcome this disadvantage. Also, in the case of two neighbourhoods, the study discusses the results about how children's self-expression and mapping skills may relate to the income levels of their household and neighbourhood.

The PPGIS approach is instrumental in enabling the identification of settings that may have been overlooked through alternative methods, as highlighted by Kyttä et al. (2018). For instance, the inclusion of verbal expressions pertaining to the marked point in the database as attributes enables the identification of clusters of locations where analogous verbal expressions are expressed by children. Moreover, the visualization of areas enjoyed or disliked by children on the map generated by network analysis (an example is presented in Figure 16), as well as the determination of the surroundings of the school or home within walking distance, can offer valuable insights into the location, thus facilitating decision-makers in identifying intervention points. The PPGIS approach also facilitates the simultaneous analysis of experiential, place-based knowledge from children together with objective environmental characteristics, as noted by Kyttä et al. (2018). However, on occasion, the locations indicated by children may not accurately reflect their actual location. This could be attributed to the child's limited cartographic aptitude. Nevertheless, it remains true that such indications can prove more instructive and advantageous than a completely blank paper. In fact, the observation of pre-existing marks may broaden the child's cognitive horizons and serve as a source of inspiration for the identification of novel points of interest.

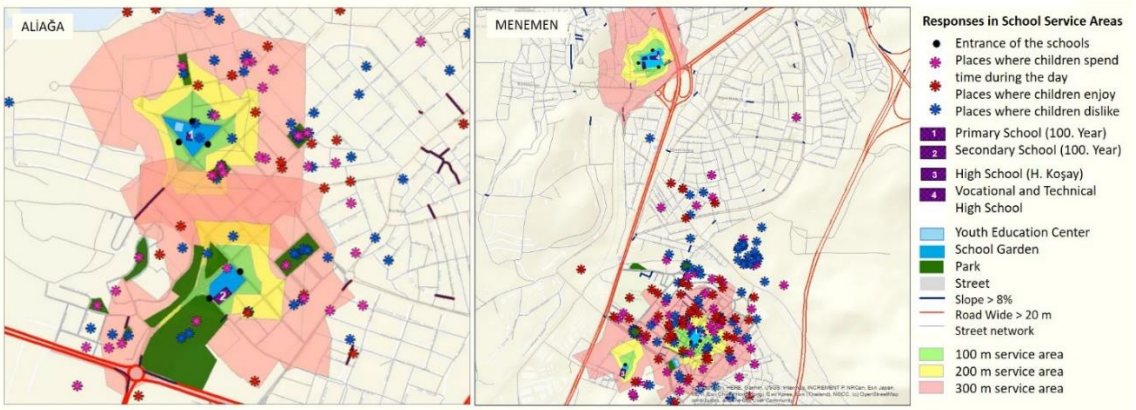


Figure 16. Responses in the school service areas via participatory GIS method

Children did not prefer an environment where they could draw and write on their own, that is, a similar exam environment. Making mapping accompanied by a guide researcher and interacting and chatting with her/him strengthened the children's sense of trust. The diversity of the answers increased in the drawings made with one-on-one attention and supported by visuals in GIS. The second method motivate young children to talk 'more' about physical, natural, and social elements in their daily life and, thus, help the researchers to grasp these children's spatial orientations in and perception of their neighbourhood. In this way, the process of research yields not only knowledge, but also a form of citizen science that actively involves children. The research design's visual elements engage children, enabling them to both enjoy themselves and respond to queries. Consequently, children's participation is fostered and increased.

4. Conclusion

Previous empirical investigations in the literature impart a resounding message to urban decision-makers, urging them to take a more proactive stance in collaborating with young citizens as children who possess the skills necessary for comprehending urban affairs, as part of the urban development process. This study also has the potential to guide researchers who want to answer the question of how urban planning can effectively coordinate the development of interconnected, liveable, diverse and inclusive urban environments for children. The results of the study have potentials to contribute to the planning practices exploring about how to include children in plan making processes and how children express the physical, natural, and social qualities of their daily spaces.

Within a participatory GIS setting, the maps generated with the assistance of children enable the visualization of their perceptions concerning their respective neighbourhoods, thereby rendering the research process child-friendly. The study's constraint became

evident when, occasionally, the children inaccurately marked the locations of existing uses due to their map reading skills' limitations. Nonetheless, the study remains an innovative one in terms of illustrating children's sentiments and opinions via a participatory approach. This study is expected to serve as a foundation for similar research methodologies, which are rare in Türkiye. In the future, decision-making mechanisms would benefit from the inclusion of comparable processes to enhance their inclusivity.

Acknowledgements. This study is a part of a research project (Improving Living Environments According to Child Development and Care: Accessibility and Usage of Open Spaces by Children in Izmir, Project No: 119K336) supported by TÜBİTAK, The Scientific and Technological Research Council of Türkiye).

References

Berg, Päivi, Tiina Rinne, Pirjo Hakala and Arto J. Pesola (2022) Children's independent mobility and activity spaces during COVID-19 in Finland. Children's Geographies, na(na), pp. 1-15.

Bozkurt, Melih, Helen Woolley and Nicola Dempsey (2019) Children's interactions with water in city centres: A case study from Sheffield, UK. Landscape Research, 44(6), pp. 671–687.

Chen, Jie, Shih-Lung Shaw, Hongbo Yu, Feng Lu, Yanwei Chai, and Qinglei Jia (2011) Exploratory data analysis of activity diary data: a space-time GIS approach. Journal of Transport Geography, 19(3), pp. 394–404.

Çubukçu, Ebru, Duygu E. Kahraman, Öykü F. Yavaşal (2018) Comparing the lifestyles and environmental perceptions of rural and urban children: a case study in Turkey. Journal of Housing and the Built Environment, 33, pp. 861-875.

Gökmen, Hikmet and Burcu Gülay Taşçı (2016) Children's Views about Child Friendly City: A Case Study from Izmir. Megaron, 11(4), pp. 469-482.

Kyttä, Marketta, Melody Oliver, Erika Ikeda, Ehsan Ahmadi, Ichiro Omiya and Tiina Laatikainen (2018) Children as urbanites: mapping the affordances and behavior settings of urban environments for Finnish and Japanese children. Children's Geographies, 16(3), pp. 319-332.

Leonard, Madeleine (2006) Children's drawings as a methodological tool: reflections on the eleven plus system in Northern Ireland. Irish Journal of Sociology, 15(2), pp. 52-66.

Loebach, Janet and Jason Gilliland (2010) Child-Led Tours to Uncover Children's Perceptions and Use of Neighborhood Environments. Children, Youth and Environments, 20(1), pp. 52-90.

Manouchehri, Bahar and Edgar A. Burns (2023) Perception, concern, competency: children's understanding of physical and non-physical aspects of urban environment in

Iran. Children's Geographies, 21(1), pp. 147-162
Wridt, Pamela (2010) A Qualitative GIS Approach to Mapping Urban Neighborhoods with Children to Promote Physical Activity and Child-Friendly Community Planning. Environment and Planning B: Planning and Design, 37(1), pp. 129–147.
Zhang, Ru, Chun-Qing Zhang, Poh Chin Lai and Mei-Po Kwan (2022) Park and neighbourhood environmental characteristics associated with park-based physical activity among children in a high-density city. Urban Forestry and Urban Greening, 68(127479), pp. 1-9.

DESIGNING FOR GENDER EQUALITY: SPATIAL THRESHOLDS AS EMPOWERMENT DEVICES (1143)

Arianna Scaioli*

Politecnico di Milano, DAStU, Milan, Italy; ariannaluisa.scaioli@polimi.it

Abstract. Designing for inclusion, justice, and care means questioning how different bodies and voices are made visible in space and how architecture can translate their needs, aspirations, and identities. Historically, the heard and visible voices were those correlated with the mainstream, usually Caucasian, abled-bodied males, who addressed design through the lens of a universal man.

Designing through a feminist critique means questioning whose voice is represented and how this attitude can inform a different kind of engagement with people and the environment.

The idea of collaboration and co-design that permeates this approach to architecture allows for blurring the lines between public and private, individual and collective, considering the thresholds between these dimensions as places where empowerment, justice and dignity arise. In this sense, the contribution proposes a reflection on the design of collective housing conceived as catalysers of inclusive and democratic practices, able to foster gender equality through design.

Keywords: Feminist Critique, Spatial Thresholds, Empowerment through Design, Collective Housing.

1. Introduction

"We define the space in which we appear, and that act of appearance then defines our roles in society." (Betsky, 1995, p. XVII)

Designing for inclusion, justice, and care means questioning how different bodies and voices are made visible in space and how architecture can be aware, encapsulate and translate their needs, aspirations, and identities. However, the built environment is a spatial palimpsest charged with cultural, political and environmental tenets, where the power relations that have shaped our cities are unveiled. Space becomes a territory of conflicts, expulsions and encounters (Sassen, 2014) where collective and individual temporalities intersect and overlap synchronically. However, historically, the heard and visible voices were those correlated with the mainstream, the" space-makers", usually

Caucasian, abled-bodied males, who addressed design through the lens of a universal man, flattening the everyday experience and use of space with the idea of 'one size fits all'.

The discussion is centred around the meaning of designing for Gender Equality, which are the values, instances and themes that should be considered and how architecture could be part of this discourse. In this sense, "Gender Equality is explored through a multifaceted perspective, encompassing the notions of care – for people and the environment – of the right to appropriate and inhabit space – where people can participate as equals in its conception and construction, and of multiple experiences in space through time – where bodies through their movement, can generate spatial configurations" (Scaioli, in-press). This intrinsic complexity shows how achieving gender equality depends on both a cultural shift and physical and spatial modification. The New European Bauhaus Framework and the SDGs offer a theoretical impulse to the architectural and spatial discourse, tracing a trajectory towards more inclusive, just and socially responsible built environments (European Commission, 2021). However, a joint effort by scholars, practitioners and communities should be made to translate these goals into the materiality of space, not to consider them as mere slogans or declarations of intent.

In light of this, the contribution, positioned within a feminist and gendered critique of architecture, tries to lay the ground for a reflection on how to translate the values of a gender-equal city into spaces and architecture. Designing through a feminist critique means questioning whose voice is represented, how bodies are "physically, socially, sexually, and discursively produced" (Grosz, 1995, p. 104), and how this attitude can inform a different kind of engagement with people and the environment, assuming open-ended, in-becoming, spatial futures encompassed in feminist thinking (Schalk M, Kristiansson T, Mazé Ramia 2017). Looking at the city and modifying its structure through and from a feminist critique would not mean designing an only-woman city, but rather a city for everyone, a caring city, where the spatial character would reflect the social and cultural one. Indeed, there is a need to reframe the question of designing for gender equality and of feminist methodologies shifting from a "women-only issue" to an "everyone issue." Specifically, building on the notion of gender as a relational category (Scott, 1986) allows us to recompose the dualism between the androcentric city and the women-centred one, not considering the two of them as separate spheres but recognising how the notion of masculinity and femininity were constructed in relation to each other.

The idea of collaboration and co-design at different scales and stages that permeates this approach to architecture allows for blurring the lines between public and private, individual and collective, considering the thresholds between these dimensions as places where empowerment, justice and dignity arise. In this sense, the contribution proposes a

reflection on the design of collective housing conceived as catalysers of inclusive and democratic practices, able to foster gender equality through design.

Through discussing two design experiences, the paper seeks to become a terrain of discussion to further reflect on the spatial relation that gender has on our built environment. The two projects discussed are cooperative housing, displaying an explicitly feminist and gendered position towards spatial design. One is located in Vienna, Frauen-Werk-Stadt I, designed specifically for women, and the other is in Madrid, breaking down traditional gender roles. The main focus is on the transition spaces between the domestic, collective and public domains. By working on the concatenation of spaces, on the spatial sequences, between inside and outside, the paper wants to tackle how gender can shape the morphology of our spaces, re-weaving the relationship between gender, body, and architecture.

2. Make It Collective! Feminist Practices For Inhabiting Intermediate Space

Bridging the intersection between spatial design and feminism allows us to recast the discipline of architecture, offering a renewed interpretation of urban phenomena, reframing our attention towards the "microphysics of everyday life" (Bassanini, 2008) and understanding how the form of space and its use are strongly intertwined. This shift in perspective offers a more comprehensive vision for the rights of bodies, voices and identities (hooks, 2000) and becomes a territory of experimentation and openings towards "altering practices" (Petrescu, 2007). As open-ended, dynamic processes of thinking and transforming space, they allow for a renewed synthesis of method, process and situated practices, where the shift from being-in-space to becoming-in-space introduces a transformative dynamism, correlating the "actual" with the "possible". (Deleuze & Guattari, 1987).

This conceptualisation of practising otherwise, counter designing the traditional male-centred city (Schalk, Kristiansson & Maze, 2017; Petrescu, 2007; Brown, 2016; Grosz, 1995) draws on a feminist urban critique which considers space as not neutral nor equal, but permanently entangled and defined by power struggle (Lefebvre, 1969), hierarchies, and discrimination. Feminist and gendered critique of space has revolved around the question "What Would a Non-Sexist City Be Like?" (Hayden, 1980), striving to spatialise the issues of gender and discrimination by design in the materiality of space. However, many questions remain underexplored on how to translate the values for a gender-equal space into the built environment and what role architects, planners and scholars can have in fostering this transformation. This androcentric city makes itself explicit on several levels: the symbolic one (street names, male standards…), the visual (sexist advertisement…), and the physical (use of space, safety, accessibility, comfort…), reiterating gender roles in space (Stratigakos, 2008). (Fig. 1)

Figure 1. Contenedor de Feminismos, A. Caramés, C.Nogueira, U. Permui, Museo Nacional Centro de Arte Reina Sofia, 2022.
Source: Photo by the Author.

Current conceptualisations of feminist spatial interventions deal with practices of reappropriation of space as a political as well as a design act. These, sometimes performative, temporary activities follow the conceptual path traced by De Certeau's "tactics", where the event triggers a tactical appropriation of spaces. Through a conscious presence of bodies in space, oriented towards the construction of a project, it is possible to enable a spatial transformation. By moulding spatiality and temporality with corporality, the event becomes an interdisciplinary device questioning and transforming the social conditions of a place. However, for a transformation to be truly effective should manifest its influence on how space is designed to foster a permanent and lasting modification. If, as Darke says, "Our cities are patriarchies written in stone, brick, glass and concrete." (Darke, 1996, p. 88), then it becomes crucial to understand how the theme of gender affects the material construction of spaces to foster a spatial culture, in a continuous tension between permanence and mutation where multiple identities coexist and interact within the urban milieu.

The contribution proposes a reflection on how gender equality can be spatialised, discussing the theme of living space rethought as a collaborative space for sharing daily life, focusing primarily on women as users and makers of space. Starting from the assumption that gender imbalance in the performance of domestic work is one of the leading causes of gender inequality and that precisely the isolation of households in their respective homes can be seen as a condition that fosters this kind of subjugation, the paper will try to recount shared and common spaces as a place capable of hosting collective forms of reproduction, as the centre of collective life, the first places for citizenship; a life traversed by different people and forms of cooperation, capable of granting intimate space (a room all to oneself) but without isolating. Rethinking these forms of cooperation and inhabiting from and through a feminist and gendered perspective brings to the foreground the issues of equality in space, where architecture can become a form of emancipation and empowerment for the "vanished" (Singha, 2018).

3. Methodology

Through a research-by-design approach (Roggema, 2017; Schoonderbeck, 2017; Fraser, 2013), the contribution explores the theme of the extension of living spaces in the same building and towards the neighbourhood, focusing on the spaces for commoning, where the tension between private and public and individuality and multiplicity can be recognised and recomposed. As part of doctoral research grounded within a feminist and gendered critique of architecture, the paper explores the spatialisation of gender equality through the presentation and discussion of two design experiences. The aim is to build a 'terrain of conversation' on design practices, methods, and approaches encompassing gender in modifying the built environment.

The two projects, Frauen-Werk-Stadt I in Wien by Franziska Ullmann (Masterplan+Project), Gisela Podreka, Elsa Prochazka and Liselotte Peretti and Entrepatios – Las Carolinas in Madrid by sAtt Arquitectura, both share the concept of collaborative living forms making explicit a feminist approach to architecture, recentring the attention towards the "practice of everyday life" (De Certeau, 1988) and the notion of care and equality. Drawing from the concept of "Space as Matrix" by Susana Torre, the contribution investigates the spatialisation of gender equality, opening the necessity of rethinking the idea of space itself and the idea and forms of inhabiting architecture. Going beyond the traditional categories of housing, public space, workspace, of individual and multiple, this notion weaves them together, breaking down the hierarchical organisation of space and allowing "fixed elements to be combined with open spatial possibilities for transformation and growth" (Torre, 1981).

The contribution presents two case studies by drawing from the theoretical framework

developed during the 1970s and 1990s and from design experiences of collective and collaborative houses developed for (and often by) women. The current conceptualisation of collective and collaborative house is enormously indebted to the Viennese Ein Küchenhaus Type to free women from domestic labour, but also the Scandinavian experience which saw in Alva Myrdal and Sven Markelius, two precursors.

The focus will be on the patterns of inhabiting these spaces from a gendered perspective, understanding how this shapes their form and typology. Looking at spaces through their interconnection allows us to rethink proximity and everyday experience in space. The aim is to disclose the relationship between gender and urban morphology and how it can contribute to shaping spaces and fostering a long-term transformation. The paper considers the concatenation of spaces, the spatial sequence, as fundamental to fostering and bringing forward a reflection on the spatialisation of gender equality. By linking the private, the common and the public, the aim is to rethink the intermediate scale holistically and through a multiscalar approach. Feminist scholars have focused on how women inhabit the domestic environment or the public domain; however, they also state the necessity to go beyond the traditional division of private/public.

The intention is to investigate the spatialisation of gender within the selected case studies. Each project is dissected in spatial elements, presenting them like micronarratives. The aim is to understand how the notion of gender and how space is used can inform spatial configurations, characters and forms, understanding how gender impacted the design of those spaces and how their transition and interconnection or separation allow recognition and appropriation of spaces.

4. A Tradition That Continues: Frauen-Werk-Stadt I In Vienna

The project Frauen-Werk-Stadt I is located in the outskirts of Vienna (1993-1997) following a design competition organised by the Frauenbüro. In those years, the city was undergoing a deep process of renovation and cultural change that brought to the recognition that housing has much more to offer than a physical shelter, but rather a place that was defined and defined the owner's identity. Housing becomes "a way of orienting oneself in the world and of dealing with the world outside – the world beyond the private" (Ullmann, 2013, p. 300). As head of the Frauenbüro, Eva Kail inspired and promoted this change, fostering extensive research on gender mainstreaming and thematic design competitions on social housing, mainly focusing on women's perspective. The exhibition and seminar organised by Kail, "Who Owns Public Space? Women's Everyday Life in the City," triggered a reflection on women's needs, the use of space through time and the need for affordable and inclusive housing.

Figure 2. Frauen Werk Stadt I. © Dieter Henkel under CC BY-NC-SA 4.0.

The innovative aspects of the project Frauen-Werk-Stadt I are related to formal and design aspects and the process of conceiving it. Accordingly, the project results from a design competition which specifically addressed women architects for the design of this pilot intervention. The intention was to shed light on the work of women architects, making them visible in the design panorama, as well as building a complex encompassing everyday needs and tasks, flexibility and openness of inhabiting and working.

The masterplan was conceived by Franziska Ullmann, establishing the general intentions for the development: "orientation and movement patterns; the relationship between public and private realms; and the different mobilities, needs and expectations of different groups in society" (Ullmann, 2013, p. 301). The complex is designed looking at the traditional Viennese Hoefe, an enclosed courtyard structure that allows for various open spaces welcoming different uses. For the design of the buildings, the municipality called three more architects: Gisela Podrecca, Lotte Peretti and Elsa Prochazka, who addressed specific issues; for instance, Elsa Prochazka's segment explored the question of housing for every phase of life, breaking down traditional hierarchies and organisations. (Fig. 3)

Figure 3. Franziska Ullmann, Design Competition Masterplan (Left). © Franiska Ullmann // Plan, Elaboration by the author based on Franziska Ullmann's drawing.

This collective housing complex welcomes, besides the 359 apartments, a series of common spaces, among which a kindergarten, a physician, a police station, commercial spaces, a pharmacy and shared facilities complementing the apartments and public spaces. They are structured as a series of rooms that mediate the relationship between private and public spaces; they display a typological variety: open spaces, open/covered, closed, semi-transparent, transparent exploring the questions of meeting, interacting, sharing and making explicit people's presence in space. (Fig. 4) (Fig. 5)

Figure 4. Common Spaces - © Dieter Henkel under CC BY-NC-SA 4.0 except the bottom left one which is by the municipality of Vienna

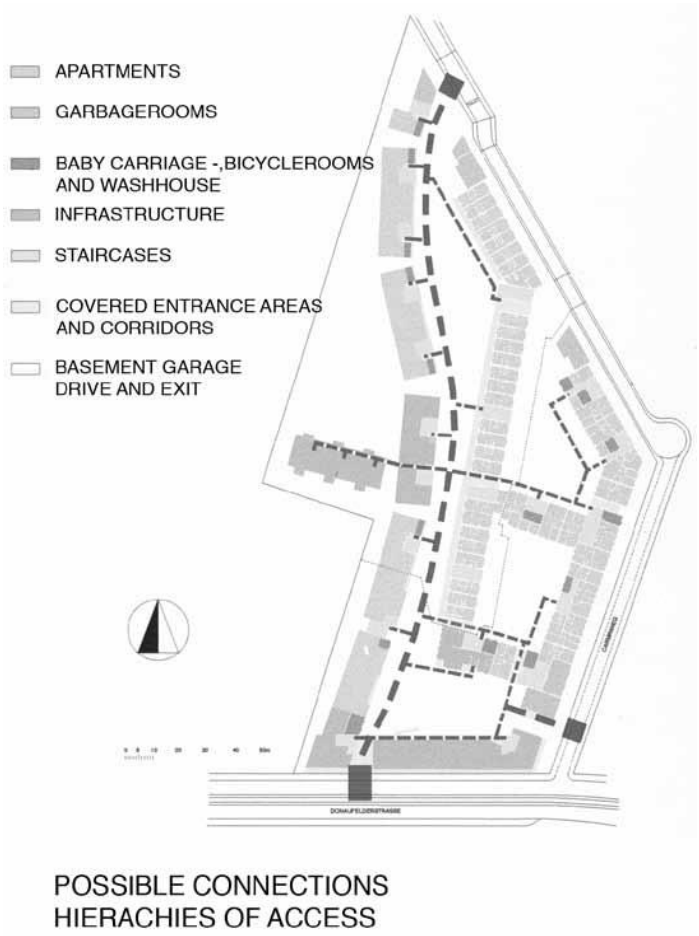


Figure 5. Franziska Ullmann, Possible Connections and Hierarchies of Access © Franziska Ullmann

This idea of looking and meeting is reinforced by the presence of a semi-public square parallel to Donaufelderstrasse and by open corridors, loggias, balconies and wide windows on the buildings projecting the inside towards the outside. The architects wanted to design a permeable complex that would become a threshold between privacy and publicity, between the house and the city. In this sense, the formal and spatial organisation of the intervention showcase a feminist approach to architecture with solid attention to the use of space by living bodies. Security, accessibility, flexibility, no hierarchy, openness and attention to everyday activities are criteria that have informed the design process and outcome. Specifically, they interact both with the material dimension of space but also on the symbolic and perceptual one, where, for instance, a greater sense of security or using the words by Ullmann to refer to as "see and be seen",

given by transparency and passages, but also on visual connections among the levels and the ground floor, allows to create a social space and a neighbourhood infrastructure. (Fig. 6)

Figure 6. The relationship between the architecture and the context © Elsa Prochazka

This openness is favoured by the presence of interconnected open and open/covered spaces that become meeting places where children can play and have their privacy while being seen by the inhabitants. These spaces are visible, especially on the ground floor, because of the distinctive elements that characterise them, such as steps, corridors, and fences. Moreover, they are on different levels, where in-between the apartments are lobbies, storages, halls, and wide passages that become places for interactions. The intention was to foster different degrees of collectivity, offering the opportunity of sharing spaces or having more private moments.

Frauen-Werk-Stadt I becomes a fundamental experience on how to rethink collective living from a feminist and gendered perspective, expanding the traditional notion of inhabiting a space, rethinking the everyday life and materialising it into architecture.

5. Micro-Stories Of Everyday Life: Entrepatios In Madrid

Figure 7. sAtt, Entrepatios Las Carolinas. © Andrés Valentín-Gamazo

Entrepatios Las Carolinas is the first ecological collaborative housing under a right-of-use regime located in Madrid (2018) designed by sAtt Arquitectura and developed through a participatory approach, together with the Entrepatios Cooperative through fifteen workshops. Although not specifically directed to women, as Frauen-Werk-Stadt I, the project encompasses a gender and feminist perspective to design, both in the process and the outcome. Expressly, gender was incorporated into the project to explore, articulate and reinforce the design solutions fostering a transformation of the traditional residential architecture to give greater importance to reproductive and productive activities and the diversity of household patterns and residential needs. Moreover, gender also informed non-spatial aspects such as the decision-making process and the financing and promotion of housing. Specifically, participatory design often facilitates significant participation of women in decision-making; from a management perspective, cooperatives help women to access decent housing, especially when they are heads of the household. (Fig. 8)

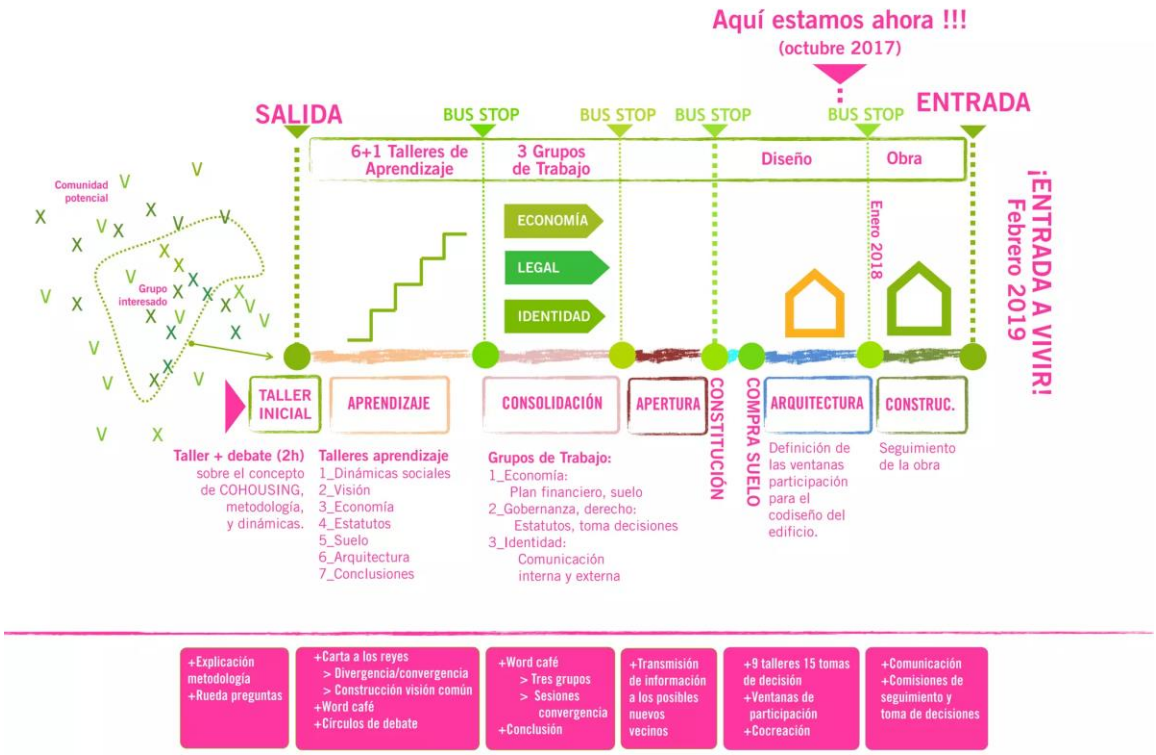


Figure 8. sAtt, Structure of the Design Process. © sAtt Triple Balance

In this project, gender considerations have influenced the three pillars of sustainability: social, environmental, and economic, where they are strongly intertwined to promote a democratic, inclusive, non-hierarchical, climate-sensitive and affordable intervention.

In Entrepatios, they have tried to ensure that the building favours encounters: corralas, communal courtyards, attics, communal kitchens, shared washing machines; they want excuses to live together, to share, an excuse to see each other, to live together, to build, collectively, other ways of relating to each other. This housing comprises seventeen apartments designed flexibly to accommodate future changes and different uses. (Fig. 9)

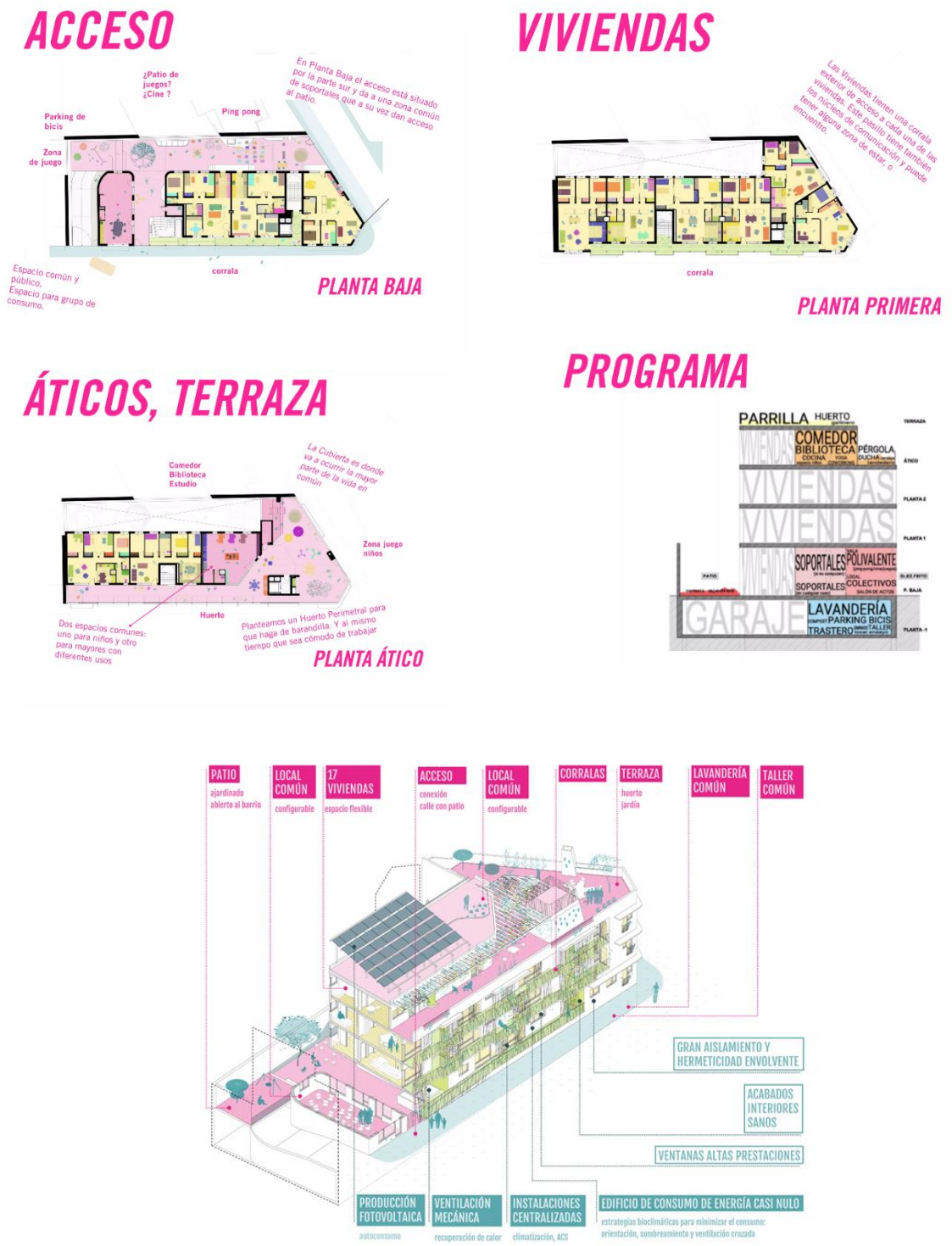


Figure 9. sAtt, Drawings of the intervention. © sAtt Triple Balance

The heart of the project lies in the shared spaces; generating and locating them, especially on the ground floor, aims to expand the living spaces in the same building and towards

the neighbourhood, binding together private and public dimensions. Workshops, communal laundry, a rooftop communal vegetable garden, a large communal room with a kitchen and several open spaces are among the shared facilities that contribute to building this complex residential architecture. These common spaces become a threshold where they can host activities from both the neighbourhood and the community living there. Moreover, gender considerations have also influenced the design of circulation spaces; On the one hand, access to the dwellings is through corridors (corralas) that favour interaction between neighbours. Their dimensions allow for some activity, becoming living areas and not just connecting devices. By extending the use of these elements located on the main façade, the building also improves the perception of security in its immediate urban surroundings, following the concept of the "eyes on the street". Also, the entrances have been rethought; for instance, the space next to the main entrance has an entrance both from the communal courtyard and from the road, fostering a greater permeability. (Fig. 10)

Figure 10. sAtt, Common Spaces. © Andrés Valentín-Gamazo

6. Building Equality Through Architecture

The two design experiences, Frauen-Werk-Stadt I and Entrepatios make explicit how gender equality can be encompassed and translated into spaces and architecture. The projects explore the theme of the extension of living spaces in the same building and towards the neighbourhood, focusing on the spaces for commoning, where the tension between private and public and individuality and multiplicity can be recognised and recomposed. By linking the private, the common and the public, the aim is to rethink the intermediate scale holistically and through a multiscalar approach. Focusing on the intermediate scale allows observing, understanding and rethinking proximity which can be made explicit through everyday activities. Here, building on the notion of the fabric as a constructed object (Corboz, 1985), a co-evolutionary milieu where different identities, collective memories (Choay, 2004), and social infrastructure in its multiplicity of experiences emerge, together with the construction of space. "Therefore, collective and spatial identity merge and shape the site consciousness" (Semprebon et al., 2021, p. 67), which is built through time by situated (Haraway, 1988) and gendered bodies (Spain, 1992) that interact in a shared urban milieu.

The concept of commons becomes crucial in this discussion, where "conceiving space-as-commons – to think beyond the notions of public and private space, and then to understand common space not only as space that is governed by all and remains open to all, but that explicitly expresses, encourages and exemplifies new forms of social relations and of life in common." (Stavrides, 2016). By focusing on collective and collaborative living as a form of emancipation fostering gender equality, the discussion starts from the idea of deconstructing traditional housing, where the trajectory to be taken means that "the household should be extended to the world" (Hayden, 1981). Cooperative housing seeks to respond to these new forms of social organisation, and together with the networks of commonality and diverse kinships that are organised around them, can be creative ways of dealing with the reproduction of life, care and upbringing. (Fig. 11)

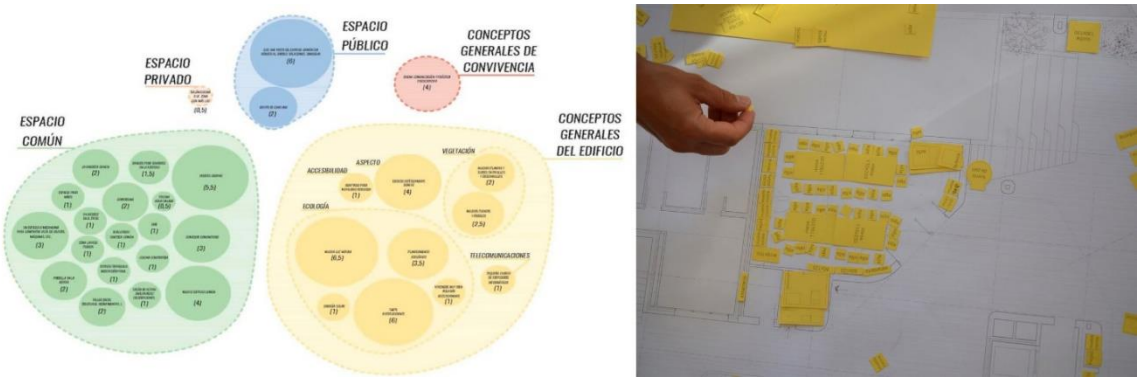


Figure 11. sAtt, Participatory Process. © sAtt Triple Balance

The discussion of these experiences sheds light on the complexity and multifaceted condition of this discourse, where the relationship between gender equality and the built environment involves the design process, the outcome, but also the management of the intervention. It deals synchronically with the materiality of space, with its cultural, social, and economic values and how it is used through time. 'Architecture as process/Architecture as object'. In this sense, these two conceptions of architectural design can be recomposed by and through a feminist critique, creating a relationship between the 'Software' or its intangible values and the 'Hardware', its material dimension.

Looking at the projects from a feminist and gendered perspective, it is possible to deconstruct a series of values and issues to trace a path towards the translation of gender equality in the built environment. These traits work at the crossroad of the material and immaterial dimensions, where these practices allow us to build a community day by day. This "Soft Infrastructure" (Mogollo, Fernandez, 2015) functions through invisible affective dimensions and relationships between elements (between people and place) or even through performative acts. Specifically, the attention to diversity and social and spatial complexity, participation in the design of its inhabitants, de-deconstruction and flexibilisation of spaces, attention to workspaces and processes, storage spaces, attention to intermediate spaces, adaptability and transformation over time.

Time thus becomes a fundamental design variable in this perspective as a way of responding to needs not yet expressed but which will become open questions for future architecture. Projects must be constructed as spaces capable of narrating the inhabitants' daily lives that can accommodate the "choreographies of life and choreographies of movement" (Ullmann, 2013) by integrating with the existing built fabric; in a continuous tension between permanence and modification. This flexibility and adaptability of spaces - understood as the possibility of accommodating multiple uses simultaneously - contribute to de-hierarchising architecture and space, moving away from the patriarchal organisation of housing and exploring ways of designing differently. Intermediate spaces are configured as thresholds, spaces between things, spaces where the first forms of citizenship, equality and democracy emerge. They are spaces conceptually located at the intersection of material and immaterial dimensions, where spontaneous and more formalised practices coexist. However, their transformative capacity is linked to their existence within a network, a concatenation of collective spaces capable of generating narrative sequences and shared dwelling use. Reflecting on the issue of how to translate the theme of gender equality in space entails reflecting on the patterns of relationships and of use of these spaces from a symbolic and physical point of view. By understanding how women and minorities use space over time, from walking to living, it is possible to rethink spaces and architectures as open to modification and adaptable to their needs and expectations, weaving together sociality, spatiality and temporality. (Fig. 12)

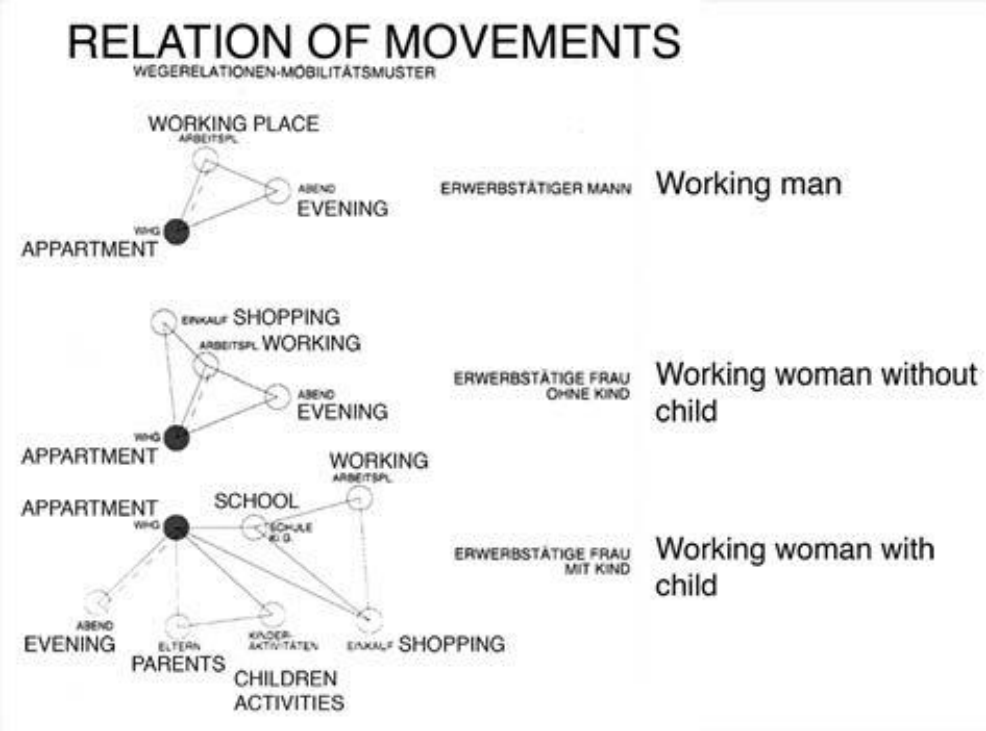


Figure 12. Franziska Ullmann, Relation of Movements. © Franiska Ullmann

In this sense, empowering more marginalised groups through architecture is essential in framing the transition towards self-reliant communities (Shuman, 2000). A shift in perspective, parallel to the mainstream one, that engages traditionally excluded populations through co-creative processes and builds local knowledge and a sense of caring to build a space in which communities, and specifically women, can participate as equals, introducing their knowledge, innovations and identities.

7. Conclusion

The contribution, by looking at two design experiences of cooperative housing through and from a feminist and gendered perspective, seeks to become a brick in the discussion about the spatialisation of gender equality. Collaborative and collective housing that expands beyond the single architecture and the traditional way of practicing could open new possibilities for neighbourhood design. In this framework, intermediate collective spaces become relevant as empowerment devices. Here the aim is not to give fixed answers or contribute to defining a 'feminist manual of intervention to foster gender equality'; but to set up a series of questions and issues to widen the discussion among practitioners, scholars and communities.

The SDGs framework has contributed to defining some goals far from their intended

objectives, where the current social, environmental and economic crisis substantially impacts how we will live together. However, it is not only a matter of rethinking our objectives, but our built environment; the heritage we have inherited is greatly indebted to patriarchal norms, where standardisation, mono-functionality, and segregation still define its character. In this sense, it is necessary to rethink the forms of inhabiting space in a more democratic, inclusive and gender-sensitive way to build a culture of preparedness towards the challenges of living in the post-2030 era.

References

Bassanini, Gisella (2008) Per Amore Della Città: Donne Partecipazione Progetto. Milano: Franco Angeli.

Bianchetti, Cristina (2020) Bodies: Between Space and Design. Berlin: Jovis.

Boys, Jos (1984) "Is there a Feminist Analysis of Architecture?" Built Environment, 10 (1), pp. 25-34.

Brown, Lori (2016) Feminist Practices: Interdisciplinary approaches to women in architecture. New York: Routledge.

Careri, Franco (2017) Walkscapes: Walking as an Aesthetic Practice. Culcidae Architectural Press.

Choay, Françoise (2004), L'allegorie du Patrimoine, Paris.

Colomina, Beatriz (ed.) (1992) Sexuality & space. New York: Princeton Architectural Press.

Corboz, André (1985), "Il territorio come palinsesto", Casabella, 516, pp. 22-27.

Cozza, Cassandra and Toscani, Chiara (2016), Relazioni – Forme e vita nel progetto di architettura, Milano: Christian Marinotti Edizioni.

Darke, Jane (1996) "The Man-Shaped City." In: Chris Booth, Jane Darke and Susan Yeandle (eds.) Changing Places: Women's Lives in the City. London: Paul Chapman Publishing Ltd, pp. 88-99.

De Certeau, Michel (1988) The Practice of Everyday Life. Berkeley: University of California Press.

Deleuze, Gilles, Guattari, Felix (1987) A Thousand Plateaus: Capitalism and Schizophrenia. University of Minnesota Press, Minneapolis.

European Commission (2021) New European Bauhaus – Shaping more beautiful, sustainable and inclusive forms of living together. europa.eu/new-european-bauhaus/index_en, last accessed 2022/03/25.

Fraser, Murray (2013) Design Research in Architecture: An Overview. Farnham, UK: AshgatePublishing.

Friedman, Alice (1998) Women and the Making of the Modern House: A Social and Architectural History. New York: Harry N. Abrams, Inc.

Grosz, Elizabeth (1995) Space, Time and Perversion: Essays on the Politics of Bodies. New

York: Routledge.
Haraway, Donna (1988) "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective." Feminist Studies, 14 (3), pp. 575–599.
Hayden, Dolores (1976) The Grand Domestic Revolution: A History of Feminist Design For American Homes, Neighborhoods, and Cities. Cambridge: MIT Press.
Hayden, Dolores (1980). What Would a Non-Sexist City Be Like? Speculations on Housing, Urban Design, and Human Work. Signs, 5(3), pp. S170–S187.
Hertzberger, Herman (1991) Lessons for Students in Architecture. Rotterdam: 010 Publishers.
Hill, Jonathan (2003) Actions of Architecture: Architects and Creative Users. New York: Routledge.
hooks, bell ([1984] 2000) "Preface to the Second Edition: Seeing the Light: Visionary Feminism." In: Feminist Theory: From Margin to Center. Cambridge: South End Press, pp. X-XV.
Jarvis, Helen (2015) "Towards a Deeper Understanding of the Social Architecture of Co-housing: Evidence from the UK, USA, and Australia." In: Urban Research & Practice, 8 (1), pp. 93-105, DOI: 10.1080/17535069.2015.1011429.
Kanes Weisman, Leslie (1992) Discrimination by Design: A Feminist Critique of the Man-Made Environment. Chicago: University of Illinois Press.
La Pietra, Ugo (2018) Istruzioni per abitare la città. 1966-2018. VIAINDUSTRIALE Publishing; Ciac Centro Italiano Arte Contemporanea.
LaCol (2018) Construir en Col·lectiu: Participació en arquitectura i urbanisme. Barcelona: Pol·len Edicions.
Lefebvre, Henri (1968) Le droit à la ville. Paris: Editions Anthropos.
Lefebvre, Henri (1984) La production de l'espace. Oxford: Blackwell.
Massey, Doreen (1994) Space, Place, and Gender. Minneapolis: University of Minnesota Press.
Massey, Doreen (2005) For Space. London: Sage.
McDowell, Linda (1999) Gender, Identity, and Place. Minneapolis: University of Minnesota Press.
Merleau-Ponty, Maurice (2002) Phenomenology of Perception. (C. Smith, Trans.). Routledge. Doi: 10.4324/9780203994610.
Mogollon, Irati, Fernández, Ana (2019) Arquitecturas del cuidado: Hacia un envejecimiento activista. Barcelona: Icaria.
Muxí, Zaida (2011) Recomanacions per a un habitatge no jeràrquic ni androcèntric Col·leció. Eines nº 13. Institut Català de les dones.
Muxí, Zaida (2018) Mujeres, casas y ciudades: Más allá del umbral. Barcelona: dpr-Barcelona.
Pansera, Annalisa (2021) 494: Bauhaus al femminile: 475 studentesse, 11 docenti, 6 donne intorno a Gropius, 1 manager, 1 fotografa. Busto Arsizio: Nomos Edizioni.
Petrescu, Doina (2007) Altering Practices: Feminist Politics and Poetics of Space. London:

Routledge.
Rendell, Jane (2011) "Critical Spatial Practices: Setting Out a Feminist Approach to Some Modes and What Matters in Architecture." In: Lori A. Brown (ed.) Feminist Practices: Interdisciplinary Approaches to Women in Architecture. Ashgate, Farnham, UK, pp. 17–56.
Rendell, Jane, Penner, Barbara, Borden, Iain (2000) Gender Space Architecture: An Interdisciplinary Introduction. London: Routledge.
Roggema, Rob (2017) "Research by Design: Proposition for a Methodological Approach." In: Urban Science, 1(1): 2. https://doi.org/10.3390/urbansci1010002.
Rose, Gillian (1993) Feminism & Geography: The Limits of Geographical Knowledge. Cambridge UK: Polity Press.
Rossi, Aldo (1978) L'architettura della città. Clup.
Sánchez, Ana (2021) Las viviendas colaborativas como comunes urbanos. PEC. UOC.
Sanchez de Madariaga, Inés, Novella Abril, Inés (2021) *Proyectar Los Espacios de la Vida Cotidiana. Criterios de Género para el Diseno y Contratación Publica de Vivienda.* [Online] Available from: https://habitatge.gva.es/documents/20051105/0/Proyectar+Espacios+de+la+vida+cotidiana.pdf/00e52704-9b3f-749d-fabf-367846023a19?t=1644996515802. Accessed [15/05/2023]
Santus, Kevin, Scaioli, Arianna (2021) "Designing the urban commons through gender and nature-based approach: A renewed project for public space in times of crisis." In: Ri-vista. Research for Landscape Architecture, 19(2): 208-221. Doi: 10.36253/rv-11426.
Scaioli, Arianna (in press). "Gendered Bodies. Feminist Approaches to Spatial Design" in Manuel Blanco Lage, Oya Atalay Franck, Nicolas Marine, Rodrigo de la O Cabrera (Eds.) Towards a New European Bauhaus. Challenges in Design Education & Research (EAAE AC 2022). Springer Nature Switzerland AG.
Schalk, Meike, Kristiansson, Thérèse, Mazé Ramia (2017) Feminist Futures of Spatial Practice: Materialisms Activisms Dialogues Pedagogies Projections. Baunach: AADR - Art Architecture Design Research.
Schoonderbeek, Martin (2017) "A Theory of 'Design by Research'; Mapping Experimentation in Architecture and Architectural Design." In: Ardeth, 1, pp. 62–79. https://doi.org/10.17454/ARDETH01.05.
Scott, Joan Wallach (1986) "Gender: A Useful Category of Historical Analysis." In: The American Historical Review, 91(5), pp. 1053–1075. https://doi.org/10.2307/1864376.
Semprebon, Gerardo, Santus, Kevin, Sartorio, Stefano, Scaioli, Arianna (2021) "Design and Circular Economy. Architectures that regenerate the built fabric." AGATHÓN 9, pp. 62-71, DOI: 10.19229/2464-9309/962021.
Shuman, Michael (2000), Going Local – Creating Self-Reliant Communities in a Global Age, New York: Routledge.
Singha, Sumita (2018) "Introduction: The Vanished, the Immodest, and the 'Other Other':

The Virtues of Women in Architecture." In Singha, Sumita (ed) Women in Architecture: Critical Concepts. London: Routledge.
Spain, Daphne (1992) Gendered Spaces. Chapter Hill: Univ. of North Carolina Press.
Spain, Daphne (2002) How Women Save the City. Minneapolis: University of Minnesota Press.
Stavrides, Stavros (2016) Common Space: The City as Commons. London: Zed Books.
Stratigakos, Despina (2008) A Woman's Berlin. Minneapolis: The University of Minnesota Press.
Torre, Susana (1981) "Space As Matrix," Heresies: A Feminist Publication on Art & Politics, 3 (11): pp. 51-52.
Tronto, Joan C. (2005) "An Ethic of Care." In: Cudd, Ann E., Andreasen, Robin O. (eds.), Feminist Theory: A Philosophical Anthology. Massachusetts: Blackwell Publishing, pp. 251–263.
Ullmann, Franziska (2013) "Choreography of Life. Two Social Housing Pilot Projects in Vienna", In Sanchez de Madariaga, Inés & Roberts, Marion (eds.), Fair Shared Cities. The Impact of Gender Planning in Europe. Aldershot- Nueva York: Ashgate, pp. 297-323.
Urban Development Vienna (2013) Manual for Gender Mainstreaming in Urban Planning and Urban Development. Municipal Department, Urban Development and Planning, Urban Development Vienna.
Vestbro, Desiree U., Horelli, Liisa (2012) "Design for Gender Equality: The History of Cohousing Ideas and Realities." In: Built Environment, 38(3).

TRACK 10: INTERDISCIPLINARY PLANNING EDUCATION: CHALLENGES, DIALOGUES, INNOVATIONS

A COMPARATIVE PRODUCT ANALYSIS OF ONLINE AND FACE-TO-FACE BASIC DESIGN EDUCATION (1079)

Şirin Gülcen Eren[1], Aynur ULUÇ Keçik[1], Ebru Ala[1*]

[1] Süleyman Demirel University, Faculty of Architecture, Department of City and Regional Planning, Isparta, Turkey; *ebruala@sdu.edu.tr

Abstract. The first year of education in the city and regional planning discipline focuses on one-on-one and face-to-face basic design education, primarily conducted through planning studios I-II. Assignments are given to freshmen to enhance their urban planning and design knowledge, perspectives, design thinking, creative thinking, and design judgments. The COVID-19 Pandemic and the 2023 Kahramanmaraş Earthquakes occurred successively, resulting in a significant shift towards online university education. Course instructors and administrations had to amend education methodologies, materials, and course contents accordingly. The aims and objectives of design courses were fulfilled through various digitalized learning systems and programs. However, the quality of the design products declined during this period.

Therefore, this study aims to compare the basic design outputs of students in the online courses of 2020-2021 and the face-to-face courses of 2022-2023 fall term planning studios at Süleyman Demirel University in Isparta, Turkey. The purpose is to determine the effectiveness of different education methodologies in basic design education and assess the outcomes in terms of quality and performance. Assignments from both online and face-to-face courses will be compared to evaluate the impacts of online education on students' learning and creativity. This research is exploratory in nature and employs a comparative analysis of two fall term final assignments (The Shell Project), assessing their level of meeting 16 design requirements. The evaluation of the study was conducted based on the grades of the submission, final grades, and course success grades and averages.

The research presented shows an increase in the design quality of assignments in face-to-face education. This improvement is attributed to enhancements in meeting course requirements, the interactive nature of the courses, and changes in implementation

processes. Additionally, there was a higher level of interaction with students, and their efforts to learn and actively participate in the course were accelerated. The outcomes of this research are expected to provide valuable insights for lecturers and academic staff involved in first-year planning studios. It will assist them in the development of course curricula, methodologies, and the preparation and delivery of design education for teaching the visual language.

Keywords: City planning, Basic Design education, Online education, Face-to-face education, Covid-19.

1. Introduction

Basic design undergraduate university education is a canonical architectural education that is traditionally practiced in a face-to-face manner (Broadbent and Ward, 1969). The field of urban planning and so the City and Regional Planning (CRP) departments present an aim to enhance the student's design-focused thinking and visual perception skills through basic design education (Bayraktar et al., 2012). Basic design education aims to contribute to and establish the fundamental aspects of urban planning and urban design (Chiaradia et al., 2017) for a better urban quality and livable environments.

According to Oğuz, Özyılmaz, and Dağtekin, the underlying principle of the design education provided for this purpose involves the ability to create designs by combining historical and cultural values, materials, and technology, while striving to achieve a contemporary interpretation (2008 cited in Açıcı Kurak, Sönmez, and Ertaş Beşir, 2019). Students are also expected to learn basic design principles (Eren, 2021a), use necessary tools and to possess skills that enable coordination between the eye, mind, and hand (Asu Besgen et al., 2015). To enhance these skills, basic design education is implemented through various forms and styles of teaching (Özdemir, 2016).

To cultivate a design mindset that can solve problems, design education emphasizes learning through experience. This is achieved through project-based education, which forms the foundation of its teaching approach. The curriculum incorporates both design theory and practical application and is typically structured around studio-based learning to encourage creative exploration and experimentation through assignments. Students are expected to produce design solutions through drawings, models, or prototypes. Because of this, face-to-face teaching and regular interactions are crucial components of pedagogy (Mehta, 2020) and the development of design thinking. Project courses are conducted on a semester basis for four years, mainly in studios/workshops.

With the emergence of emergency situations such as natural disasters, human-induced disasters, and pandemics, online university education systems have gained popularity in many countries. This has been particularly evident during the recent Covid-19 pandemic,

where online education methods and tools have been widely adopted worldwide to minimize human contact and replace face-to-face education. Online courses provide students with the opportunity to participate in and follow the course regardless of geographical restrictions (Ibrahim et al., 2020).

Numerous scholars (Denel, 1979; Günay, 2007; Mehta, 2020; Peimani and Kamalipour, 2021; Bayraktar et al., 2022; Acar, 2020; Eren, 2021a) have focused on incorporating technology into education, restructuring their courses and teaching methodologies, and investigating the impacts of online teaching and learning systems in their academic studies. It has been determined, as initially stated by Dumford and Miller (2018 cited in Peimani and Kamalipour, 2021), that students who take online courses typically demonstrate lower levels of participation in collaborative learning, communication with faculty and other students, and peer discussions compared to students who attend traditional face-to-face courses.

Due to the Covid-19 Pandemic and the subsequent earthquakes in Kahramanmaraş, Turkey occurred in 2023, the field of urban planning, like many other disciplines, has been obliged to experience online education. Basic design education courses have been organized either fully online or in a hybrid format upon the request of students or university administrations. This unexpected situation has brought about changes in the academic calendar, educational methodologies, materials, course contents, and studio projects.

Acar (2020) emphasizes that universities and their respective actors and units have been dealing with various aspects of the issue and entered the process unprepared. Efforts to find solutions to the encountered problems are ongoing. Since each institution forms its own practice and memory, there is no common implementation of scientific content, processes, and methods in basic design education.

During online education, technical field trips, which are a significant part of basic design education, could not be realized. As a result, students have received incomplete instruction in terms of understanding space, the elements that constitute a space, different types of spaces, levels, and topography. These developments have led to observed differences in the quality of design outputs between online design products and those produced during face-to-face education in terms of meeting the requirements.

The Planning Project I-II (PLN 101-102) courses offered by the Department of City and Regional Planning at the Süleyman Demirel University (SDÜ) Faculty of Architecture (Isparta, Turkey) is a practical course delivered in two semesters during the first year of the undergraduate education. In this course, students receive integrated education from point to space and city through face-to-face teaching methods (Eren, 2021b). Additionally, the course aims to teach the fundamental visual language that creates aesthetics and perception, and to enable students to acquire design formation through obtaining certain

design knowledge and skills. Different assignments are given to freshmen to develop their urban design knowledge, perspectives, design thinking, creative thinking, and design judgments. Furthermore, the course aims to enhance students' personal expression skills such as writing, speaking, and articulation, as well as their representational abilities.

During the COVID-19 pandemic, it was observed that online education differed in its purpose and effectiveness compared to face-to-face education after the pandemic. Therefore, there is a need to question the differences in the educational methods based on the outputs. In this regard, this study aims to compare students' basic design outputs in the planning studios of the online fall term of 2020-2021 and the face-to-face fall term of 2022-2023, in order to determine which education methodology is effective in basic design education and to assess the quality of the outcomes. It is expected that this inquiry will contribute to subsequent studies on the applicability of face-to-face, online, and hybrid education methods in the discipline.

The paper begins by providing an overview of the problem area, conceptual framework, research scope, and research methodology. It then presents the findings of the study, followed by an evaluation of these.

2. Method

The methodology of this study is based on a comparative analysis, an exploratory research method, and a case study approach. The research aims to investigate how online and face-to-face education differ in terms of product, and how planning studio education methodologies affect the quality of students' final outputs in terms of meeting the requirements of the assignments. In other words, this research involves a qualitative comparison of the end-of-semester outputs of a first-year basic design course in a city and regional planning department. This choice is primarily motivated by the nature of the final submissions as indicators of the student’s level of comprehension and assimilation of their education, whether delivered online or face-to-face. By comparing the level of meeting the assignment requirements and the performance grades across different educational methods, it will be possible to determine which type of education is more effective in teaching visual language.

2.1. Case Study: Süleyman Demirel University CRP 101 Planning Course I

Within the scope of the research, a comparison was made between the final outputs of the online Planning Project I (PLN 101) course conducted during the 2020-2021 academic year fall semester and the face-to-face Planning Project I course held during the 2022-2023 academic year fall semester at the Department of City and Regional Planning, Faculty of Architecture, Süleyman Demirel University (Isparta, Turkey).

The fall semester final submission is a "shell", which presents the initial form of human

habitation. The Shell Project focuses on creating a design product using modules/modulation, grids, and basic design and Gestalt principles. The requirements specified in the final assignment sheets related to the design problem are the same for both fall semesters.

The midterm and final grades, including the project submissions and the Shell Project, are recorded in the University Student Information System (SDU NET) for the Planning Project I course. The arithmetic average of all homework submissions and selected class practices is calculated by the course coordinator and entered into this system. The system then determines the student's final grade through two different calculations: one based on the class average and the other based on the weights of the midterm exam (40%) and the final exam (60%). As a result, the grade for the final submission given by the coordinator alone differs from the final grade of the course.

2.2. Data Gathering and Data Analysis

The research population consists of 100 students enrolled in the online Planning Project I course during the 2020-2021 fall semester and 74 students enrolled in the 2022-2023 fall semester. The number of students who submitted the final exam for both semesters is 61 and 59, respectively. All the submissions between the final and midterm exams have been examined during the grading process.

In this study, in addition to the requirements of the final submission, the comparisons of the distribution and averages of the top five and bottom five submissions that meet the requirements the most and the least are provided based on the education method. The midterm grades, along with the arithmetic average of the assignments between the midterm and final exams (including some class practices) that include the Shell Project final submission grade, are used as performance indicators for the course grades. The grades of students who took the makeup exam do not include the assignments or class practices between the midterm and final exams. Only the passing grades from the makeup exam are recorded in the system for each participating student.

The submission of the scaled 1/10 version of the Shell design, representing the module and modulation of the shell through photographs taken from different angles in different environments, is a requirement for online education. On the other hand, the in-person submission of the same scaled shell, its presentation in front of the jury in the studio environment, and photographing it in the same format are the requirements for face-to-face education. The relationship between class attendance and performance in both face-to-face and online Planning Project I courses has not been examined within the scope of this research. In addition to this, the comparison of students' overall class performance weighted average and the course grade average in PLN 101 is considered an externality since it is not directly influential and a determining factor in evaluating the quality of the outputs.

The evaluation of the study was conducted based on the grades of the Final Shell Project submission, final grades, and course success grades and averages.

3. DISCUSSION

In the 2020-2021 online Fall Semester Planning Studio I course; 76 students submitted the Shell Project. The average grade for the Shell submission was 57.95. The average grade for the final project, including the Shell submission and the assignments after the midterm, of the 61 students whose final grades were entered, was 61.46. The average grade for the 82 students who passed the PLN 101 course was 56.34.

In the 2022-2023 face-to-face Fall Semester Planning Studio I course, 59 students submitted the Shell project, with an average grade of 58.88. The average grade for the final project, including the Shell submission and the assignments after the midterm, of the 59 students whose final grades were entered, was 57.66. The average grade for the 61 students who passed the course was 56.51.

The findings of 2020-2021 online and 2022-2023 face-to-face Fall Semester Planning Studio I courses are presented below in Table 1:

Table 1. Performance and Participation Comparison of Students in Face-to-Face and Online PLN 101 Planning Studio I Courses in the Fall Semester

	Education Methodology	
	Online 2020-2021	**Face-to-Face 2022-2023**
Requirements	16	16
Number of Students Enrolled to the Course	100	74
Number of Exempted Students from the Course	3	0
Number of students who submitted the Shell project	76	59
Number of students who took the final exam	61	59
Number of students who took the makeup exam	18	8
Number of students who passed the course	82	61

Number of students who failed the course - Those who did not fulfill the course requirements (excluding conditionally passed students)	8	5
Number of students who failed the course - Failed due to absenteeism	14	11
Average Final Grade (including post-midterm submissions)	61,46	57,66
Course Grade Average (Midterm + Final + Makeup)	56,34	56,51
Average Grade for the Shell Final Project Submission	57,95	58,88
Highest Grade	95	90
Lowest Grade	20	40
Percentage of Students who Submitted the Final Project	%76	%79,73
Percentage of Students who Passed the Course (Including Conditional Pass)	%88	%78.38

In online education, instructors tend to give more lenient and easier grades, as can be observed from the lowest grades and the percentage of students passing the course, as indicated in Table 1. Students often face difficulties in concentrating during online classes, lack the necessary infrastructure for studying, and may not take the course as seriously. However, despite these challenges, the average grades for final project submissions and overall course grades remain almost the same in both types of education.

Table 2. Highest and Lowest Grade Fulfillment Levels of Requirements for Shell Project Submissions in the 2020-2021 Online PLN 101 Course (Used for Grading)

2020-2021 Fall Term- Online

Obligatory Requirement/ Sample Number	Examples Meeting the Requirements (Number)					Examples Not Meeting the Requirements (Number)				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
Shell	Tunnel	Tunnel	Shall	Shell	Shell	Tunnel	Door	Shell/ Room	Shell/ Room	Shell
Scale (1/10)	2	2	2	2	2	2	2	2	2	2
Ratio-Proportion	1	2	2	2	2	0	0	0	2	0
Grid	0	0	0	0	0	0	0	0	2	0
Basic Design Principles	0	0	2	0	0	0	0	0	0	0
Solid-Void	2	2	2	2	2	0	0	0	0	1
Human Action (Standing-Lying Down- Sitting)	2	1	1	2	1	0	0	0	0	0
Compliance with standards based on human actions (Neufert-based)	1	0	2	2	0	0	0	0	0	0
Action-Form Harmony (Form-Function balance)	2	1	2	2	1	0	0	0	0	0
Prime geometric shape (Minimum 2,5cm)	2	2	2	2	2	0	2	0	2	1
Module (Minimum 3, maximum 5 prime geometries)- Modulation	0	0	2	1	0	0	0	0	0	0
Hierarchy/ Unity / Harmony / Order	2	1	2	2	2	0	0	0	0	0
Balance/ Continuity in the Whole	1	2	2	2	2	0	0	0	2	0

Shell Height (Max. 25 cm)	2	2	2	2	2	2	0	2	2	2
Corrugated Cardboard/Craftsmanship	2	2	2	2	2	1	2	1	0	1
Photographing from different angles (To define the shell's position and its relationship with the surroundings)	2	2	2	2	2	2	2	2	2	2

Note: 0 None, 1 Partially, 2 Existing

Table 3. Highest and Lowest Grade Fulfillment Levels of Requirements for Shell Project Submissions in the 2022-2023 Fall Semester (Based on Grading)

2022-2023 Fall Term Face-to-Face

Obligatory Requirement/ Sample Number	Examples Meeting the Requirements (Number)					Examples Not Meeting the Requirements (Number)				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
Shell	Shell	Shell	Shell	Shell	Shell/ Room	Room	Sculpture	Room	Sculpture	Sculpture
Scale (1/10)	2	2	2	2	2	2	2	2	2	2
Ratio-Proportion	2	1	2	2	2	2	0	0	1	0
Grid	0	0	0	1	0	0	0	0	0	0
Basic Design Principles	2	0	2	2	0	2	0	0	0	0
Solid-Void	2	2	2	2	1	1	0	0	0	0
Human Action (Standing-Lying Down- Sitting)	2	1	1	1	1	1	0	1	1	0
Compliance with standards based on human actions (Neufert-based)	2	1	1	1	2	1	0	1	1	0
Action-Form Harmony (Form-Function balance)	2	1	1	1	1	1	0	1	1	0

Prime geometric shape (Minimum 2,5cm)	2	2	2	2	2	2	2	2	2	2
Module (Minimum 3, maximum 5 prime geometries)- Modulation	2	2	2	2	2	2	2	0	0	0
Hierarchy/ Unity / Harmony / Order	2	2	2	1	2	2	0	0	1	0
Balance/ Continuity in the Whole	2	2	2	2	2	2	2	0	1	0
ell Height (Max. 25 cm)	2	2	2	2	2	0	0	0	0	2
Corrugated Cardboard/Craftsmanship	2	2	2	2	2	2	1	1	1	1
Photographing from different angles (To define the shell's position and its relationship with the surroundings)	2	2	2	2	2	2	2	2	2	2

Note: 0 None, 1 Partially, 2 Existing

Tables 2 and 3 provide an overview of the extent of the compliance level of the Shell projects in the PLN 101 course. The data reveals that in face-to-face education, the basic design outputs tend to meet the requirements to a greater degree, indicating higher quality compared to online education. Specifically, the examples assessed in face-to-face education demonstrate that they fulfill most of the requirements outlined in the project guidelines. However, in the online education setting, it has been observed that although five examples produced surpass the class average in terms of quality, they fail to meet certain fundamental mandatory requirements. This suggests that while online education may produce designs of high quality, there are still gaps in meeting essential design criteria. These findings highlight the need for further evaluation and improvement in online education to ensure that the fundamental requirements of basic design education, such as design principles and grid, are adequately addressed.

In both tables, it has been determined that successful works fulfill many of the requirements while low-scoring works fail to meet the requirements. It has been found that even high-scoring works do not utilize grids or basic design principles, which are essential for creating aesthetics. It has been identified that this group lacks in terms of human actions and the conformity of actions to standards and form. In online education, module and modulation could not be created in the products.

Attendance is not compulsory in online education. Students acquire information through online resources and do not read the course assignment sheets. Attendance in online classes is low, as mentioned by Dumford and Miller (2018, cited in Peimani and Kamalipour, 2021). It is also observed that projects given for performance and gaining experience are often not fully completed or submitted.

It has been determined that the system allowing students to pass without attending classes leads to insufficient participation and fulfillment of requirements. In face-to-face education, participation in project courses is mandatory, and if a student fails the course (except for those who pass conditionally (DD and DC) or those with a course average of 2.00 in the graduation stage), the student is required to retake the course in the same semester of the following year. It is recognized that such external factors influence students' in-class performance and the level of meeting the requirements of their produced works. However, this is beyond the scope of this study and requires further research.

Based on the evaluation presented in Tables 2 and 3, the design products that meet the most and least requirements of PLN 101 Final Projects from the 2020-2021 and 2022-2023 Fall Semesters are provided in Figures 1-20.

In Figures 1-5, the projects that best meet the requirements of the online 2020-2021 Fall Semester Final Project -Shell design can be seen (Samples 1-5).

Figure 1a-b. The project that received the highest grade (by Ezgi Kaynakçı)

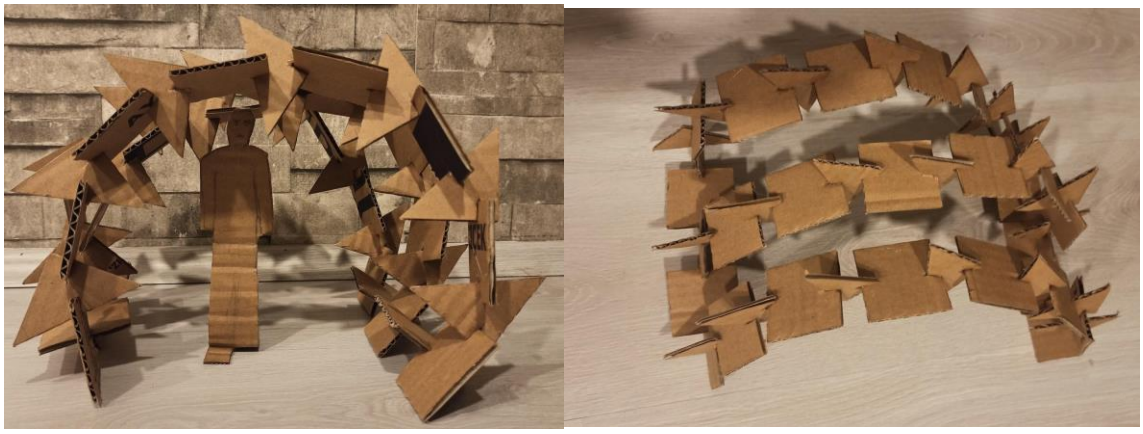


Figure 2a-b. The project that received the highest grade (by Kaan Yılmaz)

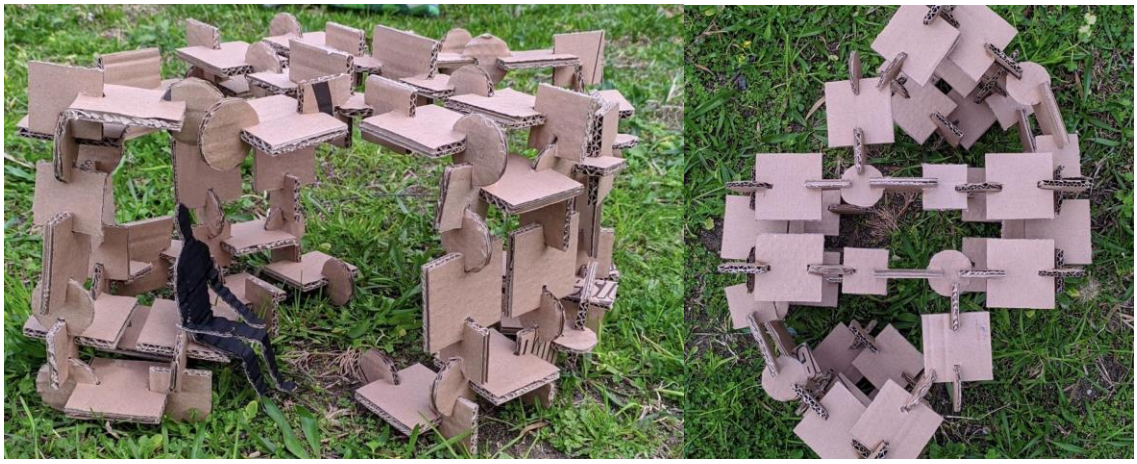


Figure 3a-b. The project that received the highest grade (by Muhammet Fatih Yöneç)

Figure 4a-b. The project that received the highest grade (by Sinem Yıldırım)

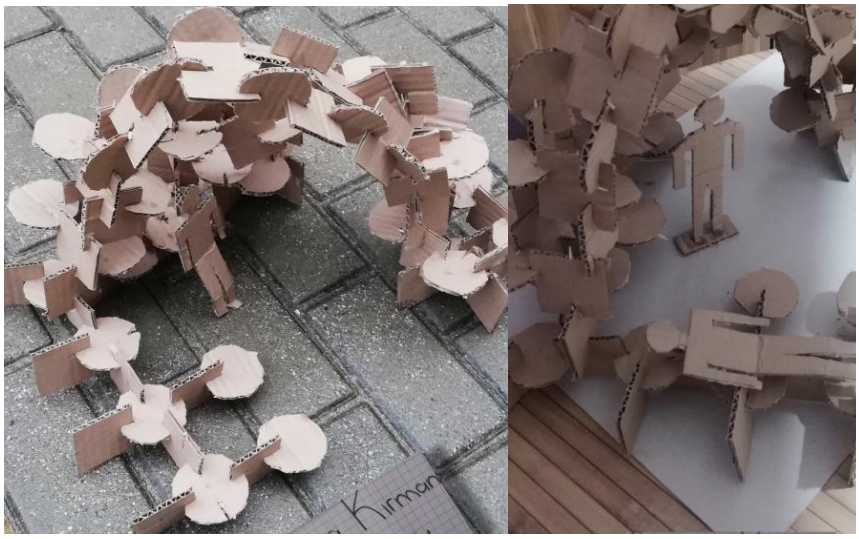


Figure 5 a-b. The project that received the highest grade (by Rabia Kırman)

In Figures 6-10, the projects that least meet the requirements of the online 2020-2021 Fall Semester Final Project- Shell design are presented.

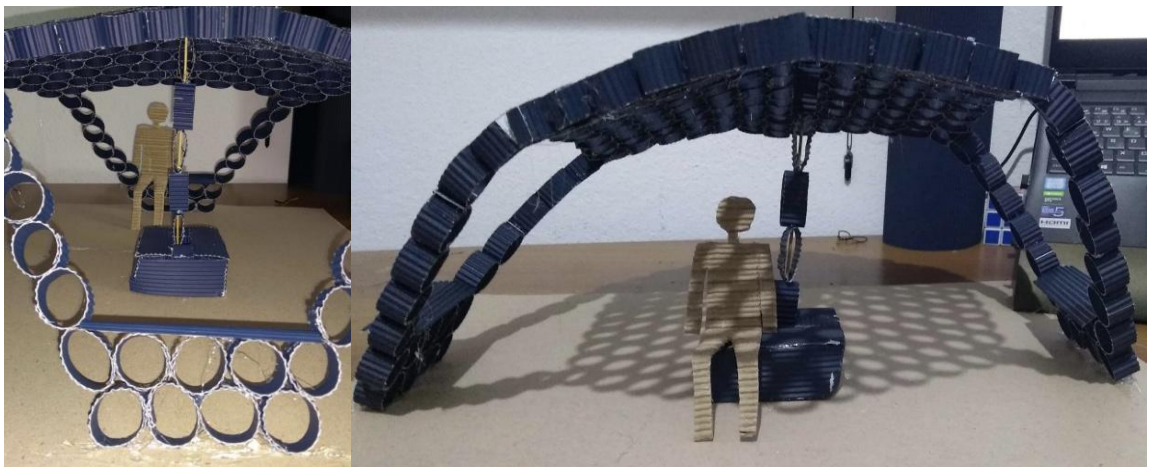


Figure 6 a-b. A sample meeting assignment ‘s requirements at the minimum level

Figure 7 a-b. A sample meeting assignment‘s requirements at the minimum level

Figure 8 a-b. A sample meeting assignment ‘s requirements at the minimum level

Figure 9 a-b. A sample meeting assignment‘s requirements at the minimum level

Figure 10 a-b. A sample meeting assignment‘s requirements at the minimum level

In Figures 11-15, the design projects that best meet the requirements of the face-to-face 2022-2023 Fall Semester Final Project- Shell design are presented:

Figure 11 a-b-c. The project that received the highest grade (by Burcu Acar)

Figure 12 a-b-c. The project that received a grade above the class average (by Kader Kılıç)

Figure 13 a-b-c. The project that received a grade above the class average (by Sıla Battal)

Figure 14 a-b-c. The project that received a grade above the class average (by Yasin Bayrak)

Figure 15 a-b-c. The project that received a grade above the class average (by Gizem Kırlı)

In Figures 16-20, the design projects that least meet the requirements of the face-to-face 2022-2023 Fall Semester Final Shell design are listed:

Figure 16 a-b-c. A sample meeting assignment‘s requirements at the minimum level

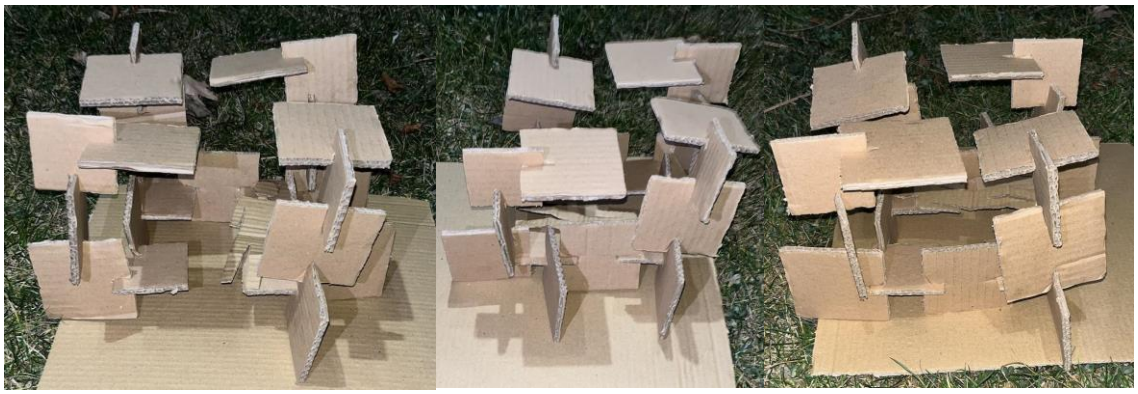


Figure 17 a-b-c. A sample meeting assignment‘s requirements at the minimum level

Figure 18 a-b-c. A sample meeting assignment‘s requirements at the minimum level

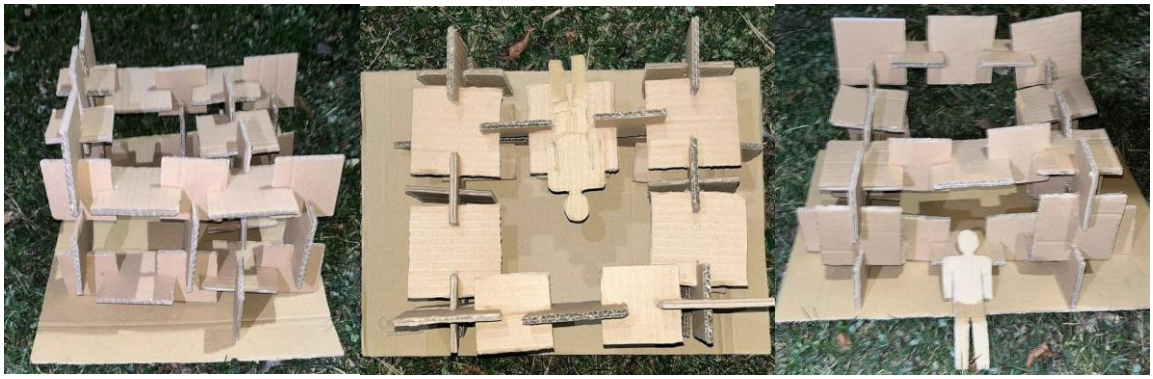


Figure 19 a-b-c. A sample meeting assignment‘s requirements at the minimum level

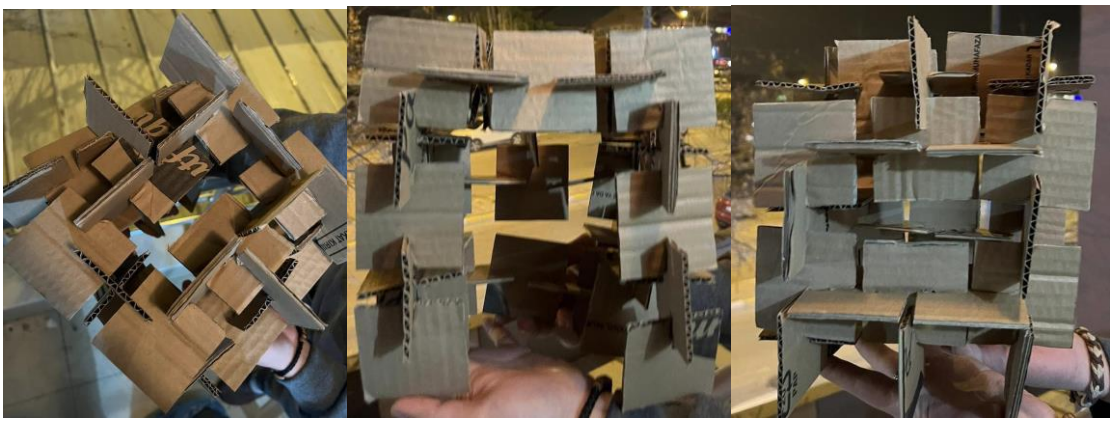


Figure 20 a-b-c. A sample meeting assignment‘s requirements at the minimum level

4. General evaluation

This research was conducted based on the online and face-to-face education samples of the Planning Project I course at the Süleyman Demirel University's Department of Urban and Regional Planning. The aim of this research is to determine which teaching method enables what types of output in basic design education and to assess the quality of the outputs. Based on this aim, the main differences between online and face-to-face education were examined in this study.

These differences include students losing concentration in online education, lack of participation in classes, failure to review the lessons, and completing assignments based on only information, not knowledge. One-fourth of the students in online education and one-fifth in face-to-face education did not submit their final assignments. Additionally, it was observed that students had difficulty finding the required materials and drawing tools for submissions during online education.

This research evaluates the impact of different teaching methods on the output of basic design education. The results indicate that students' performance in online education is lower when compared to face-to-face education, and the quality of the outputs have decreased in the online environment. The research findings can be utilized to assess measures for improving the educational process and enabling students to learn more effectively.

According to Reeves (2013 cited in Peimani and Kamalipour, 2021), educators have faced difficulties in adapting certain activities, such as performance assessment, to the virtual learning environment while maintaining the quality of content knowledge and effective interactions between students and lecturers. This holds true for the case study as well. The lack of mandatory attendance in online education has made it challenging to monitor project progress and assess whether course objectives have been achieved or not. The final results of online education demonstrate lower quality in design products.

A decrease in workmanship quality (a decline in motor skills) is another observed phenomenon in online education. This decline, which is developed through in-person critiques, is attributed to reduced class hours, lack of interaction with instructors and inability to work in a classroom environment. The attention to detail in submitting assignments is more pronounced in face-to-face education.

Both methods share the commonality of similar performance grades. The class average remained the same in both periods compared (56.34-56.51), with only a slight difference of 0.9 points (57.95-58.88) in the assignment grades. Although this may create the perception that there is no difference in terms of assignment products and overall performance between the two teaching methods, it should be emphasized that online education tends to give higher grades more easily due to various external factors and less effort required from students. The pass rates also support this observation: 88% of students passed the course in online education, while this rate was 78.38% in face-to-face education.

A common factor in the examined teaching periods is that low-performing students were unable to meet the assignment requirements, and high-performing students were unable to utilize the necessary tools (such as grids) to create aesthetic and high-quality designs, as well as to comply with standards and form in creating a healthy and quality environment. Module/modulation was also not achieved. This indicates a lack of thorough follow-up of in-semester courses, insufficient research and sketching, and inadequate time allocated for the work.

In the face-to-face fall term, there is an improvement in the design quality of assignments in terms of meeting requirements, the interactive nature of the courses, and the changing implementation processes. The level of interaction with students and their efforts to learn and participate in the course also increased. Direct interaction with students can

contribute to improving the quality of their design products. As shown in Table 3, the design product quality is higher in face-to-face education. For example, even in project samples that do not fully meet the assignment requirements in face-to-face education, basic design criteria and the use of grids can still be observed, which is not the case in online education.

During emergency situations, online teaching and learning systems have been preferred over face-to-face methods due to their advantages. Firstly, online systems offer flexibility to students, allowing them to complete their course tasks at their own pace and schedule. Secondly, these systems provide improved access to course archives, including video recordings and digital textbooks. Lastly, online systems contribute to the development of digital technology skills.

On the other hand, online education has its own limitations. One major drawback is the reduced interaction between students and instructors. This can hinder the feedback process for assignments, limit opportunities for asking questions, and impede discussions about their work. Additionally, as highlighted in this study, the quality of design products tends to decrease in online education. Moreover, student attendance and participation may be limited, as some students may lack motivation to stay on track. Although flexibility and easy access to course resources are advantages, they can also be reasons for disadvantages, as online students may not have the same access to resources and opportunities as traditional face-to-face students.

In conclusion, while online teaching and learning systems offer advantages such as flexibility and easy access to course resources, this study demonstrates that they can negatively affect the outcomes of basic design education in the field of city and regional planning, particularly in terms of meeting assignment requirements.

References

Açıcı Kurak, F., Sönmez, E. & Ertaş Beşir, Ş. (2019). ”Tasarım Eğitiminde Sınır Kavramı İle Kavramsal Bir Yaklaşım” sed 7 (2), s.209-219.

Acar, A. (2020). Acil Uzaktan Eğitim Döneminde Mimarlık Birinci Sınıf Eğitimi Değerlendirmeleri Başlarken. Arkitera (https://www.arkitera.com/gorus/acil-uzaktanegitim -doneminde-mimarlik-birinci -sinifegitimi-degerlendirmeleri/ Access Date: 23 Temmuz 2020). 1-20.

Besgena, A., Kuloglub, N. & Fathalizadehalemdari, S. (2015). Teaching/Learning Strategies through Art: Art and Basic Design Education. Procedeia - Social and Behavioral Sciences 182, 428 – 432.

Bayraktar, B., Görer Tamer, N., Tekel, A., Gürer, N., Ceylan Kızıltaş, A., Memlük, N.O. & Armatlı Köroğlu, B. (2022). Görsel Eğitimde Yaratıcılık ve Temel Tasarım. Ankara: Nobel

Yayınları.
Broadbent, G. & Ward, A. (1969). Design Methods in Architecture. New York, G. Wittenborn.
Chiaradia, A.J.F., Sieh, L. & Plimmer, F. (2017). Values in urban design: A design studio teaching approach. Design Studies 49 (2017) 66-100.
Denel, B. (1979). A Method for Basic Design. Ankara: METU FA. Publication No.31.
Erdoğdu, G. & Pelin, S. (2016). Temel Tasarım Eğitimi:(Bir Ders Planı Örneği Basic Design Education: A Course Outline Proposal). Bildiri). Doğuş Üniversitesi, Sanat ve Tasarım Fakültesi, İstanbul, 26(1), 7-19.
Eren, Ş.G. (2021a). Pandemi Dönemi Temel Tasarım Eğitiminde Kırılganlıklar - Süleyman Demirel Üniversitesi. 29. Kentsel Tasarım Sempozyumu, MSGSÜ, 1, 14-29.
Eren, Ş.G. (2021b). Şehir Planlama Temel Tasarım Eğitiminde Öğrenci Kültürel Birikimi ve Formasyonu Analizi: Süleyman Demirel Üniversitesi Örneği. Tasarım+Kuram, 17(34), 139- 159. Doi: 10.14744/tasarimkuram.2021.29291
Günay, B. (2007). Gestalt Theory and City Planning Education, METU JFA, 2007/1 24(1), 93-113
Ibrahim, A.F., Attia, A.S., Bataineh, Asma' M. & Ali, H.H. (2020). Evaluation of the online teaching of architectural design and basic design courses. Ain Shams Engineering Journal. Case study: College of Architecture at JUST, Jordan, Ain Shams Engineering Journal, https://doi.org/10.1016/j.asej.2020.10.006
Mehta, S. (2020). COVID–19 and its Impact on Design Education; Call for Creative Integration of Digital Technology for its Effective Online Delivery. Retrieved from https://www.academia.
edu/43423977/COVID_19_and_its_Impact_on_Design_Education_Call_for_Creative_Integration_of_Digital_Technology_for_its_Effective_Online_Delivery
Özdemir, E.E. (2016). Mimarlık Eğitiminde Temel Tasarım Dersinde Öğrencilerin Başarıları ve Öğrenme Stilleri İlişkisi. STD. 139-156.
Peimani, N. & Kamalipour, H. (2021). Online Education in the Post COVID-19 Era: Students' Perception and Learning Experience. Educ. Sci. 2021, 11, 633. https://doi.org/10.3390/educsci111006

COMPARING COMMUNITY ENGAGEMENT IN PLANNING EDUCATION AND CO-CREATION IN HIGHER EDUCATION: A LITERATURE REVIEW (1122)

Yen-An Weng-Lu[1*], Hsiutzu Betty Chang[1]

[1] Department of Urban Planning, National Cheng Kung University, Tainan, Taiwan; [*]andy22884818@gmail.com

Abstract. Higher education has recently started to adopt co-creation design methods to foster active learning. However, long before this trend, planning education had already been using teaching methods such as studios that incorporate community participation to reap the benefits of teacher-student co-creation. This study explored the similarities and differences between teacher-student co-creation in higher education and community-based planning education in several aspects: research purpose, theoretical concept, methodology, and pedagogy. A literature map was produced according to the findings. Compared with higher education, community-based planning education focuses more on interdisciplinary collaboration and deals with more uncertainty in the face of complex issues. There is a need for further research on teacher-student interaction from the perspective of students.

Keywords: Community Engagement, Literature Review, Planning Education, Higher Education, Co-creation of Learning.

1. Introduction

In recent years, higher education teachers have begun to make students more active and involved in their courses. The response to this new style of teacher-student interaction has attracted widespread attention from the academic community. One pedagogical approach in this shift, co-creative learning, is based on the idea of the collaborative learning process, in which students are partners in teaching (Bovill, 2013; Díaz-Méndez and Gummesson, 2012). The student-as-partner concept holds that increased student engagement can enhance teaching and learning performance effectively (Deeley and Bovill, 2015). Student-centered and collaborative learning can enhance students' educational experience and competency by providing interdisciplinary educational environments and new types of classroom interactions (Purkarthofer and Mäntysalo, 2022).

This co-creative approach to learning is not uncommon in planning education. The planning studio tradition has long employed this pedagogy in space planning. Over the

past few decades, student engagement and community engagement through service learning or other project-based learning models have expanded the scope of co-creation from teachers and students to professionals and stakeholders (van Karnenbeek et al., 2020). Planning students become essential participants as they enter their communities and play a crucial co-creative role in working with others to solve problems. In the co-creation of learning, students advise their teachers and other relevant personnel through their reflections, thus benefiting all parties involved (Pinel and Urie, 2017).

Research on the co-creation of teaching in higher education has been discussed in depth. Similarly, planning education has long demonstrated the benefits of co-creative teacher-student interaction through community-based planning practice courses (Kirschner and Peltan, 2019; van Karnenbeek et al., 2020). However, the differences in teacher-student interactions between higher education and planning education have not been widely discussed. Therefore, this study compares higher education and planning education in terms of the teacher-student co-creation process in the context of community participation. This paper also summarizes the major trends in community-based planning education research, presents a literature map, and suggests directions for future research in planning education.

2. Teacher-Student Co-creation in Planning Education and Higher Education

2.1 Co-creation

The concept of co-creation originates from marketing when businesses and customers work together to create products and services based on their needs as service technology matures and new features no longer provide sufficient value (Sanders and Stappers, 2008). From the perspective of marketing and management strategies, co-creation integrates the resources of both producers and consumers to create a new form of production value, allowing consumers to become co-creators of commodity value (Perk et al., 2012). While the value generated by co-creation in the marketing and management fields is mainly around physical products and commodities (Dollinger et al., 2018), what truly matters in the co-creation process is the active (rather than passive) participation of both parties in the interaction (Voorberg et al., 2014).

2.2 Value Co-creation In Higher Education

In recent years, higher education has adopted different curriculum design methods and instructional experiments to encourage students to participate more actively in the instructional process. The idea of “students as partners” has begun to attract attention in higher education (Marie, 2017). Co-creation of value takes the service-dominated logic concept of marketing and transforms it into the co-creation of teaching and learning in

higher education classrooms (Díaz-Méndez and Gummesson, 2012). The interactive relationship between teachers and students has been shifted from the traditional top-to-bottom guidance approach to the new side-by-side participation approach for both curriculum design and activity arrangement.

Based on the dual structure theory of value co-creation in marketing, Dollinger (2018) proposed a comprehensive conceptual model as a theoretical framework for higher education. Additionally, a new basic framework for co-creation theory can be formed by combining the value co-creation process with the expected benefits of having both the perspectives of teaching institutions and students. European higher education institutions have also proposed a conceptual model of social innovation co-creation based on teacher-student collaboration. They have also discussed the implementation plan for reform toward a co-creative education system. (Kumari, et al., 2019)

Research and evaluation case studies have shown that course curriculum co-creation can increase students' self-learning motivation (Bovill, 2013). Some instructional experiments have been found to allow students to participate in the course design, teaching content, and course evaluation and have improved their learning and cross-domain competencies. In addition, value co-creation can generate added value through the interactive process between teachers and students (Bergmark and Westman, 2015; Lubicz-Nawrocka, 2018).

In the ever-expanding empirical research literature on instructional experiments of co-creation in higher education curricula, students can play four roles in the co-creation process: representative, consultant, co-researcher, and pedagogical co-designer (Bovill et al., 2016). These roles are not mutually exclusive and may overlap with each other. Moreover, students may play these roles to different degrees when they collaborate when co-creating courses and participate in course actions. Research on curriculum and instruction has attempted to clarify the terminology related to co-creation. Kaminskiene (2020) used text analysis to classify instructional co-creation topics and academic terms and established a framework based on instructional co-creation, teacher-student collaborative learning, and teacher-student partnership. Collaborative learning is the process of teachers and students working together in a course; teacher-student partnership focuses on the equal role of teachers and students; and value co-creation emphasizes the instructional value generated as a result of the teacher-student collaboration in the course.

2.3 Teacher-Student Interaction in Planning Education

For many years, planning education students and teachers have been engaging the community through planning studios or similar courses. Interacting with the community has produced co-creation benefits for both teachers and students. In the past few decades,

the discipline of spatial planning has adopted a variety of instructional methods. Our literature review indicates that the topics of "student community engagement," "service learning," "university-community partnership," "collaborative learning," and similar approaches have been trending upward.

Student community engagement (SCE) is a traditional approach by which planning and architecture professionals connect their students with the community. The curriculum is planned such that students can directly enter and interact meaningfully with the community and learn from the experience (Sieh and Frank, 2018). Students can develop practical skills by participating in community activities. SCE teaching and research have changed the relationship between the university and the community. Researchers are no longer just observers from outside the community; rather, they communicate directly with their research object (community) to build relationships and form a synergy between non-academic activities and academic research (Frank and Sieh, 2016).

Unlike SCE and other educational theories, the teaching theory of service-learning from North American universities emphasizes equality between educational institutions and communities, allowing students to serve and interact with the community from an egalitarian perspective while gaining practical experience in the process (Furco, 1996). In planning education, service-learning development meetings have two important functions: connecting students with community organizations and tying together community-based foundational knowledge of the community, practical skills, and civic engagement (Levkoe et al., 2018).

The core concept of university-community partnership also seeks to create peer-to-peer interactions between the university and the community through community participation. Such an interaction must be based on equal status and mutual respect, giving, and acceptance. It also requires more bottom-up participation and initiative from community organizations, while the students and the courses propose ideas from their perspectives for the community's benefit.

Collaborative learning is often used in planning education in recent years as an instructional method for students to learn together in the classroom. Through group thinking, mutual assistance, and joint action, individuals can learn from each other and create an excellent educational atmosphere (Korkmaz, 2012). Collaborative learning is a student-centered instructional method that enables students to communicate with each other in a course environment to complete specific goals. In recent years, planning education has also begun to move toward collaborative learning in designing some courses in the planning studio. Students form a coordination committee to set the course's project schedule. This approach emphasizes students' autonomy rather than teachers' control (Purkarthofer and Mäntysalo, 2022).

The above instructional theories of community-based planning education form a

contextual framework. It ranges from SCE, which takes a top-down approach to teach about participation, to service learning and university-community partnership and other related theories that assume that all participating parties are equal and take a bottom-up approach to examine and promote community participation. In addition, collaborative learning also creates a new type of learning mode in the classroom, allowing students more autonomy in the arena of instruction. The teacher-student interaction in community-based planning education produces benefits similar to those produced by co-creation. Therefore, our text analysis focused on the literature specific to the aforementioned instructional theories of community-based planning education. Additionally, teacher-student cooperation in higher education was also examined. Then, the value co-creation of the two was compared to measure the differences and particularities in teacher-student interactions.

3. Methodology

This research compares teacher-student co-creation in higher education with teacher-student interaction in planning education, all in the context of community engagement. We classified the literature to identify the overall trends, differences, and particularities of higher education and planning education topics related to community participation, specifically to understand the teacher-student interaction in co-creation in teaching and learning.

Our method of analysis was based on the literature classification method and the editorial coding classification strategy proposed by Wang and Ran (2021). Although their work focused mainly on the conceptual analysis of public policy professional network governance and collaborative governance, the taxonomy they used can be applied to the conceptual differences between higher education and planning education. The method includes four steps: (1) Identify the content of the research topic; (2) identify the common research themes; (3) identify the distinctive themes; (4) grasp the connection and difference (“entanglement”) between the two concepts (Wang and Ran, 2021).

3.1 Literature Search and Coding Strategy

First, this study used the following three steps to set the scope of the literature search. We started with the Web of Science search engine for literature retrieval. We then set the title, abstract, time, article type, and discussion topic in the database as follows. (1) The title and abstract are related to community-based higher education and planning education; the keywords included higher education, co-creation, value co-creation, co-creative, student, planning education, collaborative, collaborative learning, community engagement, and service learning. (2) The publication dates of the articles were limited

between 2013-2022. (3) The types of articles were mainly periodicals. These specifications yielded 171 articles.

Secondly, after reading the titles and abstracts of the 171 documents, articles that were not related to community participation were eliminated. We also ensured that the content focused on teacher-student interaction. Finally, 54 teacher-student collaboration articles about teaching co-creation in planning education or higher education involving community engagement were selected as the analysis sample of this study.

Finally, we coded 54 documents in three steps. The first step was to read each document's title, abstract, and keywords to classify them into two categories (higher education vs. planning education). If doing so was unable to determine the category, we read the full text to classify it. In the second step, we read the full text to confirm the objectives, theoretical concepts, research methods, and pedagogies of each document. Finally, we classified and synthesized the research articles that shared similarities, which served as the basis for the subsequent text analysis.

3.2 Sample

After conducting the preliminary screening that yielded 171 documents, we found that there were 114 research articles on the co-creation of teachers and students in higher education, with an upward trend in the past ten years. However, the research on teacher-student interaction in planning education did not increase dramatically in the same period, totaling 57 articles (Figure 1). The trend of publications indicates that the teacher-student co-creation instructional method has been getting more attention in higher education. On the whole, more articles were about higher education than planning education.

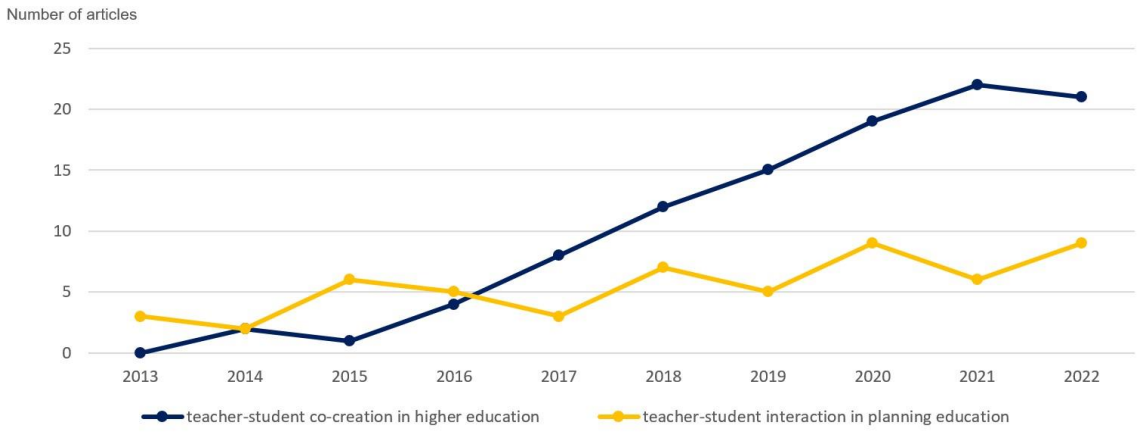


Figure 1. Teacher-student co-creation in higher education and planning education.

The literature was further screened to retain 54 teacher-student interaction articles related to community participation. It was found that the number of articles on teacher-student co-creation in higher education dropped significantly to 18, although the overall number of papers has slowly increased over the last ten years. Similarly, the number of articles in planning education dropped slightly to 35, but the overall number has also increased slightly over the decade (Figure 2). After filtering for "community engagement," there were more articles on planning education than on higher education.

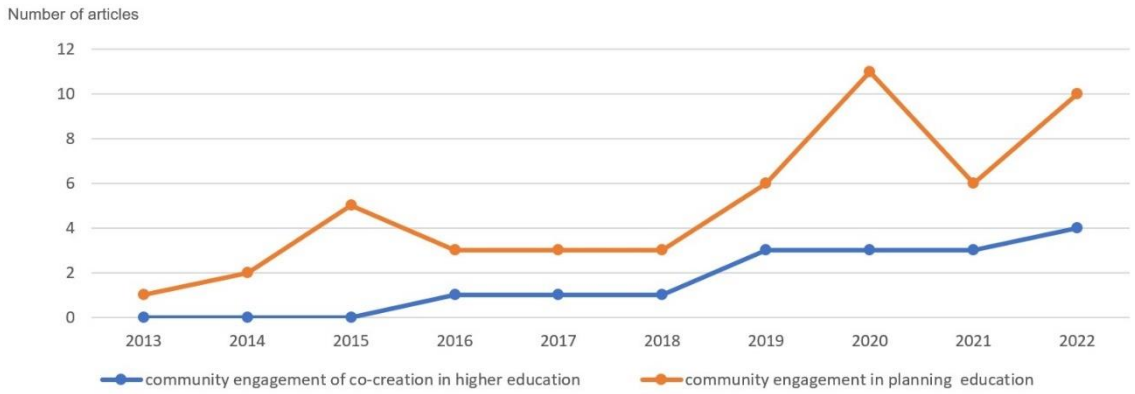


Figure 2. Number of research articles about community engagement in higher education and planning education

3.3 Trend of Community Engagement in Planning Education and Higher Education Research

Looking at the overall trend (Figure 3), without incorporating community participation, the amount of literature on teacher-student co-creation in higher education is higher than that in planning education. But as soon as the theory of "community participation" is required for the content, the number of articles on teacher-student co-creation in higher education reduced significantly and became fewer than in planning education. The proportion of community-participation papers is higher in planning education than in higher education.

We then followed up with a comparative analysis of the studies' purposes, theoretical concepts, methodologies, and pedagogies to distinguish between community-based planning education and higher education. All 54 community participation samples were included in the analysis of the purposes, theoretical concepts, and methodologies. However, for the analysis of the pedagogies, some articles did not mention specific teaching methods; thus, only 35 articles were used in this particular comparison.

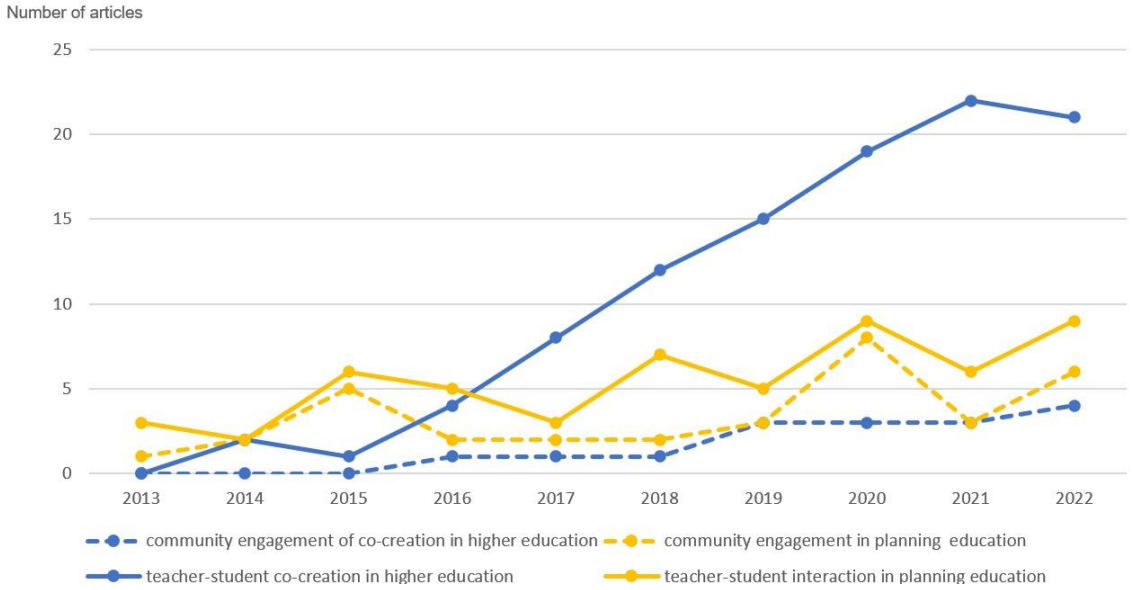


Figure 3. Trends of higher education and planning education research.

4. Results

4.1 Common and Distinctive Themes in Research Purposes

4.1.1 Common Themes

In the context of community participation, the studies from higher education and planning education had in common four purposes: assessing course pedagogies, exploring the state of teacher-student interaction, assessing student learning outcomes, and proposing a theoretical framework.

First, "assessing course pedagogies" was a purpose shared by the largest number of studies. These studies (from both higher education and planning education) experimented with various pedagogies in teaching the content and evaluated the overall implementation results (Figure 4). The pedagogies these studies worked with could be divided into many types of subcategories. Among these, "collaborative learning" dominated the pedagogies in the planning education articles, while "experiential learning" was included in both higher education and planning education research. Through curriculum design, collaboration among students and participation in the community can

improve course effectiveness and achieve co-creation goals. Remarkably, the concept of interdisciplinary education was unique to planning education. This pedagogy emphasizes that curriculum arrangements be made such that planning students can cooperate with students from other disciplines to tackle together unknown and complex community planning issues and challenges.

Second, the articles from higher education and planning education shared the purpose of "exploring the state of teacher-student interaction." They mainly discussed the interactions and roles of teachers, schools, and communities in the process of curriculum implementation in the context of community participation, as well as students' perceptions of the community engagement process. Some of the planning education articles further emphasized students' unique capabilities and contributions to the community.

Third, "assessing student learning outcomes" emphasizes what the students can learn through community-based courses. Both planning education and higher education used a variety of theories to assess the skills and knowledge that students acquire through community participation, including university-community partnerships, service learning, community engagement, and other theories of planning education and co-creation theories in higher education.

Fourth, "proposing theoretical frameworks" means establishing new indicators or frameworks suitable for describing community participation. The planning education articles discussed community planning capabilities and construction methods, teaching students the steps to practice community participation, suitable course arrangements for graduate students, and principles for establishing evaluation indicators and characterizing community participation in an educational context. In contrast, the higher education articles mostly presented theoretical frameworks for determining the interactive indicators that affect students' co-creation behavior by evaluating the factors of students' community participation and introducing the concept of sustainability.

4.1.2 Distinctive Themes to Planning Education

Community-based planning education had a unique research purpose—"exploring the power exchange among teachers, students, and communities," which was not found in the higher education articles. This goal refers to understanding how knowledge is exchanged among community stakeholders, students, and teachers. Moreover, this theme is about understanding the mechanism of power flow in relationships and strengthening peer-to-peer cooperation between schools and communities instead of unilateral domination.

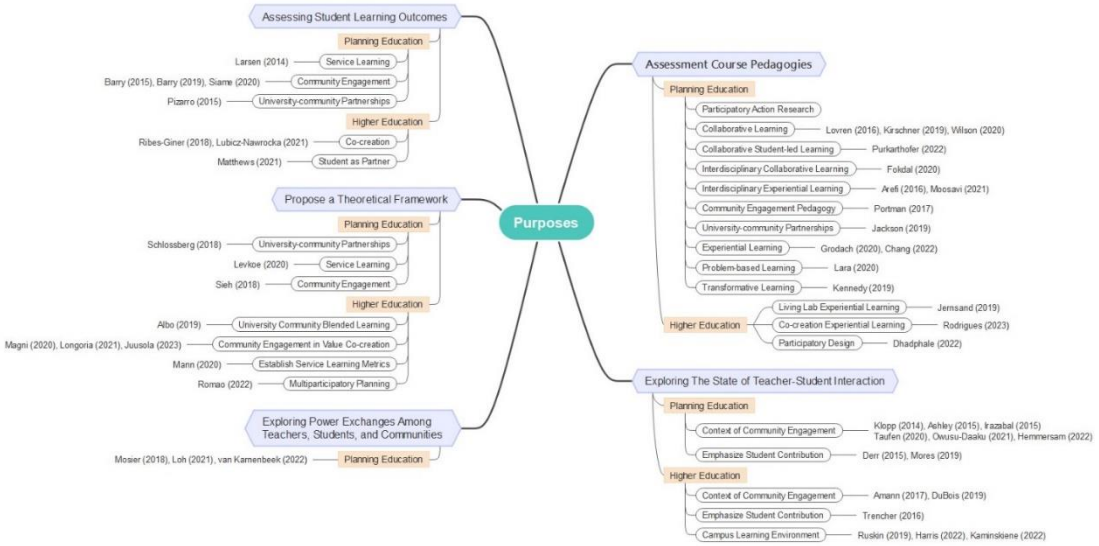


Figure 4. Literature map of the research purposes in planning education and higher education

4.2 Theoretical Concepts

Comparing the theoretical concepts in the context of community participation, it was found that the planning education studies highly emphasized the theories of "community engagement," "service-learning," "partnership," and "collaborative learning" in teacher-student interaction. Due to the limitations placed on the higher education literature search, most of them use "co-creation" as the leading theory. However, some studies used theories similar to those used in planning education.

The theories of "community engagements" and "service-learning" have a long tradition of being used in community-based planning and architectural education. By applying these theories, students can directly interact with and learn from the natural world and acquire learning knowledge and experience. Our literature review confirmed that these theories are well represented in planning education research.

The literature in both planning education and higher education includes the theoretical concept of "partnership." However, there are some differences in the terminology used. The sub-theories from planning include "community partnerships," "university partnerships," "community-university partnerships," and "university-community partnerships." Their focus on the relationship between universities and communities is evident. Higher education, on the other hand, focuses on "student partnership." It is combined with co-creation to explore the equal relationship between students and

teachers in the classroom, placing less emphasis on the community than planning education does.

“Co-creation” is a teaching theory widely discussed in higher education in the past ten years. The core concept is about changing the conventional interaction between teachers and students, from the teacher guiding the students to complete certain tasks to the teacher completing the tasks with the students. Therefore, the number of co-creation documents is much higher in higher education than in planning education. Van Karnenbeek (2022) proposed a planning education theoretical framework of the “community knowledge triangle” that depicts the knowledge exchange among community practitioners, students, and teachers from the co-creation perspective. Although planning education has less literature on the theory of co-creation, the abovementioned theories related to community participation show that planning education benefits from teacher-student co-creation in a different form.

Finally, the theoretical concept of “collaborative planning” was found in planning education research in the context of community participation. The application of the collaborative planning theory included different pedagogies, such as experimental learning, transformative learning, and other teaching experiments that emphasize student teamwork and mutual learning of knowledge between different community stakeholders to tackle issues and challenges jointly through the coursework.

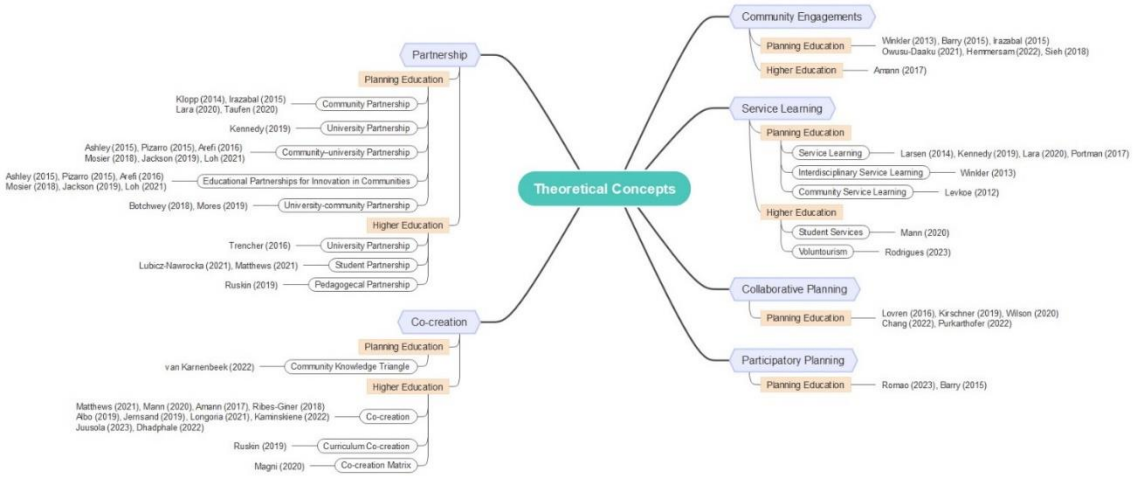


Figure 5. Literature map of the theoretical concepts in planning education and higher education

4.3 Research Methodologies

We found that case study research and participatory action research were the primary

research methodologies used in both planning education and higher education. These methodologies also correspond to what we found when classifying the research purposes, where “assessing course pedagogies” accounted for the highest number of studies. Case study research measures and evaluates curriculum effectiveness through cases of teaching experiments. The number of participatory action research papers has increased in recent years. This methodology redirects the curricula and the way of interacting with students through the collective reflection of students and teachers on the implementation of the curriculum (i.e., action). The predominant methods and tools used in these two research methodologies were questionnaires, interviews, focus groups, and student learning logs. All the research results on the effectiveness of student participation in these papers were based on the teacher’s observations and analyses, and none was from the perspective of the students.

Our analysis also showed that planning education and higher education each used research methodologies that the other did not. However, the number of such studies was relatively small. For example, qualitative theories used in planning education (e.g., grounded theory, cyber methodology, and exploratory research) discuss the role of planning education in community participation from the perspectives of application and practice. In higher education, some articles used quantitative methods (e.g., confirmatory factor analysis and structural equation modeling) to explore the composition and relationships between potential variables, whether the relationship conformed to the co-creation theory of the research object, and whether the relationship may be causal.

On the other hand, our analysis indicated that most of the existing research was conducted from the perspective of teachers by interviewing students or analyzing student learning logs. Research about community participation has rarely been carried out from the perspective of students.

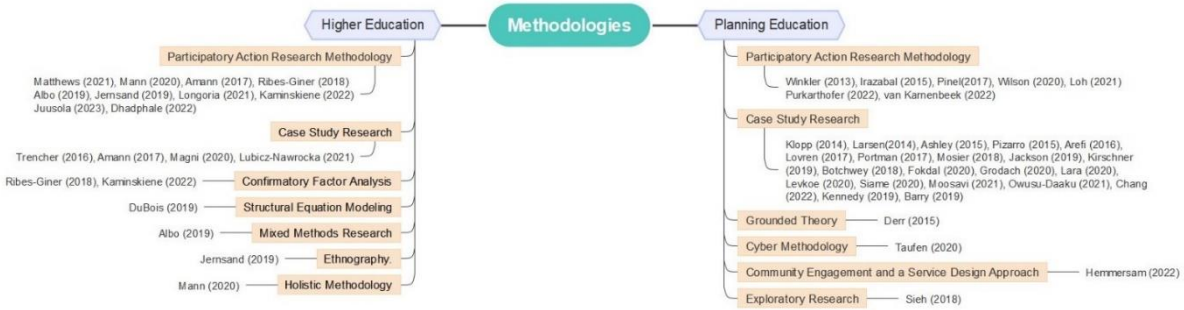


Figure 6. Literature map of the research methodologies in planning education and higher education.

4.4 Pedagogies

Upon classifying the pedagogies, we found that the planning education studies concentrated on the application of certain teaching methods. In contrast, due to the small

number of studies available in the context of community participation, higher education has not shown any salient trends in any specific pedagogies. Overall, the pedagogies adopted in higher education were “problem-based learning,” “blended learning design,” “work-integrated learning,” “action learning,” and other pedagogical approaches, but there was no clear indication of which approach(es) was the main focus when community engagement was involved.

In terms of community-based planning education, “studio pedagogy of community,” “problem-based learning,” “interdisciplinary pedagogy,” “experiential learning,” and “collaborative pedagogy” were commonly used.

Studio pedagogy of community is manifested as planning studio courses that focus on community engagement so that teachers and students can enter the community as part of community-based planning studio courses. This is not a single pedagogy but a broader category, and the papers provided little information on the specific teaching methods. However, it can be seen from the number of articles in this category that planning studio courses are an important space for community participation in planning education. Most of the pedagogies described below are also put into practice through planning studios.

Experiential learning provides students with real-life situations from which they gain knowledge and experience. This learning method is excellent for community participation, especially when planning education often requires students to understand what is happening in the space that they are planning. Through experiential learning, students can increase their mastery and understanding of the issues at hand.

Courses that use community-based problem-based learning (PBL) allow students to acquire knowledge and skills as they solve problems by actively participating in real-life issues related to the community. The final solution is full of possibilities. There was only one study related to PBL in our higher education literature sample, but four in planning education. This shows that the planning profession often has to deal with complex and unknown issues.

Interdisciplinary pedagogy is often applied in planning education. Such courses recruit students from different disciplines to promote each other’s planning knowledge and mastery of planning issues, thereby creating a more diverse course. The problems to be solved in planning education curricula usually cover a variety of disciplines, so it is often necessary to cooperate with different professional fields to achieve the instructional objectives.

Collaborative pedagogy is based on a teaching model in which teachers, students, and community members share specific learning goals, and learning occurs when working in groups. Collaborative pedagogy also includes interdisciplinary features whereby participants learn from each other in the learning process and set the ideal learning objectives jointly. Community-based planning education that uses a collaborative approach creates a more equitable space for dialogue between teachers and students and between schools and communities.

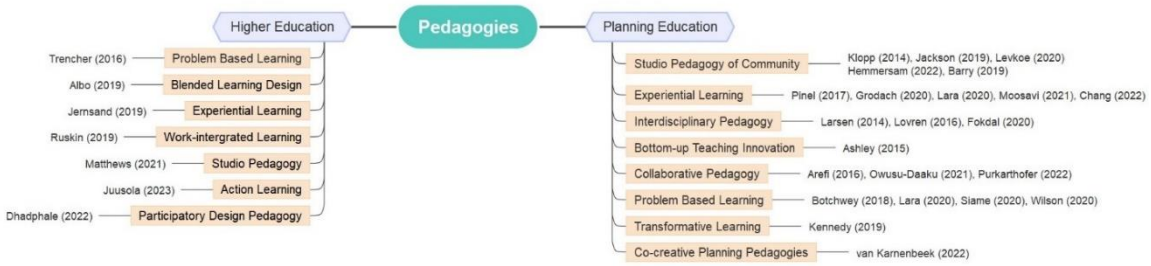


Figure 7. Literature map of the pedagogies in planning education and higher education

5. Conclusions

Comparing the four aspects of research (purpose, theory, methodology, and pedagogy) between planning education and higher education in the context of community engagement, we found some themes that are common to both, and some that are unique to each. First, a comparison of research purposes revealed that both higher education and planning education emphasize the benefits and challenges of the various teaching methods for the students and the courses. Planning education tends to pay more attention to interdisciplinary courses. This indicates that, more so than higher education, planning education values the process of community engagement and is required to handle complex issues. In terms of theoretical concepts, most of the concepts used in planning education are based on the theory of community participation. Compared with the theory of co-creation used in higher education, planning education focuses more on the interaction between teachers, students, and the community. Additionally, the literature in planning education seldom uses the co-creation theory; nevertheless, the process of teacher-student interaction in planning education is closely related to co-creation, which also emphasizes the subjectivity of students and the production of shared knowledge. Regarding the research methodologies, the most common ones are case studies and participatory action research. In addition to evaluating curricular effects and teacher-student interaction, action research in community-based planning education is closely tied to community issues and teacher-student interaction.

On the other hand, teaching methods such as PBL, blended learning, and Experiential

learning are more commonly used in planning education than in higher education. Again, this reflects the importance that planning education places on problem-based courses that allow students to experience the process of community participation to obtain a more pragmatic knowledge base. In contrast, community participation in higher education requires more research before specific research trends can be observed.

Overall, we found that in the context of community participation, most of the current research in co-creation in higher education and planning education has been conducted from the teachers' perspective by interviewing students or analyzing student learning logs. Rarely does research use the students' own perspective to examine the learning spaces in the context of community engagement. In addition, planning education has a stronger research base than higher education on the topic of community participation, pays more attention to interdisciplinary participation, and faces more uncertain and complex issues.

This study's results are limited by several aspects in the selection of the literature. First, in the first step of text collection, the higher education articles were limited to those with the theme of "co-creation." In the second step, the keywords of community participation were narrowed down so that the literature was significantly reduced. Therefore, there was insufficient literature to compare higher education with planning education in some of the subsequent comparative analyses. Therefore, it is suggested that the concept of "co-creation" be eliminated in future studies and simply use the background and theories of community participation to compare planning education with higher education.

References

Andrea I. Frank and Louie Sieh (2016). Multiversity of the twenty-first century – examining opportunities for integrating community engagement in planning curricula. *Planning Practice & Research*, 31(5), pp.513-532.

Carl Grodach (2020). Video Learning in Community Planning. *Journal of Planning Education and Research*, 40(4), pp.482-490.

Catherine Bovill (2013). An investigation of co-created curricula within higher education in the UK, Ireland and the USA. *Innovations in Education and Teaching International*, 51(1), pp.15-25.

Catherine Bovill, Alison Cook-Sather, Peter Felten, Luke Millard and Niamh Moore-Cherry (2016). Addressing potential challenges in co-creating learning and teaching: overcoming resistance, navigating institutional norms and ensuring inclusivity in student-staff partnerships. *Higher Education*, 71(2), pp.195-208.

Chang Hsiutzu Betty and Huang Wei-Ju (2022). Stakeholder Workshops as a Pedagogical Method for Experiential Learning in Collaborative Planning Education. *Planning Practice and Research,* 37(4), pp.427-445.

Charles Z. Levkoe, Abigail Friendly and Amrita Daniere (2018). Community Service-

Learning in Graduate Planning Education. *Journal of Planning Education and Research*, 40(1), pp.92-103.

Domitilla MagniMagni, Alberto Pezzi and Demetris Vrontis (2020). Towards a framework of students' co-creation behaviour in higher education institutions. *International Journal of Managerial and Financial Accounting*, 12(2), pp.119-148.

Elizabeth B.-N. Sanders and Pieter Jan Stappers (2008). Co-creation and the new landscapes of design. *CoDesign*, 4(1), pp.5-18.

Eva Purkarthofer and Raine Mäntysalo (2022). Enhancing Knowledge, Skills, and Identity Development Through Collaborative Student-Led Learning: Experiences With the Gradual Empowerment of Students in a Planning Studio Course; Early. Journal of Planning Education and Research, 12.

Furcal Andrew (1996). Service-learning: A balanced approach to experiential education. *Expanding Boundaries: Serving and Learning*, 1, pp.1-6.

Helen Perks, Thorsten Gruber and Bo Edvardsson (2012). Co-creation in Radical Service Innovation: A Systematic Analysis of Microlevel Processes. *Journal of Product Innovation Management*, 29(6), pp.935-951.

Jenny Marie (2017). Moving Towards Sustainable Outcomes in Student Partnerships: Partnership Values in the Pilot Year. International Journal for Students as Partners, 1(2).

Josefine Fokda, Ratka Colic and Danijela Milovanovic Rodic (2020). Integrating sustainability in higher planning education through international cooperation Assessment of a pedagogical model and learning outcomes from the students' perspective. *International Journal of Sustainability in Higher Education*, 21(1), pp.1-17.

Katariina Juusola (2023). Enhancing teaching and learning through the co-creative learning community approach. *Educational Action Research*, 31(1), pp.102-117.

Larissa LarsenLarsen, Laura S. Sherman, Laura Cole, Darshan Karwat, Krista Badiane and Paul Joseph Coseo (2014). Social Justice and Sustainability in Poor Neighborhoods: Learning and Living in Southwest Detroit. *Journal of Planning Education and Research*, 34(1), pp.5-18.

Leticia Castillo Longoria, Ignacio López-Forniés, David Cortés Sáenz and Jorge Sierra-Pérez (2021). Promoting sustainable consumption in Higher Education Institutions through integrative co-creative processes involving relevant stakeholders. *Sustainable Production and Consumption*, 28, pp.445-458.

Lilian van Karnenbeek, Leonie Janssen-Jansen and Deborah Peel (2020). Conceptualising Co-creative Planning Pedagogies: The Community Knowledge Triangle. *Planning Practice & Research*, 37(4), pp.446-463.

Louie Sieh and Andrea Frank (2018). Designing Impact Evaluation for Students' Engagement with Communities in Planning Education. *Journal of Planning Education and Research*, 42(2), pp.231-243.

Lovely S. Mores and Jeongwoo LeeWoongkyoo Bae (2019). University-Community Partnerships: A Local Planning Co-Production Study on Calabarzon, Philippines.

Sustainability, 11(7), pp.16.

Mahyar Arefi and Firas Al-Douri (2016). Exploring pedagogical opportunities between architecture and planning: the case of University of Nevada, Las Vegas. *Planning Theory & Practice*, 17(1), pp.72-92.

Mollie Dollinger, Jason Lodge and Hamish Coates (2018). Co-creation in higher education: Towards a conceptual model. *Journal of Marketing for Higher Education*, 28(2), pp.210–231.

Montserrat Díaz, Méndez and Evert Gummesson (2012). Value co-creation and university teaching quality. *Journal of Service Management*, 23(4), pp.571-592.

Richa Kumari, Ki-Seok Kwon, Byeong-Hee Lee and Kiseok Choi (2019). Co-Creation for Social Innovation in the Ecosystem Context: The Role of Higher Educational Institutions. *Sustainability*, 12(1), pp.307.

Richa Kumari, Ki-Seok Kwon, Lee Byeong-Hee and Choi Kiseok (2019). Co-Creation for Social Innovation in the Ecosystem Context: The Role of Higher Educational Institutions. *Sustainability*, 12(1).

Samantha Mosier and Megan Ruxton (2018). Sustainability university-community partnerships: Lessons for practitioners and scholars from highly sustainable communities. *Environment and Planning C-Politics and Space*, 36(3), pp.479-495.

Sareh Moosavi and Judy Bush (2021). Embedding Sustainability in Interdisciplinary Pedagogy for Planning and Design Studios. Journal of Planning Education and Research, 14.

Sinem Korkmaz (2012). Case-Based and Collaborative-Learning Techniques to Teach Delivery of Sustainable Buildings. *Journal of Professional Issues in Engineering Education and Practice*, 138(2), pp.139-144.

SL Pinel and R. Urie (2017). Learning Reflective Planning: The Application of participatory action research principle to planning studio design and assessment. *Journal of Architecture Learning*, 34(1), pp.32-48.

Susan J. Deeley and Catherine Bovill (2015). Staff student partnership in assessment: enhancing assessment literacy through democratic practices. *Assessment & Evaluation in Higher Education*, 42(3), pp.463–477.

Tany, Lubicz-Nawrocka (2018). Students as partners in learning and teaching: The benefits of co-creation of the curriculum. *International Journal for Students as Partners*, 2(1), pp.47-63.

Ulrika Bergmark and Susanne Westman (2015). Co-creating curriculum in higher education: promoting democratic values and a multidimensional view on learning. *International Journal for Academic Development*, 21(1), pp28-40.

Victoria Derr (2015). Integrating community engagement and children's voices into design and planning education. *Codesign-International Journal of Cocreation in Design and the Arts*, 11(2), pp.119-133.

Vladka Kirschner and Tomáš Peltan (2019). Towards better cooperative learning in urban

planning education. *Journal of Geography in Higher Education*, 43(4), pp.399-414.
W H. Voorberg, V. J. J. M. Bekkers and L. G. Tummers (2014). A Systematic Review of Co-Creation and Co-Production: Embarking on the social innovation journey. *Public Management Review*, 17(9), pp.1333-1357.
Wang Huanming and Ran Bing (2021). Network governance and collaborative governance: a thematic analysis on their similarities, differences, and entanglements. *Public Management Review*, pp.1-25.

OVERCOMING CHALLENGES IN DELIVERING COMMUNITY ENGAGED LEARNING FOR PLANNING STUDENTS IN THIRD-LEVEL EDUCATION (1142)

Jeanette Fitzsimons

Centre for Planning Education & Research, University College Cork, Ireland; jeanette.fitzsimons@ucc.ie

Abstract. Community-Engaged Learning (CEL) provides real-world experiences where students can grapple with the complexities of the world while developing their planning skills and competencies, before pursuing their professional careers.

For the teacher, CEL is time consuming, involves liaison with many stakeholders, and requires preparation and planning. Students can be daunted by the prospect of interacting with stakeholders and engaging in a professional manner with community groups. No longer an intellectual exercise in the comfort of the classroom; the student must embody the attributes of a planner in a real-world setting.

Despite the challenges, CEL can be a significant but rewarding undertaking for students, teachers and communities, which can result in impactful rewards for all.

Keywords: Planning Pedagogy, Community-Engaged Learning, Civic Engagement, Collaboration.

1. Introduction: Embedding CEL in urban planning education

'Planners need to demonstrate their ability to transform understanding into practical and achievable outcomes… Employers want to see more than credentials; they want to see people demonstrating competence. One's ability to do a job depends on knowledge, skills and qualities.'

(Reeves, 2009, p.29)

In striving for excellence in the graduate planners' skillset, a number of competencies need rigorous real-world applications; an integral skill is working in meaningful partnership with communities and civic groups. This is a study of and reflection on the challenges and learnings from five Community-Engaged Learning (CEL) projects with over 80 postgraduate students as part of the their education and professional training on the Masters in Planning and Sustainable Development (MPlan) in University College Cork (UCC), Ireland, over a five-year period.

Including real-world projects as part of the planner's postgraduate education is valuable and impactful. Each project is located in a different place, context, and timeframe and with different community members sharing their individual and collective views of their place. The students develop an understanding of the locality of each project from the outset, which is then enhanced by hearing about lived experiences. McCarthy *et al.* (2010) discuss the value of using real-world problems in the classroom:

'*The richer the course is in such illustrations, the more likely students are able to identify with the discipline and see themselves as practitioners who will be able to transfer their knowledge and understanding from the university to the world of employment and the community as a whole'*

(McCarthy et al, 2010, p.7)

The Irish Planning Institute Education Guidelines (2019) sets out that '*in accordance with the ethical principles of the profession, planning education is carried out with an awareness of the need for proper planning principles to be understood by the general public, a commitment to citizen participation in planning and an inclusive approach to diversity and equality of opportunity*.' (IPI, 2019, p.5) CEL projects with local communities centred on planning and place issues embodies this overarching purpose to the requirements of the profession.

Each of the partnering communities are unique, therefore each students learning about the complexity of those places and the opinions of the people within them is individual and responsive to this.

The MPlan programme has dual accreditation with the Irish Planning Institute and the Royal Town Planning Institute. This results in a full curricula of competencies, knowledge and skills for students to attain. As CEL is time-consuming, its value must be evident and impactful otherwise it would be easier for academics not to engage in CEL and instead, describe case studies of engagement and best practice scenarios in the classroom. However, learning through doing brings students' skill development and knowledge to a deeper level, albeit, it takes time, commitment, partnerships and skills. Brew and Mantai (2017) assess students' research experiences in Australian third level institutions, they quote a participant who said '*students are so engaged when they're doing their own research they're just on fire and interested in a way that they aren't when they're just reading about the research other people do. They're so interested and they learn more…*' (p.566)

This spark of fire is evident in the CEL projects undertaken as part of the MPlan. This paper includes an analysis of student reflections on the projects and it is evident that these experiences spark a fire in them and that they see themselves as professional planners.

The author reflected after the first CEL project, that the student's enthusiasm was evident

and hearing them say 'I felt like a real planner', and 'that is what I want to do when I'm working' was uplifting and confirmed the efforts and challenges to undertaking the project was worthwhile.

This paper includes an overview of student planner CEL projects from 2019-2023, the challenges faced, strategies and lessons learnt to overcome these challenges and reflections on the process and future improvements. It is not intended as a 'how to' guide, as each CEL project, place and community is distinctive. These learnings from five years of collaboration with MPlan students – are formally through analysis of student's reflective assignments and interview with community partners and informally by the author's own observations on student's actions and discussions and reflections with students and various partners. The CEL projects are further investigated by analysis of feedback forms from the community and follow-up interviews with a community partner about the process and outcomes of the CEL projects.

2. Benefit of Community-Engaged Learning as part of postgraduate planning education

Engagement with communities as part of third level education is common in many disciplines. The UCC Civic and Community Engagement Plan reference The Carnegie Community Engagement Classification (2006) definition of community engagement as:

'*the interaction with and collaboration between a University, its staff and students, with the wider community for the mutually beneficial exchange of knowledge and resources in a context of partnership and reciprocity. The purpose is to enrich scholarship, research, and creative activity; enhance curriculum, teaching and learning; prepare educated, engaged citizens; strengthen democratic values and civic responsibility; address critical societal issues; contribute to the public good; and make available cultural, recreational and other assets and contribute to the regeneration of neighbourhoods and community wellbeing*." (UCC, 2006, p.5)

There are many terms used to describe third-level student engagement in the community, such as, service-learning, community based learning and community service learning, this paper aligns with Brudney and Russell's suggestion that on balance community-engaged learning reflects *"the centrality of the community in the service learning". (*Brudney and Russell, 2015, p.278*)*

Real-life projects such as these have long-lasting, impactful outcomes, and substantially increase the quality of student learning. Through co-creating knowledge with students, underpinned by the Sustainable Development Goals (SDGs) and creating connections with societal partners. Goggins and Hajdukiewicz consider that '*education and collaborative partnerships are central to the implementation of sustainable development. Quality education and Partnerships for the Goals form two of the SDGs (SDG 4 and 17)*.' (Goggins

and Hajdukiewicz, 2022 p.2)

To perform the community engagement deepens the learning for the student and adding a reflection to this performance, deepens and extends the learning and understanding. McCarthy outlines that '*the learner comes gradually to understand by performing, doing or engaging in activities that are real within the world which is to be understood*.' (McCarthy, 2002, p.35)

Boyer's Scholarship of Application outlines that beyond volunteering and activities, scholarship is achieved if it is tied to the discipline: "*to be considered scholarship, service activities must be tied directly one's special field of knowledge and relate to, and flow directly out of, this professional activity. Such service is serious, demanding working, requiring the rigor – and the accountability – traditionally associated with research activities."* (Boyer,1990, p.22)

Brew (2012) suggests a community of practice of academic departments, networks of professionals, staff and students, disciplines where '*teaching which encourages active learning, critical creative thinkers and lifelong learning*.' (Brew, 2012, p.109-10)

Within the MPlan programme students examined the effectiveness of community and participatory planning, through examination of the writers such as Flyvbjerg, Healey, Arnstein, Innes, Forester, amongst others. The CEL project offers opportunity for the students to see theory in action and examine how these theories are applied to real-world situations. "*They learn to respond to social and political nuances and hidden complexities that classroom simulations are simply unable to replicate."* (Botchway and Umemoto, 2020, p.332)

This project was designed to enhance student's learning and understanding by doing and through their performance the students demonstrated an understanding of how to engage with a community.

Students '*direct engagement with the community for mutual benefit, as part of the overall aims and ethos of a programme of study, can provide excellent learning experiences as well as activities which are meaningful in their own right. Reflective analysis of the project and the student's role in it can form part of their summative assessment*.' (Fung, 2017, p.91)

In addition, their findings from the event will be shared with the community, thus reinforcing the 'why' of learning by highlighting the relevance of their work. These projects are an example of research-based teaching and learning. The information gathered by the students is valid data that the communities and societal partners can use in the future.

3. Overview of CEL Projects

The five CEL projects discussed occurred from 2019-23; this timeframe aligns with the authors' teaching of the *Information and Engagement Skills module* on the MPlan. Table one illustrates the CEL projects: when they occurred, who the civic and community partners were and the outputs of each project. The scale of project varies depending on the community's needs, project parameters and available resources.

The locations of the CEL projects are all within 12km of the planning school either within Cork City Council or Cork County Council's jurisdiction. While they are within the catchment of Cork City Centre each presented a different context, which varied from greenbelt village under growth, heritage town to city centre neighbourhoods.

There are similarities in the projects. Each one had a Community Engagement workshop using a variation of the Place Standard Tool. The Place Standard Tool is a '*framework to structure conversations about places and prompts for discussion between groups*.' (Guise and Webb, 2017, p.195) It can be adapted to each place and project. It was originally designed in Scotland and is an award winning methodology. The tool is framed by the overall question "What is good about this place?" with a series of themes and prompt questions to facilitate conversations. Students record the conversation points on post-it notes and facilitate a community rating of the question on a sliding scale, the rating is recorded on a circular compass.

Figure 1. MPlan students recording the participants rating using the Place Standard Tool

While a similar format used for each CEL, a distinctive bespoke methodology is created each time. The projects have a number of steps, which differ year-on-year:

- Approach by a community group or a Local Authority to undertake a CEL project with MPlan students

- Scoping meeting with the community group and any other partners to set out the expectations and agree outputs
- Introduce students to the community and their area
- Co-create the engagement event
- Practice through role play before the event
- Perform the event
- Report and reflect on the event including peer review of data

Some of these projects were less than four months in total and some had a two-year partnership.

It is important to create a useful output for the community groups, therefore the CEL projects conclude with a summary report including an overview of the process, findings of the engagement exercise and other data collected. The scale of report differs, some reports were solely a report of the engagement, and others included land use surveys, business owner surveys, and observations.

Table 1. MPlan CEL project outputs 2019-2023

Place	When	Partners	Outputs
Glounthaune *Village within greenbelt of Cork City*	2019	Glounthaune Community Association	Community Engagement workshop Summary report of findings
Blarney *Heritage Town north of Cork City*	2021-23	Heritage Council Cork City Council Community groups	Data collection – land use surveys, pedestrian counts, observations, business surveys Community Engagement online webinar Submission on Cork City Draft Development Plan review Collaborative Town Centre Health Check report

Tower & Cloghroe *Commuter Town and satellite village north of Cork City*	2021-23	Heritage Council Cork City Council Tower Tidy Towns	Data collection – land use surveys, pedestrian counts, observations, business surveys Community Engagement online webinar Submission on Cork City Draft Development Plan review Collaborative Town Centre Health Check report
Shandon *Historic inner city neighbourhood*	2022	Cork City Council	Data collection – land use surveys Community Engagement event Summary report of findings
Blackpool *Historic inner city neighbourhood*	2023	Cork City Council Blackpool Regeneration Group	Data collection – land use surveys Community Engagement event Place-making community mapping exercise Summary report of findings

The differences between the projects largely depended on the context or adaptions that were required. Blarney and Tower reports were online engagements due to Covid-19 restrictions and followed the Heritage Council's Collaborative Town Centre Health Check methodology, so were more complex. Shandon engagement event involved students presenting to the whole community group together rather than smaller groups because we were not allowed to stick posters to newly painted walls. The Glounthaune project included debriefing in the classroom as it was during the semester, the other engagement events were post-semester. The differences were learning experiences for students and organisers.

4. Overcoming the challenges of incorporating CEL in planning education

Delivering CEL has its challenges: it is time consuming, involves liaison with many stakeholders, and requires preparation. Students can be daunted by the prospect of

engaging in a professional manner with community groups. No longer an abstract exercise in the comfort of the classroom, the student must embody the attributes of a planner in a real-world setting. As Botchwey and Umemoto (2020) outline:

'"*… community-engaged learning is not a straightforward or simple form of pedagogy. As an instructor of undergraduate or graduate students, one must manage many moving parts and foster a web of social relations. There are relationships between the instructor and the client, relationships between the client and the students, and relationships among students that affect their collective learning and experiences*."

(Botchwey and Umemoto, 2020, p.332)

In an already busy academic year, it can be a juggling act to include a complex project. The development of a robust and replicable CEL methodology, which is iteratively evolved and learnt from year-on-year, eases the workload and helps to establish trust with community partners. The challenges faced to date are discussed in the following paragraphs.

An overview of the student's learning progression is evident through action and reflection. Each student undertook a reflective journal, which was a helpful pedagogical tool for the student to document and reflect on their learning and for the teacher to learn from their experience.

4.1. Challenge one: Establishment of a community partnership and setting expectations

Prior to undertaking an engagement exercise, and preferably early in the project timeline, the lecturer or school needs to partner with a community group. If a group approaches the school, sometimes it is because something is wrong or needed in their community or they are unhappy with the current situation or planning proposals within their locality.

Using the Place Standard Tool opens a positive open conversation rather than reactionary to any existing issues. Developing trust and partnership takes time, so, it is beneficial if there is an established relationship, reputation for impactful engagement or common connection. The three more recent partnerships were at the invitation of the local planning authority, Cork City Council. Established trust and a working relationship between the planning school and the Social Inclusion Office and Planning department of the City Council has enhanced the collaborations.

As this practice moves to an established annual engagement project, other communities are keen to collaborate with some contacting the planning school directly. In 2022, a community member from Blackpool attended the Shandon event and asked if Blackpool could be the next CEL project, this community representative, emailed feedback on how they thought the event would be improved. This collaboration and co-design enhanced the subsequent event.

The projects undertaken to date have varied in scale, from an engagement event with follow-on report to large collaborative projects using the Heritage Council's Collaborative Town Centre Health Check programme. The scale of each project has varying demands on the time of lecturers and students. The partners' expectations of the outputs may be unrealistic, as they generally need to sit within the timeframe of an academic year and align with semesters and assignment deadlines.

A scoping discussion between academic staff, community partners, including the local authority, can help set the scene and decide the parameters of the study. For instance, in Blackpool, the community were keen to undertake a large scale collaborative town centre health check (CTCHC). The two previous CTCHCs took almost two years to complete and were more complex than other consultations. The CTCHCs larger workload was also funded by 'Town and Village Grant' as part of Project Ireland 2040 and students received payment for their time working on it. After a discussion with the community as to what they wanted for their community, agreement was reached that a land use and vacancy survey and an engagement evening would satisfy their needs and be completed in a short-timeframe. This evolved to include a small placemaking exercise within the event. It is important to agree at this stage what the community's role is as often it is a group of volunteers.

In projects to date, this preparatory engagement happens without student involvement, as it can be time-consuming and to keep projects in scope. Some students have reflected they would like to be involved at this stage.

4.2 Challenge two: Preparing the students

To ensure a genuine engagement with the community it is important that the students are well prepared; including familiarity with the area, understand the area's planning policy and demography, be mindful of potential issues that may arise and have the necessary skillset to engage meaningfully. Firstly, the students' knowledge of engagement, power dynamics, and participation in planning within the theoretical planning framework occurs in a concurrent module, the students recognise the link between theory and practice; for instance, within student reflections it was noted:

'*… was a success and it was beyond my expectations how much I learnt from it. It was extremely helpful to get some real life context for the skills lectures. Additionally, even though the community engagement event was part of the skills module, what we learned was also helpful for other modules, for example Planning Theory*.' (2019, Student 3)

"*I feel that the module, as it unfolded, provided a really good framework under which this participation event could happen and allowed for a firm understanding of the conceptual and theoretical principles underpinning the engagement while also developing*

communication and time management skills that proved vital on the night." (2023, Student 6)

The preparation in the classroom and in the community took different forms, there were information sessions, lectures, talks, and meetings. Time was spent on developing a bespoke Place Standard tool to be used for each community group, after visiting the place and meeting the community, students were paired up, allocated a theme, given background material to review and asked to run the Place Standard Tool with their classmates and teacher acting as the community. The group would ask tricky questions that might occur at a real event and after each pair's presentation the group reflected what to do next time. This exercise was informal and unmarked, yet on the night of the event it was evident having a role play experience of the event made a significant difference to the calmness and confidence of the students.

Students reflected that nerves were lessened due to the practice, expectations were clear, the practiced how to deal with tricky situations. The perception that the practice sessions in the classroom were worthwhile is represented by these student quotes from across the five years:

"…*This time offered an opportunity to relax my nerves about public speaking by practising in front of my classmates...*" (2022, Student 4)

"…*Preparing in class allowed me to understand the aim of the event and learn how to properly facilitate without leading questions or introducing bias...*" (GOM: Shandon)

"*It is quite amazing what practice does and I felt quite calm when presenting which created a firm base for the real engagement. Through this practice run although, it was casual and fun but simultaneously very informative. I was able to pick up on useful tricks such as creating a positive image using body language, giving the recorder time to write by asking the residents follow up questions further including them in the process, and coming up with prompts to kick start certain questions if residents find it difficult to openly express their views and much more."* (2022, Student 11)

"*Conducting a rehearsal event in the studio was particularly beneficial as it allowed me to understand the process from the community's perspective. Furthermore, the practice session helped me to gain insight from my peers regarding the best way to ask follow-up questions for a deeper understanding.*" (2022, Student 9)

*'Because I was never involved in facilitating a public consultation previously, having the preparation in studio before the consultation was invaluable. It really set us up for the night of the consultation. It also orientated us in how we were to facilitate the consultation using the place standard tool and helped to showcase the consultation in a competent way.' (*2019, Student 4*)*

4.3 Challenge three: unfamiliarity with the place

On a couple of occasions there has been a student from that town or neighbourhood, typically most students are unfamiliar with that area or may have a particular mind-set, bias or opinion about that area. To avoid the pitfall of helicoptering in students to talk with and listen to communities, but who may not know the local street-names or landmarks, a variety of preparations were undertaken. Some approaches worked better than others. Malone sets out that for positive ongoing dialogue with a community, there are two prerequisites:

1. 'A Willingness to listen and learn from them
2. *A meaningful understanding of the site context'* (Malone, p.65)

For the projects with no Covid-19 travel restrictions, a walking tour was undertaken either by community representatives or civic partners. This increased the students' awareness of the place and a connection developed between the students and the community. The community were the experts on these outings. Walking around the places and listening to our guides appealed to students' learning in various ways; through observation while walking, through speaking with and listening to community members and appreciating the landscape and context from a different vantage point. The students gained familiarity with the place before meeting the public formally at the event.

"*This is where the community led walk was truly beneficial, as it gave me both a sense of what topics were contentious for the local people, and allowed me to better visualise what people were talking about during the engagement*." (2023, Student 4)

"*The informal meeting with the council and a representative of the community during our land use survey gave us a flavour of what to expect and what some of the potential issues may be."(*2022, Student 2)

"*The community walk prior to the main event was essential in my opinion. It allowed us to establish a rapport with some of the key community event organisers and gave us a snapshot of what general opinions and topics people were likely to be discussed in the main event. … The first set of people I talked to on the day were a couple who were very eager to talk about their specific lane. The fact I knew which lane it was and a little bit about it thanks to the community walk seemed to be very much appreciated and led to a get conversation. I personally feel it's very important to be at least moderately acquainted with the area under discussion as it displays sincerity and far greater insight can be gleaned*." (2023, Student 5)

In some CEL projects, the students undertook land use and observational studies in advance of the engagement, using ArcGIS Online, which was an additional output. This provided a rich data resource for the community and council and also led to student's familiarity with the streets, layout, topography, vacancy, etc.

An additional benefit to students collecting data on the ground was highlighted when interviewing the City Council Social Inclusion officer; he said:

"*When communities see students on the ground recording data, even for a few days, they experience people engaging with their place. They feel the students are there to listen and are on the community's side. Due to the student's involvement different people were engaged in these projects compared to the usual people who are involved. It attracted new voices*."

In Blackpool the land use study was undertaken after the engagement event, it was interesting to read how this impacted student learning as shown in this reflection:

"*It was interesting, having heard what people found difficult about moving around the area, to experience it first hand while doing the land use survey … and I could clearly see where the community was coming from. I feel as though a full picture was painted for me of Blackpool and its issues, because of the structure of the community led walk, followed by the engagement event, rounded up with the mindful day spent surveying the area*." (2023, Student 6)

Presentations and discussions about the place in the classroom from academic staff, heritage officers, social inclusion officer, housing experts, and others also helped to familiarise students with the area and they learned from the perspectives of various other disciplines who work closely with the planning profession.

4.4 Challenge Four: Learning to listen

One of the consistent reflections students make is their realisation how well and how much the community know about their place. Kitchen (2007) maintains that:

"*local people often have a great deal of knowledge about and 'feel' for their area, much more so than an individual planner could developer other than through protracted study, and thus quite apart from arguments about people's rights in a democratic society there is a clear pragmatic argument for planning services to try to find ways of tapping into this base of knowledge and concern*." (Kitchen, 2007, p.72)

Understanding the importance of the local voice through the experience of listening to communities is a clear benefit of these projects. To ensure students do listen, time is spent at the role play and in the skills module learning the skills of listening. Any preconceived ideas or biases also challenged in advanced. It is important the students are open to

listening and learning.

Learning that the community were an important source of knowledge about their own place and that their views should be valued.

'*I was taken back by just how involved the community were in the discussion and how willing they were to engage in comprehensive conversation about the various themes that we had in the different groups on the night.' (*2019, Student 1)

The reflections highlight how much of the learning comes from the experience:

"As planners, we must trust in the community's capacity to advocate effectively on behalf of its own wellbeing—to not do so would risk falling into the pitfalls of the top-down planning … What I hadn't realized was just how easy that pitfall is to fall into—all it takes is thinking that you know better than those we are working on behalf of, and while in terms of technical knowledge we do know a bit more about the planning process and the theory behind it, we simply cannot match the lived experience and wisdom of the communities we interact with, learn from, and work for." (2022, Student 3)

"I expected there to be a level of negativity to the conversation that evening, that people would use the event as a platform to express their anger at issues. However, the group members added to the discussions in a productive manner, explaining their issue, offering a solution but also listening to other members inputs and views on the issue they had presented." (2022, Student 11)

*'The night was also good because it helped me to empathise with people more and understand that some people can feel strongly about what could be considered small issues. It was interested how to see people engaged with planning issues and how passionate they were about the issues.' (*2019, Student 9*)*

Developing this understanding helps form planners of the future who will listen to the communities. It is transformative and echoes best practice in both planning and sustainable development. It moves the experience from an individual exercise to a collective understanding of the needs of others, a social responsibility.

4.5 Challenge Five: Student ownership of the process and performance

In early iterations of the engagement session, the students presented what they were asked to by the lecturer. In subsequent years, the students made minor changes to wording. More recently students have worked through the questions in studio time in the classroom, made amendments after the role play session and sought feedback from the community partners in advance. Each year it is a learning experience, communities questioned what particular questions meant or the wording didn't suit. As the format of the event involves asking the questions to small groups, they could change it as they

progressed through the evening.

The students demonstrated adaptability, slotting into roles that were not prescribed such as welcoming attendees and cleaning up afterwards, adapted to the change of format without drama when needed, changing questions slightly if something was not working mid event. These adaptations demonstrated ownership of the process and confidence that they were doing the correct thing.

One student noted:

I also had the opportunity to sit down with my fellow presenter and rewrite some of the questions in a way that I felt would best create discussion amongst the community. This really did help to put me at ease as I felt prepared when I arrived at the venue." (2022, Student 4)

Many students also critically reflected on how the process could be better, such as:

*'Not all sectors of the community were well represented at the evening. The majority of the attendees were elderly people, some middle-aged and only one young person. It is difficult to get a fair representation of each group at meetings like these and this was clear from the night. As a result we may have missed out on issues that only effect certain groups that were not represented at the meeting.' (*2019, Student 15)

"*Something I noticed about the event was how almost all of the community that joined us were a similar age and ethnicity. It is clear from what everyone had told us that Blackpool is a very diverse area, and I would like to find ways to reach the entire community so that this diversity could be represented in the attendance at the consultation*." (2023, Student 6)

No process or project plan is perfect, and the best way to learn by doing, and reflecting and this applies to teachers and students. Undertaking this review highlighted that the debrief after the event in Glounthaune was very successful and should be reintroduced in future projects. That day all the students were very eager to present their feedback, share their experiences and learn from each other by asking questions, when sometimes they are reluctant to stand up and speak in class.

4.6 Challenge Six: Making sure the community benefits

It is difficult to measure the value of CEL projects for the community. Brudney and Russell (2015) suggest one method is a market-based monetary estimate of the value of the final product. Their research notes that placing monetary value on CEL may fail to account the multiple impacts the projects may result in direct and indirect benefits. To measure the impact of the MPlan CEL projects three methods were used. A survey of participants on the night of the engagement, post project interviews with community partners and

measuring the impacts against some of the societal impacts listed in *Engaged Research Society and Higher Education: Addressing Grand Societal Challenges* (Campus Engage, 2017).

4.6.1 Survey of Participants

In Glounthaune in 2019 and Blackpool in 2023 participants were given a similar short feedback form on their experience of the event. Not all participants filled out a form. At both events, all but one person who filled out the feedback form found the event 'very easy' or 'easy' to participate in.

In 2020-2022 events were online due to Covid-19 or had social distancing and feedback forms were not undertaken.

When the community were asked on their perceptions of the positive and negative aspects of the event.

Table 2. What participants liked most and liked least about the events

	Glounthaune (2019)	**Blackpool (2023)**
Liked most	Interactive Event Students listened to us I could give my viewpoint Enjoyed listening to other people's opinions Had an opportunity to think It was engaging and friendly	Enjoyed speaking about their area Hearing what other residents said Their voices were heard The students were excellent Questions were good and relevant It was interesting. Small discussion groups helpful in contributing their thoughts.
Liked least	The room was noisy It was difficult to hear One person may dominate the conversation Would like more time to debate Some overlap in the questions Needed a bigger room	Room was too noisy Would like more time to discuss topics Differing opinions They were repeating things Would like a bigger venue to reduce noise Some students were very quiet / shy and hard to hear.

Many of the things respondents did not like were linked to the noise and logistics of the event. They were very animated and busy as shown in figure 2 below. The attendance numbers were not known until the evening of the events.

All respondents would recommend this type of workshop to other communities.

Figure 3. Many discussions in action in Blackpool

4.6.2 Post project interviews with civic and community partners

The Shandon findings were presented to the City Council CEO and senior members of staff by staff and students. The impact of this was outlined by the Social Inclusion officer that the findings were taken on board for future project planning and "*it was an added resource containing the community's voice that CCC were able to use and direct future work. The community group has a copy of the report*."

He added that one of the benefits of the Blarney study was that "*a local group was formed because of the health check project to get it over the line and a lot of synergies were created and connections with Council staff the report helped direct Town & Village funding spend within the area and the community leaders were happy and reassured that their planned projects were what the local wanted. It informed funding allocation in the area*."

The Glounthaune community partner described the CEL project as "a 'ballast' in a pretty uncertain time for the village. It gave us a solid foundation and helped us consider what we want in our village, how we want it go change and grow. To have such great interest in the village from an outside group, at a time where we were floundering to try to come to terms with the sudden changes occurring in Glounthaune, brought a sense of hope. The consultation event, held by a third party who handled it with great diligence and impartially, and produced a fantastic document, really crystallised the 'community opinion.' Now we have a much better idea of what is important to this community."

4.6.3 Wider impacts of the CEL Projects

Table 4. Societal Impacts from the CEL projects 2019-2023

Adapted from Campus Engage (2017)	Impact of the CEL projects
New Knowledge Production	Land use studies in Blarney, Tower, Shandon & Blackpool Publication of the summary reports of the engagement events & data collection Community mapping in Blackpool Presentation to local and international conferences
Environmental Impacts	Stimulating public debate Reports used as submissions on planning policy
Policy & planning impacts	Findings submitted to planning policy review – evidence informed Used for funding by communities for future projects Presentation to senior City Council CEO/
Public Service Impact	Improved community and civic engagement
Social and Cultural Impacts	Stimulation of public debate and interest Greater awareness of public's role in contribution to policy Discussion Increase public's role and responsibility in contributing to social challenges / solutions
Spin off Projects	Thinking about Tower: urban design and mobility report Glounthaune: submissions for funding

5. Conclusion

Table three highlights the variety of direct outputs for the community groups that have resulted from these CEL projects. There will be many indirect outputs. The students and graduates may replicate this experience in their careers. The engagement with communities in the Cork region led to students' discovering the community's values and aspirations.

Personal reflection was embedded in the process: students considered their professional skills along with personal skills such as how to work with communities; how to listen actively and to think creatively and adapt to situations. Through collaborating with the local communities, the students, learned the value of joint working in analysing the context of a place and collecting data. It also helped to reinforce the importance of the local voice in planning.

Seeing the student's enthusiasm was a delight; students said afterwards that 'I felt like a real planner', and 'that is what I want to do when I'm working'.

In conclusion, CEL allows the practice of planning to be relevant to the student's lives, in particular those students who have had a couple of years' learning online due to Covid 19. The application of theory through engagement, meeting communities and on the ground work results in motivation and appetite for collaborative planning and reflects Boyer's (1995) concept of scholarship. The students' now know they can engage effectively with the community, they achieved this with the scaffold slowly being dismantled throughout the process.

*'Overall the whole experience was a really positive way to learn about the place standard tool and how it can be used to engage and communicate with a community when dealing with planning issues and development plans. It was my first time having to apply the knowledge I learned in class to a real-life situation and it was very rewarding how it turned out.' (*2019, Student 10*)*

The students develop their ability to investigate, collaborate and understand the theories and best practice they learn in the classroom and take this beyond their college experience. CEL is a pedagogy that naturally prompts students to be problem solvers, excellent communicators, reflective practitioners and to understand the processes and efforts involved in reaching consensus when working with members of the public. These hard-earned skills and competencies will stand to graduates as they pursue their professional careers.

Funding. This project was supported by the Strategic Alignment of Teaching and Learning Enhancement fund which is a National Forum for the Enhancement of Teaching and Learning in Higher Education/Higher Education Authority award.

References

Bender, Eileen and Gray, Don, The Scholarship of teaching and learning in higher education: An overview. In Rowena Murray (ed.) *The Scholarship of Teaching and Learning in Higher Education* (pp6-16). Berkshire: OUP/McGraw – Hill

Botchwey, Nisha & Umemoto, Karen (2020), A Guide to Designing Engaged Learning Courses in Community Planning, *Journal of planning education and research*, 40(3), pp. 332-344.

Boyer, Ernest L. (1990) *Scholarship Reconsidered: Priorities of the Professoriate.* Princeton, N.J.: Carnegie Foundation for the Advancement of Teaching.

Brew, Angela (2012) Teaching and research: new relationships and their implications for inquiry-based teaching and learning in higher education, *Higher Education Research & Development*, 31(1), pp. 101-114

Brew, Angela & Mantai, Lilia (2017) Academics' perceptions of the challenges and barriers to implementing research-based experiences for undergraduates, *Teaching in Higher Education*, 22(5), pp.551-568

Brudney, Jeffrey L. and Russell, Allison R. (2015) Hours Aren't Enough: New Methodologies for the Valuation of Community-Engaged Learning. *Nonprofit Management & Leadership*, 26 (3), pp. 277-293.

Campus Engage (2017) Engaged Research Society and Higher Education: Addressing Grand Societal Challenges Together [Online] Available from: https://www.iua.ie/publications/engaged-research-society-and-higher-education-addressing-grand-societal-challenges-together/ Accessed [23/05/2023]

Fung, Dilly (2017) *A Connected Curriculum for Higher Education*. London, UCL Press.

Goggins, Jamie; Hajdukiewicz, Magdalena (2022) The Role of Community-Engaged Learning in Engineering Education for Sustainable Development. *Sustainability (Basel, Switzerland)* 14 (13) pp.8208

Guise, Richard & Webb, James (2017). *Characterising Neighbourhoods: Exploring Local Assets of Community Significance* (1st ed.). New York: Routledge.

Irish Planning Institute (2019) *Education Guidelines* [Online] Available from: https://ipi.ie/wp-content/uploads/2021/05/ipi_education_guidelines_2019_final_revised_draft_1_july_2019_1.pdf Accessed [25/05/2023]

Kitchen, Ted (2007) *Skills for Planning Practice* Basingstoke: Palgrave Macmillan.

Malone, Lesley. (2018). *Desire lines: a guide to community participation in designing places*. London: RIBA Publishing

McCarthy, Marian (2002) Where Finbarr taught, let Munster learn. In: Lyons, Nona, Hyland, Áine and Ryan, Norma (eds) *Advancing the Scholarship of Teaching and Learning Through a Reflective Portfolio Process: The University College Cork Experience* University College Cork: The Staff Enhancement and Development Committee, pp. 27-32.

McCarthy, Marian, Neville, Grace, Higgs, Bettie and Murphy J (2010) From dry ice to

Plutarch's fire: The integration of research and teaching and learning. In: Salerno-Kennedy, Rosanna and O'Flynn, Siún (eds) *Medical Education: The State of the Art.* New York: Oxford Nova Science

Reeves, Dory (2009) Future scoping- developing excellence in urban planners, *Australian Planner*, 46(1) 28-33,

Reeves, Dory (2017) *Management Skills for Effective Planners*. Bloomsbury Publishing.

UCC Civic and Community Engagement Plan Available from: https://www.ucc.ie/en/civic/governance/acivicallyengageduniversity/ [Accessed 24/5/2023]

TEACHING A NEW MIXED METHOD IN SPATIAL CASE SELECTION THROUGH DEPOLITICIZE OF PLANNING. CASE STUDY: LESS DEVELOPED REGIONS (1144)

Samaneh Niazkhani[1*], Esfandiar Zebardast[2], Angela Million[3]

[1] Urban and Regional Planning, University of Tehran and Technical University of Berlin; Samane.niazkhani@gmail.com

[2] Urban and Regional Planning, University of Tehran

[3] Urban and Regional Planning and SMUS Director, Technical University of Berlin

Abstract. Urban planning is an inherently political activity, Therefore, political science approaches are included in it; But this does not always have positive synergistic results of the cooperation of different disciplines in interdisciplinary; Especially in researches that focus on evaluation of plans and in important steps such as sampling, politicians' interventions have a bad effect; Because the quality and correct selection of samples has an undeniable effect on the generalizability of the research. So it should be controlled by the researcher.

In this research, we will introduce a mixed method in spatial case selection among less developed regions(provinces), while helping to improve the validity and reliability of the research, it will remove the shadow of political interference and bias in sampling. In line with the scope of the research, which is the less developed regions of Iran, sampling has been done. The sampling results in this research, show that the selected provinces from each cluster promote geographical and spatial contiguity with their previous (less developed) cluster, a matter that was expected to happen due to the isotropic property of spatial development

Keywords: Interdisciplinary, Depoliticizing planning process, Mix method, Spatial case selection, Less developed regions.

1. Introduction and purpose

Several researches confirm the role of politics in planning and the political role of planners, because planners are active forces in creating change (Albrechts, L., 2003). While plan evaluation has received significant attention from researchers in recent years, the process of plan evaluation is usually not done properly in practice (Guyadeen and Seasons, 2016). One of the factors of this issue is the undeniable link between politics and planning. In fact, urban planning is inherently a political activity (Adam, 1994), so political science approaches are included in it. But this does not always have positive synergistic results from the cooperation of different fields in an interdisciplinary field. Especially in

researches that focus on the evaluation of plans and in important stages such as sampling, politicians' interventions have a bad effect. Indeed, there are always tensions over issues such as who (what), how, and under what circumstances are involved (C White, 1996), because the outcomes of planning processes are always affected by the interrelationships between a variety of stakeholders and parties. (Campbell, 2001). In this regard, continuous efforts have been made to depoliticize development (and what is somehow related to development, such as evaluations and reform policies) in the planning process (HOUT, 2008). For example, Mössner (2016) describes how consensus building emerges as a political strategy that aims to depoliticize sustainable urban development. This issue becomes more sensitive when it comes to the evaluation of spatial samples in spatial development plans and especially cross-cutting issues such as the sustainability of settlements. Therefore, it is necessary to deal with the results of spatial plans and in other words to evaluate it from the perspective of the sustainability of settlements implementation (Niazkhani, 2023); in this evaluation process, it is more important to pay attention to the subtle points that affect the correct and unbiased evaluation; Because the quality and correct sampling has an undeniable effect on the generalizability of the research. Therefore, it should be controlled by the researcher. Finding a way based on scientific methods and techniques for it, is the main problem of this research. In fact, this research seeks to answer the question of how to select spatial samples in planning processes, such as the evaluation of development plans, especially in less developed regions, in a scientific and valid way and free from harmful policy interventions.

Of course, the traditional approaches of planning and its modules such as evaluation do not work for today, and one of the necessary changes in planning is that planning should also pay attention to the effects of policy issues and decision-making processes. Without this, development plans are unlikely to be more useful than in the past (Rakodi, 2001). But in the parts of the planning process, which in this research is the evaluation of plans in general and sampling in particular, political interventions diminish the reality necessary to be published in the evaluation result. Because politicians don't want some regions to be known as less developed and research on them, especially of the evaluation type. In many less developed societies, urban planning organizations are vulnerable because their activities (such as plan evaluation) are dictated and hindered by traditional political elites and mainstream intervention (Cobbinah, P.B., Darkwah, R.M. 2017). Therefore, newer and mixed methods should be used in planning, which can be both a scientific and justified defense against the intervention of politicians and also create a deeper understanding of the phenomenon for the researcher.

Mixed methods enable the political researcher (such as planners) to understand complex phenomena qualitatively and also to explain the phenomena through numbers, graphs and basic statistical analysis. According to Rossman and Wilson (1985), a multi-method approach for research that is influenced by political factors in some aspects, has the

potential to understand complex phenomena, see this phenomenon from multiple and more complete lenses, and use eclectic methodologies which gives better answers to problems. In brief, it should be said that a mixed study is a study in which the researcher combines both quantitative and qualitative methods of data collection and analysis in a unique and integrated study. These studies are more suitable for problematic issues. One of the possible problems in sampling is deviating from the path of choosing samples that contain the most information (Berndt, 2020) and are the best for research; It means that the result of their investigation is the richest.

On the other hand, since in the processes of reducing inequalities and promoting balanced regional development, the less developed regions have been neglected (Moreno Pires et al, 2020) and have suffered from the accumulated negative factors of economic and social development for a long time (Majerová, 2007); Studies show that in these regions, urban and settlements sustainability indicators have a lower score than other regions (Xu et al., 2020). In fact, the lack of attention to sustainable development in these regions has faced its settlements to: an adverse cycle of socio-economic and environmental imbalances, unprecedented challenges such as poverty, decline in quality of life, income gaps, rupture social issues and injustice in the distribution of services. Considering the spatial nature of development and its opposite, i.e. underdevelopment and deprivation that can leak to its neighboring regions, the underdevelopment regions of a country can be considered as a threat to national development. Therefore, the proposed models presented in the direction of sustainable development try to maximize the benefits for the development of communities by giving priority to less developed regions (Sherafati et al, 2019). Therefore, it is important to provide a framework that can be used to evaluate the quality of spatial development plans from the perspective of sustainability of settlements implementation (Niazkhani, 2023); And in this regard, the more desirable is the mechanism of evaluation controlled from the shadow of negative interventions such as the deviation created by politician in dictating samples. The validity of different parts of this mechanism, which means that in sampling part, samples be the richest, is proven by finding facts such as isotropic properties in development in spatial placement of samples. Therefore, the main goal of this research is to present a new hybrid method in selecting spatial samples through depoliticization of planning in less developed regions of Iran.

2. Theoretical and experimental foundations

In terms of epistemology, political issues have become more obvious with the development of planning from a rational perspective to the contemporary communication situation (transition from instrumental rationality to communicative rationality in planning) (Khakee, 1998). In a research, Albrecht documents the powerful informal arenas that are brought to the open space and the power games involving planners and

politicians and shows that many of the actual planning discourses are in conflict with the logic of some politicians (Albrechts, L., 2003).Politics and planning cannot be separated, and in this connection, planners often defend public interests; But there are unresolved process issues in planning (and its modules including accurate and comprehensive evaluation)(Pløger, 2021). On the other hand, judgment about the broader claims of systems planning should be suspended until a rigorous and comprehensive evaluation. Indeed, as part of this evaluation, the relationship between policy and planning activities will remain ambiguous as long as these two concepts retain their elastic definitions. In this context, it is not desirable that the deductive logic dominates the political activity, nor is it possible that the interactive logic of politics dominates the planning activity, mutual influence can be considered acceptable. Finally, although policy is a logical activity in advance and although planning is a tool for development goals, they should be conceived as interdependent but semi-autonomous activities. They are linked to the process of formulating desirable goals that are also feasible (Dimitriou., 1973).

The issue of inequality and less developed regions in many countries is a fundamental challenge in the path of development. Especially for those countries whose territory of sovereignty includes vast geographical areas. These inequalities are a serious threat to the balanced regional development and make it difficult to achieve national unity and integration (Shankar and Shah, 2003). People who live in the marginal regions of countries are usually far from the focus of development plans and policies; This causes to decrease the level of their economic and social development (Dawson, 2001. Inequalities within and between regions are one of the prominent phenomena of third world countries, which are caused by economic, social and political conditions (Hosseinzadeh Dalir, 2003). In Iran, there have also been regional inequalities and disparities with increasing alarming rates; This situation has led to serious problems such as migration from deprived regions to more prosperous and developed regions (Noorbakhsh, 2002); Human Development Report in Iran (2019) explains these differences; It introduces spatial plans as a long-term plans to achieve social justice and regional balance as one of the most important human development policies in development PBOIRI and UN, 2019). The correct regional development policies play an important role in strengthening the economic activities and sustainable development of less developed regions and, as a result, reducing regional differences. Appropriate guidance of public investments and development programs and projects is an important step in the direction of reducing regional inequalities and achieving sustainable and balanced development in the settlements of less developed regions (Matsumoto. 2008). Convergence in the development of regions will be achieved when the less developed regions grow and develop at a faster rate than other regions. Otherwise, the continuation of existing trends with the focus of economic development in developed regions will lead to national and regional divergence and imbalance (Purohit. 2008). Spatial plans try to create a kind of coordination and homogeneity of growth

between different regions and each region can enjoy proper growth and development in the same way and uniformity with the order of the whole of the national land (Ashkouri, 13 85). Proper evaluation of spatial plans by prioritizing the positive and negative points of less developed regions spaltial plans, helps countries to approach the goals of balanced and sustainable development faster. In the way of implementing this evaluation, the first important step is the accurate and scientific sampling in less developed regions.

2.1 Less developed regions council of Ministers approval document

As it was said, one of the major and fundamental comprehensive issues in the field of spatial development planning is the issue of paying attention to less developed regions and creating balanced development, which can be presented in the form of balanced development of sectors or regions. But before trying to implement any balanced regional development strategy, or evaluating related plans, it is necessary to identify the less developed regions through the regional differences in the environmental, economic and social dimensions (Arief, 1982). Therefore, the balanced regional policy framework can be properly guided and organized. In line with the policy of social justice, as the central goal of development plans, the level of regions in terms of the distribution and consumption of various economic, social, environmental and etc indicators, the deficiencies and inadequacies for future development plans has considered in legal documents of government. These types of documents can show the situation of different spatial regions in a comparative manner and classify them in terms of development opportunities and bottlenecks and determine development priorities for governments. In this way, by measuring the development level of the regions, it is possible to target and make decisions about the necessary tools to prioritize them in planned interventions. The less developed regions council of Ministers approval document of Iran (approved in 2008, extended until now), is a document that is used as a criterion in Iran's spatial development planning.

2.1.1 Classifying method in "Less developed regions council of Ministers approval" document

There are various methods for classifying the development of regions and any of them has advantages and disadvantages. The lack of statistics and information and their inadequacy, as well as the existence of numerous and scattered indicators in many cases, cause confusion and in identifying and determining level of development in regions; Therefore, logical combination of indicators is necessary to facilitate decision-making. Of course, any kind of integration should be done based on scientific principles to make the indicators sufficient, expressive and meaningful (Hosseinzadeh Delir, 2013). Classifying and zoning socio-economic development level of regions is often considered as a decision-making

issue of several MCDM [1] indicators (Martic and Savic, 2001), which is used in the mentioned document on the less developed regions in Iran. This method can analyze different aspects of the study, simultaneously and integrally (Papadopoulos and Karagiannidis, 2008).

2.1.2 Classifying criteria and indicators:

In order to clear the nature of the less developed regions mentioned in the above document, it is necessary to know the criteria and indicators classifying based on them. In the main aspects of:

- environmental criteria, indicators such as: the share of arable land from the total land, land erosion class, average height and slope class of land, average annual temperature and rainfall, climatic condition, water resources condition, mineral potential of the region, earthquake and flood potential;
- Social and cultural criteria, indicators such as: household size, real population growth rate, population density, ratio of urbanization, literacy rate, ratio of health and treatment centers and health centers to the number of villages, ratio of doctors to population, ratio of secondary schools to the number of villages, The ratio of public library to the number of villages, the ratio of sports facilities to the number of villages, the ratio of villages with safe drinking water to the number of villages, the ratio of villages have post offices to the total number of villages, the ratio of uninhabited villages to the total number of villages in the district,
- Economic criteria and its infrastructure indicators such as: employment rate, activity rate, job burden, ratio of employees by agricultural, industry and service sectors to total employees, ratio of agricultural land to total land of the sector, ratio of irrigated and dryland the total of agricultural lands, per capita of heavy and light livestock, density of tractors and combines per 100 hectares of land, ratio of rural cooperative companies to the number of villages, ratio of villages have gas to the number of villages, ratio of bank branches to 10,000 population, the distance of the center of the district from the center of the city, the distance of the center of the district from the center of the province; has been considered for classifying the regions. As it is found, in this document, an attempt has been made to select indicators that:
- First, covers different dimensions, including the natural situation, the capabilities and talents of the region, and the potentials of the occurrence of danger, deprived, health and medical, educational, population, social and cultural services, human resource, infrastructural services and agricultural production characteristics of the regions and

[1] Multiple Criteria Decision Making

- Second, should have the least overlap with each other and its information should also be available and up-to-date in terms of geographic political divisions up to the sector level.

According to what was mentioned, classifying of the less developed sectors was done based on each of the environmental, social-cultural and economic indicators separately, and to be continue based on the composite index in each of those main aspects by MCDM method. At the end, the final classifying was done based on the overall composite indicators (all environmental, social-cultural and economic indicators) and the result reflected in the less developed regions council of Ministers approval document.

2.2 Evaluation of spatial development plans and sampling methods:

Although many efforts have been made to correct regional development imbalances in Iran, there is an uneven distribution of facilities, services and activities, and the existence of inequalities and development gaps, both between provinces and within provinces. It has been always as one of the topics the subject of attention of the socio-economic organizations and institutions of the country. Most of the studies in this field have also confirmed the existence of spatial disparities in the level of development, the increasing trend and its adverse consequences and obstacles to run correct and accurate evaluation (Klantari,1998; Amirahmadi, 1986; Norbakhsh, 2005; Sharbatgholei, 1999). Table 1 shows a summary of the most important researches carried out in the field of evaluation of spatial development plans and sampling methods related to this research along with its results.

Table 115**.** A summary of the most important researches and their results

Title	Result	Source
Evaluation of the planning process of "territorial spatial development" in Iran and improvement solutions	- Documentary and qualitative method - The most important reasons for the non-realization of development plans in Iran are conceptual, organizational, and legal aspects and the inability to control negative political interventions.	Sharif Zadegan et al (2010).
Evaluating obstacles to territorial spatial plans in Iran with an integrated approach	- hybrid approach - The most prominent obstacles among the six categories of obstacles studied (economic, geographical and territorial, political and security, study and research, social and cultural, and administrative and structural), is administrative-	Soltani, (2012)

	structural obstacles and their effect on the weakness of control in political interventions in The implementation of plans.	
Pathology and evaluation of territorial spatial plans in Iran	- Documentary-analytical method (relying on the network analysis method) - The most important factors in the crippling damage of spatial development plans in three management areas, "the dominance of the petroleum economy and its political shadow over other aspects", the structural area, "the traditionally of the planning system and the content area, is "the depth of regional inequalities and the increase of less developed regions " .	Amou and Hataminejad,(2018)
Urban planning and politics in Ghana	Dominant political elites, with little or no urban planning background, control and dictate urban planning activities. This leads to chaotic scenes and urban damage across Ghanaian cities. The analyzes here reinforce the growing recognition that urban planning outcomes in Ghana and most African countries are not shaped by professional practice and reflect political elites, not the aspirations of the community interest and goals.	Cobbinah, P.B., Darkwah, R.M. 2017
Sampling Methods	In this research, specific sampling techniques are listed and defined, and the pros and cons are presented for consideration. In addition, issues related to sampling methods are described to highlight potential problems. One of these problems is deviating from the path of sampling that are richest and the best for research	Berndt,2020

According to the findings of studies, the negative involvement of politicians in planning processes, including the evaluation of development plans, is significant. In order to answer the research question that "What is the proper method for choosing suitable spatial

samples in the field of plan evaluation?", It is doubtful that data can be collected from all cases. Therefore, there is a need to select rich samples that can be the most comprehensive representative of the statistical population. Since there are different types of sampling techniques/methods, the differences must be understood to choose the appropriate sampling method for research (Taherdoost, 2016). Therefore, with respect, this paper presents a new mix method for spatial sampling.

3. Methodology

3.1 Methods

For almost three decades, various researchers have debated the concepts, methods, and quality standards for studies that use a hybrid of quantitative and qualitative approaches (Creswell, 2003~ Greene & Caracelli, 1997~ Miles & Huberman, 1994; Newman & Benz, 1998; Tashakkori & Teddlie, 1998, 2003). According to Rossman and Wilson, the hybrid of qualitative and quantitative research methods strengthens and validates these methods; Richer data is provided (Rossman and Wilson; 1985: p.637). In other words, in mixed research methods, the researcher combines the elements of qualitative and quantitative approaches in order to deeply understand the phenomena. The approach of this research is Mix-Method Research; Nastasi et al. (2007) believe that the research process of evaluating of developing plans reaches its peak in a qualitative-quantitative process, going back and forth. In this research, in order to provide rich samples to evaluate the spatial plans of less developed provinces, the quantitative method (Quan) is used for Clustering the statistical population (provinces). In fact, when the total research area is vast, the better method for the researcher is to divide the area into equal or smaller parts and then choose smaller units (Etikan, 2017). The right option in this situation is clustering. Cluster sampling is also called Block sampling. In cluster sampling, the sampled population is divided into groups called clusters. Instead of these subgroups being homogeneous based on selection criteria such as stratified sampling, a cluster is as heterogeneous as possible to match the population (Linda, 2008). In fact, the nature of the clustering technique causes the cases within each cluster (provinces in this research) to be most similar to each other (isotropic) and least similar to rest of the other (Edwards, 1965). One of the advantages of using cluster sampling is its cost-effectiveness in reducing costs by focusing on selected clusters, which gives less accuracy than simple random sampling (Etikan, 2017).

In the next step, instead of randomly choosing from each cluster, in order to choose the best sample that has the most data and data saturation occurs in it (Gill, 2020), one of the qualitative sampling techniques, judgmental or purposive sampling is used. That is, here the usual path of clustering is changed and the sampling path continues with the

qualitative method (Quan). Informed decisions about sampling are critical to improving the quality of research synthesis. In primary research, Patton is often cited as an authority on the subject of purposive sampling. However, in Patton's original texts there is no suggestion as to which purposive sampling should be used for which research combination, but it is explained that different purposive sampling strategies may be particularly suitable for constructing multi-perspective, liberating, participatory and deconstructive interpretations of published research (Suri, 2011). The perspective that is the focus of this research is getting rid of the negative shadow of politics in diverting the direction of planning research. So one of Patton's 16 purposive sampling strategies appropriate to the synthesis process of qualitative research, which has been found suitable for this research, is Critical case sampling. It is popular in the first stages of research for more in-depth study or in cases where funding is limited. It is a method in which a number of important or "critical" items are selected and then reviewed. The criterion for deciding whether an instance is "critical" or not is generally decided using the following phrase: "If it happens there, does it happen anywhere?" or "If that group has a problem, can we be sure that all groups have a problem?" (Etikan et al, 2016). Therefore, the critical samples of each cluster have been selected with a purposive non-random technique to select the richest samples that the most comprehensive and most difficult evaluation results are obtained from them.

In the final step, qualitative methods will be used again to interpret the output based on spatial development facts, such as the property of isotropic development in adjacent regions.

3.2 Method execution

In the first step of the research, in line with the purpose of the research, based on the less developed regions determined in the document approved by the Council of Ministers, the provinces of the country have been clustered; The data was analyzed with SPSS software and the provinces that are close to each other in terms of less developed parts were classified into five clusters with clustering technique; The data in this matter were extracted from the latest less developed regions council of Ministers approval document. The fifth cluster, which includes the capital province of Iran, i.e. Tehran, was excluded from the sampling, because it did not have less developed regions at the city level. From the other four clusters, the least developed or in other words the most critical province of each cluster, which had the highest percentage of less developed regions, were chosen as the representative of that cluster.

4. Conclusion and discussion

The selected provinces(samples) resulting from the execution of the method explained in

the previous part are: Sistan and Baluchistan province with 92.9 percentage (92.9 %) of LDR[2] (which is the strongest breaking point among other provinces and alone in the first cluster), Ilam with 75 percentage (75%) of LDR, Khuzestan with 60.9 percentage (60.9%) of LDR and Kerman with 45 percentage (45%) of LDR that they have accommodated. Table 2 shows the output of the software analysis and the selection of critical samples.

Table 16. Output of software analysis and selection of critical samples

Province	Number of Cities	Number of LDR Cities	LDR %	Cluster	Critical case
Sistan and Baluchestan	14	13	0.929	**1**	*
Ilam	8	6	0.750	**2**	*
southern Khorasan	8	6	0.750	**2**	
kordestan	10	7	0.700	**2**	
Bushehr	9	6	0.667	**2**	
Hormozgan	12	8	0.667	**2**	
Khuzestan	23	14	0.609	**3**	*
Kohgiloyeh and Boyerahmad	5	3	0.600	**3**	
Western Azerbaijan	17	10	0.588	**3**	
Kermanshah	14	8	0.571	**3**	
Kerman	20	9	0.450	**4**	*
North Khorasan	7	3	0.429	**4**	
Zanjan	7	3	0.429	**4**	
Khorasan Razavi	25	10	0.400	**4**	
Chaharmahal va Bakhtiari	7	2	0.286	**4**	
Fars	26	6	0.231	**4**	
Golestan	13	3	0.231	**4**	
Hamedan	9	2	0.222	**4**	
Ardabil	10	2	0.200	5	
Yazd	11	2	0.182	5	
East Azarbaijan	19	3	0.158	5	
Lorestan	10	1	0.100	5	
Markazi	11	1	0.091	5	
Mazandaran	17	1	0.059	5	
Esfahan	23	1	0.043	5	
Tehran	15	0	0.000	5	
Semnan	9	0	0.000	5	
Qazvin	5	0	0.000	5	
Qom	1	0	0.000	5	
Gilan	16	0	0.000	5	

The locations of these provinces, selected sample of this research, marked in Iran's geography illustrated in Figure 1.

[2] Less developed regions

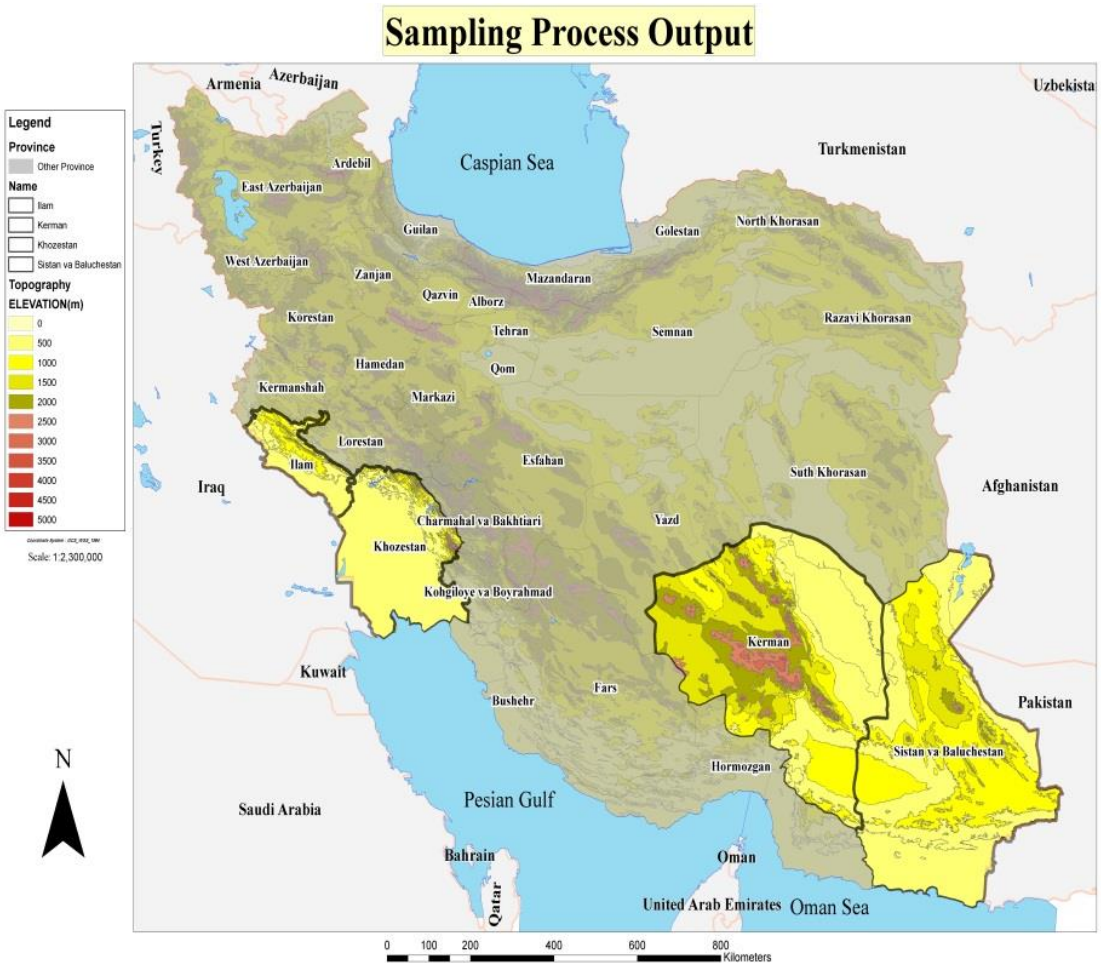


Figure 1. Spatial proximity of selected samples

As the map shows, selected provinces from each cluster promote their geographical and spatial contiguity with the previous (less developed) cluster. This was expected to occur due to the spatial isotropic property of the development. In fact, its reflection in development can be explained that the drivers and stimulators of the development in a region, penetrate into the adjacent region after a while and can be the driver and stimulator of the development for adjacent region as well. This is because most of the adjacent regions have the same or similar natural advantages; Therefore, activating the industries and activities related to that natural advantage in one of the regions, after a while through the transfer of technology and labor, is the catalyst for the activation of similar industry and activity for the adjacent region. Even if the natural advantages of the adjacent regions are not similar, the similar culture and social context work to place the adjacent regions on the same track for development; The concept of trickle-down effect in the Growth pole theory (Gai and Zhou, 2022; Roberts, 1995; Lasuen, 1969) is rooted in

this fact. There is also the opposite side. That is, the regions whose economic and social equations have determined underdevelopment, remain like a patient with a contagious disease, and often their dysfunctions and weaknesses in development affect the adjacent regions as well. For example, patterns of agricultural cultivation that are not compatible with the environment, immigrant flows, non-completion of the production and trade chains of goods, etc. are examples of this contagion. In a word, regions learn from each other in the path of development; Both positive and negative. This leads to their isotropic at the level of development. Isotropic, a concept that describes similarity in different sciences such as physics, chemistry, economics, and geography, can be recognized in urban development and planning be as a radiant horizon of further research in interdisciplinary planning education field.

In brief since the Depoliticizing of planning is an issue that has been addressed in the current discussions of planning, teaching a Method that can cancel the negative interventions of politicians by relying on scientific evidence can be very useful. Also, introducing of the Isotropic concept in spatial development, which is one of the results of the application of this method, can open the horizon for further interdisciplinary researches in urban planning.

References

Adam, D., 1994, Urban planning and the development process, Routledge,ISBN13: 9781857280210

Albrechts, L. (2003). Reconstructing Decision-Making: Planning Versus -Politics. *Planning Theory*, *2*(3), 249–268. https://doi.org/10.1177/147309520323007

Amirahmadi, H. (1986). Regional Planning in Iran: A Survey of Problems and Policies. The Journal of Developing Area, No 20, pp. 501-530.

Amou, Ibrahim; Hataminejad, Hossein. (2018). Pathology and evaluation of land improvement plans in Iran. Journal of Regional Planning. Volume 9, Number 34 - Summer 2018; Page 27-38. (In Persian)

Arief, S. 1982. Regional Disparities in Malaysia. Social Indicators Research, 11: 259-267

Ashkouri, Seyyed Hasan, 2015, principles and bases of regional planning, third edition, Tehran, Payam publishing house. (In Persian)

Berndt AE. Sampling Methods. *Journal of Human Lactation*. 2020;36(2):224-226. doi:10.1177/0890334420906850

Campbell, Heather. (2001). Planners and Politicians: The Pivotal Planning Relationship?. Planning Theory & Practice. 2. 83-85. 10.1080/14649350122677.

C White S. , (1996), Depoliticising development: The uses and abuses of participation, Development in Practice, 6:1, 6-15, DOI: 10.1080/0961452961000157564

Cobbinah, P.B., Darkwah, R.M. 2017 Urban planning and politics in Ghana. *GeoJournal* **82**,

1229–1245 (2017). https://doi.org/10.1007/s10708-016-9750-y
Creswell ,John W.,1999, Chapter 18 - Mixed-Method Research: Introduction and Application, Editor(s): Gregory J. Cizek,In Educational Psychology,Handbook of Educational Policy, Academic Press, 1999,Pages 455-472, ISSN 18716148, ISBN 9780121746988, https://doi.org/10.1016/B978-012174698-8/50045-X.
Creswell, J. W. (2003). Research design: Qualitative, quantitative, and mixed methods approaches (2nd ed.). Thousand Oaks, CA: Sage.
Dawson, J. I., (2001), Latvia's Russian minority: balancing the imperatives of regional development and environmental justice, Political Geography, No. 20, pp. 787–815.
Dimitriou Basil,1973,The interpenetration of politics and planning,Socio-Economic Planning Sciences,Volume 7, Issue 1,1973,Pages 55-65,ISSN 0038-0121,https://doi.org/10.1016/0038-0121(73)90011-6.
Edwards, A. W. F., & Cavalli-Sforza, L. L. (1965). A Method for Cluster Analysis. Biometrics, 21(2), 362–375. https://doi.org/10.2307/2528096
Etikan Ilker, Sulaiman Abubakar Musa, Rukayya Sunusi Alkassim. Comparison of Convenience Sampling and Purposive Sampling. American Journal of Theoretical and Applied Statistics. Vol. 5, No. 1, 2016, pp. 1-4. doi: 10.11648/j.ajtas.20160501.11
Etikan Ilker, 2017, Sampling and Sampling Methods, Near East University Faculty of Medicine Department of Biostatistics, NicosiaTRNC, Cyprus, Volume 5 Issue 6, Received: April 08, 2017 | Published: May 4,
Gai, K. and Zhou, Y. (2022), "Ownership, trickle-down effect and shared development: a political economy analysis", China Political Economy, Vol. 5 No. 1, pp. 52-71. https://doi.org/10.1108/CPE-10-2022-0015
Gill SL.2020, Qualitative Sampling Methods. *Journal of Human Lactation*. 2020;36(4):579-581. doi:10.1177/0890334420949218
Greene, J. C., & Caracelli, V. J. (1997). Defining and describing the paradigm issue in mixed-method analysis. In J. C. Greene & V. J. Caracelli (Eds.), Advances in mixed-method evaluation: The challenges and benefits of integrating diverse paradigms (New Directions for Evaluation No. 74, pp. 5-17). San Francisco: Jossey-Bass
Guyadeen, Dave & Seasons, Mark (2016) Plan Evaluation: Challenges and Directions for Future Research, Planning Practice & Research, 31:2, 215-228, DOI: 10.1080/02697459.2015.1081335
Hosseinzadeh Delir, Karim, (2003) Regional Planning, First Edition, Semit Publications, Tehran
HOUT W., (2008), Governance and the Depoliticisation of Development, chapter: Development and governance: An uneasy relationship, pp16, eBook: ISBN9780203886953
Kalantari, K. (1998). Identification of backward region in Iran. Geographical research quarterly.No 48. Mashhad
Khakee, A. (1998). Evaluation and Planning: Inseparable Concepts. *The Town Planning Review*,

69(4), 359–374. http://www.jstor.org/stable/40113511

Lasuen .J.R. 1969. On Growth Poles. Urban Studies. Volume 6, Issue 2. First published June 1969 -https://doi.org/10.1080/0042098692008023

Linda,2008-2022, Sampling Methods, Except from The Certified Software Quality Engineer ,Handbook by Westfall

Majerová, Věra. (2007). Social factors influencing the differences between developed and less developed regions. Agricultural Economics (Zemědělská ekonomika). 53. 513-517. 10.17221/975-AGRICECON.

Martic´, M. and Savic´, G., (2001), An application of DEA for comparative analysis and ranking of regions in Serbia with regards to social-economic development, European Journal of Operational Research, No. 132, pp. 343-356

Matsumoto, M., (2008), Redistribution and regional development under tax competition, Journal of Urban Economics, No. 64, pp. 480–487

Miles, M. B., & Huberman, A. M. (1994). Qualitative data analysis: A sourcebook (2nd ed.). Thousand Oaks, CA: Sage.

Mössner S., (2016) Sustainable Urban Development as Consensual Practice: Post-Politics in Freiburg, Germany, Regional Studies, 50:6, 971-982, DOI: 10.1080/00343404.2015.1102875

Moreno Pires S, Polido A, Teles F, Silva P & Rodrigues Ch; (2020) Territorial innovation models in less developed regions in Europe: the quest for a new research agenda?, European Planning Studies, 28:8, 1639-1666, DOI: 10.1080/09654313.2019.1697211

Nastasi B, Hitchcock J, Sarkar S and others; Mixed Methods in Intervention Research. Journal of Mixed Methods Research Volume 1 Number 2 April 2007 164-182 © 2007 Sage Publications; DOI 10.1177/1558689806298181.

Newman, I., & Benz, C. R. (1998). Qualitative-quantitative research methodology: Exploring the interactive continuum. Carbondale: University of Illinois Press.

Niazkhani, S, 2023, Towards sustainable human settlements in less developed regions of IRAN: The result of provincial spatial plans?, Ph.D. Dissertation, publish in progress ,School of Urban Planning, College of Fine Arts, UNIVERSITY OF TEHRAN and GCSMUS in Technische Universität Berlin

Noorbakhsh, F., (2002), Human development and regional disparities in Iran: a policy model, Journal of International Development, No. 14, pp. 927–949.

Papadopoulos A. and Karagiannidis, A., (2008), Application of the multi-criteria analysis method Electre III for the optimisation of decentralised energy systems, Omega, No. 36, pp. 766 – 776

PBOIRI (Plan and Budget Organisation of the Islamic Republic of Iran) and United Nations,(1999), Human Development Report of the Islamic Republic of Iran 1999, Plan and Budget Organization of the Government of Iran and the United Nations, Tehran.

Pløger, J. (2021). Conflict, consent, dissensus: The unfinished as challenge to politics and planning. Environment and Planning C: Politics and Space, 39(6), 1294–1309.

https://doi.org/10.1177/2399654420985849
Purohit, B. C., (2008), Health and human development at sub-state level in India, The Journal of Socio-Economics, No. 37, pp. 2248–2260
Rakodi Carole,2001,Forget planning, put politics first? Priorities for urban management in developing countries,International Journal of Applied Earth Observation and Geoinformation, Volume 3, Issue 3,2001,Pages 209-223,ISSN 1569-8432, https://doi.org/10.1016/S0303-2434(01)85029-7.
Roberts, J.Timmons, 1995,Trickling down and scrambling up: The informal sector, food provisioning and local benefits of the Carajás mining "Growth Pole" in the Brazilian Amazon,World Development,Volume 23, Issue 3,Pages 385-400, ISSN 0305-750X,https://doi.org/10.1016/0305-750X(94)00142-L.
Rossman, G. B., & Wilson, B. L. (1985), Combining Quantitative and Qualitative Methods in a Single large-Scale Evaluation Study.
Shankar, R. and Shah, A., (2003), Bridging the Economic Divide within Countries: A Scorecard on the Performance of Regional Policies in Reducing Regional Income Disparities, World Development, Vol. 31, No. 8, pp. 1421–1441.
Sharbatgholei, A. (1999). Urbanization and Regional Development in Post Revolutionary Irna.West view Press, Oxford
Sharif Zadegan Mohammad Hossein; Razavi Dehkordi Sidamir. (2010). Evaluation of the planning process of "land preparation" in Iran and ways to improve it. Journal of Environmental Sciences, Summer 2019, Volume 7, Number 4; From page 87 to page 100.(In Persian)
Sherafati M, Bashiri M, Tavakkoli-Moghaddam R, Mir Saman Pishvaee;(2019). Supply chain network design considering sustainable development paradigm: A case study in cable industry; Journal of Cleaner Production; Volume, Pages 366-380; ISSN 0959-6526; https://doi.org/10.1016/j.jclepro.2019.06.095
Soltani, Naser. (2012). Evaluating the obstacles facing land development projects in Iran with an integrated approach. Journal of Space Planning and Design. Term 17, autumn 2012, number 3. (In Persian)
Suri, H. (2011), "Purposeful Sampling in Qualitative Research Synthesis", Qualitative Research Journal, Vol. 11 No. 2, pp. 63-75. https://doi.org/10.3316/QRJ1102063
Taherdoost, Hamed, Sampling Methods in Research Methodology; How to Choose a Sampling Technique for Research (April 10, 2016). Available at SSRN: https://ssrn.com/abstract=3205035 or http://dx.doi.org/10.2139/ssrn.3205035
Tashakkori, A., & Teddlie, C. (1998). Mixed methodology: Combining qualitative and quantitative approaches. Thousand Oaks, CA: Sage.
Xu, Z., Chau, S.N., Chen, X. et al. (2020) Assessing progress towards sustainable development over space and time. Nature 577, 74–78. https://doi.org/10.1038/s41586-019-1846-3
Ziyari, Karamatullah, 1388, planning and planning in Iran. (In Persian)

THE BEAUTY OF TRANSITION: AESTHETICS AND INNOVATION IN STRATEGIC URBAN TRANSITION PROJECTS: EXPERIENCES FROM CLASSROOM (1156)

Peter Ache

Radboud University, Nijmegen, The Netherlands; peter.ache@ru.nl

Abstract. The challenge of transition to a new more resilient and sustainable urban age is huge. Collectively, in our modern lifestyle as 'urbanites' we consume environmental services to an extent which matches several planets in scale. In diverse institutional settings, these challenges are constantly debated and looked at, with a view to possible solutions. Most of this, still, stays on the level of paper. But how do we generate the urgently needed concrete actions and changes? Especially, how do we evoke on the level of the individual energy and commitment as the basis of a potential system change? As difficult as this may be, instead of devising new 'big plans' (Burnham) the paper suggests developing 'beautiful' plans, projects, ideas to stir the affects of citizens. Within the environment of a MA course in spatial planning at Radboud University (Nijmegen), the beauty of transition was further explored.

Keywords: aesthetics, transition, New European Bauhaus, education, theory and concepts.

1. Introduction

This paper explores some possible dimensions of beauty and aesthetics in spatial planning, the latter is used here in a comprehensive manner, from urban design to town and country planning and beyond. The paper will (1) provide some conceptual reflections on issues, which can be considered relevant when discussing beauty and aesthetics in planning, or rather, which we want to suggest as relevant in the context of planning. The paper will then (2), intermittently, use examples from a master course organised at the Radboud University (Nijmegen). With that, we present some evidence under two perspectives: First, a collection of examples which show how a perspective of beauty and aesthetics could be developed. Secondly, a set of dimensions which young future professionals consider relevant in the context of transition strategies, to which conceptual aspects will be added. The paper will then (3) propose some actions towards 'beautiful' plans and planning, certainly aware about a possible critique against 'beautification' of cities (Jacobs). The last part will be done in view of the transition challenge that societies are confronted with. It will also be done in view of the New European Bauhaus launched by the European Commission at the beginning of 2021 stating: "The New European

Bauhaus is a creative and interdisciplinary initiative, convening a space of encounter to design future ways of living, situated at the crossroads between art, culture, social inclusion, science and technology. It brings the Green Deal to our living places and calls for a collective effort *to imagine and build a future that is sustainable, inclusive and beautiful for our minds and for our souls."* (https://europa.eu/new-european-bauhaus/index_en, emphasis added, see also (Ban et al., 2021)). What does this entail in terms of educating coming generations of planning professionals?

2. The beauty of transition – starting observation

During a conference on innovative municipalities (https://kommunen-innovativ.de/fachkonferenz), the small city of Krumbach (AT) was presented as outstanding example of innovation in transition strategies. That municipality initiated an international architectural design project called BUS:STOP Krumbach. The project had several ambitions: combining international design thinking with traditional materials, traditional local craftsmanship, landscape design and the grand challenge of a transition to a more sustainable transport system. The example was presented as particularly interesting by Harald Welzer (Welzer, 2019), a renowned sociologist in Germany working on issues on transformation, because of the small scale of the municipality (about 1000 inhabitants), the innovative approach chosen, and the out of the box thinking applied by this village. Here, a particular 'design element' and its 'beauty', mainly resulting from the combination of local vernacular techniques with international design teams, created 'innovative and beautiful actions on a small scale' to stimulate different courses of action in the field of mobility. The resulting bus stops had indeed amazing designs, as can be seen from Figure 1 (see https://www.bregenzerwald.at/aktivitaet/busstop-krumbach/). The conference and discussion did not enter the field of planning at that time, but gave the stimulus to reflect on these and other approaches focusing on beauty and aesthetics to develop some lessons for the larger transition challenges e.g. at city regional scale and how to achieve this in planning education.

Figure 1. Busstop Krumbach (Sou Fujimoto)
Source: www.krumbach.at

Beauty and transition are not entirely new topics in the field of planning, as is well known. Already the ancient Vitruvius called in his principles of architecture and design for: Firmitas (stability), Utilitas (functionality) and Venustas (beauty). In his view, architecture depends on Order, Arrangement, Eurythmy, Symmetry, Propriety, and Economy. Especially Eurythmy stands for the graceful and the true-to-size appearance in the assembly of the structural elements of building(s) (https://en.wikisource.org/wiki/Ten_Books_on_Architecture/Book_I).

However, the best-known example in planning will be the 'city beautiful' movement of the 19th century, which started in many places in Europe and the United States of America. At its origin, the book by Camillo Sitte (Vienna) is often placed (Sitte, 1889). His work *'Der Städtebau nach seinen künstlerischen Grundsätzen'* provided for the first time a compendium of principles for a modern city design and planning [1]. The main concerns of

[1] The subtitle of the original publication further specified his endeavour: a contribution to the solution of actual challenges in architecture and monumental sculptures with specific concern for Vienna. The section on 'the limits of art in modern city design' focuses specifically on aspects of art, beauty and aesthetics. For inspection see https://archive.org/details/diestadtebaunach00sitt/page/n6/mode/1up.

the city beautiful movement were the poor living conditions of citizens in the period of accelerating industrialisation and urbanisation. The movement promoted ‘beauty’ not for its own sake but as a civic virtue, advocating beautification to increase urban quality of life at large, in addition to modern functional structures. Daniel Burnham's 1909 Plan of Chicago is one such example experimenting with central elements defined by the movement. For the European context, Berlage’s extension plan for Amsterdam South in the Netherlands from 1904 (though ultimately not realised) can be named as another example (Cammen et al., 2012). In modern times, scholars like Jane Jacobs criticised the city beautiful movement – and within that everything particularly oriented towards order - as a ‘design cult’ and stated: “To approach a city, or even a city neighborhood, as if it were a larger architectural problem, capable of being given order by converting it into a disciplined work of art, is to make the mistake of attempting to substitute art for life.” (Jacobs, 1961, p. 373)

According to Talen and Ellis (Talen & Ellis, 2004), Jane Jacobs was right claiming that a city cannot be a ‘work of art’. However, according to the same authors, Jacobs based here judgment wrongly by mixing her criticism on the dominating modernist planning approaches, which promoted the cult of the individual architect genius, decontextualization, specialization and fragmentation, with her critique regarding the ‘design’ orientation of the city beautiful movement. Following the suggestions of Talen and Ellis (2004), if the intention is to bring back art and beauty into city planning, ancestors of the city beautiful movement and the particularities of the movement itself should come into focus. Talen and Ellis’ (2004, p. 13 f) exploration of aesthetic dimensions in planning amongst others remark, that the original idea of ‘beautification’ came also with an idea to represent diversity in the melting pots of the new world. Without going further into detail of that discussion, it is worthwhile looking at the element of diversity. The view here is that it is necessary to make a distinction between incremental, collectively oriented notions of aestheticism, and city design that is preoccupied with self-expression, individuality or the dominance of one ruling individual or institution. One is organic, fluid, and derived from a pluralistic view of the city. The other is absolutist and dependent upon centralized authority. Elements that come back in philosophical perspectives on aesthetics and beauty.

To state it clearly, we do not want to suggest a return to a simple ‘beautification’ for our times and prepare cities for a new 'pomposity'; though some more recent urban design projects could be considered exactly as that, especially the still notorious high-rise buildings (Jencks, 2006). What we want to suggest is to pay attention to beauty and aesthetics as cultural dimensions of local transition strategies. Reformulating the well-known quote from Burnham in the following way: *"Make no standard projects; they have no magic to stir citizen's blood and probably themselves will not be realized. Make beautiful projects; aim for high aesthetics in hope and work, triggering people’s affections*

and stimulating their dreams."

The objective to reflect on the 'beauty of transition' is to elaborate on aspects of beauty and aesthetics as cultural dimensions and as part and parcel of local transition strategies. It further invites - students as future - planners to explore the potential of beauty and aesthetics in such strategies. Important questions emerge, for instance, concerning the role of vernacular, locally authentic practises or how participation as an element of such strategies could inspire the adoption of local forms of knowledge and aesthetic appreciation. Again, quoting Talen and Ellis (2004, p 15) who claim a "need for a participatory, interactive kind of art, the need to avoid separation of art and life, and the need to integrate art and nature. It is precisely these emphases on integration that can be used to support the connection between aesthetics and city planning."

3. Conceptual aspects

Until now, the text introduced a range of terms: aesthetics, beauty, art, planning, urban design and architecture, innovation, and transition. The following section, therefore, tries to develop main conceptual aspects which were used to structure our approach and thinking about beauty and aesthetics. This account is far from complete and marks only a starting point that will be further inquired.

We must start with a number of definitions, first. Following Scruton (2007), aesthetics (also esthetics in American English) is a branch of philosophy that deals with the nature of beauty and taste, as well as the philosophy of art (its own area of philosophy that comes out of aesthetics). It examines aesthetic values, often expressed through judgments of taste. In our context, aesthetics relates to sensations, perceptions, feelings that grasp 'beauty' and largely depend on the context of use. In the context of poetry for instance Baumgarten (Scruton, 2007, p. 233) defined in the 18th century beauty as 'sensuous knowledge, through which we grasp particulars, as opposed to intellectual or conceptual knowledge'. The philosopher Kant (Scruton, 2007, p. 233, Kant: Critique of Pure Reason) spoke about a sensuous aspect of our appreciation of beauty, in his view mostly an appreciation of natural beauty; not made but 'found'. Scruton (2007, p. 238) further emphasises, that we appreciate mostly through assessment, "… though we may differ in our judgements of taste in landscapes and the like, we all agree in making them." In short, it is difficult to establish up-front an idea of beauty, but human beings are happily engaged in finding specific dimensions of that very same beauty.

A very stimulating source regarding beauty and aesthetics can be found in the work of Mirza Tursić, who wrote a PhD thesis at EPFL on the topic (Tursić, 2017). In reflection on the argumentation provided in his article on the city as aesthetic space (Tursić, 2019), we would like to emphasise the following aspects: The aesthetic space brings together past

and present but might as well stimulate an idea of a future of becoming. Tursić (2019, p. 205) describes the aesthetic space as a particular sort of direct lived experience through which memories of the past, latent reality and the actualized perceived present are conjured together, informing one another. However, this production of aesthetic space might as well be seen critical, at least being on the edge of creating *ideology* (see also above comments by Jacobs).

In his view, aesthetic spaces are created by self-conscious actors, with each individual having an idea of what society should be like and what it should look like (with reference to Norbert Elias). At the same time, aesthetic qualities should be considered as properties that emerge from the interaction between individuals and their environment and society, within a process of constituting themselves as self-reflective subjects (Tursić 2019, p. 208). And last, any aesthetic experience requires an active participation from the observer, because it is the imaginative attention of the individual that enables them to see a certain object in one way or another (Tursić 2019, p. 209).

One aspect in Tursić's argumentation brought particular resonance. Citizens create a network of aesthetic spaces. With reference to de Certeau (1984) and his walking the city project the following aspect stands out: The city is experienced (and therefore produced) in a way that the fragments replace the totality, while conjunctions between the fragments remain totally or partially omitted (Tursić 2019, p. 212). The beauty of a city is a classic example of the emerging property of a city since the aesthetic appreciation of the city as a whole cannot be solely understood as the sum of the aesthetic appreciations of its separate parts. As part of a spatialized practical action, aesthetic phenomena appear as a constant reminder of the power of that which does not appear visibly and the power of the unknown. This is why individuals' aesthetic sensibilities should be a matter of societal debate (Tursić 2019, p. 218). We can only reiterate the final point, that it is equally important to address the role of the unconscious (Soja, 1996) and expose this to societal debate, not least with a view towards lines of conflicting views (Ache, 2017). Leading to an interim summary also relevant for classroom, the relation between beauty, aesthetics and the transformation of spaces should preferably be experienced in a 'corporeal' exposition. Unfortunately, due to the Corona pandemic a corporeal experience and the inter-individual exchange about it was largely impossible.

Besides such basic definitions, we searched for additional tools for a more specific analysis, applied mostly to written documentation of urban transition projects (the major source during the Corona pandemic). First, as we are looking at space, the works by Henry Lefebvre (1991) provide a unique interpretation of its dimensions. With Lefebvre we can assume that societies are not just occupying pre-given static space, but rather produce that very space. In turn, space is an active element in the constitution and functioning of society. The Lefebvrian space operates with three main dimensions, the lived, perceived

and conceived space (see also figure below, from Wiedmann & Salama, 2019). By allocating aspects of beauty and aesthetics, the lived and perceived space might certainly be seen as the most relevant places. The conceived space, as was outlined at the start with the example of the city beautiful movement, is open for professional perspectives on beauty and aesthetics.

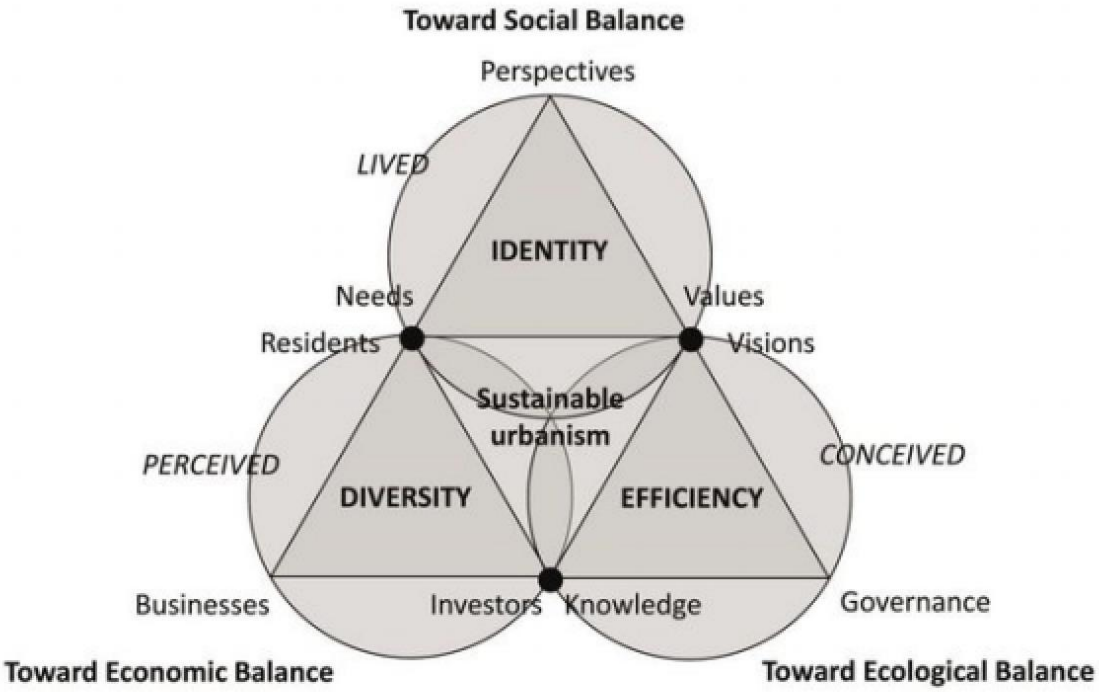


Figure 2. Lefebvre'ian Space (Wiedmann and Salama, 2019)

Other scholars from the field express similar perspectives; we already referred to Soja (1996, p. 57): “Everything comes together in Thirdspace: subjectivity and objectivity, the abstract and the concrete, *the real and the imagined*, the knowable and the unimaginable, the repetitive and the differential, structure and agency, *mind and body*, consciousness and the unconscious, the disciplined and the transdisciplinary, everyday life and unending history. Anything which fragments Thirdspace into separate specialized knowledges or exclusive domains - even on the pretext of handling its infinite complexity - destroys its meaning and openness.” Of course, addressing ‘beauty’ in that context with a professional mindset might contribute to destroying *meaning* and *openness*.

However, to try understanding it, is not forbidden, using again Tursić (2019, p. 205): “I analyze a particular sort of direct lived experience through which memories of the past, latent reality and the actualized perceived present are conjured together, informing one

another. Studying the aesthetic space can help urban researchers better understand how the world becomes internalized or externalized by inhabitants, how they develop a stronger concern for justice, or how novelty is borne from a constant dialogue between the ethical and the aesthetic." Here, the aspects of 'novelty' and 'justice' add further dimensions to the discussion: taking a perspective of beauty might allow us to develop alternative and probably more 'just' perspectives on future urban transitions.

Following the ideas of Geels and Schot (2007), transitions in socio-technical regimes can happen on three principal layers: niche, regime and landscape level (see Figure 3 below).

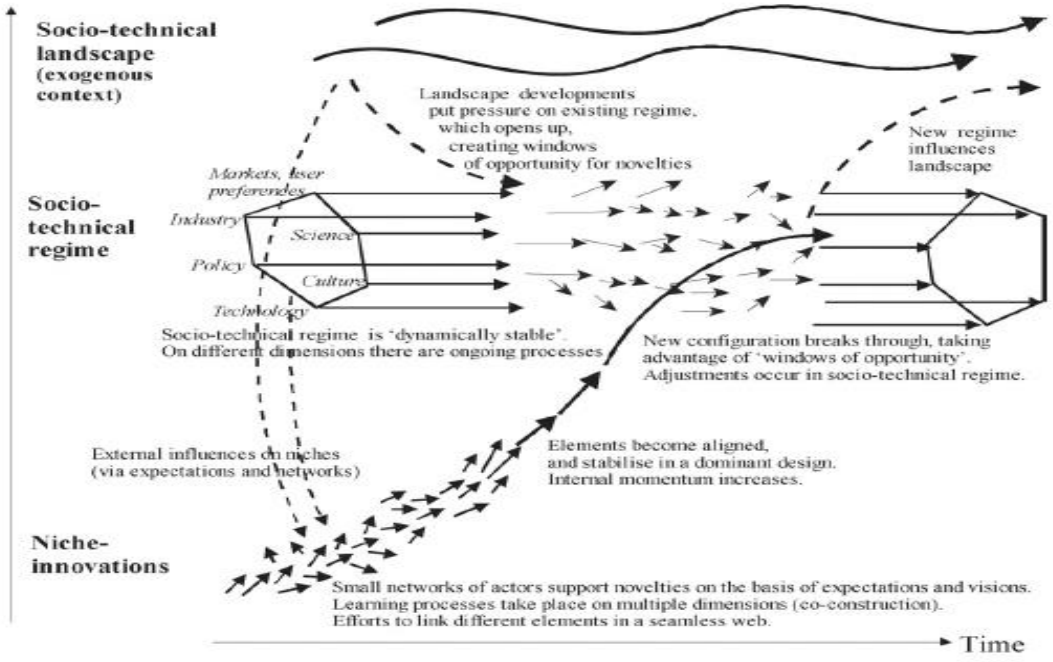


Fig. 1. Multi-level perspective on transitions (adapted from Geels, 2002, p. 1263).

Figure3. Transition - a multi-level perspective
Source: Geels and Schot, 2007.

The 'avalanche' settings at the bottom and in the centre of the above figure depict a conceptual aspect that opens for several transition directions creating a window of opportunity for experimentation and novelty. We suggest understanding aspects of beauty and aesthetics as important element in that context, starting with the niche innovations but extending further into the other elements.

Before outlined concept of transition includes at the system level exogenous elements which could be labelled political or strategic, bringing for instance the European policy

and strategy context into the equation. We consider three European policies relevant here: In December 2020, a new Territorial Agenda (2020b) was agreed upon by European ministers. The TA 2030 formulates a central objective: “A sustainable future for all places and people which does not leave anybody behind has been underlined as essential for Europe’s future.” It neatly connects to the Green Deal (2019) of the European Commission, the major strategic development program towards a ‘Just Europe and a Green Europe’. At the same time the New Leipzig Charter (2020a) was released, which like the TA2030 promotes a place-based approach, calls for policy coordination and effective multi-level policy frameworks as common principles. Especially the New Leipzig Charter provides guidance for applying these in cities, urban areas, their functional regions, and peri-urban areas. It supports strengthened cooperation between and across spatial levels, including urban-rural partnerships. The principles of good urban governance and quality design ensure attractive, inclusive, durable, adaptable places which contribute positively to making places more pleasant and attractive for people to work, live and enjoy. It is essential (that) public authorities plan positively for the achievement of high quality and inclusive design when considering development in our cities, towns and villages.

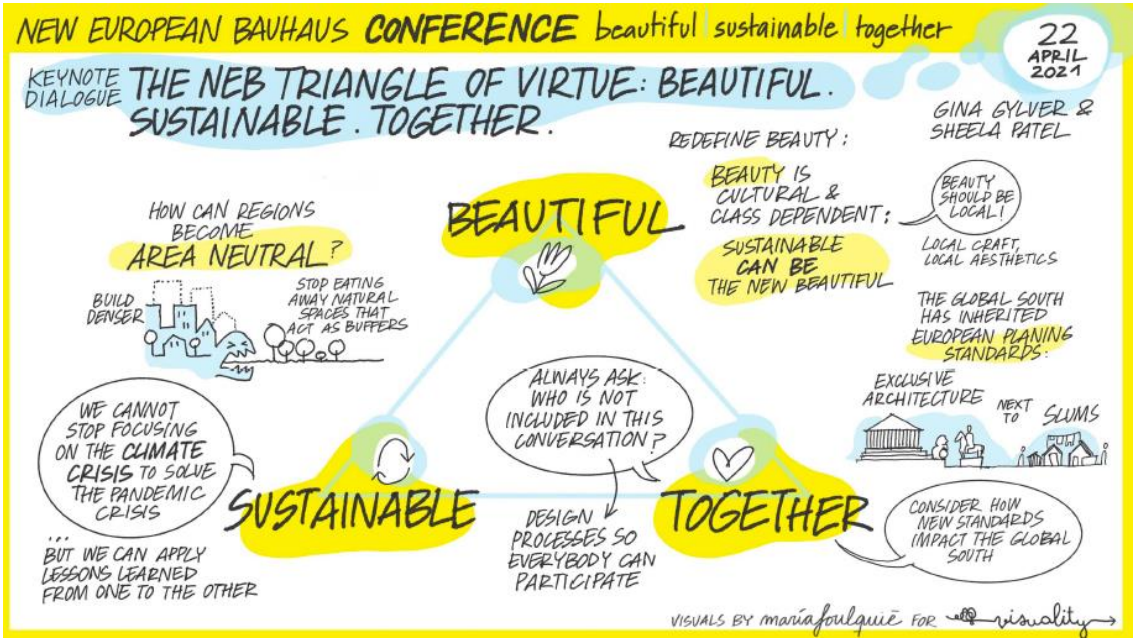


Figure 4. New European Bauhaus

Source: EC.

Shortly after these two initiatives, the European Commission launched the New European Bauhaus at the beginning of 2021: “The New European Bauhaus is a creative and interdisciplinary initiative, convening a space of encounter to design future ways of living, situated at the crossroads between art, culture, social inclusion, science and technology. It brings the Green Deal to our living places and calls for a collective effort to imagine and

build a future that is sustainable, inclusive *and beautiful for our minds and for our souls.*" (https://europa.eu/new-european-bauhaus/index_en)

Coming back to Lefebvre and his tripartite concept of space, we can combine it with above outlined perspectives in several ways: As lived experience, beauty is produced and reproduced on the individual level and becomes an element of societal engagement, up to the point of being turned into a dominant aesthetic program (at the interface of perceived and conceived space). Planning but also strategy contribute perspectives on beauty and aesthetics, in professional terms but also regarding aspects of power. EU policies and initiatives can be interpreted as part and parcel of the conceived space element; the positive aspect here being that beauty and aesthetic receive more attention, especially in the New European Bauhaus. Now we need the next generation planners to play with these elements and create beautiful spaces.

4. On-Off-Beauty: Approaching Beauty and Aesthetics in Student work

As was emphasised in the conceptual section, beauty and aesthetics are basically constructions, depending on a capacity of the individual to perceive beauty and aesthetics (Kant) but also depending on some societal practices. With 'style', grown out of historic roots and kind of generalised as shared practice, a pattern can become dominant within a specific period of time, in a specific society, in a specific place. How do those aspects return in our exercise?

But before talking about findings from the course, a brief outline of the program as such shall provide an overview. The course was an invitation to elaborate on aspects of beauty and aesthetics as cultural dimensions and as part and parcel of local transition strategies. It further invited students to explore the potential of beauty and aesthetics in such strategies. The main step to elaborate on those aspects are case studies of self-selected projects, in a Dutch, European, or global context. The main approach for doing so is a 'transition theatre'[2]. In his work on theatrical performance, Peter Brook contends that "[t]ruth in theatre is always on the move" (Brook, 1996, p. 140). Akin to Brook's argument, the 'transition theatre' will act as a heuristic device to reflect on the interplay of planning theory and practice, and, as such, to uncover the diverse articulations of beauty and aesthetics in ongoing transitions. In terms of learning aims and objectives, the course connects to the following competence and learning outcomes of the SP MA program: critically assessing and adequately applying theories and concepts; compare existing strategies and projects and develop creative new approaches; autonomously design and

[2] Special thanks to the co-teacher I Barba-Lata who generously provided for the course his knowledge and previous teaching experiences with this theatrical approach.

perform a case study; learn to apply new methods; critically reflect on normative assumptions involved in planning; alternative ways of communication and engagement; develop a European comparative perspective. The course consisted of two main elements: First, in several lectures, main conceptual elements were presented and discussed with students. Topics included are: European Context; Beauty and aesthetics in urban planning; transition theory. Second, students had to work in groups on self-selected case studies, exploring the various dimensions of beauty and aesthetics and developing a 'transition theatre' approach. The overall runtime was four weeks, so the course resembled more a kind of intensive workshop and project. The course had about eighty participants. In the next couple of paragraphs, we will look at some of the outcomes of this working process.

The first task to address aspects of beauty and aesthetics was openly defined at the very start of the course: participants were invited to take pictures from any kind of street scene which they considered 'beautiful' or 'aesthetically' appealing. They had no previous knowledge of the topic, except the course syllabus, but some might have done a bit of background research before starting. They were asked to document a certain/specific scene of their "liking" or choice and remove the central aspect of beauty or aesthetic, which contributed mostly to their judgment. The results do not stand hard statistical test but provide some interesting dimensions, which can be traced back to Lefebvre.

The collection of scenes and, within that, objects that trigger the individual to consider aspects as beautiful or aesthetically appealing range from the natural environment to the urban fabric, include greenery and especially trees (as landmarks) or water (which is not that surprising in the Netherlands, of course), include churches, windmills, and bridges (the important landmarks in the flat lands). Also squares, public parks and gardens as well as streets alongside canals or 'grachten' are considered appealing. Typically, these are symbolic structures charged with historic meaning, which belong to the perceived space of societal practices. For some observers, the street corner with cafes or graffiti and murals on buildings attracted their attention as appealing, an aspect of the lived space. (See Figures 5 & 6)

Figure 546.

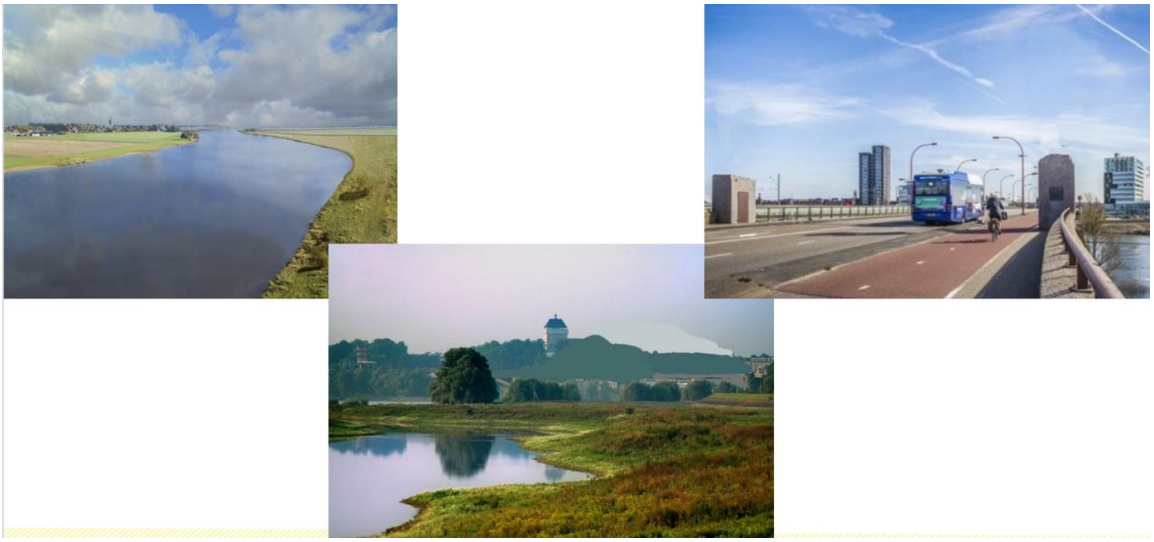


Figure 647.

When looking at the qualifiers to answer the why question, the term 'beautiful' was used frequently in combination with feelings, memories, history of the place but also stories told (on both, experienced and abstract level). Observations perceived the beauty and aesthetics of spaces and places mostly from a visual perspective. Potentially, one could think in extension of sound, smell, haptics as elements of beauty and aesthetics. Interestingly, in only a few cases that came to the front (like mentioning bird song).

Observations are frequently connected to personal feelings, activities and social interaction; walking the dog or walking with friends during a certain daytime and in an intimate conversation give a certain feel and touch to a place; the beauty or aesthetic value of a certain condition is perceived not just through a pair of eyes, but many - and in cases more than human. (See Figures 7&8)

Figure 48.

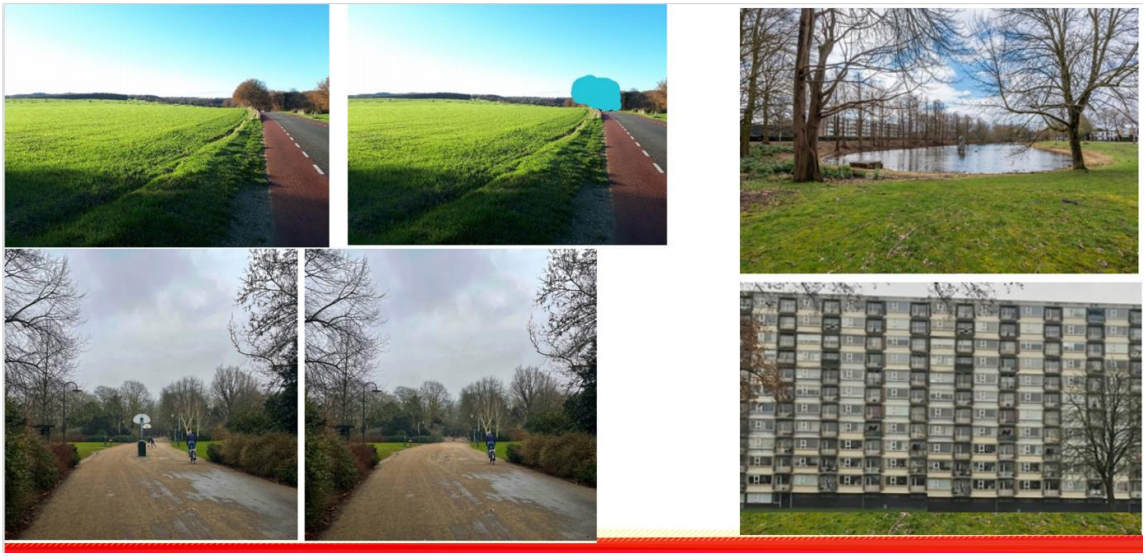


Figure 8.

Interesting outliers were a few (see Figure 6 top left picture Maas trees; Figure 8 top left - transition to mystical realm): What we consider a natural scene receives additional value through the intentionally grown trees as way signs (river basin marker); a certain landmark defines a transition zone to mentally step over into a new realm, an experience of intricate beauty.

We also invited at the very start of the first lecturing session in classroom students to share some thoughts on beauty and aesthetics “as such” using ‘mentimeter’ as a tool. From that, some further aspects can be highlighted (reservation: for most students, EN is a second or third language partly restricting the wording).

Students make judgments about “beauty” - basically from “inside” (gut feeling, nature of human). Other comments link to that by alluding to feelings, emotions, expressions which come “automatically”. The latter can of course be something trained for, indicative for such dimensions are upbringing, forming character, conditioning, or connected with others. This aspect of a nature of the human is reflected in the academic literature and especially in the philosophy on aesthetics by Kant, who claims that as rational beings we cannot escape making aesthetic judgments, as was briefly outlined before. (See Figure 9)

Figure 9.

When thinking about aesthetic aspects in planning, first ideas expressed by students were (full list): urban design in most instances followed by a collection of other aspects, like greenery, multifunctional development, reconnecting with nature, diversity but also uniformity. Listening to locals and the act of “designing beautiful spaces” were also mentioned, as making places from spaces, so transforming the abstract to a (not literally)

concrete setting. (See Figure 10)

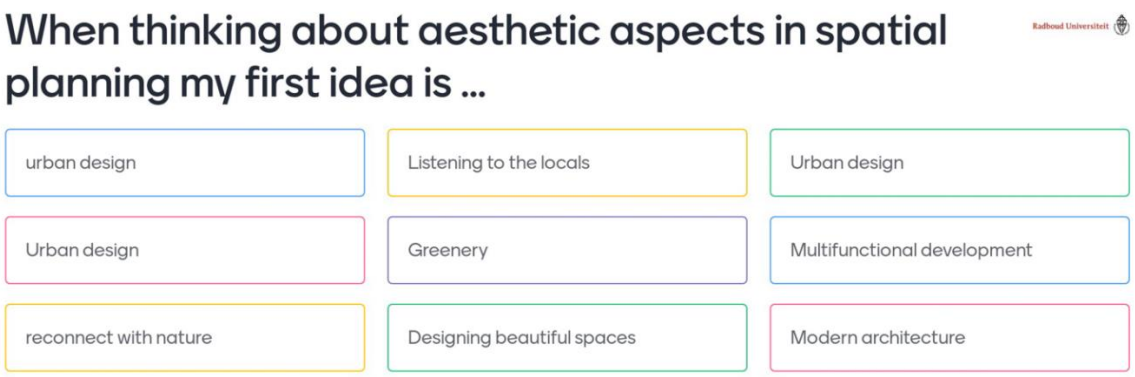


Figure 10.

As said, these are a collection of utterances at the start of the program. What can be seen is the broad range of dimensions listed which also mirror the scientific and academic discussion. A last point in that was the question, where students would see aesthetics placed, as given or created. Students voted with a clear majority for ‘created’; the aspect stands somewhat opposite to the idea that especially beauty is conceived but might as well be seen as a kind of professional deformation; planners are making plans for places, that includes design and aesthetics - which is why such a course is needed!?

When reflecting on the entirety of examples and notions regarding beauty and aesthetics, and when using as a structuring device the Lefebvre'ian trinity of spaces, one can order the observations as depicted in figure x. Mind the reader, that the Lefebvre'ian spaces show overlap and are not mutually exclusive.

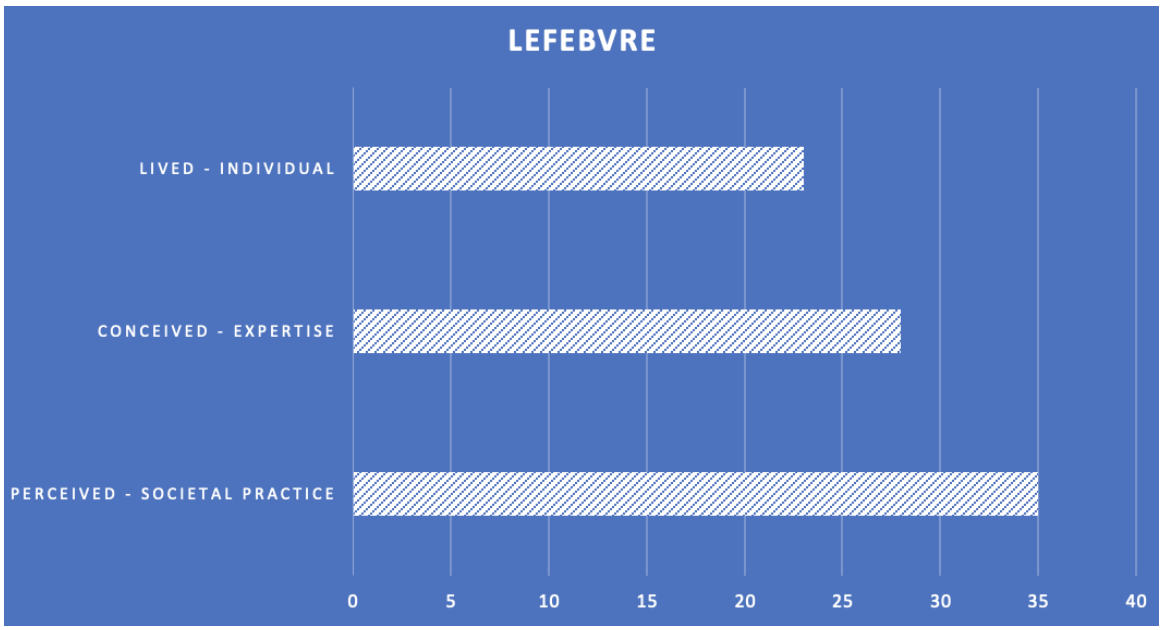


Figure 11. (multiple mentions possible)

What the group of students and their observations show, resonates with Tursić (2019, p. 205) "... Studying the aesthetic space can help urban researchers better understand how the world becomes internalized or externalized by inhabitants, how they develop a stronger concern for justice, or how novelty is borne from a constant dialogue between the ethical and the aesthetic." What needs to be seen is the second aspect, a concern for justice, novelty, and the dialogue between ethical and aesthetical; we will return to this in the group and individual projects.

5. Beauty of transition: case studies

In a second task, students had to study cases for a review of "planned" beauty and aesthetic in concrete projects (though, mostly visited in the digital world as outcome of the CoV restrictions). Tabel 1 presents the choices of projects; student groups collected two examples for their analysis.

Table 1. Overview of Transition Projects

City	*Project*	*Material Dimension*	*Transition Perspective*
New York	*Highline*	Public Space	Social Justice
Seoul	*Seoullu Skygarden*	Public Space	Climate mitigation
Rotterdam	*Dakpark*	Public Space	Climate mitigation
Singapore	*Solar Supertrees Bay South Garden*	Public Space	Climate mitigation
Copenhagen	*Superkilen Urban Park*	Public Space	Social Justice
Seville	*Metropol Parasol*	Public Space	Climate mitigation
Copenhagen	*Hyyge Harbour Bath*	Public Space	Climate mitigation
Arnhem	*Central Station*	Mobility	Public transport
Kyoto	*Kyoto Station*	Mobility	Public transport
New York	*Oculus Transport Hub*	Mobility	Public transport
Naples	*Metro dell'arte*	Mobility	Public transport
London	*Canary Wharf*	Urban renewal	Economic
Amsterdam	*NDSM Wharf*	Urban renewal	Economic
Milan	*Bosco Verticale*	Green building	Housing, Climate mitigation
Amsterdam	*Valley*	Green building	Housing, Climate mitigation
Nijmegen	*Waalfront*	Urban renewal	Housing
Antwerp	*Park Spoor Noord*	Urban renewal	Housing
Bristol	*Citizenspace*	Urban renewal	Housing
Tilburg	*Spoorzone*	Urban renewal	Housing
Jinhua	*Yanweizhou Wetland Park*	Flood protection	Climate mitigation
Nijmegen	*Room for the River (Nevengeul)*	Flood protection	Climate mitigation
Dhaka	*Flood protection*	Flood protection	Climate mitigation

Source: author (groups times cases?).

In terms of the material dimension addressed, public spaces are clearly in the lead, followed by urban renewal projects. Others address mobility, greening or flood protection as material dimension. In terms of the transition aspect, several dimensions can be identified, with housing and climate mitigation as the more frequent topics. Of course, individual projects reach out to more dimensions and are following current requirements to integrate various dimensions - the Table provides the main foci of those. The transition aspects addressed by projects were climate mitigation, housing, public transport,

economic development and in two cases ‘social justice’. We were interested in the line of argumentation and interpretation which students developed in their group but also individual papers (the latter inviting for a conceptual reflection).

Group Paper

Students were comparing two cases from the list above, starting from an interesting transition perspective (see Table 1) and looking besides others into dimensions of beauty and aesthetics, which will be briefly presented in this section.

Within the collection of examples, obvious candidates to discuss aspects of beauty and aesthetics have been the architectural and urban design projects like the Highline (NY), Parasol (Seville), Solar Supertrees (Singapore), or the Skygarden (Seoullu 7017). Besides the obvious design element, these projects were discussed as well at the intersection with aspects of justice (Highline), participation (Superkilen) or environmental dimensions (Supertrees). More specifically, students were developing arguments regarding how those urban designs helped positively influence the other dimensions. To be more specific, how can a project revitalising public space by reusing outdated infrastructures (Hihgline, Skygarden) provide access for all citizens to green infrastructures and public spaces? On the one hand, one receives some innovative public space with ‘pleasant’ architectural features and ‘attractive’ forms; formulating also ‘accessibility’ as part of beauty or aesthetics. On the other, not just doing that but obviously also initiating processes of gentrification and, in the preparation and implementation of the projects, being partially void of participative processes or a fuller recognition of citizens interests (all these perspectives were established using publicly available sources).

The set contained several examples working on mobility issues (railway station projects in Arnhem, Kyoto, or projects on metro stations in New York and Naples). Students were interested in 'attractive' stations with 'beautiful' designs, combining aesthetic quality with smart features, ultimately asking questions regarding the shift in transport modes towards public transport. Can an aesthetically appealing design attract more people to public transport, which is the intention of both projects (with the answer being open, as no real tests on site were possible).

Other examples addressed questions of ‘natural’ beauty, from architectural projects (Bosco Verticale, Milan) to water management projects (Wetland Park, Jinhua or Room for the River, Nijmegen). Aspects of beauty and aesthetics in the first set were connected to environmental sustainability, human wellbeing, but as well the optimal use of the territory; sustainable features, smart technology and healthy living trends; and in general appearance and accessibility. Aspects of beauty in the second set were seen in connection with influences of local materials and symbolism; specific lighting; or the integration of cultural infrastructures via the design of adjacent public spaces. Beauty in the second case was defined in connection with the infusion of local cultural and historical elements

directing perspectives/views; nature preservation; or, indeed, public participation in the development of the project.

Overall, the features outlined before are not that surprising, with maybe the definition of 'accessibility' as aspect of beauty as exception. However, what was interesting to see was that the appeal to identify dimensions of beauty and aesthetics and embed these in broader aspects of transition, worked out in that widening the perspective and also preparing some critical inquiry into plain design dimensions led to different discussions. Questioning together with students whether a project like Metro dell'arte really multiplies the number of public transport users and what else would be needed (like ticket pricing) to do so, helped putting things into perspective. It also helped, from a comparative perspective, discussing projects in view of different local contexts and assess their functionality.

Performances

The performances by the same student groups elaborated on before mentioned aspects further. Juxtaposing cases and elaborating the findings with a view towards engaging people or proposing different strategies. As a case in point the performance by the group working on the Parasol (Seville) and the Harbour Bath (Copenhagen) shall be mentioned here, called 'uninspired': The movie starts with the feelings of an individual student, running through the obviously uninspiring local environment, who accidentally bumps into two foreign students (from Copenhagen and Seville, respectively) who 'sing' to him how beautiful the two public spaces are which are open to all with the refrain 'public spaces give people happy faces' focusing on public needs obviously cheering the student up (one of the students composed and sang a song for that purpose). One might consider this a broad brush picture with standard appeals and narratives (public needs), but engaging for that movie by explicitly starting from individual feelings and being cheered up by two foreign students (which were not foreign but acted as those), shows how complex the engagement on the side of students became.

An interesting and relevant dimension here is, that in all cases were students were engaging in the matter by acting and performing (bringing in their personality and body) one immediately saw more stimulating results and a clearer reflection on relevant items. In terms of the teaching program, these performances were supported by several rounds of feedback before the final performance. All of the performances were delivered as video recordings (with a maximum length of six minutes) for which students used standard editing software and, mostly, their mobile phones to record the performances. Certainly, this group of students in their early twenties had many skills in that respect; social media and video platforms seem to have trained them well.

Individual Paper

The individual papers were supposed to elaborate further on conceptual aspects of beauty and transition. What we present here, are extracts from some of the papers and especially the final sections reflecting on the beauty of transition.

Students were particularly stimulated by the dimensions of the lived and perceived space. Experiences and interactions of the newly created public spaces were considered very relevant; a reflection obviously also of the literature consulted for interpretation. However, students applied their reading of the academic literature to the respective cases coming to interesting insights: „Through reviewing the case of the Metro dell'Arte, one can remark the successful application of both physical and symbolic elements of beauty and aesthetics to induce the transition in mobility (Darley, 2019). Not only were physical artworks, architectural elements, and archaeological remains applied to the stations to create an attractive perceived and conceived space, symbolic elements of beauty like inclusivity, meaning-making, and collaboration also were included by planning authorities to create the conceived space. In the Metro dell'Arte, this has led to a diverse lived space (De Risi, 2018; Corbi, n.d.). Subsequently, this has led to the increased attractiveness and use of public transportation, leading to more sustainability in the city." None of the local actors were of course using any of these conceptual elements, explicitly. The interpretation is that of the student.

Other comments echoed such aspects and dimensions, emphasising local cultures, heritage, but also interaction and embeddedness due to participation and co-creation: „The 'beauty of transition' recognizes the need to let shared values and civic identity lead the way to create a place that is locally embedded among residents and is sustainable for years to come. Accordingly, the strategic transformation will have a positive impact on society, the environment, and the economy."

In terms of the broader idea of transition strategies, the following statement brings another nice view to the table: "The argument that has emerged, and that can also be drawn over a broader perspective on sustainability transitions, is that the instances of beauty experienced by city inhabitants can in different ways shape and thus change the practices they are engaged in. This follows from the fact that beauty can lift people's bodily experienced spaces. A resulting change in user practices can be translated to a change in regime rules which then reconfigures the deep structure of the larger system. A sustainability transition could thus be promoted, as just one of the many different ways, by the very individual and cognitive experiences of delight and a sense of place." The connection between bodily experiences and change of practice that opens up new innovative niches which can penetrate the regime level to push for innovations and create opportunities for sustainable change sounds at least worth considering.

Students are aware of critical perspectives, too, like in the case of iconic architectures and

global players in the field: “The role of beauty in this (illusion of a) transition is taking place at the landscape and the regime level. As described by Edwards (2021), a new generation of train station design is emerging. Prof. … coined the term ‘Calatrava’ising’, indicating the hope of city councils to hire a famous architect who is supposed to create a change for better in their region. The window of opportunity in this case is filled with a globalized design.”

„In this way, it can be said that both within the beauty and aesthetics of temporary use …, friction arises between the user and the planner. On the one hand this creates possibilities to develop beauty and aesthetics in the lived and perceived space but on the other hand these possibilities and the results remains limited by the pressing power of the conceived space." But, frictions respectively conflict over the built environment can be used in creative ways, creating solutions outside beloved boxes.

6. Create beauty in/with planning - Reflection and discussion

As was demonstrated, in the setting of a MA course and based on the works of students, the interpretation and application of beauty and aesthetics in transition developments at an urban scale provide rather diverse perspectives. They are clearly a first approximation but nevertheless also very informative regarding our intention to outline a more systematic approach towards these dimensions in planning and its education.

A central aspect relates to the following: Aesthetic values are not simply inherent to an object, a building, or a place, but are continuously shaped by cultural conditions and dynamic social processes. Aspects of beauty and aesthetics are continuously shaped by, and in turn shape our deep cultural conditions, our shared identities and ideas. These expanded networks of meaning (Tursić) , through which our notions of beauty and aesthetic quality arise, also shape fundamental feelings of interconnectedness and togetherness. With the aspect of affect and social connection beauty and aesthetics can be mobilised to nurture transition processes. We find this back in the New European Bauhaus’ notion of aesthetics, considered not dependent on individual judgement but emanating from a sense of community and place, of diversity and distinction. To make this even more effective, we must dare to imagine the as-yet-unknown instead of relying on well-known typologies (so against unreflective traditionalism or inherited notions of beauty and aesthetics).

We should try to embed these aspects into our teaching, no matter whether in specific or general courses. With the suggested approach combining conceptual dimensions with personal experiences and reflection through, in the end, analysing concrete projects (even if only virtually visited) and acting out transition (inviting for creative techniques involving bodily experience in group settings), many dimensions of beauty and aesthetics can be

addressed. Better of course in a life world setting with more actors around; but that was impossible given the Corona pandemic situation. Suffice to say, that some students had difficulties with the topic as such. It was considered lying too far outside their expectations based on specialisations (water management, mobility, real estate); the novelty was too challenging. Likewise, asking them to produce a kind of theatrical performance to present conceptual and concrete aspects created similar reservations. A majority of students just engaged in standard ways, navigating their way through the separate tasks. However, several performances (all of them were video recordings) were outstanding, including a James Bond re-make to explain the necessity for transformation strategies; stirred not shaken with beauty! What can be seen from the reactions of the group of more eager students is how the engagement with beauty and aesthetics stimulated their degree of reflection, creativity and energy, invested in conceiving and further developing transition ideas and projects. Which is promising, not least for the transition challenges ahead. We need to start dreaming of beautiful projects - and learn in classroom how to do so.

References

Ache, P. (2017). Metropolitan visions: instant, concrete, and conflict free futures? *Territorio*(80), 7-14.

Ban, S., Bria, F., Dávida, E., Eliasson, O., Gylver, G., Heilbron, T., Ingels, B., Magas, M., Schriever, P. M., Mitsotaki, A., Murphy, O., Patel, S., Quenum, L., Rišková, M. B., Schellnhuber, H. J., Skvaril, P., Sousa, J. P., & Trammer, H. (2021). *New European Bauhaus Concept Paper. Presented to the President of the European Commission Ursula von der Leyen by the New European Bauhaus High-Level Round Table*. https://new-european-bauhaus.europa.eu/system/files/2021-07/2021-06-30_New_European_Bauhaus_Concept_Paper_HLRT_FINAL.pdf

Brook, P. (1996). *The Empty Space – A Book about the Theatre: Deadly, Holy, Rough, Immediate*. Simon&Schustere.

Cammen, H. v. d., Klerk, L. d., Dekker, G., & Witsen, P. P. (2012). *The selfmade land. Culture and evolution of urban and regional planning in the Netherlands*. Spectrum.

de Certeau, M. (1984). *The Practice of Everyday Life* (S. Rendall, Trans.). UC Press.

Geels, F. W., & Schot, J. (2007). Typology of sociotechnical transition pathways. *Research Policy*, *36*(3), 399-417. https://doi.org/https://doi.org/10.1016/j.respol.2007.01.003

Informal meeting of Ministers responsible for Spatial Planning and Territorial Development and/or Territorial Cohesion. (2020a). *The New Leipzig Charter. The transformative power of cities for the common good*.

Informal meeting of Ministers responsible for Spatial Planning and Territorial Development and/or Territorial Cohesion. (2020b). *Territorial Agenda 2030. A future for all places*.

Jacobs, J. (1961). *The death and life of great American cities* (Vintage Books Edition, 1992 ed.). Random House.

Jencks, C. (2006). The iconic building is here to stay. *City*, *10*(1), 3-20.

Lefebvre, H. (1991). *The production of space*. Blackwell.

Scruton, R. (2007). In search of the aesthetic. *British Journal of Aesthetics*, *47*(3), 232-250.

Sitte, C. (1889). *Der Städtebau nach seinen künstlerischen Grundsätzen: Ein Beitrag zur Lösung modernster Fragen der Architektur und monumentalen Plastik unter besonderer Beziehung auf Wien*. Graesser. https://archive.org/details/diestadtebaunach00sitt/page/n6/mode/1up

Soja, E. (1996). *Thirdspace: Journeys to Los Angeles and Other Real and Imagined Spaces*. Blackwell.

Talen, E., & Ellis, C. (2004). Cities as art: exploring the possibility of an aesthetic dimension in planning. *Planning Theory & Practice*, *5*(1), 11-32. https://doi.org/10.1080/1464935042000185044

Tursić, M. (2017). *Aesthetic Space: The visible and the invisible in urban agency. (PhD thesis, EPFL)*. EPFL.

Tursić, M. (2019). The city as an aesthetic space. *City*, *23*(3), 205-221.

Welzer, H. (2019). *Alles könnte anders sein. Eine Gesellschaftsutopie für freie Menschen*. Fischer Verlag (e-books).

Wiedmann, & Salama. (2019). Mapping Lefebvre's theory on the production of space to an integrated approach for sustainable urbanism. In M. E. Leary-Owhin & J. P. McCarthy (Eds.), *The Routledge Handbook of Henri Lefebvre, The City and Urban Society* (pp. e-book). Routledge

TRACK 11: TURBULENT URBAN FUTURES: UNCERTAINTY AND ADAPTABILITY

THE DISTRIBUTION, CAUSES AND GOVERNANCE OF URBAN SHRINKAGE IN CHINA (1060)

Qian ZHAO

College of Architecture and Urban Planning, Tongji University, Shanghai, China; 594081886@qq.com

Abstract: The spatial distribution of shrinking cities shows a trend of spreading from local to global, and shrinking has gradually become the new normal of urban spatial evolution. From 2000-2010 to 2010-2020, the agglomeration area of urban shrinking in China migrates from the central region to the northeast, and the population spilover of shrinking towns decreases in a circular pattern. By collecting the data of the last three population censuses and using qualitative, quantitative and questionnaire interview methods, we find out the factors closely related to the phenomenon of urban shrinking, such as geographical location, population structure, urban industrial power, employment positions, public service supply, etc. In response to geographical location and population structure factors, governance strategies are put forward from the perspective of rational formulation of population development policies.

Keywords: Urban Shrinking, Shrinking City, Population Forecast, Distribution Mechanism.

1. Introduction

Since the 1960s, the spatial distribution of shrinking cities has shown an evolution trend from local regions to global expansion (Wu and Sun, 2017). By referring to relevant literature and summarizing the development process of shrinking cities, it can be roughly divided into three development stages: from 1960-1990, the phenomenon of urban shrinking began to appear in the old industrialised cities of developed industrialised countries (Oswalt, 2005); From 1990-2000, the transformation of regional social system accelerated the process of urban shrinking, and the global shrinking urban agglomeration spread to the former socialist countries in Eastern Europe (Mykhnenko and Turok, 2008; Haase, Grossmann and Rink, 2013). In 2000, more than one-sixth of the cities in the world were experiencing population loss to varying degrees (Wiechmann and Bontje, 2015;

Howe, Bier and Allor et al., 1998; Wiechmann and Pallagst, 2012), and urban shrinking gradually became the new normal of urban spatial structure evolution. In the context of global urban shrinking, a number of Chinese scholars have carried out empirical studies on shrinking cities from different levels and perspectives in recent years. According to the data of two population censuses, MAO, Long and Wu (2015) found that the urban population of different sizes in China has decreased significantly (Mao, Long and Wu, 2015). Scholars such as Long and Yang (2015) put forward the paradox of local shrinking between population loss and spatial growth. They found that under the background of rapid urbanisation, a large number of urban population decreased while construction land increased (Long and Yang, 2015). Many scholars investigated urban shrinkage in the Pearl River Delta, Beijing-Tianjin-Hebei Region, Yangtze River Delta, Wuhan metropolitan area and Hunan Province (Li, Du and Li, 2015; Wu, Long and Yang, 2015; Liu and Zhang, 2017; Zhou, Qian and Yan, 2017). Most of the relevant researches focus on the law of population loss in China's cities and towns, but lack of in-depth analysis of the causes of population loss. Therefore, based on the data of the fifth national population census, the sixth national population census and the seventh national population census, this paper observes the spatial distribution characteristics of shrinking cities in China, analyzes the main causes of urban shrinking, and provides corresponding governance measures for different causes of shrinking cities.

2. The Distribution Of Urban Shrinking In China

A number of international scholars have defined the concept of shrinking city. As far as cities are concerned, there are two schools of thought. Martinez proposed that the urban region should include the whole and part of the city, metropolitan areas or towns, and the International Shrinkage Network research Institute in Germany proposed that a city could be defined as an area with more than 10,000 people. In terms of " shrinking ", relevant researchers have different definitions of the duration of population loss and the proportion of population loss. The duration of population loss is mostly defined as 2 years, 5 years and 40 years, and the proportion of population loss is mostly defined as 2 percent, 10 percent and 25 percent of the total population (Li, 2017). On the basis of previous studies, the concept of shrinking cities in this study is defined, that is, cities with population growth rate less than or equal to -10 percent during the decade of census. Due to the limitation of research conditions, only the prefecture-level city level can be grasped in the seventh census data, so the prefecture-level city is selected as the research object of the current distribution of urban shrinking in China.

2.1 China's Shrinking Urban Areas Migrate To The Northeast

By comparing the spatial distribution differences of population shrinking zones from 2000-2010 and from 2010-2020 (Figure 1), the agglomeration areas of shrinking cities spread from Sichuan Province, Ningxia Hui Autonomous Region and Hubei Province to northeast

China, and spread around the original shrinking cities. The number of shrinking cities has expanded from 11 prefecture-level cities and 3 provinces a decade ago to 45 prefecture-level cities and 12 provinces. Currently, shrinking cities are concentrated in Heilongjiang, Jilin, Liaoning, Sichuan, Gansu, Shaanxi and Inner Mongolia Autonomous Region, with sporadic distribution in Anhui, Hebei, Shanxi, Hunan and Hubei provinces.

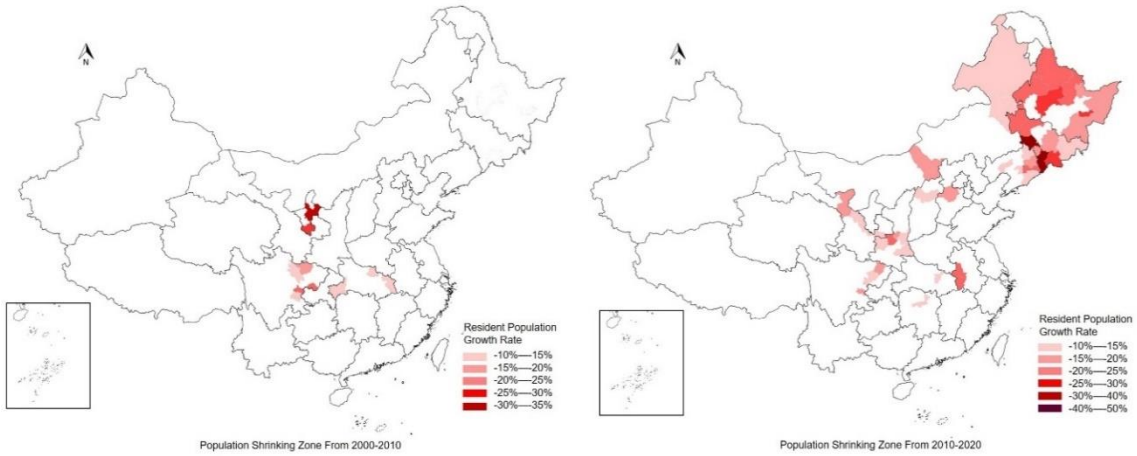


Figure 1. Spatial distribution evolution of two decadal population shrinking zones, China's resident population growth rate ≤ minus10 percent of prefecture-level cities

Sources: Fifth National Census of China, Sixth National Census of China, Seventh National Census of China

2.2 The Population Migration Of Shrinking Towns Is Decreasing In Different Levels

This paper selects xiuyan County, Anshan city, a typical shrinking town in Liaoning province, to observe the change of permanent population in Xiuyan County from 2010 -2020 (Figure 2), and calculates that the shrinkage rate of permanent population in Xiuyan County is about minus13 percent in ten years. In ten years, the total resident population of Xiuyan County continued to decline, showing a typical urban shrinking characteristics.

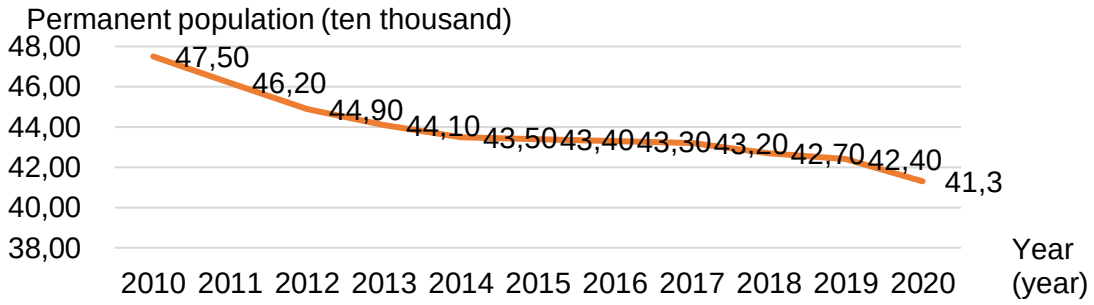


Figure 2. Xiuyan county resident population change rule

Source: Permanent Resident Population data of Anshan Territorial Space Planning, Seventh Population Census of China

In order to analyze the outflow data of permanent resident population in Xiuyan County in 2019, a questionnaire on population migration in Xiuyan County with a total sample size of 2,127 was issued to collect the destination and main reasons of population migration. The research subjects included urban and rural populations, covering a diverse group of people. After the data of the starting and ending points of population flow fall into space, it presents the distribution characteristics of three echelons, and the total number of people decreases by layers. The first echelon is the urban areas in Liaoning Province. The population flowing to this region accounts for 70 percent of the total outflow, mainly concentrated in Dalian, Shenyang and Anshan. The second tier is the developed cities in Beijing-Tianjin-Hebei city cluster and Jiangsu, Zhejiang and Shanghai metropolitan circle, and the population flowing to these developed cities accounts for 20 percent of the total outflow. The third tier is the more peripheral provincial capital cities or coastal cities, such as Haikou, Jinan, Weihai, Urumqi, Panjin, etc., only accounting for 10 percent of the total outflow population scattered in the above cities. In general, people tend to migrate to nearby developed cities.

3. The Main Cause Of Urban Shrinking In China

3.1 Location: Steep Terrain And Extreme Climate

China's population growth slowed down in regions where the growth difference of permanent population was less than minus 10 percent between 2000-2010 and 2010-2020 (Figure 3). China's population growth slowdown zone is far larger than the urban shrinking zone, indicating that China is changing from the development mode of "urban growth as the main body" to the development mode of "urban shrinking as the normal" (Wu and Li, 2019). By analyzing the distribution characteristics of the slowdown zones of population growth, it is found that the slowdown zones are highly correlated with the

topography and geomorphology distribution of China (Figure 3). Slowing population growth zone distribution in an average elevation of 4000 meters above the first rung area, the first step and the second step and the second step, linking to the third step is relatively steep terrain along the line, as well as the northeast and northwest northern cold area, steep terrain and extreme weather is one of the key factors that led to the shrinking of the city.

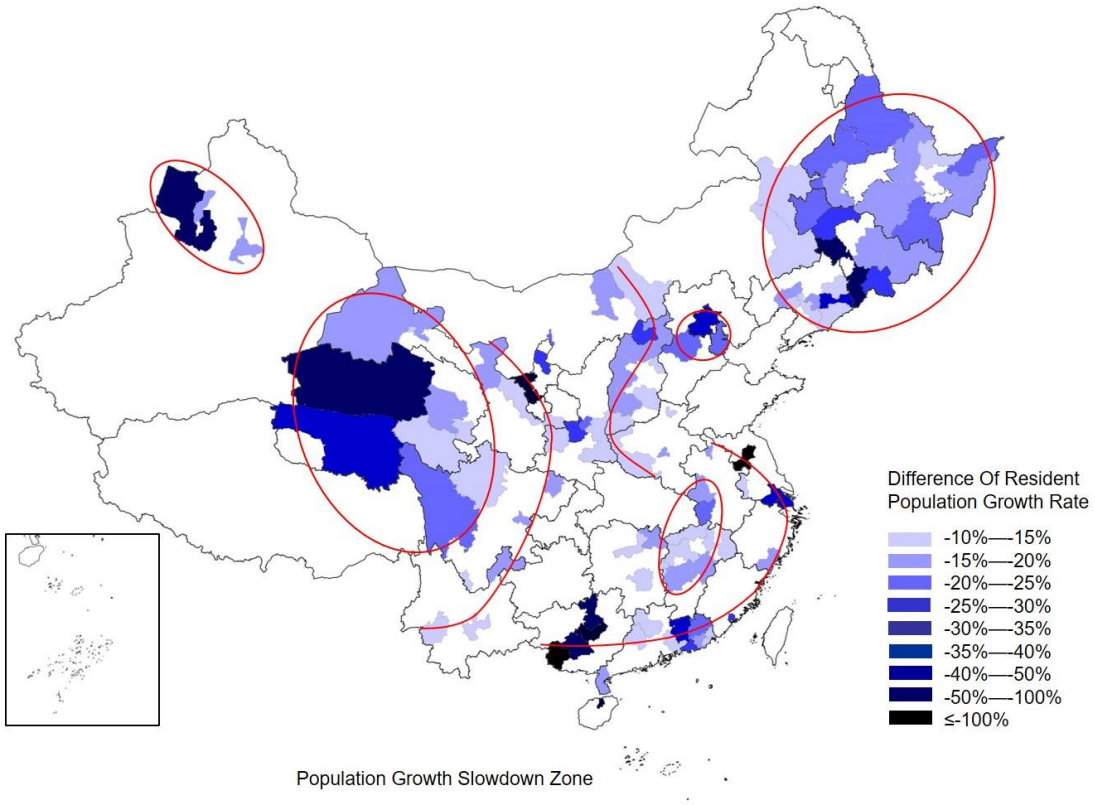


Figure 3. Population growth slowdown zone, Comparison of the last decade and the last decade, China's resident population growth rate ≤minus 10 percent of prefecture-level cities

Sources: Fifth National Census of China, Sixth National Census of China, Seventh National Census of China

3.2 Population Structure: Fewer Children And Aging

The level of natural population growth depends on birth rate and death rate, reflecting the degree and trend of natural population growth. In cities with a negative natural population growth rate, the number of urban births is less than the number of deaths, the fertility rate is generally low, the population aging degree is high, and the problem of aging with fewer children appears. Cities with negative natural population growth rate in

China in 2020 are mainly concentrated in the three northeastern provinces, Sichuan province and Jiangsu, Zhejiang and Shanghai (Figure 4). Except for Jiangsu, Zhejiang and Shanghai, the areas with negative natural population growth rate basically coincide with the areas with urban shrinking, indicating that negative population growth is an important factor affecting urban shrinking. Some cities in northeast China and Sichuan province, affected by mechanical migration of population and negative natural growth, are bound to show obvious urban shrinking at the earliest. Jiangsu, Zhejiang and Shanghai are affected by population migration, and the gap caused by natural negative population growth is filled by floating population (Li and Liu, 2020), which is also the reason why the natural growth rate of cities is negative but there is no shrinking phenomenon.

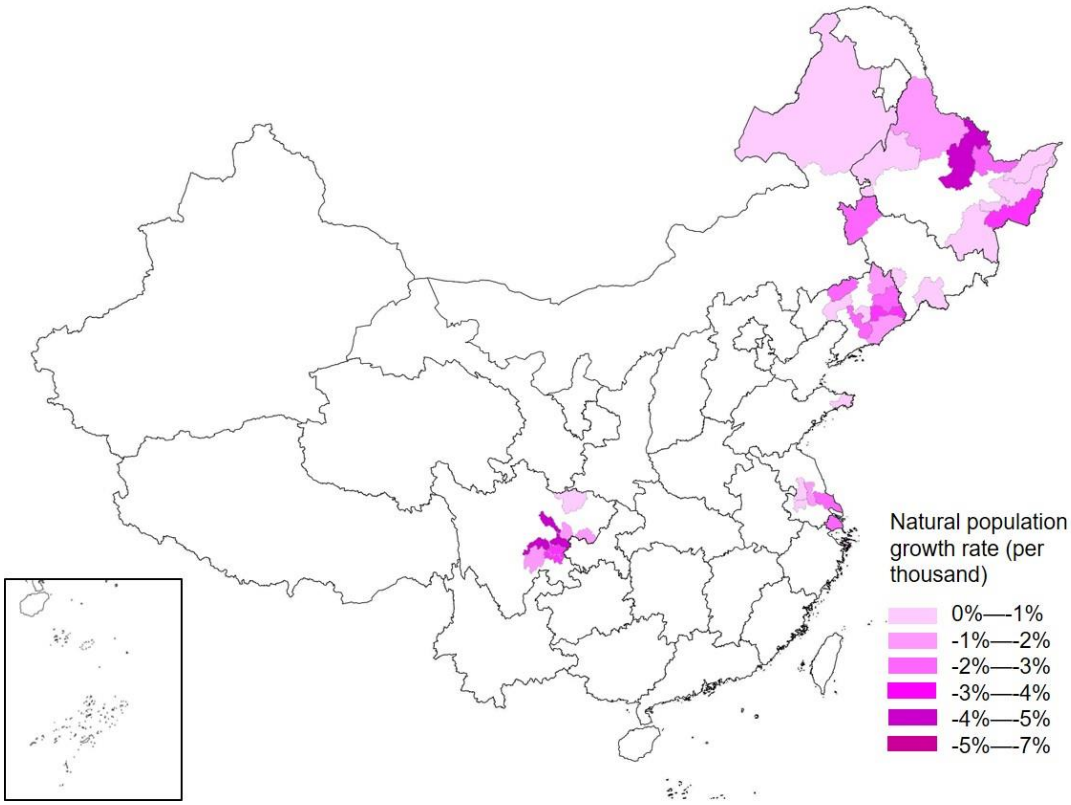


Figure 4. Spatial distribution of cities with negative natural population growth rate in 2020 and the proportion of cities by province

Source: Seventh National Census of China

3.3 Urban Industrial Power: Traditional Industry And Resource Depletion

Based on the spatial distribution of shrinking cities in China, this paper analyzes the leading industrial types of these cities to explore the internal causes of urban shrinking. It is found that guyuan and Wuzhong cities of Ningxia Hui Autonomous Region suffered the most severe shrinking from 2000-2010, mainly producing traditional manufacturing

industries such as food industry, chemical manufacturing and textile. The province with the largest number of shrinking cities was Sichuan province, where resource-based industries such as coal mining and energy and heavy industries such as chemical fiber manufacturing are the main industries. The shrinking urban agglomeration zone from 2010-2020 has shifted to the three northeastern provinces, where the leading industries are mainly traditional industries such as equipment manufacturing and chemical industry and resource-based industries such as energy and steel. There is no exception in other agglomeration areas, and the leading industries are all traditional manufacturing and mineral resource-exhausted industries. The urban shrinking in China is the shrinking of traditional industrial-type cities and resource-exhausted cities. Firstly, under the background of globalisation, global financial flow and production organisation process lead to deindustrialisation, and the proportion of traditional manufacturing industry continues to decline, leading to the shrinking of traditional industrial cities. The other is that the development of some mineral resource-based cities has entered the later stage, and the cumulative amount of urban mineral resources has reached more than 70 percent of the recoverable amount, and the resources are about to be exhausted, leading to urban shrinking.

3.4 Employment: Driven By External Innovation And Entrepreneurship

Since the dominant industrial type of a city is a key factor leading to urban shrinking, several industrial factors are selected to analyze which other industrial factors are associated with population loss in addition to industrial types. Based on the principle of convenient data collection, the factors selected by cities and counties nationwide include number of enterprises, number of urban jobs, number of R&D personnel, number of patent authorisation, GDP, proportion of secondary industry, etc. The correlation analysis between the above industrial factor variables and the urban resident population data shows that the resident population is correlated with the number of enterprises, the number of urban jobs, the number of R&D personnel and the number of patent authorisation, but not with other factors (Table 1). The correlation coefficient between the number of resident population and the number of enterprises, R&D personnel and patent authorisation is 0.5-0.8, showing a strong correlation. The correlation coefficient between the number of permanent residents and the number of jobs is 0.8-1, showing a high correlation. The ability to provide urban employment is highly correlated with the number of permanent urban residents, and the pull of innovation and entrepreneurship outside the city leads to the migration of urban population.

Table 1. Correlation analysis between industrial factors and resident population of 2020 prefecture-level cities in China

	Number of enterprises	Number of employment positions	Number of R&D personnel	Number of patents granted	Proportion of secondary production	GDP
Population of permanent residents	0.59	0.87	0.65	0.79	-0.1	-0.05

Source: China County-level Statistical Yearbook 2020

3.5 Public Service Provision: Lack Of Educational Facilities

According to the data of Xiuyan County's Population Migration Questionnaire, the family members of migrant workers were asked about their reasons for going out. The main reason was to seek employment opportunities and the second reason was to seek better educational resources (Figure 5). Therefore, to cope with urban shrinking, we should increase local diversified employment opportunities and provide better quality and perfect education. The reasons for the return of migrants were mainly the need to return home to take care of the elderly and the lack of suitable employment opportunities in other places (Figure 6). Therefore, in addition to replenishing education facilities, improving supporting facilities for the elderly is also a key measure to attract people to return.

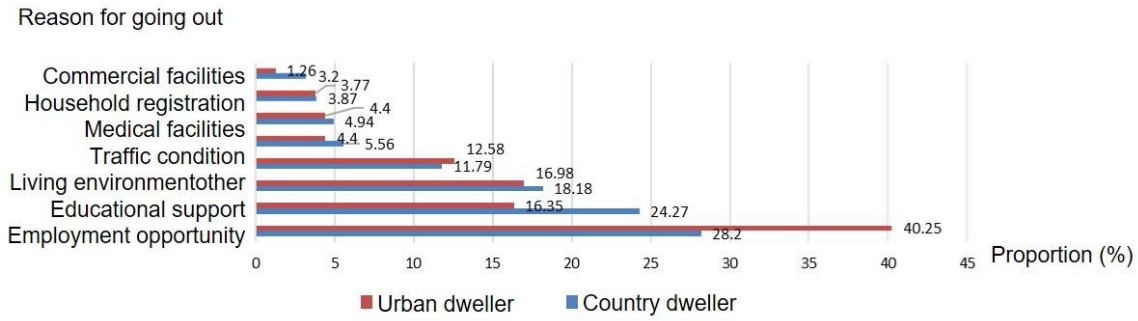


Figure 5. Reasons for migrant workers to go out
Source: population migration survey data of China

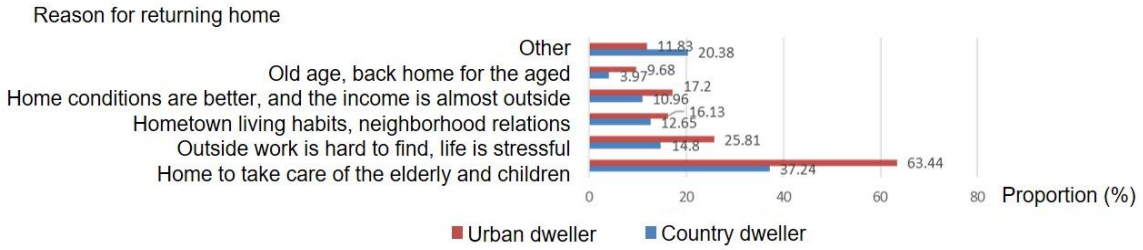


Figure 6 Reasons for migrant workers to return to local areas
Source: population migration survey data of China

3.6 Summary

Urban shrinking is a social process that occurs in different categories and functions on different levels. It is sorted out from two perspectives of composition category and spatial attribute (Table 2). Composition category includes economy, society and space, and spatial attribute is divided into four dimensions: global, national, urban and community. In the economic sphere, the main causes are the continuous flow of financial capital around the world, the deindustrialisation of countries, the depletion of urban resources and the push and pull of employment between cities; Low fertility rate and increasingly serious aging problem are the main factors in the social dimension; At the spatial level, extremely dangerous geographical location and insufficient supply of public facilities are the main causes of urban shrinking.

Table 2 Main causes of urban shrinking in China

	Economic	Social	Space
The Global	Global financial flows		
Countries	De-industrialisation		
Urban	Resource depletion The employment of push-pull	Decreases aging	The rugged Extreme weather
Community			Lack of public facilities

Source: self-drawn by author

4. Governance Of Urban Shrinking In China

4.1 Policies For Population Development Were Properly Formulated

Formulate rational policies for population development within the economic and social scope at the national and city levels. In the past decade, serious urban shrinking has occurred in northeast China, and the government has adopted positive policies to deal with it, such as the formulation of the Liaoning Province Population Development Plan

(2016-2030) and anshan City Population Development Plan (2016-2030). According to the Population Development Plan, Liaoning will implement the new development concept continuously, carry out the revitalisation strategy of the old industrial base deeply, speed up the construction of China (Liaoning) pilot Free Trade zone, and maintain the sustained, steady and healthy economic development together with the whole country. The future economic situation indicates whether Liaoning can gather population. It is clear in the plan that the total fertility rate will be raised to the level of population generation replacement (1.8) by 2030, and the total population will be kept at a reasonable scale commensurate with the overall revitalisation of liaoning's old industrial base. The formulation of population development policies provides a strong guarantee for talent and population agglomeration (People's Government of Liaoning Province, 2018).

In the traditional urban overall planning and the present territorial space planning, the population growth of shrinking cities depends on the main causes of urban shrinking. When we predict the population size of shrinking cities, we do not simply judge the future by the current growth rate, nor do we deny the fact of shrinking and plan incrementally. It is necessary to take into account all factors that affect urban shrinking, and form a more scientific method of population prediction and distribution through multi-dimensional correction of impact factors, so as to help improve the rationality of population development policy making.

4.2 Inner Urban Regeneration To Absorb Innovative Talent

In the economic and spatial categories at the urban level, the governance strategy of absorbing innovative talents through regeneration in inner cities is adopted. In Europe and America, where cities shrank earlier, governments have often reacted in one of two ways. An attitude, a receiving U.S. city of Pittsburgh iron and steel industry, for example, the government in the face of the urban population of negative growth, claiming the slow to adapt to the population fluctuation, through the renovation of the ecological environment, strengthening infrastructure construction, focus on reforming the sub-centres city to enhance the inner urban vitality, enable people to live here(Yang and Hua, 2009), slow down the trend of population outflow. , with against another in the German city of leipzig, for example, the government's response to the shrinking of urban governance strategy is divided into two phases: the first phase of "urban growth" strategy is put forward, a lot of investment in the areas of housing, employment, stimulate urban growth again, but these actions caused the government to make ends meet, produce the debt crisis, the economic downturn into state, and increased population shrinkage; In the second stage, the government puts forward the urban island strategy to make the city livable by transforming old urban areas, reusing abandoned factories, holding cultural exhibitions and sports events, improving urban living environment and optimizing urban layout, etc., so as to attract young innovative population to move in and promote economic development (Xu, 2015). The successful transformation experience of these traditional resource-based cities under government governance measures provides a

governance approach for Chinese government to deal with urban shrinking.

4.3 Education And Elderly Care Facilities Will Be Provided With Precision

At the social and spatial level of the community, education and elderly care facilities are precisely allocated. Under the influence of various factors, in the past general planning and the present territorial space planning, the government usually adopts the attitude of continuous growth to predict the total population of shrinking cities in the future. The allocation of educational facilities is based on the result of population prediction. The predicted population increases while the actual population decreases, which leads to the overallocation of educational service facilities, resulting in some idle educational space and low efficiency. Since 2005, Japan has stepped into an era of population shrinking (Shen, Zhu, Liu and Mu, 2020), with 70 percent of the country's cities experiencing varying degrees of population shrinking. In order to cope with the reduction of school-age children in shrinking cities, the Japanese government adopted regulation strategies to reduce the number of educational facilities, such as the "primary and secondary school system" and "the introduction of day school to improve commuting" (Dong, Zeng, Li and Wang, 2021). Under the condition of the reduction of students, class size and teacher allocation were guaranteed to be economical and reasonable, and precise allocation of supply and demand was realised. At the same time, in order to cope with the small number of children and aging in shrinking cities, the Japanese government has taken a series of measures to improve the parenting system, such as increasing the number of kindergartens, carrying out childcare, extending childcare hours and reissuing childcare subsidies (Shen, Zhu, Liu and Mu, 2020), to relieve the pressure of social parenting. To construct a three-tier system of home care, community care and captive living for the elderly, improve the social support system for population aging (Shen, Zhu, Liu and Mu, 2020), deal with the serious aging phenomenon in shrinking cities, and also provide governance ideas for the Chinese government to deal with urban shrinking.

5. Summary

The shrinkage of cities is due to the change of urban population, which not only follows the law of natural evolution, but also is guided by policies and embodies the value orientation. On the one hand, the natural changes of population follow the natural evolution law of population system, birth, death and other natural changes have strong regularity, which can be judged by the trend extrapolation. On the other hand, the mechanical change (migration) of population is greatly influenced by policy guidance and industrial development (Zhou and Qian, 2015). The formulation of population goals and the distribution of total population should also consider the impact of multiple factors on population development. This paper analyzes the distribution characteristics of urban shrinking in China, analyzes the main causes of urban shrinking and the feasible governance strategies of the government, so as to help China's urban development better

cope with the "new normal of shrinking ".

References

Dong,Yu, Zeng,Erli, Li,Hanzhe, and Wang,Guangpeng. (2021)Countermeasures and Enlightenment of Japanese basic education facilities planning under the background of urban shrinkage. Journal of Western Human Settlement Environment, 36(3): 116-124. (in Chinese)

Haase, A.，Grossmann, K., Rink, D. (2013) Shrinking cities in postsocial-ist Europe-what can we learn from their analysis for urban the-ory-making. RC21 Conference： Resourceful Cities.

Howe, S. R.，Bier, T.，Allor, D. et al. (1998) The shrinking central city amidst growing suburbs：Case studies of Ohio's Inelastic cites. Urban Geography, 19: 714-734.

Long,Ying，Wu,Kang. (2016) Shrinking cities in a rapidly urbanizing China. Environment and PlanningA, 48(1): 220-223.

Li,Xun, Du,Zhiwei, and Li,Xianfeng. (2015) Spatial distribution and mechanism of urban shrinkage in the Pearl River Delta. Modern urban research, (9): 36-43. (in Chinese)

Liu,Yubo, Zhang,Xueliang. (2017)Study on the phenomenon of urban shrinkage in Wuhan Metropolitan Circle. Planner, 33(1): 18-25. (in Chinese)

Li,Chenhui. (2017)Research on influence factors and planning countermeasures of shrinking cities in Northeast China. Beijing University of Civil Engineering and Architecture. (in Chinese)

Li,Jianxin, Liu,Ruiping. (2020)The difference analysis of negative population growth trend among provinces, (4): 35-36. (in Chinese)

Mykhnenko, V.，Turok, I. (2008)East European Cities—Patterns of growth and decline，1960- 2005. International Planning Studies, 13: 311-42.

Mao,Qizhi, Long,Ying and Wu,Kang. (2015)Spatial and temporal evolution of population density and urbanisation pattern in China: 2000-2010. Urban planning, 39(2): 38-43. (in Chinese)

Oswalt, P. (2005)Shrinking Cities：International Research. Berlin：Kunst-Werke Berlin, 8-12.

People's Government of Liaoning Province. (2018)Notice of the People's Government of Liaoning Province on Printing and Distributing the Population Development Plan of Liaoning Province (2016-2030), 20th. (in Chinese)

Shen,Yao, Zhu,Hongfei, Liu,Menghan and Mu,Xiayong. (2020)Research on the planning countermeasures in the age of urban shrinkage in Japan under the background of fewer children and aging. International urban planning, (2): 49-51. (in Chinese)

Wu,Kang, Sun,Dongqi. (2017)Research progress and prospect of urban shrinkage. Economic geography, (11)：60-61. (in Chinese)

Wiechmann, T.，and Bontje, M. (2015) Responding to tough times: Policy and planning strategies in shrinking cities. International Planning Studies, 23: 431 - 446.

Wiechmann, T. K. M. and Pallagst, K. (2012) Urban shrinkage in Germany and the USA: a comparison of transformation patterns and lo-cal strategies. International Journal of Urban and Regional Research, 36(2): 261-280.

Wu,Kang, Long,Ying and Yang, Yu. (2015)Local shrinkage of the Beijing-Tianjin-Hebei region and the Yangtze River Delta: Pattern, type and Influencing factors identification. Modern urban research, (9): 26-35. (in Chinese)

Wu,Kang, Li,Yaochuan. (2019)Cognitive misunderstanding and spatial planning response of urban shrinkage. Beijing planning and construction, 9-10. (in Chinese)

Xu,Bo. (2015)A study of urban shrinkage in Leipzig and Liverpool. Jilin University, 103-115. (in Chinese)

Yang,Ddongfeng, Long,Ying and Yang,Wenshi et al., (2015)Population loss and rapid spatial expansion: The paradox of urban shrinkage in China's rapid urbanisation process. Modern urban research, (9): 20-25. (in Chinese)

Yang,Xiaodi, Hua,Ying. (2009)The requirements and challenges of Globalisation to the development of innovative cities -- A case study of Pittsburgh, an American traditional industrial city. Urban development research, (12): 30-36. (in Chinese)

Zhou,Kai, Qian,Fangfang and Yan,Yan. (2017)The "Shrinking Map" of Population in Hunan Province on Multiple Geographic Scales. Geographical research, (02): 267-280. (in Chinese)

Zhou,Kai, Qian,Fangfang. (2015)Shrinking cities: Advances in urban development paths under Reverse Growth scenarios. Modern urban research, (9): 2-13. (in Chinese)

A SYSTEM DYNAMICS APPROACH FOR THE IMPACT OF TRANSIT-ORIENTED-DEVELOPMENT AND COVID-19 ON KAOHSIUNG MASS RAPID TRANSIT RIDERSHIP (1076)

Hsin-Jung Hsieh[1], Oliver Feng-Yeu Shyr[1*]

[1]National Cheng Kung University, Taiwan, [*]oliver.shyr@gmail.com

Abstract. TOD reduces private transportation use, promotes public transportation development, and increases ridership. This study examines the Kaohsiung MRT to suggest planning recommendations for each station type. System dynamics are used to simulate the feedback relationship between TOD planning factors and MRT ridership. Results show that all station types positively impact TOD-Design, while TOD-Density is the main factor affecting ridership for "Suburb" and "CBD" stations, and TOD-Diversity for "Residential" stations. The study aims to improve public transportation ridership and provide policy strategies for promoting TOD.

Keywords: transit-oriented development; system dynamics, ridership

1. Background

With Taiwan's push for Transit-Oriented Development (TOD) initiatives, cities aim to integrate people, activities, and public spaces, thereby promoting public transport usage and reducing reliance on private cars. Yet, Kaohsiung's urban development has led to a high-density, low-intensity city center and an Automobile-Oriented Development (AOD) model in emerging areas. Despite the government's TOD efforts and enhancements to metro ridership, the absence of station-specific guidelines has hindered progress and yielded unsatisfactory outcomes. Nonetheless, TOD's primary aim is to effectively reduce the use of private transport. Additionally, it seeks to facilitate the development of public transport to increase ridership (Pan, Li, Shen, & Shi, 2017).

Therefore, this study aims to investigate the main factors affecting passenger traffic at each station of the Kaohsiung MRT, and to provide customized planning suggestions for different station types. Through this study, the TOD strategy for Kaohsiung City can be further optimized. Suggestions and countermeasures for each station will be proposed to better achieve the desired goals of TOD.

The study will examine the impact of TOD planning factors on ridership using the Kaohsiung MRT Red and Orange Line as the empirical area, exploring Density, Diversity, Pedestrian and Bicycle Friendly Design, Destination Accessibility, and Distance. A system dynamic feedback loop will be established to circumvent the limitations of cross-sectional

analysis that arise due to insufficient long-term data in multivariate regression methods. The simulation results will guide policy strategies to promote TOD in the future.

• The system dynamically simulates the degree to which changes in the parameters of each factor influence ridership, and it derives appropriate planning policy tools for each type of station.

• The goal of this study is to build scenarios that simulate the impact of changes in the TOD planning elements on its ridership, as well as on the overall population, industry, commerce, and private transport.

• To develop TOD planning guidelines for each type of station.

2. Literature Review

2.1 Relationship between TOD and rapid transit patronage

Transit-oriented development (TOD) can increase public transport ridership through its three elements: Density, Diversity, and Pedestrian Friendly Design (Cervero & Kockelman, 1997). However, TOD can also have negative impacts on environmental quality (Ewing & Cervero, 2001). Studies have shown that applying TOD planning factors, such as the development of urban design around stations, can reduce total trips and vehicle miles traveled, improve air quality, and increase ridership (J. J. Lin & Gau, 2006; Cervero & Kockelman, 1997). TOD planning can also influence changes in behavioral choices and riderships, facilitating its development (Cervero, 2004). The relationship between TOD planning and public transport ridership has been explored in Taipei City, where it was found that ridership is significantly higher in a TOD-compliant urban environment (density, diversity, design). The key factors for success regarding TOD planning on the built environment can reduce the use of private modes of transport (Ewing & Cervero, 2001; J.-J. Lin & Shin, 2008). This study aims to examine the benefits of TOD planning and its dynamic impacts on ridership in order to guide subsequent strategies and to verify hypotheses to be used for simulation (Ewing, Hamidi, & Grace, 2016).

2.2 TOD Planning and Key Factors for Success

Academics have proposed a set of important planning factors for TOD implementation, including the '3D' factors of density, land use diversity, and pedestrian-oriented design (Cervero & Kockelman, 1997). According to Cervero, Sarmiento, Jacoby, Gomez, and Neiman (2009), public transit distance and destination accessibility are also important factors affecting the effectiveness of TOD, thereby forming the '5D' planning factor. The impact and relevance of these 5D planning factors on the ridership of TOD will be investigated later.

•*Density*

Compact land use density can significantly increase the frequency of public transport system services, which in turn can improve ridership and convenience (Cervero & Kockelman, 1997; Ewing & Cervero, 2017; Cervero et al., 2009). In addition, increased housing density and public facilities around public transport stations may bring additional benefits (Li, Li, Li, Xu, & Qin, 2008; Ratner & Goetz, 2009; Ratner & Goetz, 2013). However, high-density development can lead to a deterioration in environmental quality and give rise to negative issues such as congestion and social injustice (Xia, Zhengwei & Zhang Ye, 2019).

•*Diversity of Land use*

Mixed residential and commercial uses can promote walking or bicycling to destinations, increase access to public transit, and reduce the use of private transportation. Cervero and Kockelman (1997) found that mixed land use in the San Francisco Bay Area reduced travel demand and increased non-motorised use. Loo et al. (2010) suggested a strong positive correlation between mixed land use and rail transit ridership in Hong Kong. Chen et al. (2011) showed that high building densities and land use diversity promote the use of public transport.

•*Design for Pedestrian-Friendly System*

Good urban design can provide easier access to destinations and create more friendly and safe spaces for pedestrians, bicyclists, and transit passengers, thereby encouraging the use of public transport (Cervero & Radisch, 1996; Niles & Nelson, 1999). The design of mixed-use street profiles can stimulate the desire to walk, thereby reducing the use of personal transport (Cervero & Kockelman, 1997). Loo et al. (2010) found a positive correlation between mixed-use land use in Hong Kong and rail transit usage. The study also showed that limiting parking space in the city center can improve the quality of public space and the use of public transport (Y.-p. Chen et al., 2011). Pedestrian-oriented urban design can attract business concentration and development, and increase public transport ridership.

•*Distance to Mass Transit Stations by Walking*

The convenience of transfer systems between different modes of public transport around stations is crucial to enhancing inter-transit transfers. This can increase people's willingness to use public transport (Cheng, Nguyen, & Lau, 2012). As part of this planning factor, the ease of transferring is often assessed by the number of bus stops or bus routes in the vicinity of a rail station.

•*Destination Accessibility*

Improving mobility and accessibility around public transport stations can increase ridership (Cervero et al., 2009; Bai Rendezvous & Liu Renhua, 2014). Accessibility of destinations refers to the ease of reaching services such as kindergartens, schools, colleges, banks, libraries, post offices, hospitals, clinics, restaurants, shopping centers, and hostels from public transport stations. Most studies have used the number or density of these services and establishments as a measure.

2.3 Impact of TOD Factors on Ridership

Previous studies have empirically analyzed the impact of TOD planning on station ridership, primarily focusing on Taipei MRT stations and utilizing different TOD elements (Lin, M. & Shih, 2007). However, these studies have predominantly used cross-sectional data for analysis, lacking long-term validation and policy consideration. Therefore, this study selects Kaohsiung's rail transit stations as the empirical target and uses a systematic dynamic analysis method to study the main factors affecting the ridership of each station, with the goal of increasing public transport ridership.

Dynamics between Urban Transport Systems and Planning Strategies

System Dynamics is a research methodology developed by Jay W. Forrester, a professor at the Massachusetts Institute of Technology, in 1956. It is based on the concept of Information Feedback (Forrester, 1997). Through rigorous quantitative modeling and analysis, it explores the organization and scope of complex systems, the relationship between processes and information within the system, and designs strategies to change system structure and behavior (Chao-Chung Yang, Chang-Hsien Chen, Hsin-Cheng Yeh, & Chiu-Hsien Yeh, 2007).

In transport planning and urban environment studies, system dynamics can be applied to explore the impact of various factors on urban transport systems, such as policy interventions, TOD, environmental factors, tourism, and commuting (Jifeng, Huapu, & Hu, 2008). System dynamics-based analysis can also be used to examine the dynamic effects of TOD redevelopment, light rail station construction, and housing and transport affordability on urban economies.

Our study adopts a systems dynamics approach to construct a model that explores the dynamic relationship between TOD factors and ridership. This approach is aimed at improving the accuracy of system dynamics simulation and proposing guidance for subsequent strategies.

3. Research Design

The research process begins with establishing the motivation of the study, defining the

variables that affect the mass transit-oriented traffic according to the previous literature review, and incorporating density, land use diversity, pedestrian-oriented urban design, mass transit interchange distance, and destination accessibility into the system dynamic analysis system, exploring the causal loop of the 5D planning factors within each subsystem, and constructing a system dynamic model for each subsystem. The system dynamic model of each sub-system is then constructed, and the sub-systems are linked by inter-system variables to form a system dynamic model representing TOD planning.

3.1 Data Collection

Based on literature review, we select the 5D variables related to TOD planning practices in Taiwan. Considering the availability of data, we use data from 2011 to 2019, the year before the outbreak of Covid-19, for model calibration. We then simulate the future development of the area surrounding the mass rapid transit stations from 2020 to 2029. In addition, we use the data from the Red Line and Orange Line of the Kaohsiung MRT. Data for population and land use are collected within a 600-meter walking distance using ArcGIS software. Three representative stations from three categories are selected for dynamic simulations.

3.2 Diagrams and Equations for Dynamic Simulation

•*Causal Loop Diagram (CLD)*

The equations used for CLD in the dynamic simulation are mainly calibrated from our collected data and some are adopted from relevant studies.

•*Stock and Flow Diagram (SFD)*

Following the CLD, we elaborate on the SFD to highlight the impact among the key factors in the urban system. A set of specific components for system dynamics is then designed to show all the equations in the above diagrams.

•*Model Calibration and Validation*

In order to simulate future development of other mass rapid transit (MRT) stations in Kaohsiung, we calibrate all the equations and validate our model using statistical tests. We also repeatedly modify our model parameters to reduce the discrepancies between our predictions and the historical data.

4. System Dynamics

4.1 Classification of Kaohsiung MRT Stations

According to previous research (Zhang Xuesheng & Lin Mengyao, 2011), MRT stations should be classified into various groups based on their spatial characteristics and planned using different strategies. Our study applies cluster analysis based on the spatial characteristics and the 5D factors of MRT stations, dividing these stations into three groups. The details of the variables are as follows:

•*MRT Station Ridership*

The annual average number of passengers entering and exiting each station of Kaohsiung MRT in 2019 was used as the sample data to classify the different levels of station use.

•*Housing Land Use*

The land area used for residential purposes within a 600m radius of the Kaohsiung MRT station was used as sample data to group stations by residential density.

•*Commercial Land Use*

The land area used for commercial purposes within a 600m radius of the Kaohsiung MRT station was used as sample data to group stations by levels of commercial use.

•*Industrial Land Use*

The land area used for industrial purposes within a 600m radius of the Kaohsiung MRT station was used as sample data to group stations by levels of industrial use.

•*Diversity Index*

As a measure of diversity, the four categories of residential, commercial, industrial, and other uses within the 600m radius of the Kaohsiung MRT station were used to classify differences in land use diversity. The Shannon-Wiener index was then used to calculate the diversity index, as follows:

$$H = -\sum_{k=1}^{n} p_k \ln(p_k) \quad \text{Eq. 1}$$

P_k: Percentage of land area within spatial boundaries by land use type k

n: Total number of land use categories

4.2 Cluster Analysis

This study employs a two-stage cluster analysis method to classify MRT station samples. Based on shared attributes among samples, the 37 stations of the Kaohsiung MRT are divided into three clusters: "CBD", "residential core", and "suburban". The characteristics of each station type are as follows:

•*Central Business District*

CBD stations, totaling five, exhibit high MRT ridership, a high proportion of commercial and residential use, and a high diversity index.

•*Residential Core*

Residential core stations, totaling 19, have a high proportion of residential use and the second-highest diversity index.

•*Suburban Area*

Suburban stations, totaling 13, have a high proportion of industrial use but low MRT ridership and a low diversity index.

Our study selects Formosa Station to represent the CBD area, Yanchengpu Station for the residential area, and Weiwuying Station for the suburban area.

4.3 System dynamics models for subsystems

•*Population Subsystem*

The population subsystem uses 'residential population' as a metric, which is influenced by 'natural increase' and 'social increase' flows. The 'in-migration' component of social increase is influenced by the residential use subsystem (Cervero & Kockelman, 1997; Ewing & Cervero, 2017; Cervero et al., 2009). This study defines the main factors influencing in-migration as the average housing price per person and the average number of employment opportunities per person.

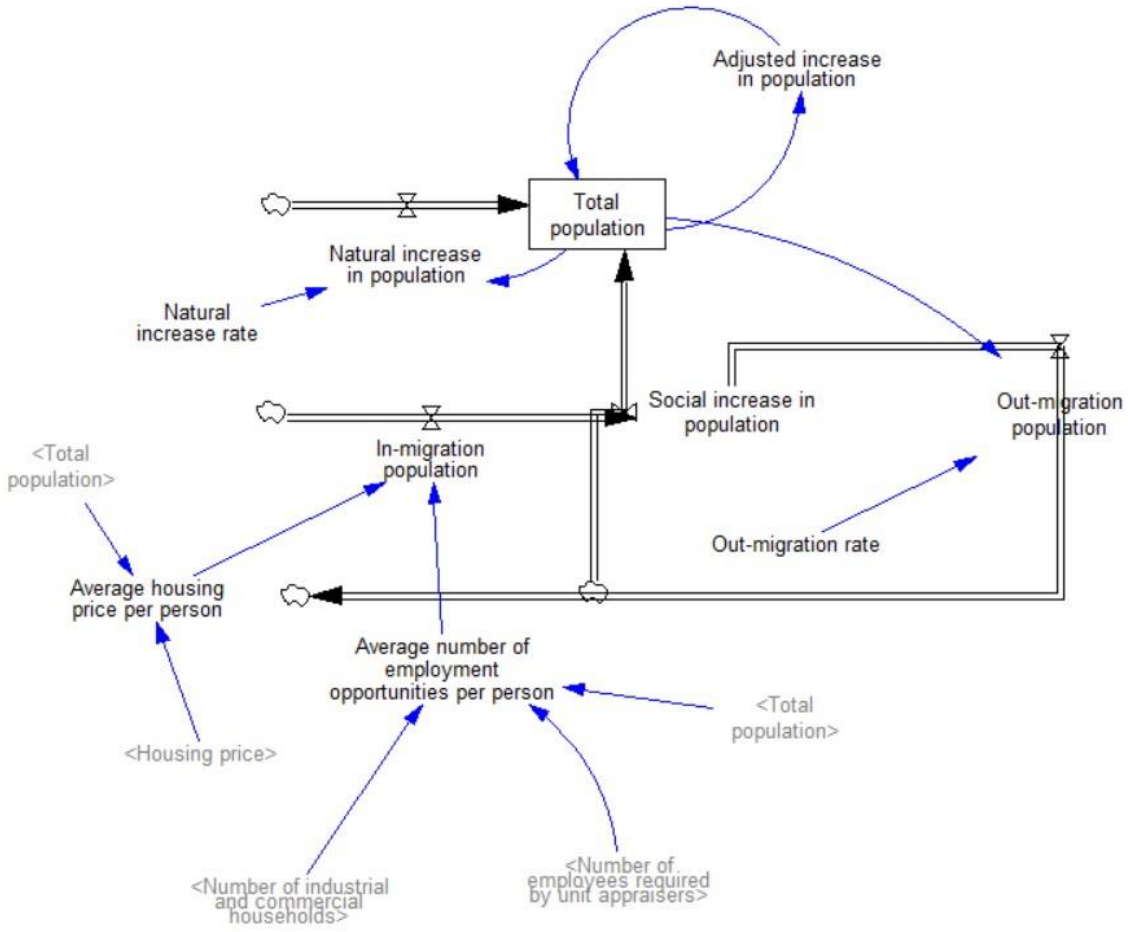


Figure 1. Population subsystem Stock and Flow Diagram

The quantitative model of the population subsystem for Weiwuying MRT station is shown below.

4.4 Resident population

(INTEGER (Social increase + Natural increase))+Adjusted residential population increase/decrease,10642) Eq.2

Description: The initial value is the total population of 10,642 in 2011, sourced from the Socio- Economic Data Service Platform

•Natural increase in population (Unit: Persons/year)

(Total residential population * natural increase rate)/1000 Eq.3

•Social increase in population (Unit: Persons/year)

Incoming population – outgoing population Eq.4

•Incoming population (Persons/year)

INTEGER (1508+(-214244)*average dwelling price per person+(-2127.55)*average employment opportunities per person+(-2.14742e-13)) Eq.5

The regression equation for the in-migration population of zone i in year t: $M_{i,t} = \beta_0 + \beta_1 X1_{i,t-1} + \beta_2 X2_{i,t-1} + \varepsilon_{it}$ Adjustment after R2 = 0.809

•Moving out of the population (Unit: Persons/year)

INTEGER (Total resident population*Employment rate/1000) Eq.6

•Average residential price per person(Unit: ($10,000/ping)/person)

Total residential price/residential population Eq.7

•Average number of employment opportunities per person (Unit: Number of shops/person)

(Number of industrial and commercial establishments * Number of workers required for the industrial and commercial sector per unit)/Total population living in the area Eq.8

•Quantitative model table of population subsystem for Yanchengpu MRT Station (Residential Station)

•Total resident population (Unit: Persons)

(INTEGER (social increase in population + natural increase in population)) + adjusting the increase or decrease in residential population, 19546) Eq.9

The initial value is the total population in 2011, 19,546, and the source is the Socioeconomic Information Service Platform.

•Incoming population(Unit: People/year)

2643.09+100053*average residential price per person+(- 4184.64)*average employment opportunities per person+- 7.32649e-13 Eq.10

The regression equation for the in-migration population of zone i in year t: $M_{i,t} = \beta_0 + \beta_1 X1_{i,t-1} + \beta_2 X2_{i,t-1} + \varepsilon_{it}$ Adjust after R2 = 0.72.

•Quantitative model table of population subsystem for Formosa Boulevard MRT Station (CBD station)

•Total resident population (Unit:People)

(INTEGER (social increase in population + natural increase in population)) + adjusting the increase or decrease in residential population, 41826) Eq.11

The initial value is the total population in 2011, 41,826, and the source is the Socioeconomic Information Service Platform.

•Incoming(Unit:People/year)

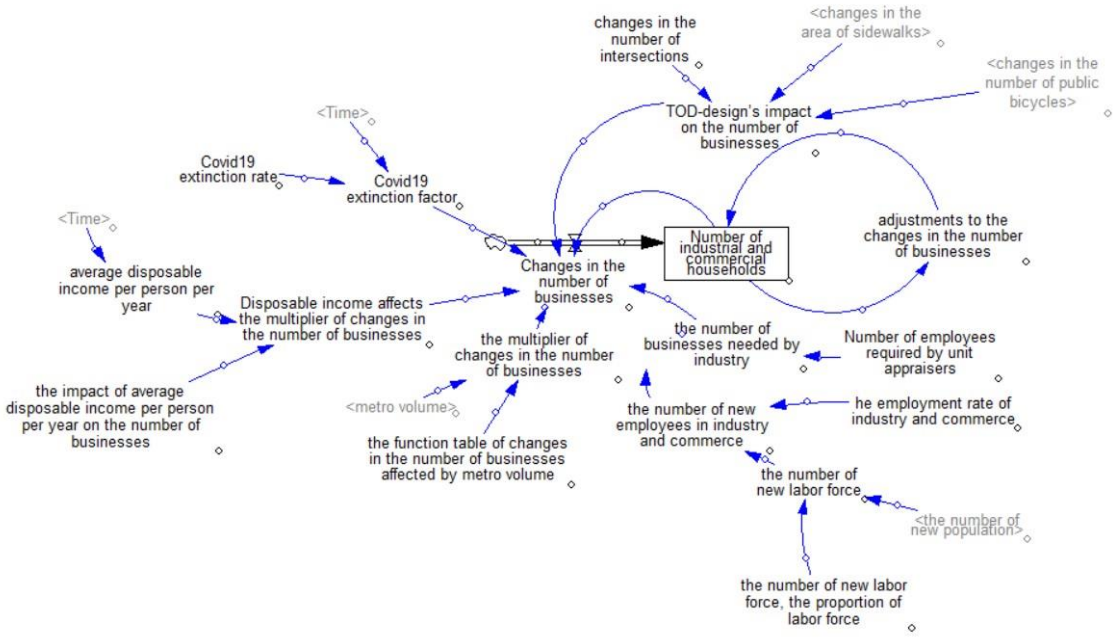
2468.63+(4.92623e+06)*average residential price per person+(2942.98)*average employment opportunities per person+(2.52637e-13) Eq.12

The regression equation for the in-migration population of zone i in year t: $M_{i,t} = \beta_0 + \beta_1 X1_{i,t-1} + \beta_2 X2_{i,t-1} + \varepsilon_{it}$ Adjust after R2 = 0.67.

•*Commercial Land Use Subsystem*

The residential and commercial subsystem is determined by the number of buildings and households. An increase in population can attract land use benefits, and public transport traffic can boost the density of facilities. This model proposes that the number of commercial and industrial households is influenced by MRT traffic, new inhabitants, and a Covid-19 discount factor. Pedestrian-oriented design can enhance public transport ridership and stimulate business development. This study considers the number of intersections, pavement area, and public bicycles as variables influencing the number of establishments (Cervero & Kockelman, 1997; Ewing & Cervero, 2017; Cervero et al., 2009; Li et al., 2008; Corbett & Zykofsky, 1999).

Increased accessibility to public transport may augment the density of housing and public facilities (Ratner & Goetz, 2013). In this study, the "new housing stock flows" are influenced by MRT ridership, while "reduced housing stock flows" are influenced by the level of housing damage (Chen, 2003; Huang, 2009). The calculation is based on the assumption, following Chen (2003) and Huang (2009), that a dwelling has a life expectancy of 50 years. This is then multiplied by the number of dwelling units, subject to the plot ratio and shelter rate stipulated by the urban plan.



•Quantitative Model of the Residential and Commercial Sub-system of the Weiwuying MRT Station (Suburb Station)

•Number of residential buildings(Unit:Stand)

INTEG ((Number of new residential buildings - number of residential buildings reduced) + increase/decrease in the number of adjusted residential buildings,5146.81) Eq.13

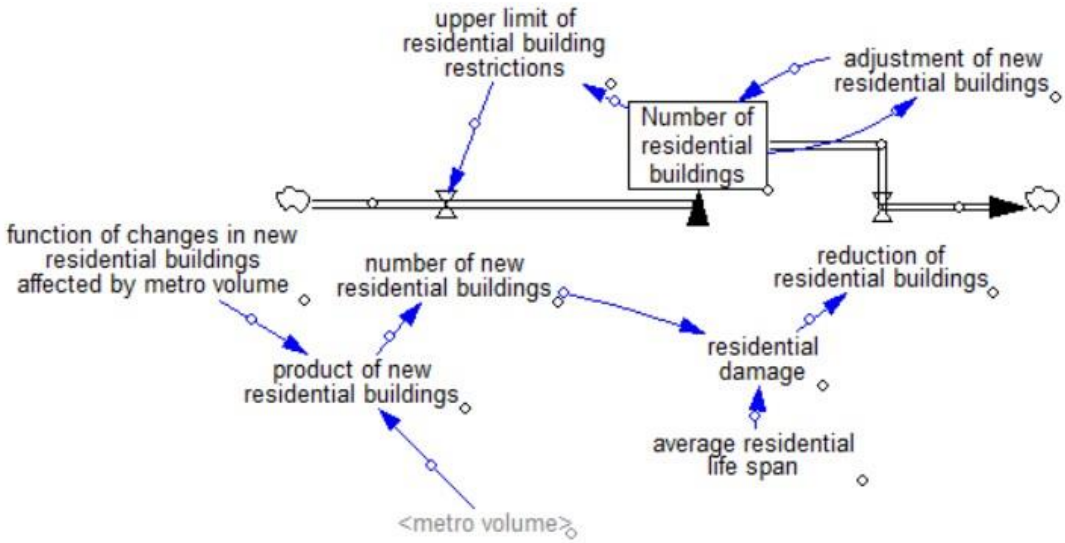


Figure 2.49 Volume flow diagram of the residential and commercial subsystem

The initial value is the number of residential buildings in 2011, 5146

•Number of new residential buildings(Unit: Stands/year)

Number of new residential buildings multiplier*number of residential buildings

•Residential Damage(Unit: Stand)

Number of new residential buildings/average residential life Eq.14

•Number of businessmen(Unit: Number of homes)

Number of industrial and commercial households = INTEG (number of industrial and commercial households increase or decrease + adjust the number of industrial and commercial households increase or decrease,529) Eq.15

The initial value is the number of business establishments in 2011, 529

•Increase or decrease in the number of industrial and commercial households(Unit: Number of homes/year)

(number of industrial and commercial demand + industrial and commercial household change multiplier * industrial and commercial households) * covid19 discount factor + "TOD- Design impact on industrial and commercial households" Eq.16

•The impact of TOD-Design on the number of industrial and commercial households(Unit: Dmnl)

Intersection increase/decrease^0.335622+public bicycle increase/decrease^1.17003+pavement area increase/decrease^0.059772 Eq.17

Historical data regression estimates

•Crossroads additions and reductions(Unit:Dmnl)

207*(increase/decrease ratio)*PULSE(111,8) Eq.18

•Sidewalk area increase or decrease(Unit: Dmnl)

24761.4*(increase/decrease ratio)*PULSE(111,8) Eq.19 Business Demand(Unit:Number of homes)

Number of new industrial and commercial workers/number of workers needed in the industrial and commercial sector Eq.20

•Number of new industrial and commercial workers(Unit: People)

Number of new labour force*Business and industrial employment rat Eq.21

•Number of new labour force(Unit: People)

Number of new population*Proportion of labour force Eq.22

•Quantification model of residential and commercial subsystem of Yanchengpu MRT station (residential core type station)

•Number of residential buildings(Unit: Stand)

INTEG ((Number of new residential buildings - number of reduced residential buildings) + increase or decrease in the number of adjusted residential buildings, 9423.4) Eq.23

The initial value is the number of residential buildings in 2011, 9423

•Number of businessmen(Unit: Number of homes)

Business households = INTEG (Business households increase/decrease +Adjust business households increase/decrease,1890.25) Eq.24

The initial value is the number of business establishments in 2011, 1890.25.

•Crossroads additions and reductions(Dimensionless)

390*(increase/decrease ratio)*PULSE(111,8) Eq.25

•Sidewalk area increase or decrease(Unit:Dimensionless)

23971.8*(increase/decrease ratio)*PULSE(111,8) Eq.26

•Quantitative Model of the Residential and Commercial Subsystem of the Miramar MRT Station (CBD Type Station)

•Number of houses(Unit: Housing Unit)

INTEG ((Number of new dwellings - number of dwellings reduced) + increase/decrease in the number of adjusted dwellings, 13077.2) Eq.27

The initial value is the number of residential buildings in 2011, 13077.2

•Business and Industry(Unit: Number of homes)

Business households = INTEG

(Increase/decrease in business households + increase/decrease in adjusted business households, 5089.77) Eq.28

The initial value is the number of business establishments in 2011, 5089.77

•Crossroads additions and reductions(Unit:Dimensionless)

1090*(increase/decrease ratio)*PULSE(111,8) Eq.29

•Increase or decrease in pavement area(Unit:Dimensionless)

86774.5*(increase/decrease ratio)*PULSE(111,8) Eq.30

•*MRT Subsystem*

MRT ridership is influenced by the number of residential buildings, the population, and private motor vehicles. This study identifies factors affecting MRT traffic as the equilibrium of residential buildings, population density, the number of residential buildings, and motor vehicles. A regression calibration is used to estimate the degree of influence of each factor on MRT traffic.

Kuby et al. (2004) suggest that the utilization of stations as transportation hubs and interchanges, and stations that provide feeder bus routes, can effectively increase ridership. Thus, the addition or subtraction of bus stops becomes an exogenous variable in improving the TOD-Distance element. Cheng et al. (2012) argue that the convenience of walking, cycling, or using public transport to get to the station significantly impacts rail use. Therefore, increasing or decreasing the number of points of interest serves as an exogenous variable for enhancing the TOD-Destination element.

•Quantitative Model of MRT Traffic Subsystem at Wibuying MRT Station (Suburban Type Station)

•MRT Ridership(Unit: People)

MRT ridership attraction + "TOD-Destination on ridership increase/decrease" + "TOD-Distance on ridership effect" Eq.31

•Attractive MRT ridership(Unit:Dimensionless)

1.78837e+06+326798*LN(residential Population density)+197283*LN(residential/commercial balance)+284304*LN(residential buildings/1000)+(-74694.7)*LN(motor vehicles/1000)+57161.1*Waiwuying National Exhibition Centre opening Eq.32

The regression equation for MRT traffic in zone i in year t: $R_{i,t} = \beta + \beta 01\ X1_{i,t-1} + \beta 2\ X2_{i,t-1} + \varepsilon it$ Adjustment after R2 = 0.739

•Balance of housing and business(Housing Unit /Shops)

(Maximum number of commercial/industrial/residential buildings) Eq.33

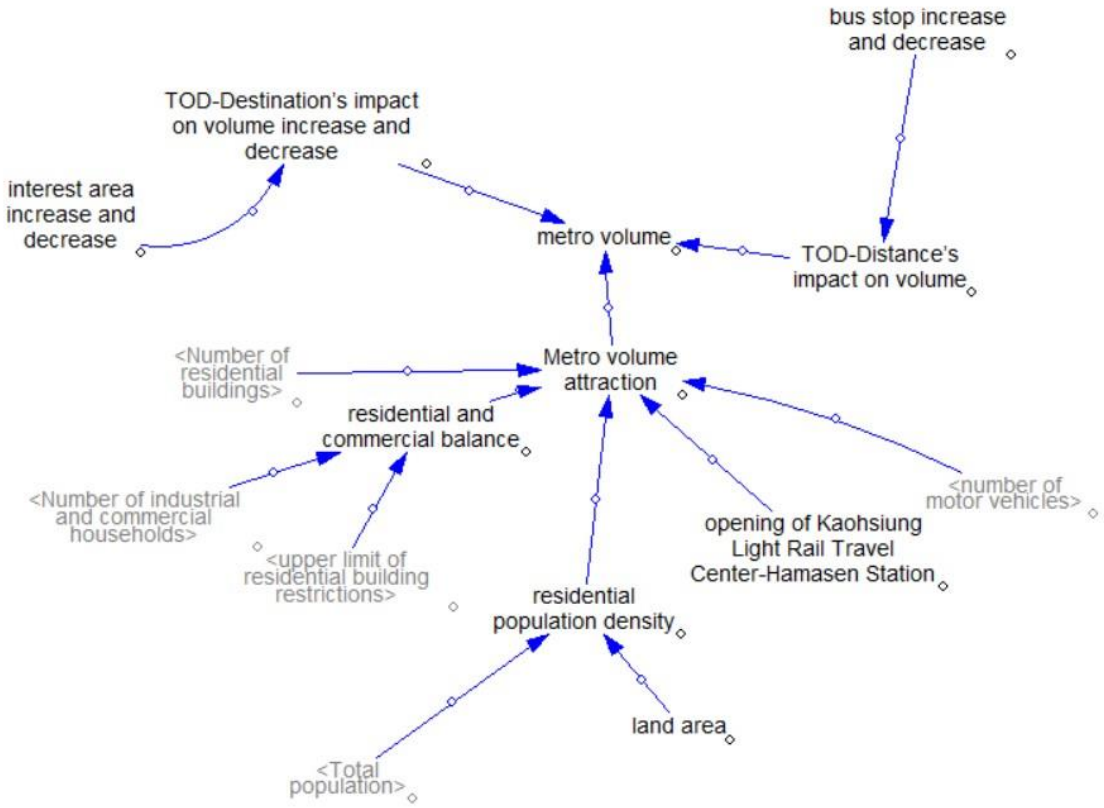


Figure 3.50 Volume flow diagram of the MRT quantum system

•Residential population density(Unit:Persons/square meter)

Total number of inhabitants / Total land area Eq.34

•Increase or decrease in area of interest(Unit:Dimensionless)

(96257.5*(increase/decrease ratio)*PULSE(111,8)) Eq.35

•TOD-Distance impact on ridership(Unit: Dimensionless)

Increase/decrease in bus stops^0.431 Eq.36

Historical data regression estimates

•Increase or decrease in bus stops(Unit: Dimensionless)

111*(Increment/decrement ratio)*PULSE(111,8) Eq.37

•The impact of TOD Destination on traffic growth and decline (Unit: Dimensionless)

Increase or decrease in area of interest^0.02 Eq.38

Historical data regression estimates

•Quantitative Model of MRT Transport System at Yanchengpu MRT Station (Residential Core Type Station)

•Attractive MRT ridership (Unit: Dimensionless)

(-521785)+3.24422e+06*residential and commercial balance+39.754*residential buildings+(-15.9978)*motorized vehicles+(-16133.6)* "Kaohsiung Light Rail Transit Center - Hamasin Station Opened" Eq.39

The regression equation for MRT traffic in zone i in year t: $R_{i,t} = \beta + \beta 01\ X1_{i,t-1} + \beta 2\ X2_{i,t-1} + \varepsilon it$ Adjustment after R2 = 0.44

•Increase or decrease in area of interest(Unit: Dimensionless)

(190769*(increase/decrease ratio)*PULSE(111,8)) Eq.40

•Increase or decrease in bus stops(Unit:Dimensionless)

144*(increase/decrease ratio)*PULSE(111,8) Eq.41

•Quantitative Model of MRT Quantum System at Miramar MRT Station (CBD Station)

•Attractive MRT ridership(Unit: Dimensionless)

(-1.25471e+07)+1.54006e+06*LN

(residential population density)+360269*LN(residential/commercial balance)+4.05396e+06*LN(residential buildings/1000)+(-713958)*LN(motor

vehicles/1000) Eq.42

The regression equation for MRT traffic in zone i in year t: $R_{i,t} = \beta 0 + \beta 1\ X1_{i,t-1} + \beta 2\ X2_{i,t-1} + \varepsilon it$ Adjustment after R2 = 0.59

•Increase or decrease in area of interest(Unit:Dimensionless)

(165670 *(increase/decrease ratio)*PULSE(111,8)) Eq.43

•Increase or decrease in bus stops(Unit:Dimensionless)

Increment/decrement ratio)*PULSE(111,8) Eq.44

•*Private Tooling Subsystem*

The private transport subsystem uses motor vehicles as a volume metric, and population and ownership rate as factors for the annual increase (Cervero & Radisch, 1996; Niles & Nelson, 1999). Mixed land use can reduce private transport and encourage active transport. In this study, we consider the balance of households and businesses as a major factor in reducing the annual motor vehicle usage.

The annual reduction in motor vehicles draws from Cervero & Kockelman (1997). This study posits that the annual reduction in the number of motor vehicle trips is influenced

by exogenous variables such as the increase or decrease in the number of public bicycles, and the expansion or contraction of pavement area.

•Quantification Model of Private Transport Subsystem at Wibuying MRT Station (Suburban Type Station)

•Annual increase in vehicles(Unit: per year)

Number of new cars + number of new motorbikes Eq.45

•Annual reduction in the number of vehicles(Unit: per year)

Number of motor vehicles*(- Change in the number of motor vehicles multiplied by the balance of households and businesses) + "TOD- Design impact on the number of vehicles" Eq.46

•TOD-Design impact on the number of vehicles(Unit: Dmnl)

Increase/decrease in pavement area ^0.109 + increase/decrease in public cycling ^0.014 Eq.47

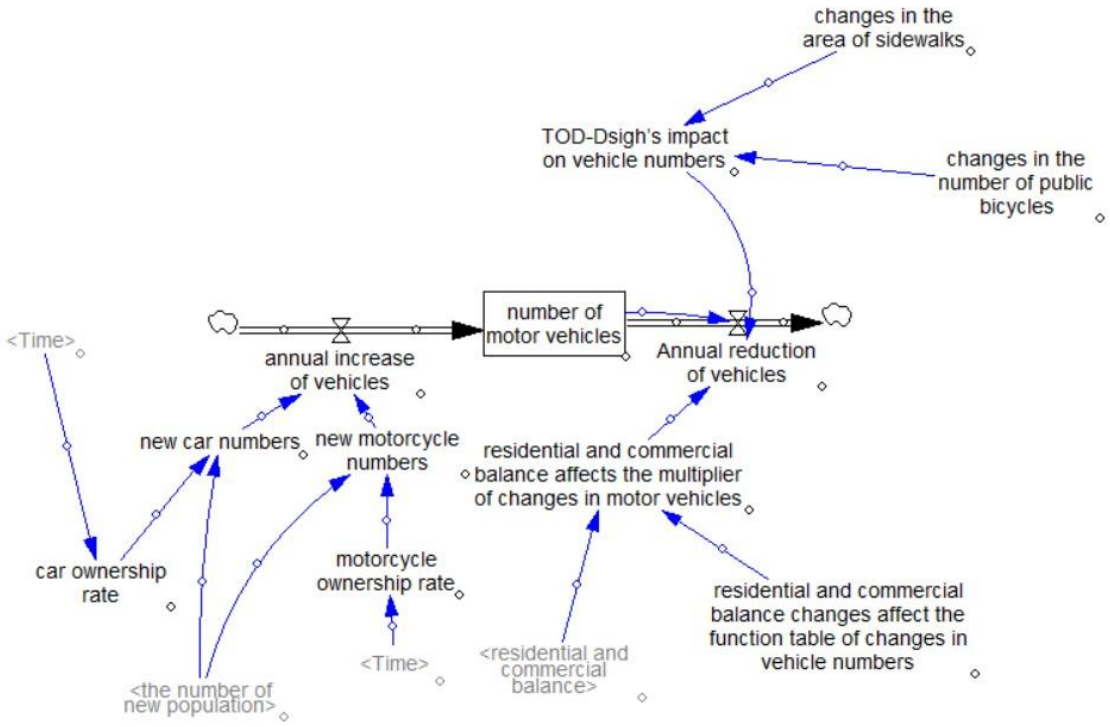


Figure 4. Volume flow diagram of the private transport subsystem

Historical data regression estimates.

•Increase or decrease in public bicycles(Unit: Individual)

7*(increase/decrease ratio)*PULSE(111,8) Eq.48

•Number of new cars(Unit:About)

Car ownership rate * new population Eq.49

•Quantification Model of Private Transport Subsystem at Yanchengpu MRT Station (Residential Station)

•Number of motor vehicles(Unit: About)

Number of motor vehicles = INTEG ((annual increase - annual decrease), 21079.3) Eq.50

The initial value is the number of motor vehicles in 2011, 21079.3

•Increase or decrease in public bicycles(Unit: Individual)

13*(Increment/decrement ratio)*PULSE(111,8) Eq.51

•Quantification Model of Private Transport Subsystem at Miramar MRT Station (CBD Station)

•Number of motor vehicles(Unit: About)

Number of motor vehicles = INTEG ((annual increase in vehicles - annual decrease in vehicles), 45106.7) Eq.52

The initial value is the number of motor vehicles in 2011, 45106.7

•Increase or decrease in public bicycles(Unit: Individual)

28*(Increment/decrement ratio)*PULSE(111,8) Eq.53

5. Model Validation

Once a dynamic model of the system has been established, it's essential to conduct model validation to ensure its accuracy. This is achieved by comparing the data produced by the model with historical data and identifying any discrepancies. Should any variance be detected, the model's structure or parameter relationship should be adjusted to enhance precision. In this study, the simulated values of relevant variables are computed using historical data from 2011-2019 as the foundation for modeling, while actual data serves as the basis for validation.

This study employs four subsystems for volume validation, including total residential population, the number of commercial and industrial households, the number of residential buildings, the number of motor vehicles, and MRT traffic. The simulated data will be compared with historical data, and the Mean Absolute Percentage Error (MAPE) will be calculated to gauge the degree of resemblance by referencing the validation

method of Haghshenas et al. The equation is as follows (1). The historical data utilized in this study ranges from 2011 to 2019.

Mean Absolute Percentage Error (MAPE):

MAPE=(1/n)Σ|(I_0-I𝑒)/(I_0)| ……(1)

Ie = system dynamic simulation value

Io = actual (observed) value

5.1 Population Subsystem

The population subsystem uses the "total residential population" volume as the validation variable. Population data within a 600m radius of the MRT station is obtained from the Socio-Economic Data Service Platform's minimum enumeration area data, which is then processed using the area ratio.

•*Weiwuying MRT Station (suburban type station)*

The population of Weiwuying MRT Station was 10,642 in 2011 and 9,858 in 2019, showing a decreasing trend year by year. The population growth rate over the 9-year period is approximately -7.4%, which corresponds to a mean absolute percentage error of 0.0203, indicating that the validity is within the confidence range.

•*Yanchengpu MRT Station (Residentialstation)*

The population of Yanchengpu MRT Station was 19,546 in 2011 and 16,981 in 2019, again showing a decreasing trend year by year. The population growth rate over the 9-year period is approximately -13.1%, which corresponds to a mean absolute percentage error of 0.0048.

•*Miramar MRT Station (CBD station)*

The population of Miramar MRT Station was 41,826 in 2011 and 39,232 in 2019, following a decreasing trend over the years. The population growth rate over the 9-year period is approximately -6.2%, with a mean absolute percentage error of 0.0166, which indicates that the validity is within the confidence range.

The actual number of residents in the areas of Weiwuying MRT Station, Yanchengpu MRT Station, and Miramar MRT Station all show a decreasing trend from 2011 to 2019, with growth rates ranging from -6.2 to -13.1%. The average absolute percentage errors range from 0.0048 to 0.02053, which are all within the confidence range.

5.2 Residential and Commercial Sub-system - Number of Residential Buildings and Commercial andIndustrial Households

The number of residential buildings and the number of commercial and industrial households are used as validation variables in the residential and commercial subsystems. Data on the number of residential buildings is obtained from the Real Estate Information Platform of the Ministry of the Interior, and data on the number of commercial and industrial establishments is obtained from the Minimum Statistical Area (MSA) data of the Socio-Economic Information Service (SES) platform. Both sets of data are scaled to fit the area within a radius of 600m from MRT stations.

•*Weiwuying MRT Station (suburban type station)*

The number of residential buildings in the area of Weiwuying MRT Station was 5,147 in 2011 and increased to 5,694 in 2019, representing a growth rate of approximately 10.6% over the 9-year period. A comparison of the actual and modeled values shows a mean absolute percentage error of 0.0028, indicating that the validity is within the confidence range. The number of commercial establishments in the Weiwuying MRT Station area increased from 529 in 2011 to 571 in 2019, representing a growth rate of about 7.9% over the 9-year period. A comparison of the actual and modeled values shows a mean absolute percentage error of 0.034, which indicates that the validity is within the confidence range.

•*Yanchengpu MRT Station (ResidentialStation)*

In 2011, the number of residential buildings at Yanchengpu MRT Station was 9423, and in 2019, this number rose to 9531, signifying a growth rate of roughly 1.14% over the 9-year span. The mean absolute percentage error, when comparing actual to modeled values, is 0.0091, which indicates a level of validity that falls within the confidence range. The quantity of business establishments at the Yanchengpu MRT Station rose from 1,890 in 2011 to 1,998 in 2019, showing a 5.71% growth rate over the same period. The actual versus simulated values show a mean absolute percentage error of 0.0216, still within the confidence range.

•*Miramar MRT Station (CBD station)*

At the Miramar MRT Station in 2011, there were 13,077 residential buildings, and by 2019, this number is expected to reach 13,590, indicating a growth rate of approximately 3.92% over the 9-year span. The mean absolute percentage error, when comparing actual to modeled values, is 0.00257, which signals a level of validity within the confidence range. The number of business establishments at the Miramar MRT Station was 5090 in 2011, and it is projected to rise to 5518 by 2019, marking an 8.41% growth rate over the same period. The actual versus simulated values show a mean absolute percentage error of 0.01298, also within the confidence range.

From 2011 to 2019, both the number of residential buildings and commercial/industrial

households at the three MRT stations have been on a growth trajectory. The growth rate of residential buildings ranged from 1.14 to 10.6, with Weiwuying Station (a suburban station) seeing the highest growth rate, and Yanchengpu Station (a residential core station) the lowest. Commercial and industrial households had a growth rate between 5.71 and 8.41. The mean absolute percentage error of the survey, ranging from 0.0028 to 0.03, fell within the confidence range.

5.3 MRT Transport Sub-system - MRT Ridership

Using "MRT ridership" as the validation variable, the MRT transportation sub-system obtains station ridership information from the Kaohsiung City Statistical Information Service website, based on the annual average number of passengers entering and leaving each station.

•*Weiwuying MRT Station (Suburban)*

In 2011, Weiwuying Station reported 92,942 MRT passengers, and by 2019, this figure is expected to reach 159,462, marking a substantial growth rate of 71.6%. A comparison of actual values with simulated ones shows a significant difference in 2018.

•*Yanchengpu MRT Station (Residential)*

Weiwuying Station had 174,983 MRT passengers in 2011, and by 2019, this figure is anticipated to rise to 271,583, an increase of approximately 55.2%. The simulated value is slightly lower than the actual value prior to 2016 and slightly higher after 2017, presumably due to the inclusion of a dummy variable accounting for the completion of the MRT Light Rail.

•*Miramar MRT Station (CBD)*

In 2011, Weiwuying Station registered 356,875 MRT journeys, and by 2019, this number is expected to reach 557,439, signifying a notable growth rate of 56.2%. When comparing actual values to simulated ones, the difference is relatively large in 2019, presumably because the model incorporates adjustments made due to the Covid epidemic's impact on the CBD station's traffic.

From 2011 to 2019, all three MRT stations have seen significant increases in MRT ridership, with growth rates ranging from 55% to 72%. The model values for Weiwuying and Yanchengpu MRT stations include dummy variables accounting for the impact of large-scale construction projects on riderships. For Miramar MRT station, the model also considers the effects of the Covid epidemic on CBD station traffic. The mean absolute percentage errors range from 0.03 to 0.09, all falling within the confidence range.

5.4 Private conveyance sub-system - number of motor vehicles

The private conveyance sub-system uses the "motor vehicle count" volume as the validation variable. Data on the number of motor vehicles within a 600m radius from the MRT stations is obtained from the General Bureau of Roads, Ministry of Transport's motor vehicle register, and processed in relation to the population.

•*Weiwuying MRT Station (Suburban)*

Weiwuying MRT Station reported 11,477 motor vehicles in 2011 and 9,963 in 2019, showing a decreasing trend year after year. This indicates a growth rate of -15.2% over the 9-year period. The comparison of actual to simulated values shows a relatively large difference from 2013 to 2015. However, the mean absolute percentage error is 0.03019, demonstrating that the validity is still within the confidence range.

•*Yanchengpu MRT Station (Residential)*

The number of motor vehicles at Yanchengpu MRT Station was 21,079 in 2011 and dropped to 17,162 in 2019. The year-after-year decrease suggests a growth rate of -18.6% over the 9-year period. When comparing the actual to modeled values, the mean absolute percentage error is 0.07356, indicating that the validity is still within the confidence range.

•*Amar MRT Station (CBD)*

The Miramar MRT Station reported 45,107 motor vehicles in 2011, and by 2019, this figure is projected to drop to 39,651. The year-on-year decrease implies a growth rate of -12.1% over the 9-year span. When comparing the actual values to the simulated ones, the latter are consistently higher than the former, but the mean absolute percentage error is 0.0577, indicating that the validity is still within the confidence range.

From 2011 to 2019, the number of motor vehicles at all three MRT stations showed a decreasing trend, with the growth rate ranging from -12 to -19. The mean absolute percentage error of the data ranges from 0.03 to 0.08, falling within the confidence range.

The results of model validation reveal that the mean absolute percentage error across the three models ranges from 0.002 to 0.094, which indicates an error of less than 10% and therefore falls within the confidence range.

6. Conclusion and Discussion

This study investigates the primary factors influencing ridership at MRT stations in Kaohsiung, focusing on TOD density, diversity, pedestrian/cyclist-friendly design, interchange convenience, and destination accessibility. Using system dynamic analysis and historical data from 2011 to 2019, a dynamic model is developed. Kaohsiung MRT is categorized into CBD, residential core, and suburban types based on ridership, residential, commercial, industrial zones, and land use diversity.

7. Limitations and suggestions for research.

This study employs system dynamics, and due to data and scale limitations, acknowledges the influence of exogenous variables. The variability of individual stations may not be fully accounted for. Recommendations for future research include improved data collection, incorporation of external factors, and sensitivity analysis to identify significant variables. These limitations may result in discrepancies between the study's findings and reality.

Acknowledgement. The study was sponsored by National Science and Technology Council for project MOST 111-2410-H-006-094.

References

Boarnet, M., & Crane, R. (2001). The influence of land use on travel behavior: specification and estimationstrategies. Transportation Research Part A: Policy and Practice, 35(9), 823 -845.

Boarnet, M. G., & Greenwald, M. J. (2000). Land use, urban design, and nonwork travel: Reproducing otherurban areas' empirical test results in Portland, Oregon. transportation Research Record, 1722(1), 27-37.

Cervero, R. (2004). Transit-oriented development in the United States: Experiences, challenges, andprospects (Vol. 102): Transportation Research Board.

Cervero, R. (2006). Alternative Approaches to Modeling the Travel-Demand Impacts of Smart Growth.Journal of the American Planning Association, 72(3), 285-295. Retrieved from https://dx.doi.org/10.1080/01944360608976751. doi:10.1080/01944360608976751

Cervero, R. (2007). Transit-Oriented Development's Ridership Bonus: A Product of Self-Selection andPublic Policies. environment and Planning A: Economy and Space, 39(9), 2068-2085. Retrieved from https://dx.doi.org/10.1068/a38377. doi:10.1068/a38377

Cervero, R., & Kockelman, K. (1997). Travel demand and the 3Ds: Density, diversity, and design. Transportation Research Part D: Transport and Environment, 2(3), 199-219. retrieved from https://dx.doi.org/10.1016/s1361-9209(97)00009-6. doi:10.1016/s1361-9209(97)00009-6

Cervero, R., & Murakami, J. (2008). Rail+ Property Development: A model of sustainable transit financeand urbanism.

Cervero, R., & Radisch, C. (1996). Travel choices in pedestrian versus automobile oriented neighborhoods.Transport Policy, 3(3), 127-141.

Cervero, R., Sarmiento, O. L., Jacoby, E., Gomez, L. F., & Neiman, A. (2009). Influences of Built Environments on Walking and Cycling: Lessons from Bogotá. International Journal of SustainableTransportation, 3(4), 203-226.

Chatman, D. G. (2013). Does TOD Need the T? Journal of the American Planning Association,

79(1), 17-31.
Chen, C., & McKnight, C. E. (2007). Does the built environment make a difference? Additional evidence from the daily activity and travel behavior of homemakers living in New York City and Journal of TransportGeography, 15(5), 380-395.
Chen, C., Shao, L.-G., Xu, L., & Shang, J.-C. (2009). A case study predicting environmental impacts of urban transport planning in China. Environmental Monitoring and Assessment, 157(1-4), 169-177.
Chen, Y.-p., Song, Y., Zhang, Y., PENG, K., ZHANG, Q., & JIN, X. (2011). Impact of land use developmenton travel mode choice: a case study in shenzhen. urban Transport of China, 9(5), 80-85.
Cheng, S.-F., Nguyen, D. T., & Lau, H. C. (2012). A Mechanism for Organizing Last-Mile Service UsingNon-Dedicated Fleet.
Corbett, J., & Zykofsky, P. (1999). Building livable communities: a policymaker's guide to transit-orienteddemand. local Government Commission.
Cox, L., Bassi, A., Kolling, J., Procter, A., Flanders, N., Tanners, N., & Araujo, R. (2017). Exploring synergies between transit investment and dense redevelopment: a scenario analysis in a rapidly urbanizinglandscape. Landscape and Urban Planning, 167, 429-440.
Crane, R., & Crepeau, R. (1998). Does neighborhood design influence travel?: A behavioral analysis oftravel diary and GIS data. Environment, 3(4), 225-238.
Ewing, R., & Cervero, R. (2001). Travel and the Built Environment: A Synthesis. Transportation ResearchRecord: Journal of the Transportation Research Board, 1780(1), 87-114.
Ewing, R., & Cervero, R. (2010). Travel and the Built Environment. Travel and the Built Environment.
Journal of the American Planning Association, 76(3), 265-294.
Ewing, R., & Cervero, R. (2017). "Does Compact Development Make People Drive Less?" The Answer IsYes. Journal of the American Planning Association, 83(1). 19-25.
Ewing, R., Hamidi, S., & Grace, J. B. (2016). Compact development and VMT-Environmental determinism,self-selection, or some of both? Environment and Planning B: Planning and Design, 43(4), 737-755.
Farr, D. (2011). Sustainable urbanism: Urban design with nature: John Wiley & Sons.
Forrester, J. W. (1997). Industrial dynamics. Journal of the Operational Research Society, 48(10), 1037-1041.
Gan, Z., Yang, M., Feng, T., & Timmermans, H. J. P. (2020). Examining the relationship between builtenvironment and metro ridership at station-to-station level. Environment, 82, 102332.
Haghshenas, H., Vaziri, M., & Gholamialam, A. (2015). Evaluation of sustainable policy in urban transportation using system dynamics and world cities data: A case study in Isfahan. cities, 45, 104-115.
Handy, S., Cao, X., & Mokhtarian, P. (2005). Correlation or causality between the built environment and travel behavior? Evidence from Northern California. Transportation Research Part D. Transport and Environment, 10(6), 427-444.

Handy, S. L. (1992). Regional versus local accessibility: neo-traditional development and its implications for non-work travel. Regional versus local accessibility: neo-traditional development and its implications for non-work travel. Built Environment (1978-), 253-267.

Jifeng, W., Huapu, L., & Hu, P. (2008). System dynamics model of urban transportation system and its application. journal of transportation systems engineering and information technology. 8(3), 83-89.

Kuby, M., Barranda, A., & Upchurch, C. (2004). Factors influencing light-rail station boardings in theUnited States. Transportation Research Part A: Policy and Practice, 38(3), 223-247.

Li, C., Li, J.-X., Li, R., Xu, M.-C., & Qin, H. (2008). Impacts of rail transit in Shanghai on its urban land usechange, The Journal of Applied Ecology, 19(7), 1537-1543.

Lin, J.-J., & Shin, T.-Y. (2008). Does Transit-Oriented Development Affect Metro Ridership? TransportationResearch Record: Journal of the Transportation Research Board, 2063(1). 149-158.

Lin, J. J., & Gau, C. C. (2006). A TOD planning model to review the regulation of allowable developmentdensities around subway stations. land Use Policy, 23(3), 353-360.

Liu, C., Pan, H., & Jia, X. (2011). The influence of rail transit on the planning and development ofmetropolitan peri-urban areas. paper presented at the Urban Planning Forum.

Loo, B. P. Y., Chen, C., & Chan, E. T. H. (2010). Rail-based transit-oriented development: Lessons from New York City and Hong Kong. Landscape and Urban Planning, 97(3), 202-212. retrieved from

Nasri, A., & Zhang, L. (2014). The analysis of transit-oriented development (TOD) in Washington, D.C. andBaltimore metropolitan areas. transport Policy, 32, 172-179.

Niles, J., & Nelson, D. (1999). Measuring the Success of Transit-Oriented Development: Retail MarketDynamics and Other Key Determinants. paper presented at the APA National Seattle, WA.

Niu, S., Hu, A., Shen, Z., Huang, Y., & Mou, Y. (2021). Measuring the built environment of green transit-oriented development: A factor-cluster analysis of rail station areas in Singapore. Architectural Research,10(3), 652-668.

Olaru, D., & Curtis, C. (2015). Designing TOD precincts: accessibility and travel patterns. European Journalof Transport and Infrastructure Research, 15(1), 6-26.

Pan, H., Li, J., Shen, Q., & Shi, C. (2017). What determines rail transit passenger volume? Implications fortransit-oriented development planning. transportation Research Part D: Transport and Environment, 57, 52-63.

Park, K., Ewing, R., Scheer, B. C., & Tian, G. (2018). The impacts of built environment characteristics of rail station areas on household travel behavior. cities, 74, 277-283.

Ratner, K. A., & Goetz, A. R. (2013). The reshaping of land use and urban form in Denver through transit-oriented development. cities, 30, 31-46.

Renne, J. L. (2005). Transit-oriented development: Developing a strategy to measure success: TransportationResearch Board.

Sung, H., & Oh, J. T. (2011). Transit-oriented development in a high-density city: Identifying its

associationwith transit ridership in Seoul, Korea. cities, 28(1), 70-82.
Thompson, G. L., & Audirac, I. (1999). TOD's Importance to Transit: Transit's Importance to TOD: PlanningScenarios for Sacramento. paper presented at the Washington, DC: 78th Annual Meeting of the Transportation Research Board.
Zhang, M. (2004). The Role of Land Use in Travel Mode Choice: Evidence from Boston and Hong Kong.journal of the American Planning Association, 70(3), 344-360. retrieved from . doi:10.1080/01944360408976383. from https://doi.org/10.1080/01944360408976383. doi:10.1080/01944360408976383
Bai, R. D., & Liu, R. H.. (2014). The Influence of Mass Transit Oriented Built Environment Attributes onMetro Ridership: A Case Study of Taipei City. The Influence of TOD Build Environment Attributes on Metro Ridership: A Case Study of Taipei City. Journal of Architecture and Planning, 15(2&3), 111-127.
Lin Makiya, & Sze Ting-Chai. (2007). Built Environment Impacts of Transit-Oriented Development on Metro Ridership - An Empirical Study of Taipei Metro System. [Built Environment Impacts of Transit- Oriented Development on Metro Ridership: An Empirical Study of Taipei Metro System]. TransportationPlanning Quarterly, 36(4), 451-476.
Xia Zhengwei, & Zhang Ye. (2019). From "5D" to "5D+N": A Study on the Influencing Factors of TODEffectiveness in English Literature. International Urban Planning, 5.
Chang, H.S., & Lin, M.Y.. (2011). A preliminary study of land use change around MRT stations: An exampleof the Muzha Line in Taipei. Journal of architecture, 12(3), 199-214.
Chen, Hsing-Yi. (2003). Systematic Dynamic Simulation of Urban Housing Price Changes: An EmpiricalStudy of Taipei City. (Master), National Cheng Kung University, Tainan, Taiwan.
Wong, P.H.. (2009). The Impact of Mass Transit Oriented Development on Urban Environment: A Case Study of Tainan Metropolitan Area. (Master), National Cheng Kung University, Tainan, Taiwan.
Yang Yanyin. (2020). A Study on the Influence of Station Scale Built Environment on the Ridership of TaipeiMetro. (Master), National Cheng Kung University, Tainan, Taiwan.
Yang, Chao-Chung, Chen, Chang-Hsien, Yeh, Hsin-Cheng, & Yeh, Chiu-Hsien. (2007). System dynamicsthinking and applications: Five South.
Zou Zhongjun. (2014). Exploring the system dynamics of six Taiwan Railway's inner bay branch lineoperations. (Master), Ming Chuan University, Taipei, Taiwan.

THE IMPACT OF URBAN STREET CANYON MORPHOLOGY ON THE MICROCLIMATE ENVIRONMENT: THE CASE OF THE REPRESENTATIVE BUSINESS DISTRICTS IN SEOUL, KOREA (1091)

Seungjae-Lee[1], Younhsang Kwon[1, 2]

[1] Department of Civil and Environmental Engineering, Seoul National University, Seoul, Korea; zzz6347@snu.ac.kr

[2] Advanced Institute of Convergence Technology, Seoul National University, Suwon, Korea

Abstract. As urbanization progresses worldwide, high-density development emerges around major cities. Korea, with an 81.9% urbanization rate (2021), is no exception, especially in Seoul. The central and Gangnam districts have strong street canyon features due to complex land surfaces, urban morphology, and heavy transportation. These factors, combined with polluted traffic emissions, threaten urban residents' thermal and pollutant exposure. Understanding vulnerable areas in terms of microclimate and ventilation is vital for livability, sustainability, and resilience in urban planning. Using Ladybug & Dragonfly in Rhino's Grasshopper, we analyzed the correlation between street canyon morphology, microclimate, and the urban heat island index. The study focuses on the geometric characteristics of urban spaces, particularly high-rise buildings and roads forming street canyons, and their impact on microclimate(thermal comfort). The findings contribute to effective management, fostering sustainable urban forms and redeveloping street spaces with consideration for the microclimate environment.

Keywords: Urban Morphology, Urban Street Canyon, Microclimate Environment, Sustainable Urban Planning, UTCI Simulation.

1. Introduction

Today, more than half of the world's population lives in urban areas. This figure was only 30% in the 1950s, but it is expected to surpass two-thirds of the world's urban population by the 2050s. Since 2000, the urban population ratio in Korea has exceeded 80% and continues to increase. By 2050, it is projected that 90% of the population will reside in urban areas. In the case of Seoul, the capital of Korea, the population density was recorded at 15,650 persons per square kilometer in 2021. Within the context of high population density, urban development is occurring, accompanied by issues such as chaotic urban expansion, traffic congestion, environmental pollution, resource scarcity, and public health concerns. Moreover, this concentration of high population density leads

to severe vulnerability to climate change.

Sustainable urban development has gained global consensus and a shared vision as a response to these issues. Nowadays, people expect sustainable urban spatial forms, including residential environments, to function in a more efficient manner and overcome climate vulnerability. Therefore, analyzing the environmental impacts based on the geometric characteristics of urban form and space is of great importance.

Seoul, as a representative city with high population density, possesses complex topography and urban form characteristics. In commercial and business areas, characteristics such as heavy transportation and strong street canyons emerge. These characteristics result from the high density of buildings and high floor area ratio, which are essential considerations for accommodating a high population within limited land, shaping a cityscape resembling a forest of buildings. As a fundamental geometric unit of urban form, the urban street canyon plays a crucial role in shaping the microclimate of central commercial and business areas. Urban street canyons, defined by various geometric parameters such as aspect ratio (H/W) and orientation, determine solar access, shading, wind conditions, and influence air and surface temperatures. Consequently, these microclimate conditions significantly affect outdoor thermal comfort indicators like the urban heat island (UHI) effect and the universal thermal climate index (UTCI). In recent decades, numerous studies have investigated the effects of urban canyon geometries, such as street aspect ratio and orientation, on the distribution patterns of microclimate parameters, including heat flux, air temperature, wind flow, and solar access, through field measurements or numerical simulations.

Urbanization is an inevitable process in human development. To create sustainable cities in the future, it is crucial to understand the characteristics of regions exhibiting climate vulnerability and address urban environmental issues related to microclimate phenomena such as UHI and UTCI. In this study, we aim to analyze the correlation between urban street canyon morphology and the microclimate environment by examining the geometrical characteristics of the central commercial and business areas in Seoul where the characteristics of urban street canyons are strongly pronounced (Central, Gangnam Business Districts). We will investigate the outdoor thermal comfort using microclimate simulations (Ladybug & Dragonfly in Parametric Rhinoceros plugins Grasshopper). Through this research, we seek to analyze the correlation between urban street canyon morphology and the microclimate environment, promoting effective and continuous management of urban spaces. The results can be applied to establishing sustainable urban forms and redevelopment of urban street spaces, taking into account the microclimate environment.

2. Site description and climate characteristic

Description of Seoul

This study was conducted for typical summer conditions in Seoul, Republic of Korea. Seoul is characterized by a distinct four-season temperate climate, with hot and humid summers, where the average maximum temperature ranges around 34 degrees Celsius (Figure 1). As the impact of climate change and urban heat island (UHI) intensifies, Seoul has experienced an increasing number of heat wave events in recent years. In particular, in 2018, there were 31 days with temperatures exceeding 35°C, marking the highest number of such days on record. According to the "Korea Climate Change Assessment Report 2020," the number of heat wave days in Korea is projected to continue increasing due to rising temperatures. It is expected that by the late 21st century, an average of 35.5 heat wave days per year will be observed, with over 30% of summer days classified as heat wave days. Therefore, to minimize the effects of climate change and urban heat island, it is important to explore the impact of urban morphology on local thermal comfort and seek measures to mitigate these effects.

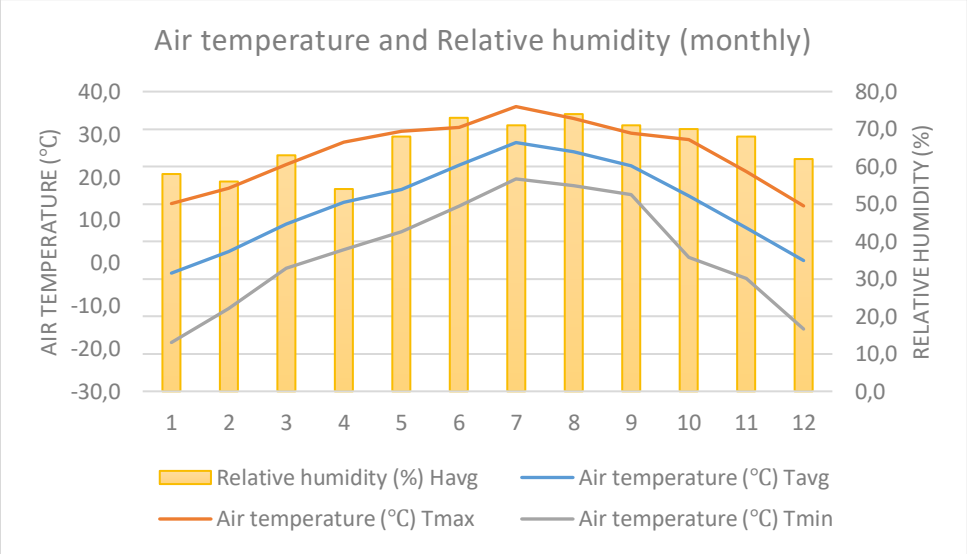


Figure 151. Air temperature and Relative humidity in Seoul

The study area focused on three central business and commercial districts with high population density during the day: Central, Gangnam Business Districts(Figure 2, 3). These areas exhibit a dense urban morphology with high buildings, highlighting the characteristics of Urban Street Canyons. By examining Figures 4 and 5, it is evident that the central commercial and business districts exhibit high values of daytime population density. The presence of a high population density in these densely populated areas is

often associated with tall building heights and high plot ratios. Consequently, these characteristics increase the vulnerability to urban heat island effects, stagnant air pollution, and other aspects related to thermal comfort in the Urban Street Canyon.

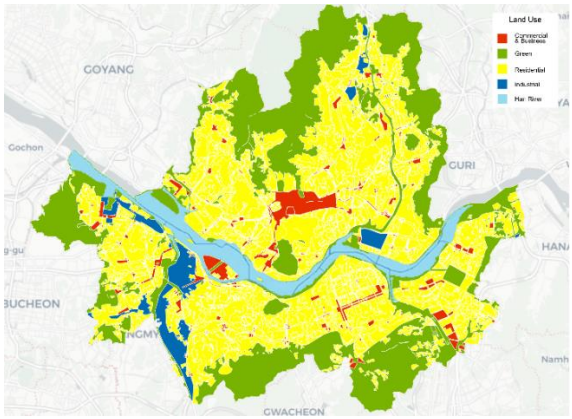


Figure 2. Land Use Plan in Seoul, Republic of Korea

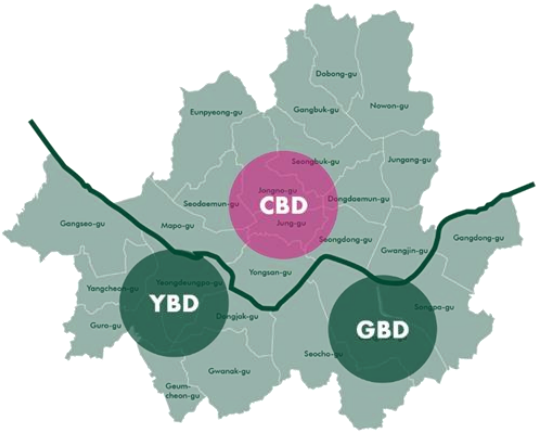


Figure 3. Three representative business districts in Seoul

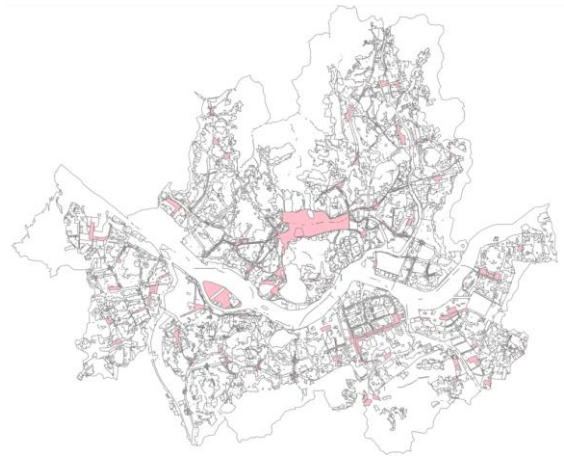


Figure 4. Business and commercial districts in Seoul

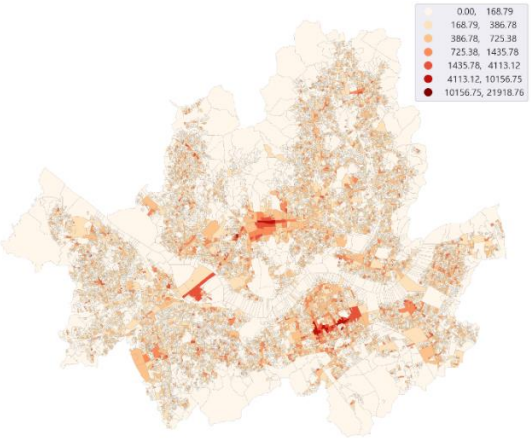


Figure 5. Weekly Living Population Density(pop/km2) in Seoul

Geometrical characteristic of urban street canyon

In the central business district of Jongro-gu in Seoul(Figure 6-left), the urban street canyon exhibits unique characteristics in terms of population density, building floor area ratio, and environmental aspects, with a notable feature being the presence of the Cheonggyecheon Stream. Firstly, the population density in the central business district of Jongro-gu is relatively high. As a prominent commercial and administrative hub, the

district attracts a large number of residents, workers, and tourists. The area is bustling with activity, leading to a dense concentration of people and contributing to a vibrant urban atmosphere. Secondly, the building floor area ratio in the central business district is also significant. Tall office buildings, commercial complexes, and government institutions dominate the skyline, showcasing the efficient utilization of available land and the vertical growth of the district. The high building floor area ratio indicates the intensive use of space for commercial and administrative purposes. Furthermore, the environmental aspect in the urban street canyon of Jongro-gu's central business district is notable due to the presence of the Cheonggyecheon Stream. The Cheonggyecheon Stream is a restored waterway that runs through the heart of the district, providing a refreshing and natural element within the urban environment. The stream offers a serene escape from the bustling cityscape and serves as a recreational and cultural space for residents and visitors. The combination of high population density, a significant building floor area ratio, and the presence of the Cheonggyecheon Stream influences the district's environment. The stream contributes to the enhancement of the urban landscape, providing ecological benefits, promoting biodiversity, and improving air quality. It also offers a cooling effect, mitigating the urban heat island effect and enhancing the overall microclimate in the area. Considering the complex dynamics of the urban street canyon in Jongro-gu's central business district, it is essential to strike a balance between urban development and environmental sustainability. This can be achieved through the implementation of green infrastructure, such as parks and green spaces, the promotion of sustainable transportation options, and the continuous preservation and enhancement of the Cheonggyecheon Stream as a valuable natural asset in the district.

In the Gangnam business district of Gangnam-gu in Seoul(Figure 6-mid), the urban street canyon exhibits distinct characteristics in terms of population density and building floor area ratio. The area is known for its vibrant commercial activities and high concentration of businesses and offices. Firstly, the population density in the Gangnam business district is notably high. The district attracts a significant number of residents, workers, and visitors due to its bustling nature and prominent economic activities. The population density is intensified by the presence of numerous commercial establishments, entertainment venues, and transportation hubs, contributing to a dense urban environment. Secondly, the building floor area ratio in the Gangnam business district is generally high. The district features a vertical urban landscape with tall buildings and a substantial utilization of available land for construction purposes. The high building floor area ratio reflects the efficient use of space and the presence of towering structures that define the district's skyline. The combination of high population density and a high building floor area ratio in the urban street canyon of Gangnam-gu's business district contributes to various effects. The concentration of people and buildings intensifies the urban heat island effect, exacerbating heat retention and temperature rise within the district. It may also result in

reduced air circulation and increased pollution levels, affecting the overall microclimate and thermal comfort in the area. Considering the dense urban morphology and the challenges posed by the high population density and building floor area ratio, it is crucial to implement appropriate urban planning strategies. These strategies should focus on promoting sustainable development, enhancing green spaces, improving pedestrian infrastructure, and implementing measures to mitigate the adverse effects of the urban street canyon on local climate, air quality, and the well-being of residents and visitors.

The urban street canyon in the central business district near the Cheonggyecheon Stream exhibits distinctive characteristics in terms of population density and building floor area ratio(Figure 7). The central business district near the Cheonggyecheon Stream is known for its high population density. The area attracts a large number of residents, commuters, and tourists due to its strategic location and vibrant urban environment. The population density in this district is typically higher compared to other areas in Seoul. The concentration of people contributes to the lively atmosphere and bustling activity, making it a vibrant hub of economic and social interactions. The central business district near the Cheonggyecheon Stream is characterized by high building floor area ratios. The district is densely developed, with tall buildings and a mix of commercial, residential, and office spaces. The utilization of land is maximized, and buildings often have multiple floors and compact footprints to accommodate the high demand for space in this prime location. The vertical expansion of buildings helps accommodate the growing population and meet the requirements of various businesses and organizations. Together, the high population density and building floor area ratio in the central business district near the Cheonggyecheon Stream create a unique urban street canyon. The tall buildings and compact urban form contribute to the formation of narrow street corridors, enhancing the canyon-like effect. This urban configuration can influence the microclimate, creating localized airflows, shading patterns, and temperature variations within the street canyon. Additionally, the presence of the Cheonggyecheon Stream adds an environmental element, providing a natural feature and promoting a more pleasant and cooler microclimate in the area. Overall, the combination of high population density, dense building development, and the presence of the Cheonggyecheon Stream characterizes the urban street canyon in the central business district near the Cheonggyecheon Stream, creating a dynamic and vibrant urban environment.

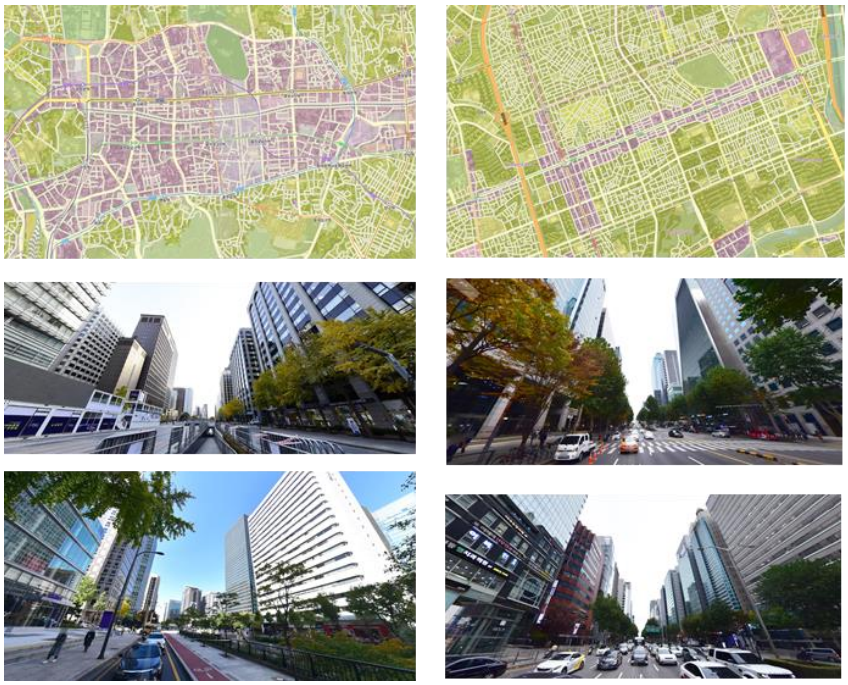


Figure 6. Urban Street Canyon in each business district

(Left: Central Business District, Right: Gangnam Business District)

Figure 7. Building Floor Area Ratio Diagram in CBD(Central Business District in Jongro-gu)

The Gangnam business district(Figure 8) features a long continuous urban street canyon that can be described from the perspectives of population density, building floor area ratio, and surrounding environment. The Gangnam business district is known for its high population density. It attracts a significant number of residents, workers, and visitors due to its prominence as a commercial and financial hub. The area is densely populated, with

a mix of residential, commercial, and office spaces. The high population density contributes to the district's energetic atmosphere, vibrant street life, and diverse cultural offerings. The building floor area ratio in the Gangnam business district is relatively high. The district boasts tall and modern buildings that make efficient use of limited land space. The buildings often have multiple floors, maximizing the utilization of available land and accommodating the demand for commercial and office spaces. The high building floor area ratio in Gangnam reflects the district's status as a prestigious and sought-after location for businesses and organizations. The surrounding environment of the urban street canyon in Gangnam is characterized by a mix of urban elements and amenities. The district is well-developed with modern infrastructure, wide roads, and pedestrian-friendly areas. Surrounding the urban street canyon, you can find a variety of amenities, including luxury retail stores, restaurants, cafes, entertainment venues, and cultural institutions. The district's well-maintained public spaces, such as parks and plazas, provide opportunities for relaxation and social interaction. Moreover, the Gangnam business district is situated in close proximity to the scenic Han River, which adds to the district's appeal. The river serves as a recreational area and offers beautiful views, creating a more pleasant environment for residents, workers, and visitors. The presence of green spaces, trees, and landscaping efforts further enhances the overall ambiance of the urban street canyon in Gangnam. In summary, the long continuous urban street canyon in the Gangnam business district is characterized by high population density, a significant building floor area ratio, and a vibrant surrounding environment. The combination of these factors creates a lively and dynamic atmosphere, attracting people from various walks of life and contributing to the district's reputation as a bustling economic and cultural center.

Figure 8. Building Floor Area Ratio Diagram in GBD (Gangnam Business District in Gangnam-gu)

3. Methodology

Ladybug and Dragonfly are parametric plugins for Rhinoceros and Grasshopper that are widely used for analyzing microclimatic conditions and environmental effects in urban areas. Here is a description of the methodology of Ladybug and Dragonfly:

Ladybug: Ladybug is a plugin that provides various weather data analysis tools for environmental simulation. It allows users to import weather data from different sources and analyze parameters such as temperature, humidity, wind speed, and solar radiation.

Importing Weather Data: Ladybug allows users to import weather data from local weather stations or global weather datasets. This data includes hourly or daily values of temperature, humidity, wind speed, solar radiation, and other relevant climatic parameters.

Solar Analysis: Ladybug enables the calculation of solar radiation and shadow analysis for specific locations and times. It helps evaluate the availability of sunlight and shading patterns in urban environments, which is crucial for understanding the microclimatic conditions and energy performance of buildings.

Outdoor Comfort Analysis: Ladybug includes tools to assess outdoor thermal comfort

using indices such as the Universal Thermal Climate Index (UTCI). It helps analyze the thermal stress on humans and evaluate the effectiveness of urban design strategies in providing comfortable outdoor environments.

Dragonfly: Dragonfly is a plugin that extends the capabilities of Ladybug and focuses on urban-scale environmental analysis. It allows users to simulate and evaluate the urban heat island effect, energy consumption, and other environmental factors.

Urban Heat Island Analysis: Dragonfly enables the assessment of the urban heat island (UHI) effect, which refers to the temperature difference between urban areas and their surrounding rural regions. It helps identify areas with higher UHI intensity and evaluate the impact of urban form, materials, and vegetation on temperature distribution.

Environmental Impact Analysis: Dragonfly supports the evaluation of various environmental factors, including daylighting, natural ventilation, and acoustic performance. It helps assess the impact of urban design decisions on these factors and optimize the design for better environmental outcomes.

By utilizing the powerful capabilities of Ladybug and Dragonfly, we conducted extensive microclimate and environmental analyses in the three bustling business districts of Seoul: the Central Business District, Gangnam Business District, and Yeouido Business District. Our simulations focused on assessing the urban heat island effect, evaluating outdoor thermal comfort using the Universal Thermal Climate Index (UTCI), analyzing daylight availability, and considering various other crucial environmental aspects. Through our rigorous analysis, we aim to uncover the intricate correlation between the morphology of urban street canyons and the microclimate environment. This comprehensive study provides valuable insights for urban planners and policymakers, enabling them to make informed decisions to enhance the sustainability, livability, and resilience of these dynamic urban areas.

4. Analysis Results

Through the simulation of thermal comfort considering the urban heat island effect using the Grasshopper plugins Ladybug & Dragonfly, notable differences were observed between the left and right sides of the Central Business District (CBD) (Figure 10). Interestingly, despite the prevalence of high-rise buildings with high floor area ratios on the left side (Figure 7), the thermal comfort indicators were relatively better compared to the right side. This can be attributed to the fact that although there are many large-scale buildings with high floor area ratios on the left side, the spacing between buildings is not densely packed, leading to a decrease in the influence of the urban heat island effect. On the contrary, the right side exhibited a trend of relatively lower thermal comfort indicators, even if the buildings were not particularly tall or spacious. This is due to the dense

arrangement of buildings with narrow spacing between them, which enhances the urban heat island effect.

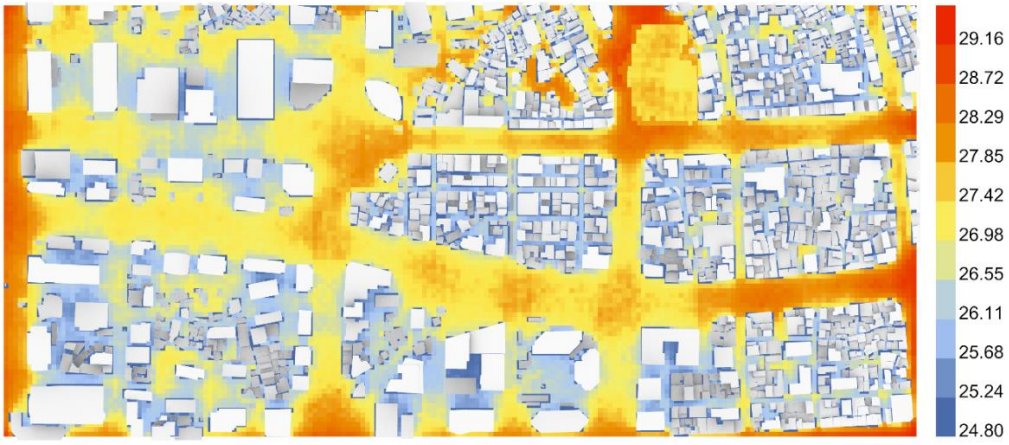


Figure 9. CBD_UTCI (Universial Temperature Climate Index) considering UHI (Urban Heat Island)

In the case of GBD (Gangnam Business District) (Figure 11), the urban street canyon showcases distinct features of intensive high-density development. Notably, the urban heat island effect becomes apparent within the dense forest of towering buildings. It is intriguing to observe that the areas experiencing the heat island effect coincide with regions characterized by taller structures, larger building sizes, and higher population density(Figure 8). This correlation suggests that the physical attributes of the built environment play a significant role in shaping the microclimate dynamics. The prevalence of tall buildings and increased population density contribute to the formation of localized heat islands, resulting in thermal discomfort and potential environmental challenges. Understanding these patterns and their implications is crucial for implementing effective urban design strategies that mitigate the adverse effects of the heat island phenomenon, ensuring a more sustainable and comfortable living environment for residents and visitors alike.

Figure 10. GBD_UTCI(Universial Temperature Climate Index) considering UHI(Urban Heat Island)

5. Discussion

The research highlights the global trend of increasing urbanization, with more than half of the world's population currently living in urban areas. Korea's urban population has exceeded 80% since 2000, and it is projected to reach 90% by 2050. Seoul, the capital of Korea, has a high population density, leading to various urban challenges such as chaotic urban expansion, traffic congestion, environmental pollution, resource scarcity, and public health concerns. The concentration of high population density also makes cities more vulnerable to climate change. In response to these issues, sustainable urban development has gained global consensus. The study aims to analyze the correlation between urban street canyon morphology and the microclimate environment in Seoul's central commercial and business areas. The characteristics of urban street canyons, such as aspect ratio and orientation, significantly affect microclimate conditions, including urban heat island (UHI) effect and thermal comfort. Seoul's climate is characterized by hot and humid summers, with an increasing number of heat wave events due to climate change and urban heat island effect.

The study focuses on two central business and commercial districts with high population

density: Central and Gangnam Business Districts. These areas exhibit dense urban morphology and unique characteristics of urban street canyons. The urban street canyon in Jongro-gu's central business district is characterized by high population density, a significant building floor area ratio, and the presence of the Cheonggyecheon Stream. The combination of these factors influences the microclimate, providing ecological benefits, improving air quality, and mitigating the urban heat island effect. The Gangnam business district also has a high population density and building floor area ratio. It features a long continuous urban street canyon with a vibrant surrounding environment. The district's well-developed infrastructure, amenities, and proximity to the Han River enhance the overall ambiance.

Through thermal comfort simulations, the research reveals notable differences in thermal comfort indicators between the left and right sides of the Central Business District. Despite the prevalence of high-rise buildings on the left side, the spacing between buildings reduces the urban heat island effect compared to the densely arranged buildings on the right side. In the case of the Gangnam Business District, the dense forest of tall buildings contributes to the urban heat island effect. Areas experiencing the heat island effect coincide with regions characterized by taller structures, larger building sizes, and higher population density. Understanding these patterns is crucial for implementing effective urban design strategies to mitigate the adverse effects of the heat island phenomenon and create a more sustainable and comfortable living environment.

Overall, the research emphasizes the importance of analyzing the correlation between urban street canyon morphology and the microclimate environment to promote effective urban management, sustainable urban forms, and redevelopment of urban street spaces while considering the microclimate environment.

Acknowledgements. This research is financially supported by Korea Ministry of Land, Infrastructure and Transport (MOLIT) as [Innovative Talent Education Program for Smart City], the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea (NRF-2021S1A5C2A03087287), the Institute for Peace and Unification Studies (IPUS) at Seoul National University under the project of “Laying the Groundwork for Unification and Peace” and the Korea Agency for Infrastructure Technology Advancement(KAIA) grant funded by the Ministry of Land, Infrastructure and Transport(Grant RS-2022-00143404).

References

Oke, T. R. (1982). The energetic basis of the urban heat island. Quarterly Journal of the Royal Meteorological Society, 108(455), 1–24.

Yao, L., Sun, S., Song, C., Li, J., Xu, W., & Xu, Y. (2021). Understanding the spatiotemporal pattern of the urban heat island footprint in the context of urbanization, a case study in Beijing, China. Applied Geography, 133, Article 102496.

Gonzalez-Trevizo, M. E., Martinez-Torres, K. E., Armendariz-Lopez, J. F., Santamouris, M., Bojorquez-Morales, G., & Luna-Leon, A. (2021). Research trends on environmental, energy and vulnerability impacts of urban heat Islands: An overview. Energy and Buildings, 246, Article 111051.

Singh, M., & Sharston, R. (2022). Quantifying the dualistic nature of urban heat Island effect (UHI) on building energy consumption. Energy and Buildings, 255, Article 111649.

Santamouris, M. (2020). Recent progress on urban overheating and heat island research. Integrated assessment of the energy, environmental, vulnerability and health impact. Synergies with the global climate change. Energy and Buildings, 207.

Wang, Y., Guo, Z., & Han, J. (2021). The relationship between urban heat island and air pollutants and them with influencing factors in the Yangtze River Delta, China. Ecological Indicators, 129, Article 107976.

Zhang, H., Wu, C., Chen, W., & Huang, G. (2019). Effect of urban expansion on summer rainfall in the Pearl River Delta, South China. Journal of Hydrology, 568, 747–757.

Pena Acosta, M., Vahdatikhaki, F., Santos, J., Hammad, A., & Dor´ee, A. G. (2021). How to bring UHI to the urban planning table? A data-driven modeling approach. Sustainable Cities and Society, 71, Article 102948.

Zheng, T., Qu, K., Darkwa, J., & Calautit, J. K. (2022). Evaluating urban heat island mitigation strategies for a subtropical city centre (a case study in Osaka, Japan). Energy, 250.

Hou, H., Su, H., Liu, K., Li, X., Chen, S., Wang, W., & Lin, J. (2022). Driving forces of UHI changes in China's major cities from the perspective of land surface energy balance. Science of the Total Environment, 829, Article 154710.

Aboelata, A., & Sodoudi, S. (2019). Evaluating urban vegetation scenarios to mitigate urban heat island and reduce buildings' energy in dense built-up areas in Cairo. Building and Environment, 166.

Skelhorn, C., Lindley, S., & Levermore, G. (2014). The impact of vegetation types on air and surface temperatures in a temperate city: A fine scale assessment in Manchester, UK. Landscape and Urban Planning, 121, 129–140.

Middel, A., Chhetri, N., & Quay, R. (2015). Urban forestry and cool roofs: Assessment of heat mitigation strategies in Phoenix residential neighborhoods. Urban Forestry & Urban Greening, 14(1), 178–186.

Hami, A., Abdi, B., Zarehaghi, D., & Maulan, S. B. (2019). Assessing the thermal comfort effects of green spaces: A systematic review of methods, parameters, and plants' attributes. Sustainable Cities and Society, 49.

Bartesaghi Koc, C., Osmond, P., & Peters, A. (2018). Evaluating the cooling effects of green infrastructure: A systematic review of methods, indicators and data sources. Solar Energy, 166, 486–508.

Rahman, M. A., Stratopoulos, L. M. F., Moser-Reischl, A., Zolch, ¨ T., H¨aberle, K.-H., Rotzer, ¨ T., Pretzsch, H., & Pauleit, S. (2020). Traits of trees for cooling urban heat islands: A meta-analysis. Building and Environment, 170.

Zolch, ¨ T., Maderspacher, J., Wamsler, C., & Pauleit, S. (2016). Using green infrastructure for urban climate-proofing: An evaluation of heat mitigation measures at the micro-scale. Urban Forestry & Urban Greening, 20, 305–316.

Lobaccaro, G., & Acero, J. A. (2015). Comparative analysis of green actions to improve outdoor thermal comfort inside typical urban street canyons. Urban Climate, 14, 251–267.

Sodoudi, S., Zhang, H., Chi, X., Müller, F., & Li, H. (2018). The influence of spatial configuration of green areas on microclimate and thermal comfort. Urban Forestry & Urban Greening, 34, 85–96.

Morakinyo, T. E., Kong, L., Lau, K. K.-L., Yuan, C., & Ng, E. (2017). A study on the impact of shadow-cast and tree species on in-canyon and neighborhood's thermal comfort. Building and Environment, 115, 1–17.

Li, J., Zheng, B., Ouyang, X., Chen, X., & Bedra, K. B. (2021). Does shrub benefit the thermal comfort at pedestrian height in Singapore? Sustainable Cities and Society, 75.

Lee, H., Mayer, H., & Chen, L. (2016). Contribution of trees and grasslands to the mitigation of human heat stress in a residential district of Freiburg, Southwest Germany. Landscape and Urban Planning, 148, 37–50.

Sun, R., Chen, A., Chen, L., & Lü, Y. (2012). Cooling effects of wetlands in an urban region: The case of Beijing. Ecological Indicators, 20, 57–64.

Kantzioura, A., Kosmopoulos, P., Dimoudi, A., & Zoras, S. (2015). Experimental investigation of microclimatic conditions in relation to the built environment in acentral urban area in Thessaloniki (Northern Greece): A case study. Sustainable Cities and Society, 19, 331–340.

Ketterer, C., & Matzarakis, A. (2014). Human-biometeorological assessment of heat stress reduction by replanning measures in Stuttgart, Germany. Landscape and Urban Planning, 122, 78–88.

Kim, Y., An, S. M., Eum, J. H., & Woo, J. H. (2016). Analysis of thermal environment over a small-scale landscape in a densely built-up Asian megacity. Sustainability, 8(4).

Knowles, R. L. (2003). The solar envelope: Its meaning for energy and buildings. Energy and Buildings, 35(1), 15–25.

Kottek, M., Grieser, J., Beck, C., Rudolf, B., & Rubel, F. (2006). World map of the Koppen Geiger climate classification updated. Meteorologische Zeitschrift, 15(3), 259–263.

Krüger, E. L., Minella, F. O., & Rasia, F. (2011). Impact of urban geometry on outdoor thermal comfort and air quality from field measurements in Curitiba, Brazil. Building and Environment, 46(3), 621–634.

Martin, L., & March, L. (1972). Urban space and structures. London: Cambridge University Press.

Martinelli, L., & Matzarakis, A. (2017). Influence of height/width proportions on the thermal comfort of courtyard typology for Italian climate zones. Sustainable Cities and Society, 29,

97–106.
Matzarakis, A., Mayer, H., & Iziomon, M. G. (1999). Applications of a universal thermal index: Physiological equivalent temperature. International Journal of Biometeorology, 43(2), 76–84.
Matzarakis, A., Rutz, F., & Mayer, H. (2007). Modelling radiation fluxes in simple and complex environments – application of the RayMan model. International Journal of Biometeorology, 51(4), 323–334.
Matzarakis, A., Rutz, F., & Mayer, H. (2010). Modelling radiation fluxes in simple and complex environments: Basics of the RayMan model. International Journal of Biometeorology, 54(2), 131–139.
Middel, A., Chhetri, N., & Quay, R. (2015). Urban forestry and cool roofs: Assessment of heat mitigation strategies in Phoenix residential neighborhoods. Urban Forestry & Urban Greening, 14(1), 178–186.
Nakamura, Y., & Oke, T. R. (1988). Wind, temperature and stability conditions in an east west oriented urban canyon. Atmospheric Environment, 22(12), 2691–2700.
Ng, E. (2009). Policies and technical guidelines for urban planning of high-density cities -air ventilation assessment (AVA) of Hong Kong. Building and Environment, 44(7), 1478–1488.
Nikolopoulou, M., & Steemers, K. (2003). Thermal comfort and psychological adaptation as a guide for designing urban spaces. Energy and Buildings, 35(1), 95–101.
Nunez, M., & Oke, T. R. (1977). The energy balance of an urban canyon. Journal of Applied Meteorology, 16(1), 11– 19.
Oke, T. R. (1988). Street design and urban canopy layer climate. Energy and Buildings, 11(1-3), 103–113.
Pearlmutter, D., Berliner, P., & Shaviv, E. (2005). Evaluation of urban surface energy fluxes using an open-air scale model. Journal of Applied Meteorology, 44(4), 532–545.
Pearlmutter, D., Berliner, P., & Shaviv, E. (2007). Integrated modeling of pedestrian energy exchange and thermal comfort in urban street canyons. Building and Environment, 42(6), 2396–2409.
Pearlmutter, D., Bitan, A., & Berliner, P. (1999). Microclimatic analysis of "compact" urban canyons in an arid zone. Atmospheric Environment, 33(24–25), 4143–4150.
Perini, K., & Magliocco, A. (2014). Effects of vegetation, urban density, building height, and atmospheric conditions on local temperatures and thermal comfort. Urban Forestry & Urban Greening, 13(3), 495–506.
Qaid, A., & Ossen, D. R. (2015). Effect of asymmetrical street aspect ratios on microclimates in hot, humid regions. International Journal of Biometeorology, 59(6), 657–677.
Salata, F., Golasi, L., Petitti, D., Vollaro, E. D. L., Coppi, M., & Vollaro, A. D. L. (2017). Relating microclimate, human thermal comfort and health during heat waves: An analysis of heat island mitigation strategies through a case study in an urban outdoor environment. Sustainable Cities and Society, 30, 79–96.
Salata, F., Golasi, L., Vollaro, R. D., & Vollaro, A. D. (2016). Urban microclimate and outdoor

thermal comfort. A proper procedure to fit ENVI-met simulation outputs to experimental data. Sustainable Cities and Society, 26, 318–343.

Santamouris, M., Papanikolaou, N., Koronakis, I., Livada, I., & Asimakopoulos, D. (1999). Thermal and air flow characteristics in a deep pedestrian canyon under hot weather conditions. Atmospheric Environment, 33(27), 4503–4521.

Song, B., & Park, K. (2015). Contribution of greening and high-albedo coatings to improvements in the thermal environment in complex urban areas. Advances in Meteorology.

Sözen, İ., & Oral, G. K. (2019). Outdoor thermal comfort in urban canyon and courtyard in hot arid climate: A parametric study based on the vernacular settlement of Mardin. Sustainable Cities and Society, 48.

Spagnolo, J., & de Dear, R. (2003). A field study of thermal comfort in outdoor and semioutdoor environments in subtropical Sydney Australia. Building and Environment, 38(5), 721–738.

Taleb, D., & Abu-Hijleh, B. (2013). Urban heat islands: Potential effect of organic and structured urban configurations on temperature variations in Dubai, UAE. Renewable Energy, 50, 747–762.

Taleghani, M., Kleerekoper, L., Tenpierik, M., & van den Dobbelsteen, A. (2015). Outdoor thermal comfort within five different urban forms in the Netherlands. Building and Environment, 83, 65–78.

Tsitoura, M., Michailidou, M., & Tsoutsos, T. (2016). Achieving sustainability through the management of microclimate parameters in Mediterranean urban environments during summer. Sustainable Cities and Society, 26, 48–64.

Wang, Y. P., & Akbari, H. (2015). Development and application of' thermal radiative power' for urban environmental evaluation. Sustainable Cities and Society, 14, 316–322.

Wong, N. H., & Jusuf, S. K. (2010). Study on the microclimate condition along a green pedestrian canyon in Singapore. Architectural Science Review, 53(2), 196–212.

Wong, N. H., Jusuf, S. K., La Win, A. A., Thu, H. K., Negara, T. S., & Wu, X. C. (2007). Environmental study of the impact of greenery in an institutional campus in the tropics. Building and Environment, 42(8), 2949–2970.

Xie, X. M., Huang, Z., Wang, J. S., & Xie, Z. (2005). The impact of solar radiation and street layout on pollutant dispersion in street canyon. Building and Environment, 40(2), 201–212.

Zhang, Y., Qin, B., & Chen, W. (2003). Analysis of solar radiation variations over Nanjing region in recent 40 years. Journal of Geographical Sciences, 13(1), 97–104.

A STUDY ON THE URBAN STRUCTURAL CHARACTERISTICS OF CENTRAL LIVING STREET FOR POPULATION DENSITY MANAGEMENT: THROUGH COMPARATIVE ANALYSIS OF NATURAL ORIGIN AND PLANNING CENTER (1101)

Minseo Kim[1*], Youngsang Kwon

[1] Department of Civil and Environmental Engineering, College of Engineering, Seoul National University, Seoul, Korea; *soon9412@snu.ac.kr

Abstract. The city road plays an important role in urban space as a space where daily life and various activities take place. However, in this space, population density management is important in terms of infectious disease management and urban revitalization at the same time as areas where a large population is active. By comparing actual urban user data (POI), urban structural spatial characteristics, and floating population data, we intend to derive the characteristics of urban space in which actual users are active. The above study is of important significance in urban risk management by studying the relationship between the morphological structure of urban streets and the urban center.

POI-intensive areas were selected for the entire Seoul Metropolitan Government to compare the urban structural differences between naturally occurring cities and planned centers through POI. Among the POI concentrated areas, Eulji-ro was the naturally occurring city, and Seolleung was selected as the planning center. POI data was visualized through GIS based on 2022 data, using a public data portal provided by the governmentThis study is basically based on multiple regression analysis. By setting the indicators of spatial syntax as major independent variables and POI-related variables as dependent variables, we would like to find out the impact of the physical structure of the city on people's behavior patterns.

As a result, many POIs were located in areas with high integration and connection, and the back street was found to be a POI-intensive area. The degree of integration of the naturally occurring area (Eulji-ro) was correlated with integration only in 800M units, and for the central street with high integration and connection, the back street with low integration and high connection compared to the central street was POI dense. Through this study, it provides an analysis framework for urban planning and location preferences in compact urban centers. In addition, the planning effect was proved through an empirical analysis between the urban center and the pedestrian-centered urban plan. This can suggest a planning direction when creating a walking environment through the development or redevelopment of a new city in the future.

Keywords: Urban Structure, Center, Population Density, POI, Space Syntax.

1. Background and purpose of the study

1.1. Background

The city road plays an important role in urban space as a space where daily life and various activities take place. By comparing actual urban user data (POI), urban structural spatial characteristics, and floating population data, we intend to derive the characteristics of urban space in which actual users are active. This spatial information will be useful basic data for infectious diseases and density management.

1.2. Purpose of the study

Quantitative characterization of urban morphological structures based on space Syntax distance analysis data is meaningful in analyzing urban forms. In addition, the purpose of the study is to analyze the correlation with urban activity center data (POI) so that urban space management can be performed through data between urban form and actual users.

2. Theoretical and Prior Research Analysis

2.1. POI

Compared to existing building usage data, POI big data can identify various functions of the center (housing, commerce, work, leisure, etc.) and has the advantage of analyzing urban spatial structure and identifying the function of the center because there are no spatial restrictions on boundaries with microscopic data.

2.2. Space Syntax

Space syntax is a spatial analysis method developed by researchers at the University of London, and is a research methodology that quantitatively presents accessibility from each space to another space by analyzing the structure of each space.

In the space syntax, there are accessibility areas that analyze the shipper's road and visibility areas that analyze the space that is the area. Among the two factors, the analysis will be conducted focusing on accessibility. As such, space syntax analyzes the mutual organic combination of space based on the interrelationship between all spaces from a macro perspective and reflects the path through which people move, so the analysis is conducted focusing on the behavior of people using space.

2.3. Analysis of previous studies

When analyzing existing previous studies, it is largely divided into a study that analyzed the correlation between side streets and pedestrian volume, and a study that analyzed the correlation between road pedestrian volume using space syntax.

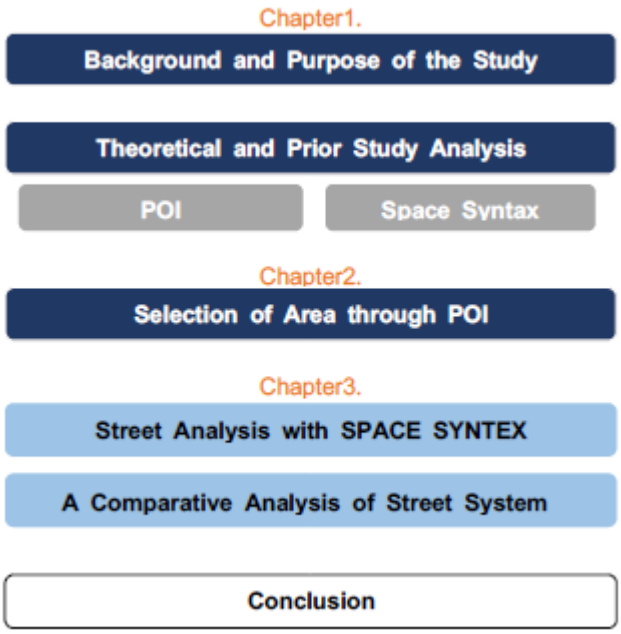
In the case of back streets and pedestrian traffic, data on empirical users were used using POI data, and road connectivity, integration, and morphological analysis were mainly conducted.

Most of the studies conducted quantitative analysis by setting indicators as variables through space syntax.

This study differs from previous studies in that it used POI data for domestic target sites to study the correlation between users' empirical data and road networks.

3. Scope and method of research

3.1. Flow of research



3.2. Selection of Area through POI

The POI data for the selection of the target site used the public data portal in Seoul, and all POI data showing actual population activity were used.

POI refers to restaurants, tourist attractions, leisure, and cultural facilities that many people visit, centering on commercial districts.

The temporal range of the analysis data was calculated based on the data in 2021 provided by the public data portal.

In addition, data analysis was conducted to examine areas that are activated on the street, such as car-free streets, green transportation, and commercial districts.

Through data analysis earlier, two locations around Seolleung Station and Eulji-ro, which has a high POI density throughout Seoul, were selected.

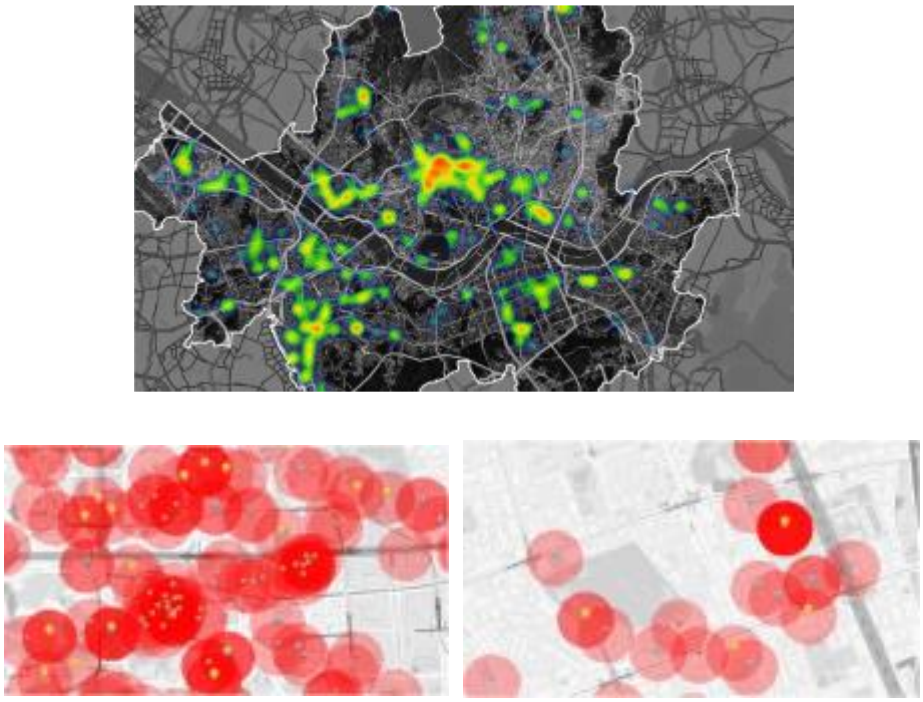


Figure 1. Seoul POI Data Density

3.3. T-test analysis and variable setting

This study is basically conducted based on multiple regression analysis. By setting the indicators of spatial syntax as major independent variables and POI-related variables as dependent variables, the impact of the city's physical structure on people's behavior was investigated.

Therefore, as independent variables, space integration, control, and connection were used, which can be collected on a road-by-road basis in space. As dependent variables, POIrelated variables such as density, absolute number, and industry of POI can be produced and used. At this time, variables related to spatial syntax are expressed by road unit, and POI is expressed by point vector in space, which is applied by road unit.

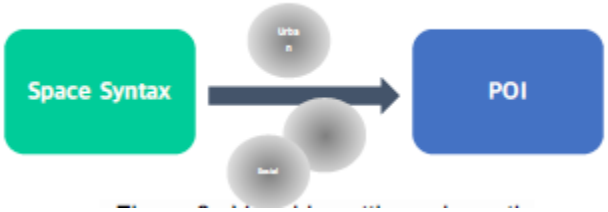


Figure 2. Variable setting schematic

4. Analysis of Living Street in the Center

4.1. Area characteristics

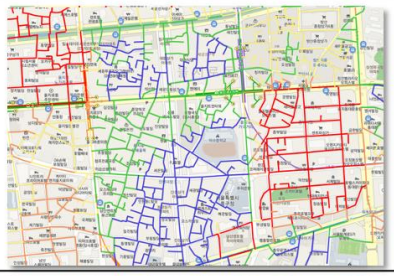
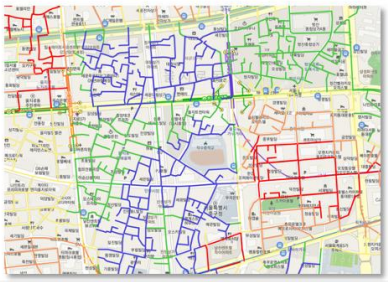
Euljiro has a high population density and floating population on both weekdays and weekends around the POI target site.

Table 2. Population density on weekdays and weekends around Euljiro Station

	Population density	The living population
Weekly population		
Weekend Population		

Around the POI target site around Seolleung Station, the population density and floating population are both higher than on weekends.

Table 3. Population density during weekdays/weekends around Seolleung Station

	Population density	The living population
Weekly population		
Weekend Population		

4.2. Analysis of Street System in Urban Space

4.2.1. Segment Analysis

For each of the two target sites, the range of radius 800m and 1000m, including the target site, was investigated, respectively. Segment analysis is used to analyze all roads as separate elements based on intersections, not axial analysis, which sees the following roads as an axis.

Table 4. Segment elements

Segment analysis investigates 8 factors

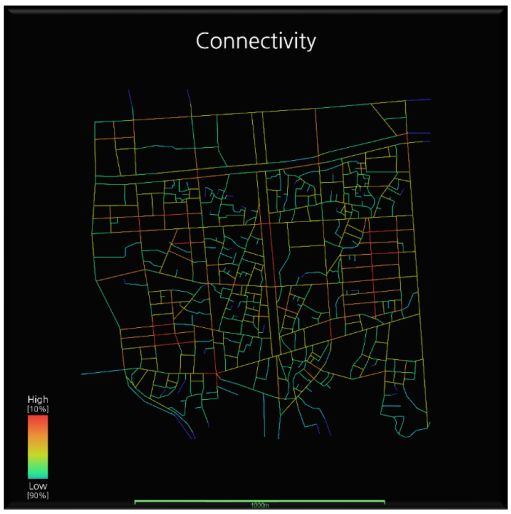
Segment	Contents
Connectivity	The number of connected roads indicates connectivity to the surrounding area
Angular Connectivity	The sum of the angles entering the road from the connected road, It also indicates the convenience of connecting to the road
Choice	When traffic occurs within the scope of the investigation, the relevant road shall be used An indicator of the likelihood of selection, indicating the activity of the road
Control	In the event of traffic on the connected road, the relevant road shall be used It is an indicator of possibility, and it is a local indicator of choice
Global Integration	We're going to make sure that all roads within the scope of the investigation are connected Indicators indicating the accessibility of the road
Local Integration [200m, 400m, 800m]	within the distance specified by local integration Measure integration for nearby roads

4.2.2. t-test

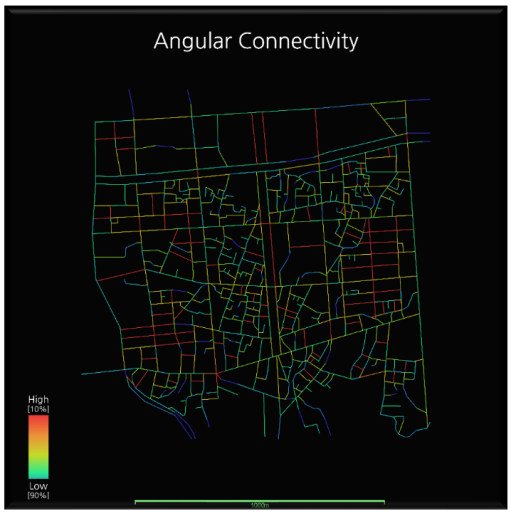
Categorize roads where POI is located and roads that are not Verify by t-test that there are significant differences in characteristics between the two groups.

4.3. Attribute Analysis Results

4.3.1. Segment Analysis Results Around Euljiro Station

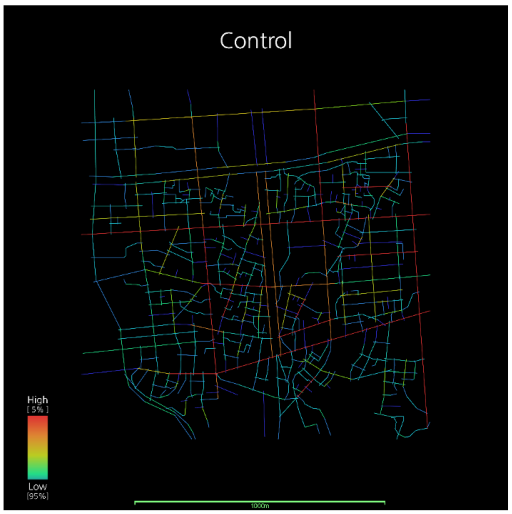


Mean	ST.DEV	MIN	MAX
3.463	1.003	1	6

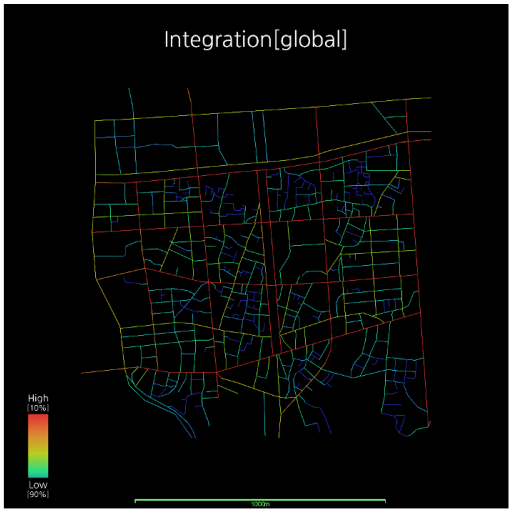


Mean	ST.DEV	MIN	MAX
2.108	.95	.022	4.238

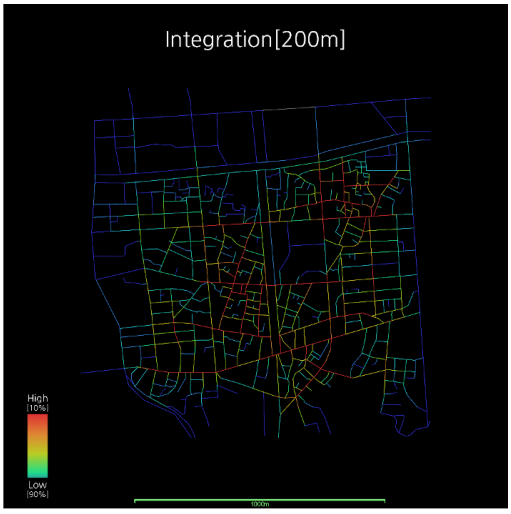
Mean	ST.DEV	MIN	MAX
23,718.612	43,808.833	0	221,237



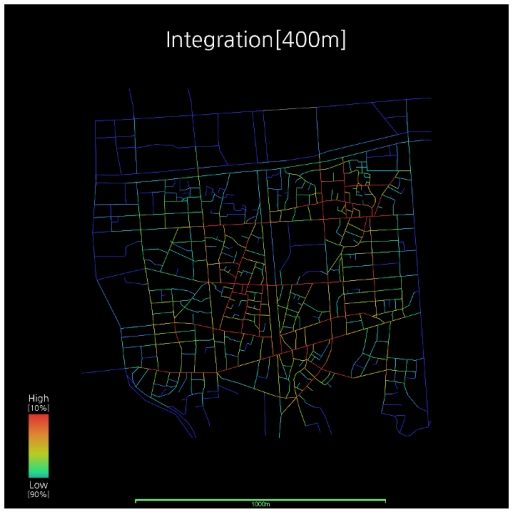
Mean	ST.DEV	MIN	MAX
1	0.782	0.056	10.776



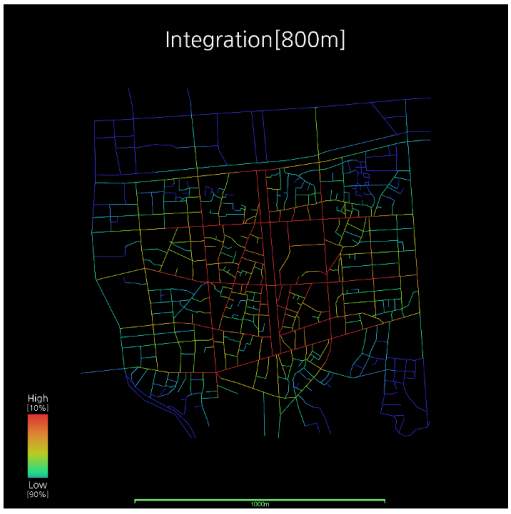
Mean	ST.DEV	MIN	MAX
408.928	87.916	171.332	599.874



Mean	ST.DEV	MIN	MAX
34.123	14.021	-1	77.911



Mean	ST.DEV	MIN	MAX
83.852	34.74	6.036	195.577



Mean	ST.DEV	MIN	MAX
221.216	84.207	32.206	454.987

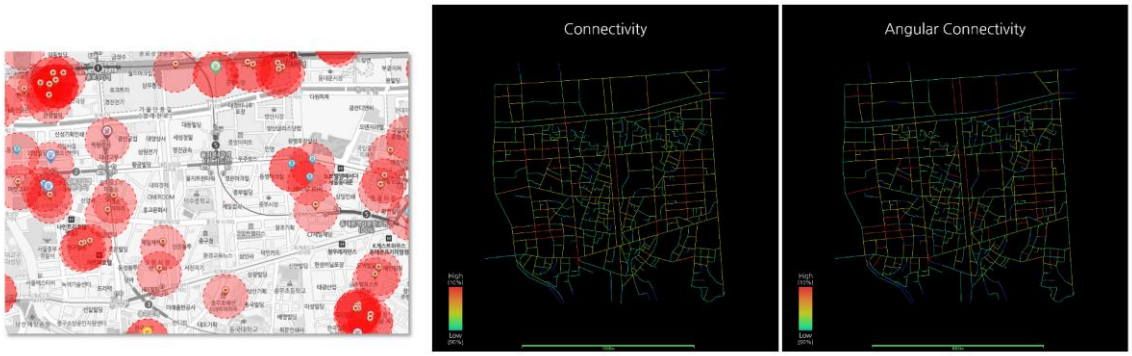
4.3.2. Results of t-test around Euljiro Station

Table 5. T-test results around Euljiro Station

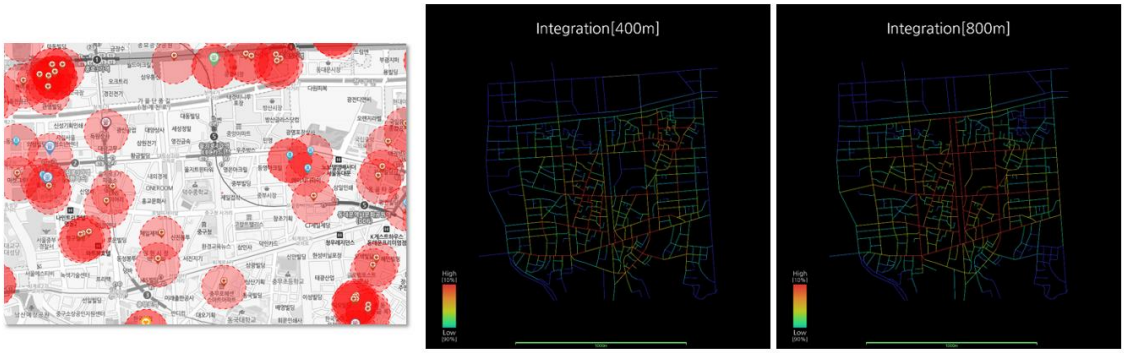
t-test	obs1	obs2	Mean (not POI)	Mean (POI)	dif	St Err	t value	p value
Connectivity	1181	227	3.437	3.599	-.162	.074	-2.2	.03**
Angular Connectivity	1181	227	2.08	2.257	-.177	.067	-2.65	.009***
Choice	1181	227	24,329.127	20,542.322	3,786.805	2938.524	1.3	.199
Control	603	145	.991	1.038	-.049	.07	-.7	.486
Integration [global]	1181	227	409.83	404.235	5.596	6.223	.9	.369
Integration [200m]	1181	227	33.937	35.095	-1.158	.947	-1.2	.222
Integration [400m]	1181	227	82.451	91.144	-8.693	2.466	-3.5	.001***
Integration [800m]	1181	227	216.903	243.653	-26.75	5.607	-4.75	0***

4.3.3. Analysis of results around Euljiro Station

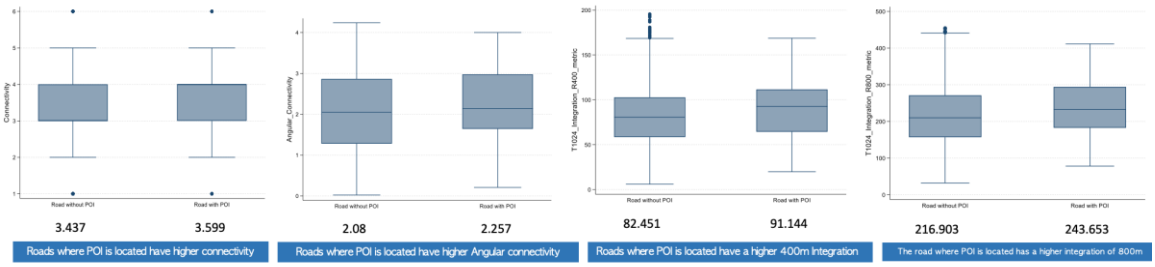
Table 6. A Comparative Analysis of the Street System of Urban Space around Euljiro Station and Actual Users



Both POI points and connectivity around Euljiro Station are highly correlated.

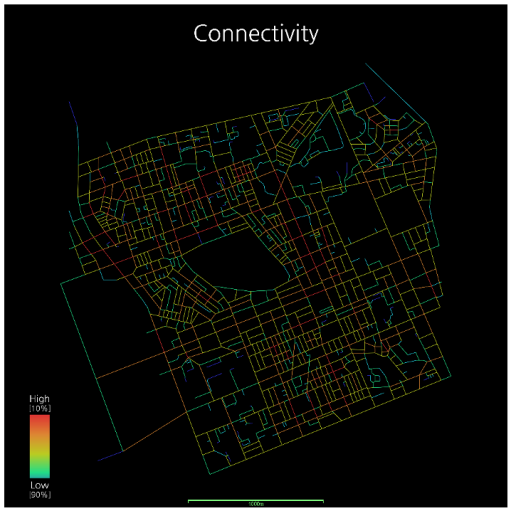


The degree of integration around Euljiro Station has a higher correlation in the 800M range of living area units than 400M.

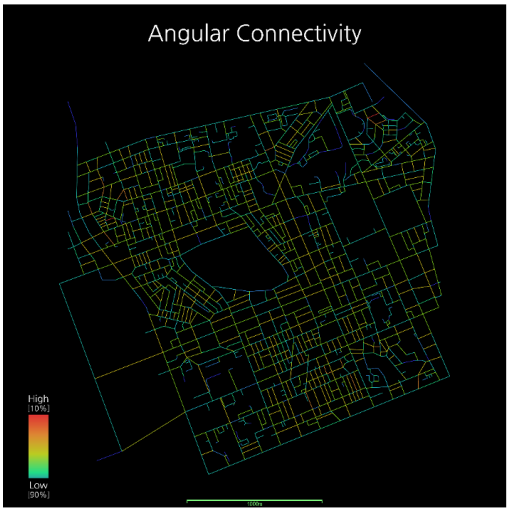


Both POI points and connectivity around Euljiro Station are highly correlated.

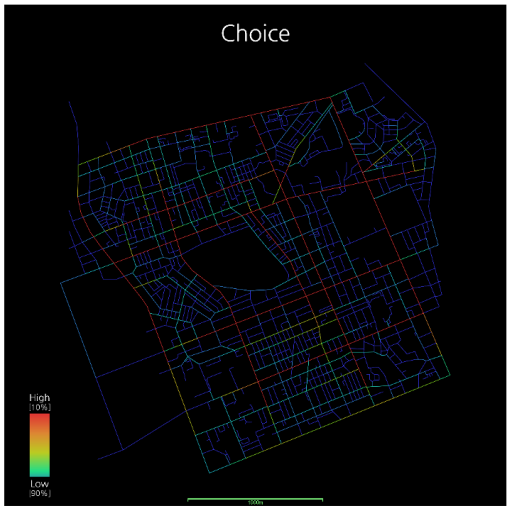
4.3.4. Segment Analysis Results Around Seolleung Station



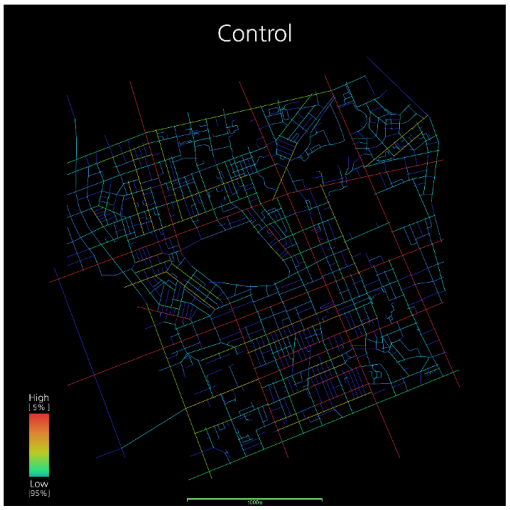
Mean	ST.DEV	MIN	MAX
3.79	1.061	1	6



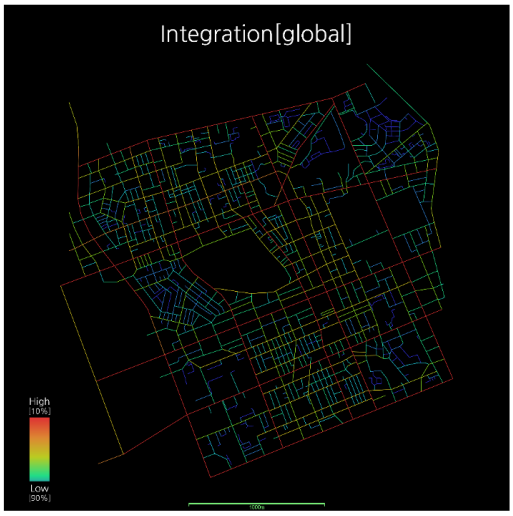
Mean	ST.DEV	MIN	MAX
2.446	.949	.025	5.328



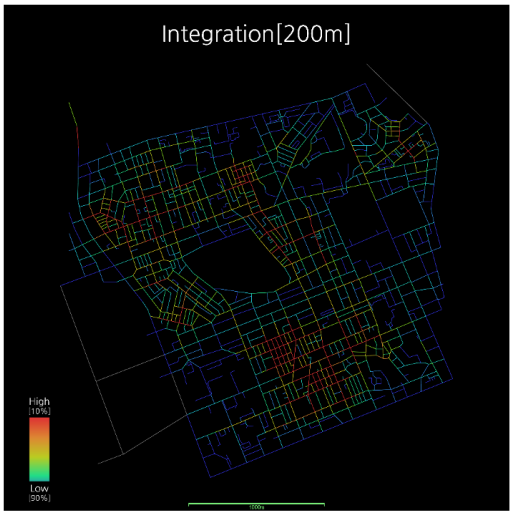
Mean	ST.DEV	MIN	MAX
63,273.822	130,000	0	1,085,614



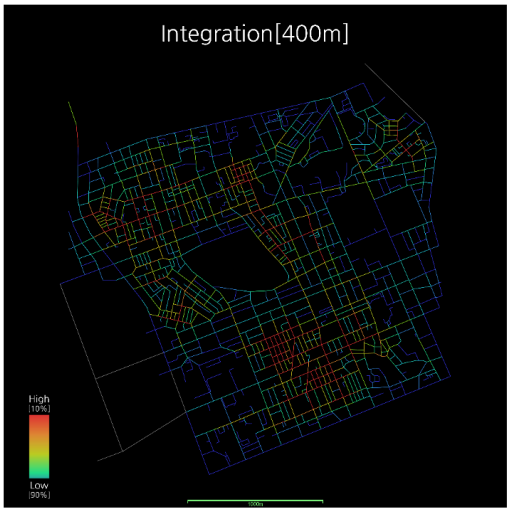
Mean	ST.DEV	MIN	MAX
0.998	0.989	0.026	11.515



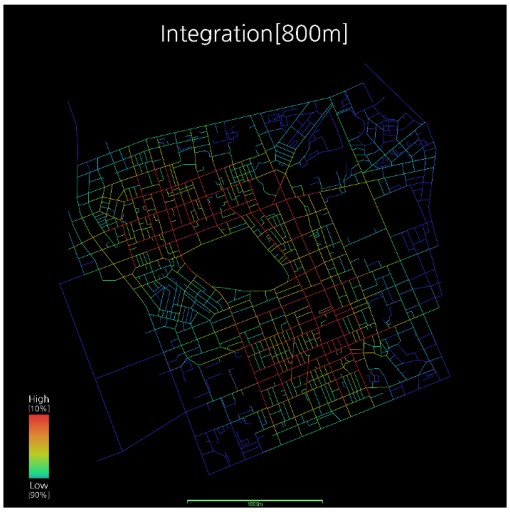
Mean	ST.DEV	MIN	MAX
694.823	147.75	254.028	1043.478



Mean	ST.DEV	MIN	MAX
23.748	10.808	-1	64.43



Mean	ST.DEV	MIN	MAX
57.887	26.658	-1	135.739



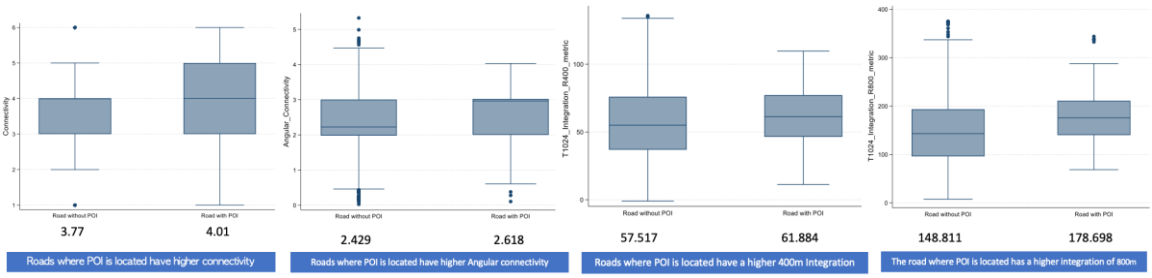
Mean	ST.DEV	MIN	MAX
151.345	66.34	7.557	375.206

4.3.4. Results of t-test around Seolleung Station

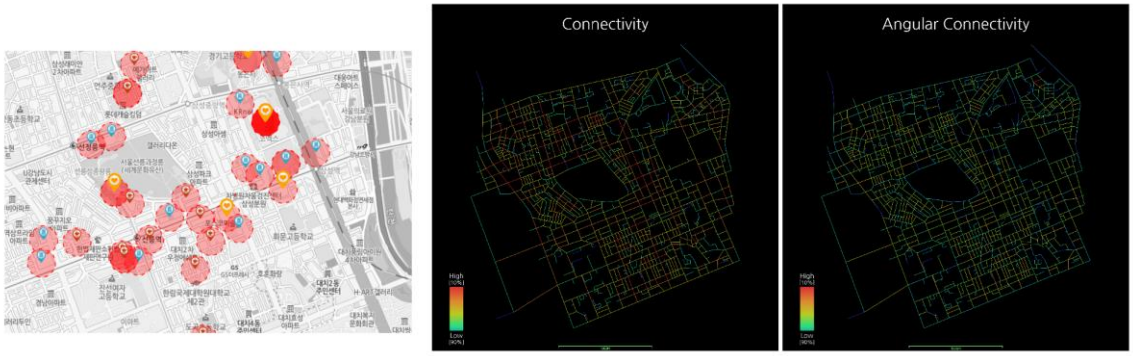
Table 7. T-test results around Seolleung Station

t-test	obs1	obs2	Mean (not POI)	Mean (POI)	dif	St Err	t value	p value
Connectivity	2321	215	3.77	4.01	-.24	.073	-3.25	.001***
Angular Connectivity	2321	215	2.429	2.618	-.189	.066	-2.85	.005***
Choice	2321	215	63016.644	66050.149	-3033.505	8331.327	-.35	.716
Control	1110	100	.992	1.071	-.079	.117	-.65	.504
Integration [global]	2321	215	691.707	728.467	-36.76	8.795	-4.2	0***
Integration [200m]	2321	215	23.605	25.296	-1.692	.813	-2.1	.038**
Integration [400m]	2321	215	57.517	61.884	-4.367	1.621	-2.7	.007***
Integration [800m]	2321	215	148.811	178.698	-29.887	3.897	-7.65	0***

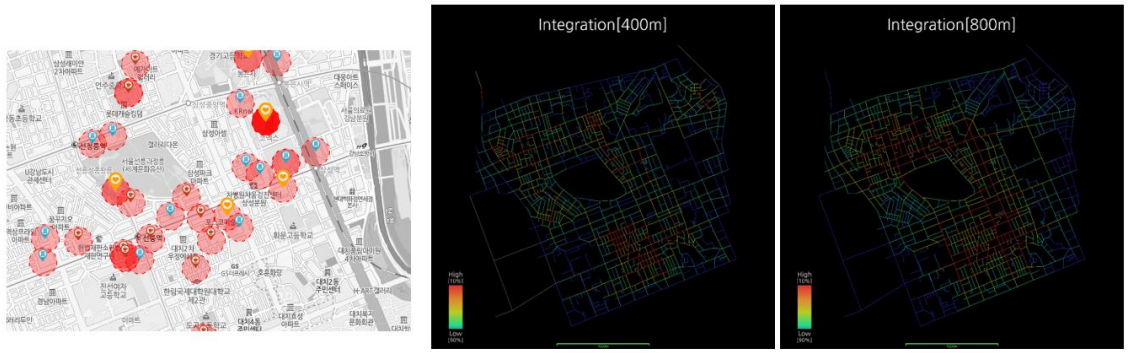
Table 8. Comparative Analysis of Urban Space Street System and Actual Users Around Seolleung Station



4.3.6. Segment Analysis Results Around Seolleung Station



Both POI and connection around Seolleung Station are highly correlated.



Both POI and integration around Seolleung Station are highly correlated.

5. Conclusion

The correlation between actual urban users and urban forms was analyzed by comparing the space syntax variable and POI characteristics, and the following three characteristics were derived.

First, POI was imported a lot in areas with high integration and connectivity.

Second, the naturally occurring area (Eulji-ro) correlates with the degree of integration only in 800M units. Third, the results of Space Syntax showed that the back street was a POI dense area. Fourth, for the central street with high integration and connection, the back street with low integration and high connection compared to the central street was found to be a POI-intensive area.

The above study can provide an analysis framework for urban planning or location selection through road network analysis in the urban center of compact cities.

An empirical analysis between urban centers and pedestrian-centered urban planning proves the effectiveness of the plan, and it can be a standard for the direction of the plan when creating a pedestrian environment through development or redevelopment of a new city.

Acknowledgement. This research was financially supported by the Institute for Peace and Unification Studies (IPUS) at Seoul National University under the project of “Laying the Groundwork for Unification and Peace.”

This work is financially supported by Korea Ministry of Land, Infrastructure and Transport(MOLIT) as Innovative Talent Education Program for Smart City"

References

Mohammad Javad Koohsari, Koichiro Oka, Neville Owen, Takemi Sugiyama, Natural m ovement: A space syntax theory linking urban form and function with walking for transport, Health & Place, Volume 58, 2019

Lei Wang, Xin Han, Jie He, Taeyeol Jung, Measuring residents’ perceptions of city streets to inform better street planning through deep learning and space syntax, ISPRS Journal of Photogrammetry and Remote Sensing, Volume 190, 2022

Chaham Alalouch, Sara Al-Hajri, Abeer Naser, Asma Al Hinai, The impact of space syntax spatial attributes on urban land use in Muscat: Implications for urban sustainability, Sustainable Cities and Society, Volume 46, 2019

Noor Alkamali, Najwa Alhadhrami, Chaham Alalouch, Muscat City Expansion and Accessibility to the Historical Core: Space Syntax Analysis, Energy Procedia, Volume 115, 2017

Magda Mŕria, Núria Salvadó, CONSERVATION OF THE URBAN HERITAGE AND SUSTAINABILITY: Barcelona as a Paradigm, Energy Procedia, Volume 115, 2017, Pages 29-40.

SMALL-AREA POPULATION FORECASTING OF SHRINKING CITIES IN SOUTH KOREA: USING SHAP(SHAPLEY ADDITIVE EXPLANATIONS) MACHINE LEARNING (1127)

Youhyun Kim[1], Donghyun Kim[1*]

[1] Department of Urban Planning and Engineering, Pusan National University, Busan, Republic of Korea; [*]donghyun-kim@pusan.ac.kr

Abstract. The purpose of this study is to identify the utility of machine learning model in projecting the population of small areas. This study was conducted between 2020 and 2040 in the local districts of Korea and compared the research results of cohort-component model and machine learning model. As a result of projecting population through the cohort-component method and machine learning, it was identified that the accuracy of the machine learning model was much higher. The cohort-component model is expected to have a high forecasting error because it only explains population change by three component: birth, death, and migration, and it is confirmed that it is almost unpredictable, especially when there are frequent population changes due to new development. On the other hand, the machine learning model reflects various variables such as socioeconomic factors in the population projecting model, which greatly reduces the prediction error. The machine learning model projected that the population would be evenly distributed across the country, especially on the central part of Busan Metropolitan City, while the cohort-component model projected that the population would be concentrated in some areas such as Gijang-gun and Gangseo-gu. The SHAP value interpreted as the machine learning model relying most heavily on the pre-population and fertile women variables to project population.

Keywords: Small-area Population Projection, Cohort-Component Method, Machine Learning, SHAP.

1. Introduction

Population data is the basis of urban planning and various policy data and is an essential leading indicator. This is because changes in the population structure not only affect all areas such as housing, economy, welfare, and environment, but also determine the size of urban planning facilities and service supply standards based on predicted population data. In other words, population is the most basic data for estimating demand in all areas encompassing cities. Therefore, inaccurate population prediction causes idle capital or congestion costs, causing social inefficiency and degrading the quality of the entire city. This means that a professional understanding of the population structure and size is

required for sustainable national land construction, and accurate population estimation should be in the first stage when establishing a basic urban plan.

In the era of population decline, questions about the rationality of future population estimates have led to the need for population prediction at a more detailed unit independent of administrative district boundaries. In fact, a lot of research and policies related to population estimation in small regions have recently been discussed domestically and internationally, and research methods that can increase the accuracy of population prediction in small regions are also being devised. (Wilson, 2015; Inoue, 2017). Statistical techniques used in the existing population estimation process only predict population change trends based on past populations, and there is a limit to setting factors that affect population size and fluctuations. Therefore, the socioeconomic characteristics or regional specificity of the region cannot be considered. Population estimation in small areas should be carried out based on scientific evidence based on big data, away from traditional statistical techniques, as it must ensure the accuracy of high-resolution data.

In this context, the grid-based future population prediction model using artificial intelligence techniques can not only diagnose detailed and specific national land phenomena but also reflect nonlinear relationships between factors that affect population fluctuations. Therefore, the purpose of this study is as follows. This study aims to predict the future population distribution of 500m grid units in Busan, Korea from 2020 to 2040 by applying cohort factor method and machine learning algorithms, which are commonly used population estimation techniques, and to develop a more appropriate future population prediction model for small areas. Accordingly, interpretable machine learning was applied to understand the linear or nonlinear relationship between factors affecting the future population.

The study is conducted in the following order. Section 2 examines research trends related to population estimation and interpretable machine learning in small areas. Section 3 explains the research model and data set in this study based on the theoretical background identified in Section 2. Section 4 presents the research results, and Section 5 presents the conclusions of the study and future research directions.

2. Theoretical background

2.1. Population Projection and Forecasting Error

Demographic discussions regarding future population prospects generally use the terms 'projection' and 'forecasting', but technically the two concepts are different. Projection is a conditional statement of future population based on assumptions related to population fluctuation factors, while forecasting(prediction) is defined as a statement about estimating the most likely future realization value based on scientific knowledge (Smith,

Tayman, & Swanson, 2001, p.3). In terms of the projection and forecasting concept, forecasting always corresponds to projection, but the inverse is not established (Wilson & Rees, 2005). In reality, population prediction is named population projection, which seems to be due to the inevitable error in predicting the future population. This mix of terms between demographers and population data users rather indicates that population projection is necessary due to the uncertainty of these data (Shaw, 2007). Alternatively, the degree of error and uncertainty of the predicted result value should be clearly presented.

The reasons for using the concept of estimation in existing population estimation studies are as follows. First, the process of predicting the future population is meaningful just by looking at the figures under certain conditions if the presented assumption is logical and there is no error in the formula process, regardless of future feasibility. Second, given that perfect prediction is impossible, it is more productive to discuss how to reduce uncertainties arising from the process of population forecasting rather than distinguishing the definition of estimation and prediction. In addition, population estimation work does not allow a wide margin of error or mechanically repeat simple conditions and assumptions, but rather involves deriving the most accurate values with some future feasibility in mind.

This study was used in accordance with the methodology using both concepts of estimation and prediction. The cohort-component method, which is a methodology that only estimates the prospective population in the future by considering only three factors that affect the structure of population fluctuation, is named population projection. On the other hand, in the case of machine learning techniques that predict values close to actual values by reflecting more realistic and diverse variables based on big data and high-end computers, population forecasting was mentioned.

Forecast Error(FE), an indicator of the accuracy of population estimation results, is defined as the difference between the population forecast value and the actual population value at the time of the estimated target year. This means the absolute value of the error, and in reality, the percentage error (PE) is used more than the absolute value of the error. Marking the error as a percentage is useful when you want to compare the result values relatively.

In some cases, there are multiple predictions for a point in time and for a particular year. This includes cases where future population estimates for various regions are conducted at the same time or where several predictions exist in a specific time series section. In this case, it is useful to present the average value of errors such as ME (Mean Error) and MAE (Mean Absolute Error). ME may not be able to present an accurate error due to offsetting of positive and negative values in the calculation process, while MAE means the average absolute value of errors, so cumulative error calculation is possible. However,

ME and MAE are also easier to interpret and more applicable when marking their values as percentages. However, high inaccuracy can be derived due to the influence of extreme values or offset of errors, respectively, MPE (Mean Percentage Error), a percentage substitution value of ME, and MAPE (Mean Absolute Percentage Error), a percentage substitution value of MAE.

Accordingly, the difference between the predicted value and the actual value is squared and presented as MSE (Mean Squared Error), and if the error is squared, the effect of the extreme can be excessively reflected, so RMSE (Root Mean Squared Error), the square root of MSE, is also used. A schematic representation of the type of prediction error that measures the accuracy of population estimation is as follows.

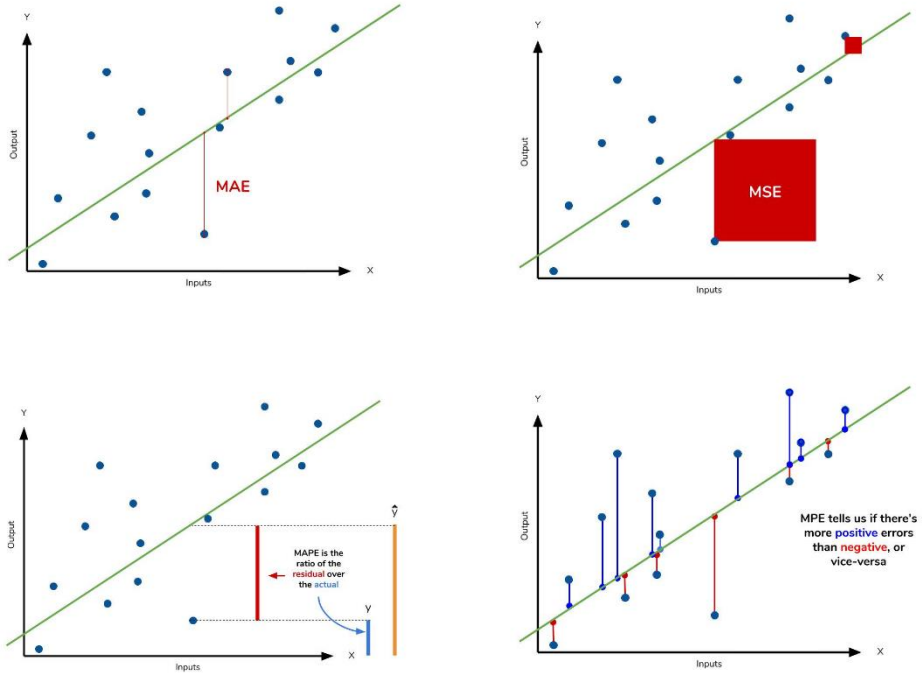


Figure 1. Accuracy of Population Projection

2.3. Small-Area Population Projection

One of the main trends in demographics is the demand for population estimation in small areas (Cai, 2007). Estimating the population of small areas is useful in that governments and companies can present more accurate investments when investing in new infrastructure or providing local services, or point to specific areas where services should

be provided intensively. However, despite the usefulness and necessity of small-area population estimation research due to inversely proportional prediction accuracy and rapidly changing demographic environment as spatial resolution is increased, related studies are still insufficient. (Wilson et al., 2023). The reasons for the difficulty in estimating the population of small areas and slow interdisciplinary development are largely as follows. First, most population prediction models, such as the cohort factor method, have been developed to address population structures within the macrogeographic range. When applying this prediction model to small areas, it is difficult to guarantee the reliability of the research results due to the lack of spatial resolution. Next, in the case of small areas, non-personal factors such as social environment context and land use that traditional population prediction models do not consider play a greater role as variables. Therefore, the second reason can also be seen as emphasizing that there is a limit to applying the traditional population prediction model to small areas (Chi et al., 2011). In recent years, the field of population estimation in these small areas has been increasing its potential due to the development of the big data field and the development of new technologies that exceed human capabilities.

Although there is no universal definition of small areas in the demographic field, small areas are generally considered the most detailed spatial unit among the regional classifications for which data can be obtained (Smith and Morison, 2005). Examples of representative small areas in previous studies include Statistical Area Level 2 in Australia, sensor tracks in the United States, Ward and census areas in the United Kingdom, and most of the populations in those areas are less than 20,000 (Wilson, 2015). Most of the studies related to small areas in Korea have been conducted at the city, county, and district levels, and these studies are focusing on the process of increasing the accuracy of population prediction due to population movement. However, as the demand for population prediction for more detailed areas increases, the unit of small areas is gradually narrowing to a narrower range such as eup, myeon, dong, aggregate, and grid. In recent years, research on how to predict grid-level population has been conducted at home and abroad, and accordingly, public and private sectors such as the National Geographic Information Service and mobile carriers are producing grid-level statistical data to support the research fiel.

Various methodologies are used to increase the accuracy of prediction in small-area population estimation studies. The methodologies used in related previous studies are largely classified into basic models, cohort factor methods, spatial statistical models, scenario-based models, and artificial intelligence techniques. The basic model is again divided into trend extrapolation and ratio, and these models require minimal data and have the advantage of simplifying the calculation process, but as the prediction period increases and the region decreases, the prediction error increases and changes in the population structure cannot be explained. The cohort factor method is the most

commonly used population estimation methodology, and is a method of estimating future populations by creating a population balance equation for the three factors of population change: birth, death, and movement. In the case of the cohort factor method, in the past, it simply remained in the accounting method considering the number of births, deaths, and transfers and transfers in the base population, but recently, it has been advanced by applying probability and regression mo. The Kocht factor method is a population forecast method that is widely used in recognition of its reliability by capturing population change patterns well, but it still has limitations to apply to small regional units. This is because it is difficult to calculate the factors of population change considered by the cohort factor method at a microscopic level. The spatial statistical model and spatio-temporal regression model have the advantage of reflecting the interrelationship between adjacent spaces overlooked by existing demographic methodologies, but prior studies show that the prediction error is not significantly reduced compared to simple regression. (Chi·Voss, 2011). Unlike the aforementioned methodologies, it is a technique that simulates future changes or predicts future populations based on theoretical backgrounds and socioeconomic and physical environmental contexts related to population change. It can be seen that scenarios are mainly organized according to land use and future development plans and urban basic plans announced by each local government, and future populations are estimated for each scenario. (Triantakonstantis·Mountrakis, 2012; Ford et al., 2019; Chen et al., 2020). This scenario-based future population estimation method has the advantage of reducing errors in predictions by reflecting land use plans and various urban population variables, but like existing demographic models such as the cohort factor method, there are limitations in the stage of building small-area data. In addition, demographic factors and natural population growth factors are relatively neglected in the population outlook and are not accepted by demographers.

Artificial intelligence techniques, a methodology used in this study, began to be applied to the population estimation system three to four years ago, and most of the population estimation studies using machine learning techniques compare whether the population prediction performance of machine learning models is significant compared to existing population estimation techniques. (Riman et al., 2019; Grosman, 2022·Tilson). Riiman et al. (2019) compared the results of the ANN (aromatic neural network) long-short term memory (LSTM) for the county area of Alabama and the results of the cohort factor method. The study presented two types of models in which data from all counties were learned in batches and models learned separately for each county. The most predictive case was when the ANN LSTM model was learned for each county, and the MAPE of this model was 5%, proving its usefulness as a population estimation model. Chen et al. (2020) predicted the population distribution every five years from 2015 to 2050 using four artificial intelligence algorithms: XGBoost, Random forest, Neural network, and Support

vector regression. This study attempted to derive realistic results by reflecting spatial variables related to population distribution such as land use and distance to urban centers in future population estimation. Grossman et al. (2022) tried to confirm the usefulness of the ensemble technique of machine learning, a technique that combines several models when predicting population. Accordingly, six models were applied: CSP (constant share of population), MEX (modified expansion model), VSG (variable share of growth model), LIN/EXP (linear/exponential), THETA, and LGBM (light gradient boosting model), and the subject of the study is SA and New Zealand. There are two methods of merging models: to derive the average value of the total model result value or to derive the average value excluding the maximum and minimum values of each model. Studies have shown that including the LGBM model improves the accuracy of the population prediction model, which has been confirmed that machine learning algorithms contribute to the reliability of population prediction in small areas. In addition, studies using LSTM algorithms that enable time-series population change trend learning or machine learning techniques, a technique for estimating future populations through past data learning related to population change, are emerging. (Weber, 2020; Grossman, Wilson, Temple, 2022).

Accordingly, it can be seen that artificial intelligence techniques such as machine learning have been applied to the field of population estimation in small areas since the past three to four years. (Riman et al., 2019; Grossman et al., 2022, Grossman·Wilson·Temple, 2022). Most of the studies that conducted population estimation in small areas using machine learning techniques aim to compare machine learning techniques with other future population estimation methods to determine whether the population outlook in small areas is significant.

3. Data and Methods

3.1. Data and Variables

This study takes Busan Metropolitan City, Korea as the spatial scope of the study. Busan Metropolitan City is seen as a representative shrinking city in Korea due to the outflow of population to the metropolitan area and the serious low birth rate. As a characteristic, the population continues to decline, aging, and the number of aging infrastructure such as abandoned houses continues to increase. The purpose of this study was to supplement the existing population estimation process when the population distribution is expected to be local due to local extinction.

The spatial scope of this study is the 500m*500m grid unit in Busan, Korea. Grid unit data were constructed using grid unit population indicators and other variables provided by the National Geographic Information Service. Grid unit data provided by the National Geographic Information Service are provided for 100m, 250m, 500m, and 1km, and this

study used 500m grid unit indicators. The urban planning implication of the 500m grid space unit in Korea is neighborhood housing. Although it does not legally and institutionally present a clear radius and area for neighborhood housing, according to Perry, who proposed the concept of neighborhood housing, the radius is about 500m grid units. Neighborhood districts are defined as the size of children's safe commuting to school as a unit of planning, or the range of average attachment to the community of residents.

The time range of the study is from 2020 to 2040. This requires the basic urban and county plans to be established based on 20 years from the base point, and the census is a part of Korea's urban planning basis, which is established every five years. In addition, before conducting population estimation using each methodology, the study predicted the population in 2020 using data from 2000 to 2020, and calculated the error compared to the actual population in 2020. This error is the percentage difference from the estimated 2020 population compared to the actual 2020 population.

3.2. Method

3.2.1. Cohort-Component Method

In estimating the future population, this study applied two population estimation methods: cohort factor method and machine learning. The cohort factor method is a method of calculating population values for each cohort by largely classifying population changes into birth, death, and population movement. In the cohort factor method, a cohort refers to a population group whose birth time matches in n-year-olds, and mainly uses a 5-year-old interval. Therefore, the cohort factor method is summarized in the following equation as follows. The cohort factor method is applied as a universal national future population estimation method because it is easy to understand demographic changes and apply them to policies (Smith et al., 2013).

(Equation 1) $P_t = P_{t-1} + B_{(t-1,t)} - D_{(t-1,t)} + M_{(t-1,t)}$

(P_t : population at time t, $P_{(t-1,t)}$: population at time t-1, $B_{(t-1,t)}$: birth population, $D_{(t-1,t)}$: dead population, $M_{(t-1,t)}$: net moving population)

3.2.2. Machine Learning

The study applied machine learning techniques as the second model of population estimation. Machine learning can be said to be a process in which humans do not build logic directly, but enter learning methods first and create logic on their own. Algorithms are created in the process of creating logic so that machines can make decisions, and

many of the machine learning algorithms in the past were impossible to implement due to lack of computational power. However, in modern times, complex operations have become possible due to the development of hardware performance, and a number of algorithms have been developed that can process vast amounts of data at high speed. The machine learning algorithm used in this study is XGBoost (Extreme Gradient Boosting).

XGBoost is one of the boosting algorithms, a way to provide stronger classification performance by stacking several weak classifiers (tree models) (Chen and Guestrin, 2016). The boosting algorithm is an algorithm that performs classification by a single tree and then weights misclassified cases to correct classifiers and improve performance.

3.2.3. XAI: Explainable Artificial Intelligence

Machine learning or deep learning models that have recently been used in many fields show high performance and low error rates through complex structures that existing statistical techniques cannot implement, but there is a limitation in that it is difficult to explain the process of deriving results due to the complex structures. However, only when the result value of the model can be understood and interpreted can the model be trusted and the basis for the result can be presented (Lundberg and Lee, 2017). XAI is a technique introduced to compensate for these problems of machine learning and deep learning, and XAI is a technique that adds the possibility of explanation so that the artificial intelligence model can know on what basis the decision was made until a specific conclusion was made. XAI is also called interpretable artificial intelligence or transparent artificial intelligence, and decision tree visualization, feature importance, and partial dependency plot (PDP) have previously been used as XAI methods, but LIME (Local Interpretable Model) and SHAP techniques have recently been introduced.

In other words, XAI is a technology that decomposes the black box tendency of the machine learning model to a level that humans can understand. In the end, the possibility of understanding artificial intelligence refers to the process of changing the basis of decisions made by machine learning so that humans can understand. Feature Importance, one of the basic techniques of XAI, measures which features contributed the most to the model's decision-making process. If the feature importance has a negative value, the feature cannot always be said to be helpful in decision-making, but it is possible to determine which data the model handles with weight while measuring the feature importance.

Another method for interpreting machine learning used in this study is SHAP (Shapley Additive exPlanations). SHAP is an XAI that uses Shapley Value and independence between features as key ideas. The Shapley value numerically expresses how much each

variable contributed to generating overall performance. According to the Shapley value, the contribution of each variable can be expressed as the degree of change in overall performance when the contribution of the variable is excluded. This logic is based on game theory, and the degree to which the i-person contributes to the overall performance when many play the game is based on the total contribution minus the sum of the contributions excluded by the i-th person.

Unlike the existing regression analysis, it can be applied even when independent variables predicting dependent variables are dependent on each other, and it is advantageous in that it can provide the basis for the influence of individual independent variables and the influence of individual independent variables.

4. Findings

4.1. Cohort-Component Method

Before applying each methodology to immediately proceed with population estimation, the reliability of this methodology was determined by comparing the consensus between the estimated population value and the actual population value for 2020 using the cohort factor method. Table 1 shows the results of population estimation using the cohort factor method from 2000 to 2020. Except for Gangseo-gu and Gijang-gun, which are currently most likely to be developed in Busan, the error between the estimated population and the actual population is 23% on average. In addition, if the cohort factor method was applied, it was predicted that the population of Busan would increase by 560,000 from the actual population value.

Most of the errors in the cohort factor method were derived from the process of estimating population movement and the process of estimating the age population in their 20s and 40s. Both processes are regions with large time-series variations and large population fluctuations for the estimation period and forecast period. This indicates that the cohort factor method has a limit to predicting the rate of population change due to social and economic factors, simply considering the increase or decrease in population, fertility rate, and survival rate at the previous time.

Table 1. Cohort-Component Method Analysis Error

Area	Sex	Projected Population in 2020	Actual Population in 2020	Error(%)
Busan	Male	1,317,651	1,638,751	19.59
	Female	1,472,815	1,710,265	13.88

Municipality	Junggu	Male	14,039	20,416	31.24
		Female	16,039	21,019	23.69
	Seogu	Male	34,940	51,127	31.66
		Female	38,883	54,172	28.22
	Donggu	Male	17,726	42,453	58.25
		Female	20,478	44,791	54.28
	Yeongdogu	Male	37,734	56,613	33.35
		Female	45,004	56,610	20.50
	Jingu	Male	141,579	168,641	16.05
		Female	165,111	182,762	9.66
	Dongnaegu	Male	70,711	127,743	44.65
		Female	83,048	135,600	38.76
	Namgu	Male	130,011	131,683	1.27
		Female	143,259	137,426	4.24
	Bukgu	Male	195,608	138,110	41.63
		Female	208,643	142,066	46.86
	Haeundaegu	Male	165,812	187,806	11.71
		Female	189,946	201,729	5.84
	Sahagu	Male	135,163	155,310	12.97
		Female	148,028	156,746	5.56
	Geumjeonggu	Male	74,961	115,296	34.98
		Female	85,107	121,919	30.19
	Gangseogu	Male	8,728	72,093	87.89
		Female	10,043	64,639	84.46
	Yeonjegu	Male	84,903	98,184	13.53
		Female	93,996	106,760	11.96
	Sooyeonggu	Male	68,568	80,698	15.03
		Female	80,313	90,760	11.51
	Sasanggu	Male	95,824	108,759	11.89
		Female	103,264	107,589	4.02
	Gijanggun	Male	41,344	83,787	50.66
		Female	41,654	85,677	51.38

Next, population estimation was conducted using the cohort-component model for 2020-2040 in consideration of an average error of 23%. Table 2 shows the results of each city, county, and district of Busan Metropolitan City that conducted population estimation. As shown in the results of the 2020 population estimate, a rapid decrease in population was expected in all regions except Gangseo-gu and Gijang-gun. Comparing the estimated population in 2035 with the population in 2040, it can be confirmed that the population of Busan Metropolitan City will continue to decrease, especially Yeongdo-gu, Sasang-gu,

Jung-gu, Seo-gu, and Busanjin-gu. In addition, as a result of calculating the PC (Percent Change) value that can confirm the increase or decrease in the population in the estimated year compared to the base year, it can be seen that the total estimated population in Busan will decrease by 26.7% on average compared to 2020.

4.2. Machine Learning

Like the cohort factor method, the error and reliability of this methodology were first determined after comparing the actual 2020 population value with the estimated value for 2015-2020. Table 3 shows the results of estimating the population of Busan using the machine learning algorithm. Unlike the cohort factor method, which derived an average error of 23%, it can be confirmed that the error range plunges to the 3% range when population estimation is performed using machine learning. When applying the cohort factor method, it was confirmed that machine learning techniques could be applied to Gangseo-gu and Gijang-gun, which had the largest error range, to derive high accuracy results when estimating the population. In addition, as a result of deriving the RMSE value, an indicator of the accuracy of the XGBoost model used in this study, it was found to be 48.27.

As a result of estimating and summing the population of each small area in Busan using the XGoost algorithm, the total population of Busan in 2040 is expected to decrease by 1.75% compared to 2020. As a result of the machine learning analysis, the top five regions that are expected to show the most rapid population change compared to 2020 were Yeongdo-gu, Geumjeong-gu, Jung-gu, Dong-gu, and Seo-gu, and all 15 cities and counties in Busan except Haeundae-gu and Gangseo-gu.

The results of estimating the population of Busan Metropolitan City by applying the XGBoost technique among the cohort factor method and machine learning algorithm are as follows. Machine learning analysis techniques derived relatively much higher accuracy in estimating the population of small areas in Busan, Korea, and both methodologies estimated that the population of Yeongdo-gu, Jung-gu, and Seo-gu would decline the most. Both methodologies estimated that the population of Busan would continue to decrease, and as a result of identifying the population by age through the cohort factor method, the decrease in the population of Busan can be interpreted as the share of the continuously decreasing young population.

It can be seen that the cohort factor method, which does not reflect various factors in the population estimation process and uses only birth, death, and migrant population as variables, produces almost inaccurate results for Gangseo-gu and Gijang-gun areas where population inflows are expected to occur most actively. On the other hand, the machine learning technique can reflect a combination of various variables that may affect changes

in the population structure, resulting in a lower error, indicating that it is highly applicable to estimating areas with large population changes.

The results of estimating the population for a 500-meter grid in Busan are shown in Figure 2 and Figure 3. Intuitively, we can see that the cohort factor method predicts a sharp decline in population compared to the machine learning method. In addition, the cohort factor method predicts that the population of Gijang-gun and Gangseo-gu will be relatively high for each municipal district in Busan in 2040, while the machine learning method predicts that the municipal districts of Busan will have a global population distribution except for Sahagu, Yeongdo-gu, and Jung-gu.

Table 2. Cohort-Component Method Analysis Result

Area		Sex	Projected Population in 2035	Projected Population in 2040	2035 Percent Change (%)	2040 Percent Change (%)
Busan		Male	1,284,881	1,139,738	-21.6%	-30.5%
		Female	1,442,910	1,321,865	-15.6%	-22.7%
Municipality	Junggu	Male	12,330	9,450	-39.6%	-53.7%
		Female	13,747	11,035	-34.6%	-47.5%
	Seogu	Male	33,415	26,873	-34.6%	-47.4%
		Female	38,202	31,924	-29.5%	-41.1%
	Donggu	Male	33,239	29,125	-21.7%	-31.4%
		Female	37,098	33,379	-17.2%	-25.5%
	Yeongdogu	Male	25,715	16,371	-54.6%	-71.1%
		Female	27,516	17,794	-51.4%	-68.6%
	Jingu	Male	108,132	86,217	-35.9%	-48.9%
		Female	130,647	110,587	-28.5%	-39.5%
	Dongnaegu	Male	110,834	102,321	-13.2%	-19.9%
		Female	127,878	121,927	-5.7%	-10.1%
	Namgu	Male	91,174	76,253	-30.8%	-42.1%
		Female	101,864	87,657	-25.9%	-36.2%
	Bukgu	Male	97,200	81,182	-29.6%	-41.2%
		Female	108,471	95,044	-23.6%	-33.1%
	Haeundaegu	Male	140,309	121,735	-25.3%	-35.2%
		Female	162,733	146,425	-19.3%	-27.4%
	Sahagu	Male	108,474	90,369	-30.2%	-41.8%
		Female	118,047	102,698	-24.7%	-34.5%
	Geumjeonggu	Male	83,041	70,516	-28.0%	-38.8%
		Female	96,528	85,846	-20.8%	-29.6%
	Gangseogu	Male	123,466	136,528	71.3%	89.4%
		Female	114,165	127,502	76.6%	97.3%
	Yeonjegu	Male	84,606	77,879	-13.8%	-20.7%
		Female	104,846	101,301	-1.8%	-5.1%
	Sooyeonggu	Male	66,141	59,666	-18.0%	-26.1%
		Female	84,387	79,883	-7.0%	-12.0%
	Sasanggu	Male	61,023	45,135	-43.9%	-58.5%

Area		Sex	Projected Population in 2035	Projected Population in 2040	2035 Percent Change (%)	2040 Percent Change (%)
		Female	67,095	53,736	-37.6%	-50.1%
	Gijanggun	Male	105,781	110,116	26.2%	31.4%
		Female	109,689	115,125	28.0%	34.4%

Table 3. Machine Learning Analysis Error

Area		Projected Population in 2020	Actual Population in 2020	Error(%)
Busan		3,428,035	3,349,016	2.36%
Municipality	Junggu	41,941	41,439	1.21%
	Seogu	108,214	105,303	2.76%
	Donggu	87,733	87,246	0.56%
	Yeongdogu	117,224	113,224	3.53%
	Jingu	358,557	351,403	2.04%
	Dongnaegu	260,425	263,345	1.11%
	Namgu	282,192	269,111	4.86%
	Bukgu	309,385	280,177	10.42%
	Haeundaegu	400,241	389,535	2.75%
	Sahagu	316,903	312,057	1.55%
	Geumjeonggu	236,116	237,219	0.46%
	Gangseogu	131,037	136,734	4.17%
	Yeonjegu	213,129	204,947	3.99%
	Sooyeonggu	176,373	171,461	2.86%
	Sasanggu	221,165	216,350	2.23%
	Gijanggun	167,400	169,465	1.22%

Table 4. Machine Learning Analysis Results

Area		Actual Population in 2020	Projected Population in 2040	Percent Change(%)
Busan		3,349,016	3,290,566	-1.75%
Municipality	Junggu	41,439	38,977	-5.94%
	Seogu	105,303	101,423	-3.68%
	Donggu	87,246	83,249	-4.58%
	Yeongdogu	113,224	103,888	-8.25%
	Jingu	351,403	346,271	-1.46%
	Dongnaegu	263,345	260,335	-1.14%
	Namgu	269,111	263,791	-1.98%
	Bukgu	280,177	277,818	-0.84%
	Haeundaegu	389,535	398,235	2.23%
	Sahagu	312,057	305,201	-2.20%
	Geumjeonggu	237,219	218,156	-8.04%
	Gangseogu	136,734	143,420	4.89%
	Yeonjegu	204,947	202,069	-1.40%
	Sooyeonggu	171,461	170,791	-0.39%
	Sasanggu	216,350	208,427	-3.66%
	Gijanggun	169,465	168,515	-0.56%

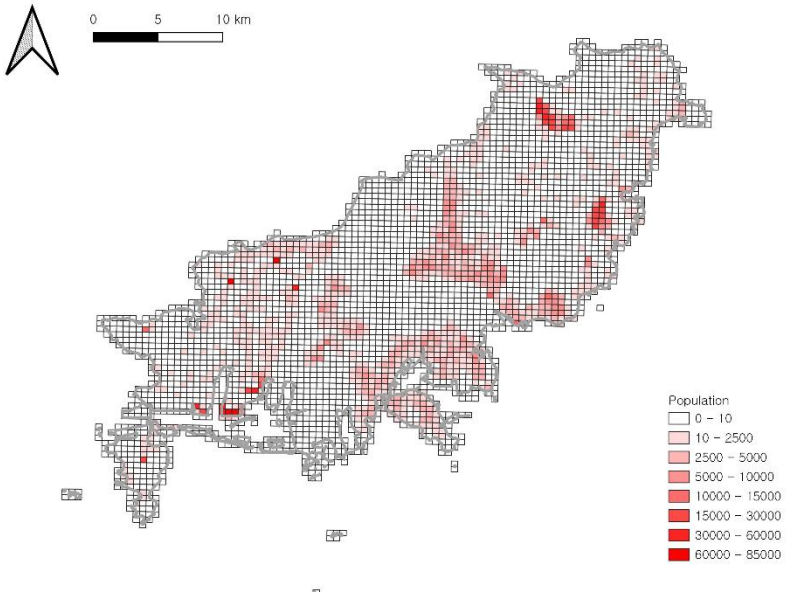


Figure 2. Results of 2040 Population Estimated by Cohort-Component Method

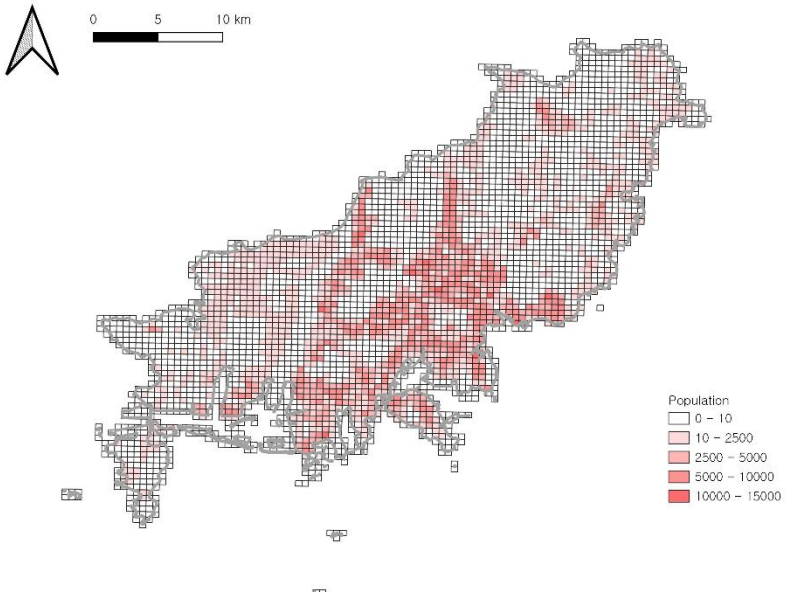


Figure 3. Results of 2040 Population Estimated by Machine Learning

4.3. XAI(Explainable Artificial Intelligence)

Figure 3 shows the results of interpreting the XGBoost algorithm by visualizing the importance of the peer among the XAI techniques. According to the feature importance graph, it can be seen that the XGBoost algorithm affects the population estimation of Busan in the order of productive female population, former population, number of houses, elderly population, and old housing ratio.

As a result of analyzing the Shapley value, it can be seen that this model is interpreted similarly to the result of the feature importance technique. The red dot in Figure 4 means that the variable had a great influence on the population estimate, while the blue dot can be interpreted as having a small effect on the determination of the population estimate. The Shapley value is interpreted to affect population estimation in the order of pre-population, productive female population, elderly population, individual housing, and old housing ratio, and in particular, pre-population variables and productive female population variables play a large role. The variance of the two variables is also large. According to Figure 4, it can be seen that the accuracy and judgment of population estimation depend greatly on the number of population at the time and the number of productive women, and other variables do not have a great responsibility for population estimation.

The difference between the feature importance and the Shapley value is the assumption of the independence of the variable. Feature importance does not assume the independence of variables, so if the dependence between variables is large, the results are likely to be distorted, and feature importance does not calculate negative influences (factors that affect population decline). This is because the feature importance technique does not intentionally learn the negative (-) variable to lower the calculation error. Thus, feature importance techniques can over-measure the value of a particular variable than the actual value.

On the contrary, the Shapley value can consider the dependence between each variable assuming the independence of the variables, and can also consider the negative (-) influence. That is, the Shapley value may interpret the machine learning model by reflecting the influence of variables on a wide range that the feature importance does not consider.

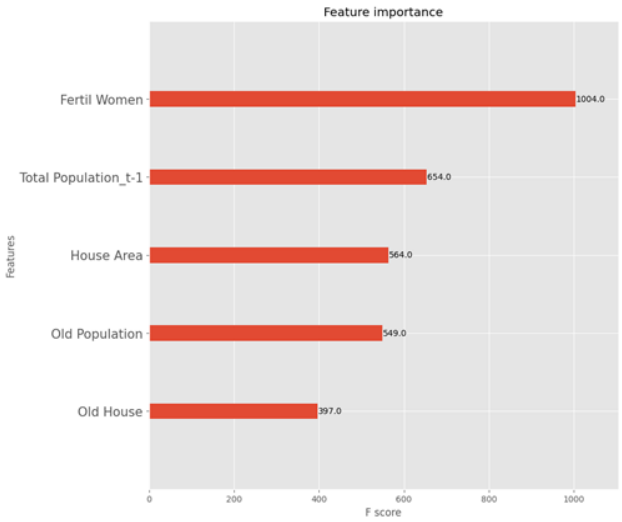


Figure 4. Feature Importance Analysis Results

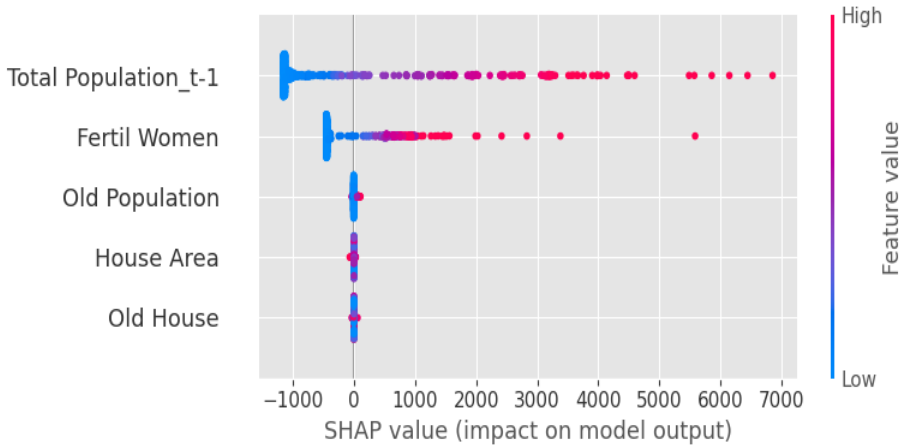


Figure 5. Shapley Value Results

5. Conclusion

The demographic structure and change of a country and region are not only affected by changes in the region, but also changes in the demographic structure itself act as a key factor in the change of the region. Therefore, it is necessary to predict and prepare for the exact cause of population structure and change and the possibility of future changes in advance, and the future population results estimated in this way function as major policy data in the region. However, despite the need to estimate the population from a more microscopic perspective due to the recent local extinction, low birth rate, and aging,

it is time to consider the new population estimation method and the applicability of the methodology.

The purpose of this study is to identify the applicability of grid-level data and machine learning techniques in estimating the population of small areas, which are recently attracting attention, and to confirm the usefulness of interpreting machine learning models using SHAP values. By comparing the results of machine learning techniques with cohort factor methods used by the Korea National Statistical Office for future population estimation and traditional population estimation methods, this study proved that it is much more useful to apply machine learning techniques to population estimation in small regions. Furthermore, not only the machine learning result value was presented, but also the SHAP value was applied to the machine learning model used in this study to explain why the machine learning model derived the corresponding result value.

As a result of the analysis, it was confirmed that the application of machine learning techniques in estimating the population of small areas in Korea's grid unit showed a much improved value in terms of estimation accuracy, which can be said to be due to the nature of machine learning techniques that can take into account social and economic contexts and other environmental characteristics that statistical methodologies are difficult to predict. The population of Busan Metropolitan City, South Korea, estimated through machine learning techniques in 2040 was 3,290,566, a 1.75% decrease from the population in 2020. As a result of analyzing the machine learning model using SHAP values, it was found that when estimating the population of small areas using the XGBoost algorithm, the variables that most positively (+) affect the result value were the population at the previous time and the productive female population. It was confirmed that other variables included in this model did not have a negative (-) influence compared to the previous population and the productive female population variables, indicating that the future estimated population results greatly depend on the past population values.

The result of the 2040 future population estimate published by the Korea National Statistical Office is 2,826,940. In this study, the population of Busan Metropolitan City in 2040 estimated using the XGBoost algorithm was 3,290,566, which is 463,626 more than the official results of the National Statistical Office. This can be interpreted as an underestimation of the population of Busan Metropolitan City in 2040 by Statistics Korea. This population underestimation and estimation error can be attributed to migration, births, deaths, and other unpredictable factors that can affect population change.

This study differs from other studies in that it was intended to present higher-level results using 500m grid data and to provide accurate population estimation results and explanatory power through machine learning techniques, unlike Korean research trends that have conducted up to 1,000m grid units. In addition, it has academic significance in that it uses XGBoost models with high predictive performance while providing an

explanation of machine learning black boxes using XAI techniques such as feature importance and SHAP. Although a highly predictive model was implemented, there was no way to interpret the model, so there was a limit to the reliability and explanatory power of the research results. This study provided a great academic contribution as it could interpret the improved research results and the inside of the improved model.

However, if various small-area population estimation methodologies are presented through the application of more algorithms with high predictive performance other than the XGBoost algorithm, it will be helpful for future small-area population estimation studies. In addition, it is expected that the error of the machine learning model will be greatly reduced by adding variables that can deal with geological characteristics such as elevation and slope and broader socio-economic contexts as variables that can affect future populations.

Acknowledgement. This work was supported by Korea Environment Industry & Technology Institute (KEITI) through "Climate Change R&D Project for New Climate Regime", funded by Korea Ministry of Environment(MOE)(2022003570002).

References

Chen, T and Guestrin, C (2016) XGBoost: A scalable tree boosting system. *ACM,* pp.785-794.

Chen, Y., Guo, F., Wang, J., Cai, W., Wang, C. and Wang, K (2020) Provincial and gridded population projection for China under shared socioeconomic pathways from 2010 to 2100. *Scientific data*, 7(1), pp.1-13.

Chen, Y., Li, X., Huang, K., Luo, M. and Gao, M (2020). High-resolution gridded
population projections for China under the shared socioeconomic pathways. *Earth's Future*, 8(6), e2020EF001491.

Chi, G and Voss, P.R (2011) Small-area population forecasting: Borrowing strength across space and time, *Population, Space and Place*, 17(5), pp.505-520.

Grossman, I, Bandara, K, Wilson, T and Kirley, M (2022) Can machine learning improve small area population forecasts? A forecast combination approach. *Computers, environment and urban systems*, 95, pp.101806.

Grossman, I, Wilson, T and Temple, J (2022) Forecasting small area populations with Long Short-Term Memory Networks. *Center for Open Science.*

Lundberg, P and Frodin, P (1998) Ecosystem resilience and productivity: Are predictions possible? *Oikos,* 81(3), pp.603-606.

Okabe, A and Sadahiro, Y (1997) Variation in count data transferred from a set of irregular

zones to a set of regular zones through the point-in-polygon method. *International journal of geographical information science,* 11(1), pp.93-106.

Cai, Q (2007) New techniques in small area population estimates by demographic characteristics. *Population Research and Policy Review*, 26(2), pp.203-218.

Ford, A., Barr, S., Dawson, R., Virgo, J., Batty, M. and Hall, J (2019) A multi-scale urban integrated assessment framework for climate change studies: A flooding application. *Computers, environment and urban systems,* 75, pp.229-243.

Riiman, V, Wilson, A, Milewicz, R and Pirkelbauer, P (2019) Comparing artificial neural network and cohort-component models for population forecasts. *Population review*, 58(2)

Smith, S.K, Swanson, D.A. and Tayman, J (2016) Practitioner's guide to state and local population projections. *New York: Springer.*

Smith, S.K. and Morrison P.A (2005) Small area and business demography. *Handbook of population,* pp.761-785.

Swanson D.A The Frontiers of Applied Demography. *Applied Demography Series.*

Triantakonstantis, D. and Mountrakis, G (2012) Urban growth prediction: a review of computational models and human perceptions.

Weber, H (2020) How well can the migration component of regional population change be predicted. A machine learning approach applied to German municipalities. *Comparative Population Studies*

Wilson, T (2015) New evaluations of simple models for small area population forecasts. *Population space and place*, 21(4), pp.335-353

Wilson, T, Grossman, I and Temple J (2023) Evaluation of the best M4 competition methods for small area population forecasting. *International Journal of Forecasting,* 39(1), pp.110-122.

PLANNING STORMWATER INFRASTRUCTURE FOR MUMBAI (1136)

Geddam Renuka Sai

Urban Planner and Architect (MUP, Architect), Visakhapatnam, Andhra Pradesh, India; arrenukageddam@gmail.com

Abstract. The study focuses on investigating of stress faced by the stormwater infrastructure in Mumbai, a megacity prone to urban floods and waterlogging. The main objective is to assess the effectiveness of the existing urban drainage systems, examine the various stress factors that contribute to their inefficiency, identify international best practices, and propose urban planning solutions to mitigate flood impacts. The study emphasizes the crucial role of infrastructure, especially in reducing the city's vulnerability. It highlights the challenges encountered by Mumbai, including rapid urbanization, haphazard development, and the dense population, which intensifies the flood risk. The research incorporates relevant theories, models, and cases to formulate comprehensive recommendations. Ultimately, the study aims to contribute to the sustainable development goals and enhance the overall well-being of Mumbai's residents.

Keywords: Stormwater infrastructure, Extreme rainfall events, High tides, Urban floods, Drainage system.

1. Introduction

Stormwater infrastructure plays a critical role in managing rainwater flow and preventing flooding in urban areas. It encompasses various systems such as storm drains, detention ponds, and green infrastructure. Proper management of stormwater infrastructure is essential for maintaining functionality, reducing flooding risks, and safeguarding water quality. However, waterlogging issues in urban areas stem from deforestation, inadequate watershed maintenance, and the construction of infrastructure that hampers natural drainage. Rapid urbanization and high population density further strain infrastructure, leading to inadequate drainage and choking. To address these challenges and ensure effective stormwater management, proper maintenance and planning are necessary. Coastal cities in India, in particular, face vulnerability to floods, emphasizing the importance of proactive prevention and mitigation measures for building resilience. Recent floods in several Indian cities have caused significant damage and economic impact. A study published in November 2019 by The New York Times predicts that rising sea levels could submerge approximately 40 square kilometers of land in Mumbai, India's

largest city and financial capital, including critical infrastructure and densely populated areas, within the next three decades. This prediction highlights the urgent need for the Indian government and local authorities to address climate change and protect residents and assets from the detrimental effects of rising seas.

2. Literature Review

China has witnessed a significant increase in urbanization, with the urban population growing from 170 million in 1978 to over 850 million in 2020. Municipalities like Beijing, Tianjin, Shanghai, and Chongqing are key drivers of regional development due to their dense populations and high demand for urban infrastructure. The resilience of their infrastructure directly impacts surrounding areas. To assess urban infrastructure resilience, the Pressure-State-Response (PSR) framework was used, analyzing the dynamic characteristics of infrastructure in these municipalities from 2002 to 2018. The study found that factors like highway length and drainage network density significantly influenced infrastructure resilience. Measures such as enhancing public transport facilities and improving drainage capacity were identified as essential for a better urban environment. Additionally, the G-Cans project in Kasukabe, Japan, has effectively reduced water damage during heavy rainfall, while the Netherlands and Chennai, India, have implemented measures like floodgates, drainage systems, and stormwater drains to combat flooding.

3. Methodology

3.1 Study area

Greater Mumbai, India's most populous city and a major financial hub, faces challenges due to limited land availability and high population density. The sewerage system collects 63% of the generated 2,680 MLD, as reported in the City Development Plan by MCGM. The MTPD collected for solid waste and construction, demolition, and silt has also increased over the years. Effective management of these systems is crucial for sustainable development in the city. The stormwater drainage system is impacted by unauthorized dumping, which reduces the capacity of nullahs/drains to carry stormwater runoff, leading to flooding in certain areas of the catchment, caused by slum dwellers, hawkers, construction, and demolition.

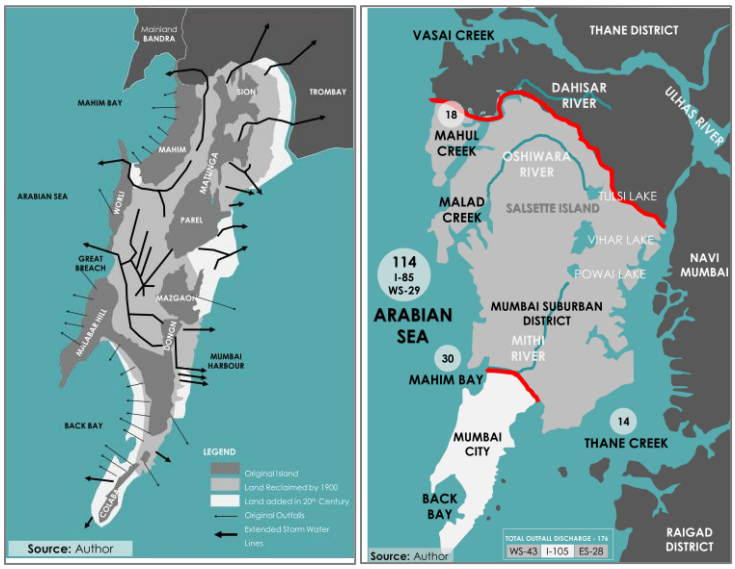


Figure 1. Showing the evolution of reclaimed land and the water bodies and outfalls in MCGM Boundary

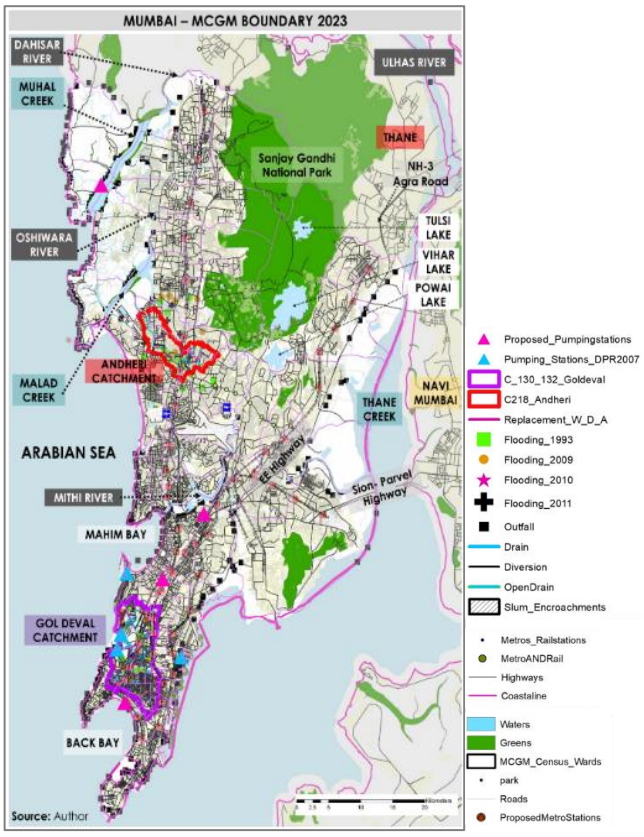


Figure 52 Showing Overview Mumbai City - MCGMC Boundary

The drainage network length-to-road length ratios in Mumbai's different regions reflect their development priorities. The western suburbs prioritize drainage infrastructure, with a ratio of 3:1, while the island city shows balanced development with a ratio of 1:1. In contrast, the eastern suburbs focus more on road development, resulting in a ratio of 1:0 for drainage infrastructure. These ratios highlight the varying stages of development and infrastructure priorities in each region.

Table 1. Showing the types of systems in the stormwater Infrastructure

TYPE	TOTAL KM	ISLAND CITY KM	WESTERN SUBURBS KM	EASTERN SUBURBS KM
Major Nallas >1.5 M width	215.07	23.37	101.50	90.20
Minor Nallas < 1.5 M width	156.50	48.00	42.10	66.40
Arch/ Box Drains	174.28	82.35	51.93	40.00
Roadside open drains	1986.98	20.00	1297.50	669.48
Closed pipe or dhapa drains	565.23	443.00	86.03	36.20
No. of water entrances	34972	32657	1706	609

Researchers often use non-probabilistic sampling techniques, such as the snowball method, to collect data from a specific group with common characteristics. This method enables them to reach a diverse group of participants. A household survey is conducted with a sample size of 90 or 100 individuals, depending on the research objectives. The participants are selected based on their willingness to participate and relevance to the research topic. The selection criteria for catchment areas are determined through consultations with stakeholders and perception surveys at the household level in critical areas. After careful consideration, Andheri Subway in K Ward and Goldeval Temple in C Ward were selected for further action.

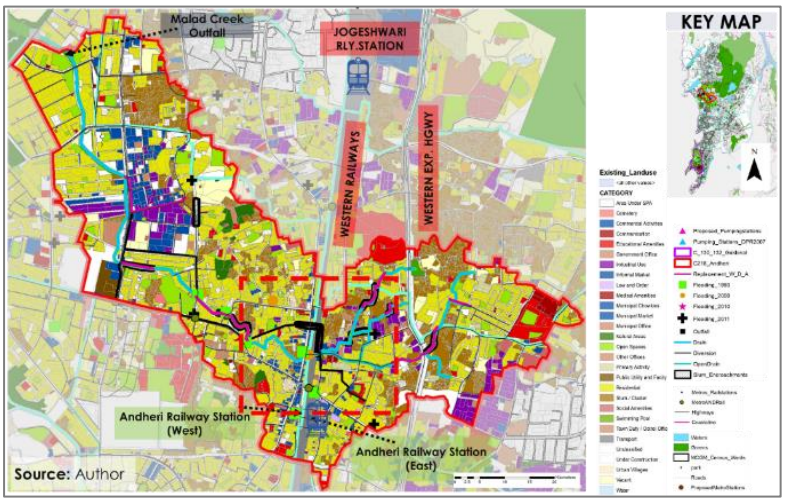


Figure 3. Showing Land use Map of Catchment 218

Catchment 218, located in Andheri (K) Ward, includes Andheri East (K/E) and Andheri West (K/W). The main waterlogging concern is the Andheri subway, a crucial transportation link between the two areas. Residential land comprises the majority of the catchment, with 61 out of 173 hectares allocated for residential use. Slum clusters cover 26 hectares, while the remaining land includes vacant plots, commercial areas, industrial zones, open spaces, and under-construction sites. Encroachment issues affect the open drain (nallah) in the area due to the presence of slums. Historical flooding data from 2009 to 2011 has been collected, highlighting a significant rainfall spike on 27 July 2005, with 944.20 mm recorded in a 24-hour period.

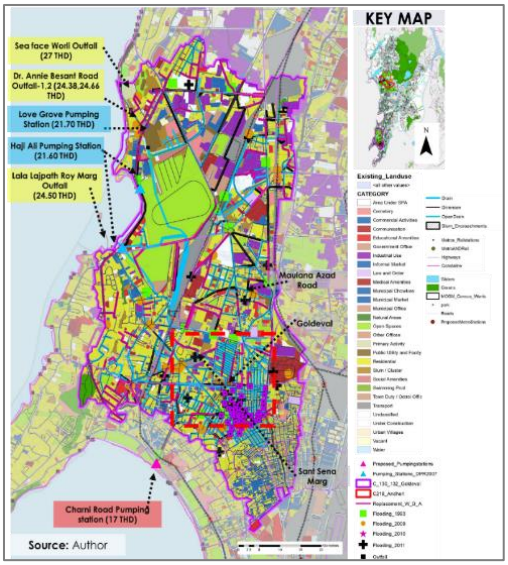


Figure 53. Showing Land use Map of Catchment 130, 132, City Nallah

Catchment 130 is the largest in Mumbai, spanning multiple wards from Fort to Parel and Byculla to the Western Coast. It includes low-lying areas near Maratha Mandir Road, Sankla Lane, Mahadev Palav Road, and BDD Chawls that are prone to waterlogging. The catchment has various outfalls, with the main one positioned below the lowest low tide level. Catchment 132, which includes Cumballa Hill, has been merged with Catchment 130. The Gol Deval Temple catchment covers an area of 1,370 Ha with ground levels ranging from 74.93 to 26.39 m THD. It consists of underground drains and open nallah, with a length of 168,280 m and dimensions ranging from 0.230 m to 30 m. Waterlogging primarily occurs during heavy rainfall between June and September, especially in July. The catchment is predominantly residential, with significant commercial and industrial areas. The Arabian Sea acts as the water-receiving body, and various outfalls drain into it, including the proposed Charni Road Pumping Station.

3.2 Data

3.2.1 Autocorrelation

BRIMSTOWAD-II Report, MCGM Engineering Hub, and climate data from the Regional Meteorological Centre Mumbai, IMD.

3.2.2 Contour, slope, basin and flow accumulation Maps

Cartosat DEM and USGS Earth Explorer (SRTM) as the primary sources.

3.2.3 Land Use and Land Cover LULC

USGS data from 1993, 2003, and 2023, using Landsat-4, Landsat-5, and Landsat-8 satellites, respectively, with a false-color composite created by changing the symbology of bands to 5/4/3, and employing supervised classification for image analysis.

3.2.4 Groundwater Recharge Potential Zones

Digital Elevation Model (DEM) and Geology data were obtained from USGS, while the SOIL-Fos Soil was used for assessing the matrix consistency ratio, which was set at 0.1 for large matrix constraints exceeding 5X5.

3.2.5 Pressure State Response Model

District Census Handbook of Maharashtra, Regional Plan of Mumbai, MMRDA, Brihanmumbai Municipal Corporation (BMC)/Municipal Corporation of Greater Mumbai (MCGM), and the Draft Development Plan 2034/MCGM Engineering Hub.

4. Results

4.1 Autocorrelation

Table 2. Showing the Autocorrelation - Date of Occurrence of Events, their Rainfall and Hightide data

Date of Occurrence	24-hr Rainfall in mm	Tide Height (mm)	Tidal Coefficient	Lunar Calender	Lag	AutoCorrelation-Rainfall	AutoCorrelation-Tides
05 July 1974	575.6			FM	0	1.00	1.00
30 July 1975	417.2			NM	1	-0.09	-0.35
31 July 1984	544.3			FM	2	0.17	-0.13
16 June 1990	421.2			FM	3	0.16	0.23
10 June 1991	477.6			NM	4	-0.07	-0.43
23 August 1997	346.2			FM	5	0.14	0.28
17 July 2000	351.5			FM	6	-0.08	-0.08
27 July 2005	944.2	4.7		FM	7	0.12	-0.17
16 July 2009	179.0			waning gibbous moon phase	8	-0.11	0.15
26 July 2011	375.0	3.5	54.0	FM	9	-0.09	
1 September 2011	283.0	4.7	88.0	waxing crescent moon phase	10	-0.11	
15 July 2014	200.0	4.5	96.0	FM	11	-0.24	
19 June 2015	283.0	4.5	75	waxing crescent moon phase	12	-0.07	
02 August 2015	265.0	4.9	104	FM	13	-0.08	
29 August 2017	315.0	3.3	46.0	waxing crescent moon phase	14	-0.08	
02 July 2019	375.0	4.5	89.0	waxing crescent moon phase	15	-0.05	
05 August 2020	331.8	4.5	81.0	waning gibbous moon phase	16	-0.03	
18 July 2021	250.0	3.7	60.0	waning gibbous moon phase	17	-0.05	

The table presents rainfall data along with the corresponding dates and tidal height overlapping with the lunar calendar. By applying the autocorrelation method, the graph demonstrates a stationary autocorrelation, indicating a dependence between the variables.

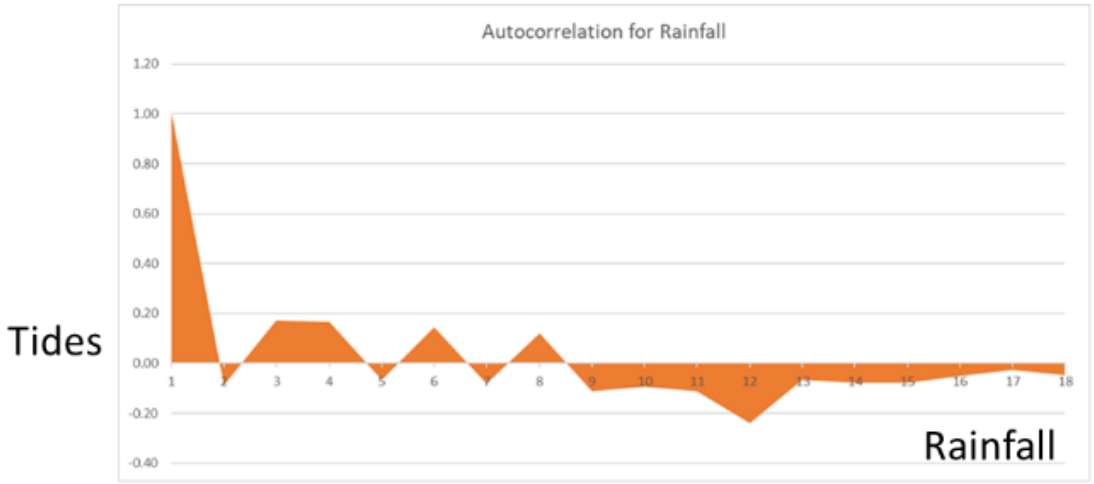


Figure 5. Showing Autocorrelation- Date of Occurrence of Events Rainfall Intensity

By applying the autocorrelation method, the graph demonstrates a stationary autocorrelation, indicating a dependence between the variables.

4.2 Physiography

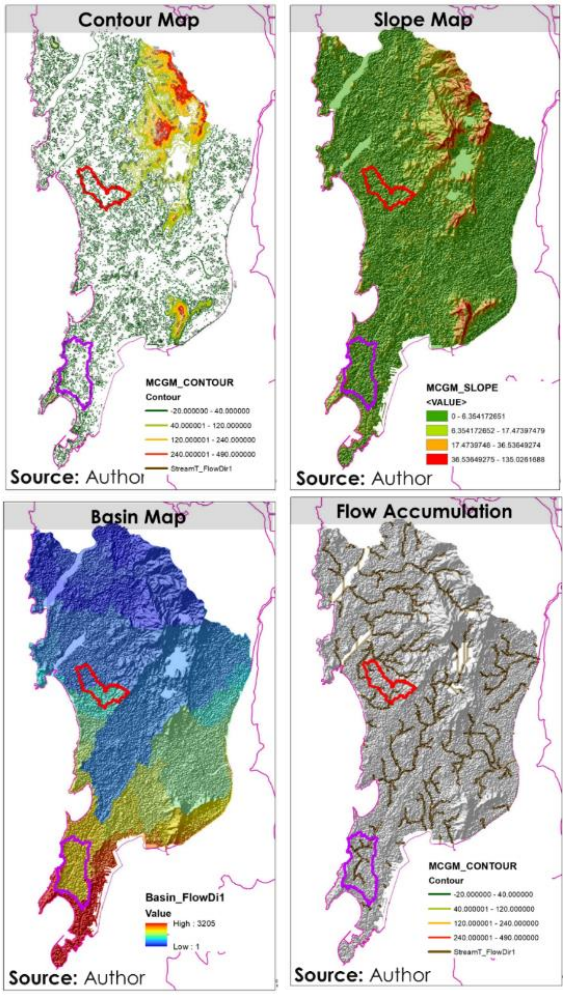


Figure 6. Showing Catchment boundary 218, Mogra Nallah and 130,132, City Nallah

The topography of catchment areas is determined by contour and slope maps, with a contour interval of 20 meters ranging from -20 to 490 meters and a slope range of 0 to 135 meters. The flow direction of water is determined by basin maps, with catchments 218 lying in the low to medium-range basins and catchments 130 and 132 in the medium to high range. Flow accumulation analysis is used to identify the topographic ridges where water accumulates.

4.3 Land use and land cover maps for the years 1993, 2003, 2013, and 2023

The analysis of land use and land cover indicates a consistent increase in built-up area, corresponding with population growth due to migration, while water bodies have steadily decreased due to slum encroachments, leading to disrupted water flow and increased flooding.

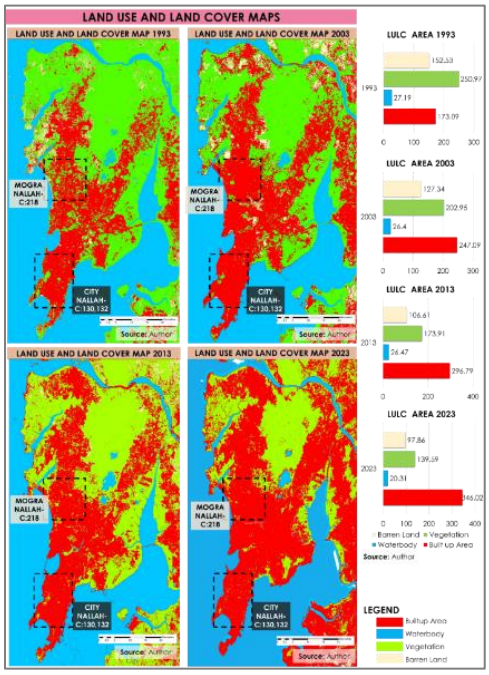


Figure 7. Showing Land Use and Land Cover Maps- 1993, 2003, 2013, 2023

Additionally, vegetation has significantly declined, reducing groundwater recharge capacity and disrupting the city's ecological balance, while barren land has experienced a gradual decrease over time.

4.4 Groundwater Recharge Potential Zones

The Weighted Overlay Method is employed to determine groundwater potential zones, while the Analytic Hierarchy Process (AHP) is used to identify and map these zones using remote sensing techniques. Rank-assigned scale values are derived from field surveys, stakeholder consultations, expert opinions, and existing reviews.

Table 3. Showing Weighted Overly Method for Groundwater Potential Zones

	Matrix	Rainfall	Geology	Slope	Drainage density	LULC	Lineament density	Soil	Normalized Values
		1	2	3	4	5	6	7	
1	Rainfall	1	3	3	5	5	5	7	38%
2	Geology	1/3	1	3	3	5	5	5	25%
3	Slope	1/3	1/3	1	1	3	3	5	13%
4	Drainage density	1/5	1/3	1	1	2	3	3	9%
5	LULC	1/5	1/5	1/3	1	1	1	3	6%
6	Lineament density	1/5	1/5	1/3	1/2	1	1	1	5%
7	Soil	1/7	1/5	1/5	1/3	1/3	1	1	4%

A Matrix Consistency Ratio of 0.1 is assessed for large matrix constraints (> 5X5) to ensure accuracy. Ultimately, the Weighted Overlay Method is applied to establish the final groundwater potential zones.

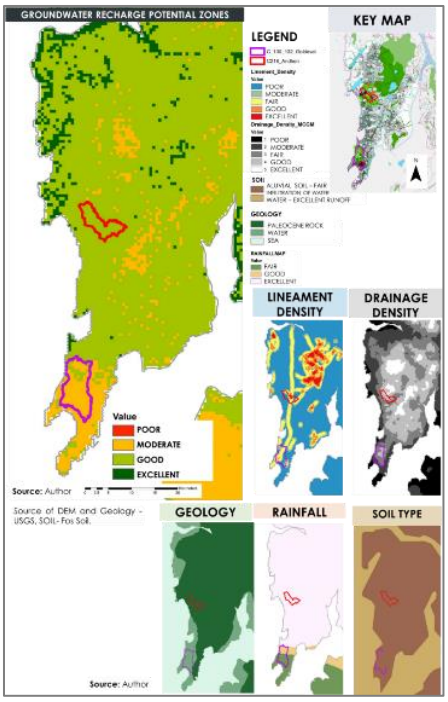


Figure 8. Showing Groundwater Recharge Potential Zones

The survey coordinates are noted and plotted for spatial analysis by Cross tabulation Method. A Survey questionnaire is prepared after careful observation on the site by rekey survey. And the survey area is 500 mts is selected from the point of conflict the Andheri subway 2.5%, 54% of it from Andheri East and 44% from Andheri West.

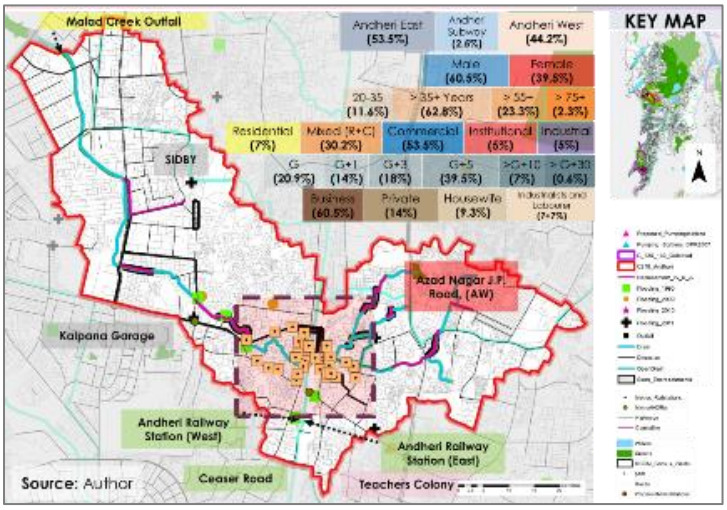


Figure 9. Showing Stormwater Drains Map of Catchment 218 - 43 Surveys

The survey data reveals that 61% of the participants were male, while 39% were female. The age distribution of the participants was as follows: 20-35 years (11.6%), >35 years (62.8%), >55 years (23.3%), and >75 years (2.3%). The survey also considered the land use categories, including residential (7%), mixed (residential and commercial) (30.2%), commercial (53.5%), institutional (5%), and industrial (5%). The height of the buildings was categorized as ground floor (20.9%), G+1 (14%), G+3 (18%), G+5 (39.5%), >G+10 (7%), and >G+30 (0.6%). In terms of occupational status, the participants were categorized as business (60.5%), private (14%), housewives (9.3%), and industrialists/laborers (7% each).

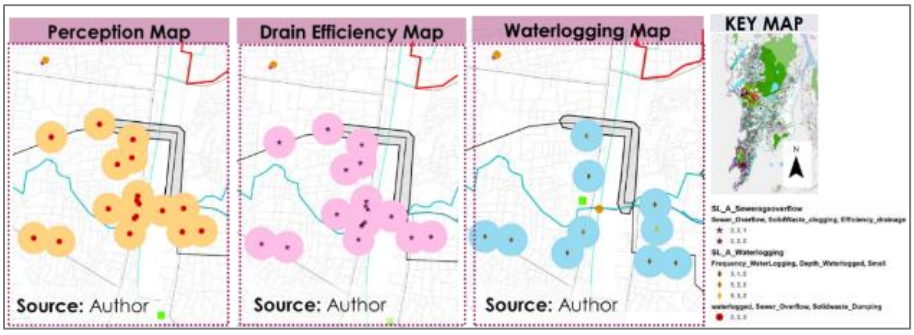


Figure 10.54 Showing Perception, Drainage Efficiency, Waterlogging

The perception Map determines the Current status where Waterlogged Sewerage overflow and Solid waste Dumping are considered. Drain Efficiency determines the Map of Sewerage overflow, Solid waste clogging, and Drain Efficiency (Not at all, Somewhat)

critical Points Mapped. Waterlogging Map determines the Frequency of waterlogging, Depth, and Smell are considered and critical Points are Mapped.

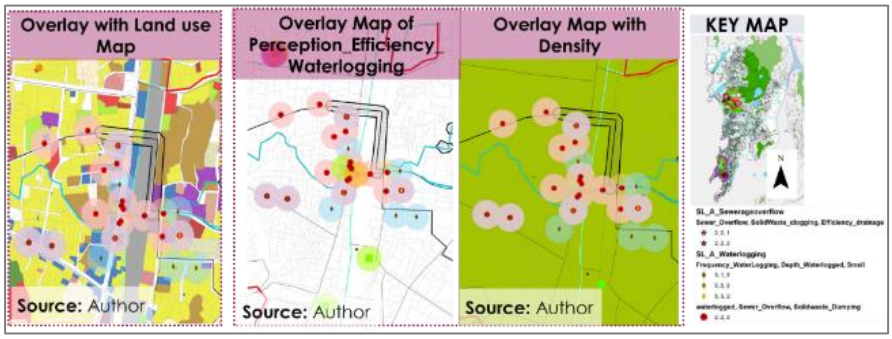


Figure 55. Showing Overlay of Perception, Drainage Efficiency, Waterlogging- Land use and density

Overlay with Land use Map determines Most waterlogging can be seen along the road with the critical points being similar. Overlay Map of Perception, Efficiency, Waterlogging, and Overlay Map with Density determines Overlaying all three considerations and with the previous history of flooding we can determine the terrain is a reason and waterlogging is due to the dumping of solid waste and inefficient drainage and Density ranges from 200-400 pp sq. km.

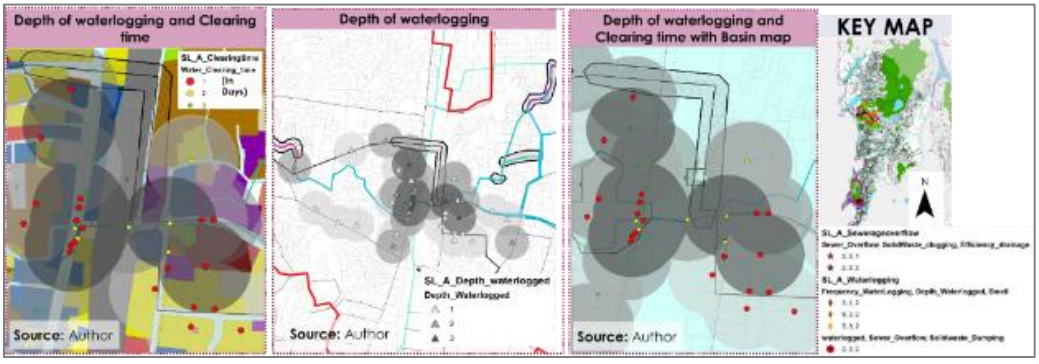


Figure 12.56 Showing Depth of waterlogging and Clearing time - Land use

The depth of waterlogging and clearing time are visualized using color-coded symbols, with red dots and dark grey buffers representing critical points with significant waterlogging and slow clearing. Yellow indicates moderate cleaning time within a day, while green represents areas that clear in less than 12 hours. Commercial and industrial land use, slum encroachments on drains, and an institution are primarily affected. The depth of waterlogging map highlights severe flooding depths exceeding 5 meters. The overlay of waterlogging and clearing time with the basin map shows the constrained

terrain. Spatial analysis using the cross-tabulation method is performed based on survey coordinates, and a survey questionnaire is prepared after careful site observation through rekey survey.

Catchment 130 and 132 are major areas of concern for waterlogging, particularly during the heavy rainfall months of June to September, with July being crucial. The Gol Deval Temple is a key location that connects traffic from South Bombay to North Bombay. The survey area, selected within a 500-meter radius of the conflict point, includes various locations such as Gol Deval Temple (27.7%), MS Ali Road (21.3%), Zohar Chowk (17%), and Ducan Road (23.4%). The survey participants consist of 40.4% males and 59.6% females, distributed across different age groups. Land use categories considered in the survey include residential, mixed (residential and commercial), commercial, institutional, and industrial.

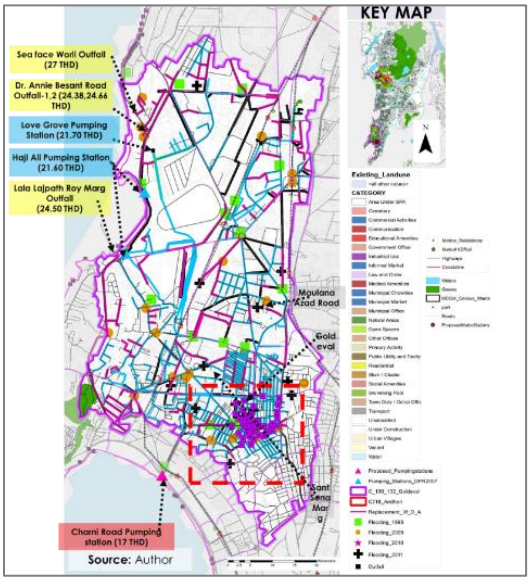


Figure 5713. Showing Stormwater Drainage Map of Catchment 130, 132, City Nallah- 47 Surveys

The height of buildings, including street hawkers, is also taken into account, with various categories such as G+1, G+3, G+5, >G+10, and >G+30, determining the depth of potential losses. The occupational status is Business (21.3%), Private (19.1 %), Housewife (29.8 %), Industrialists and Laborers (10.6+10.6 %), and Students (8.5%).

Figure 58. Perception, Drainage Efficiency, Waterlogging

The perception Map is to know the Current status where Waterlogged Sewerage overflow and Solid waste Dumping are considered. Drain Efficiency Map- Sewerage overflow, Solid waste clogging, and Drain Efficiency (Not at all, Somewhat) critical Points Mapped. Waterlogging Map- Frequency of waterlogging, Depth, and Smell are considered and critical Points are Mapped.

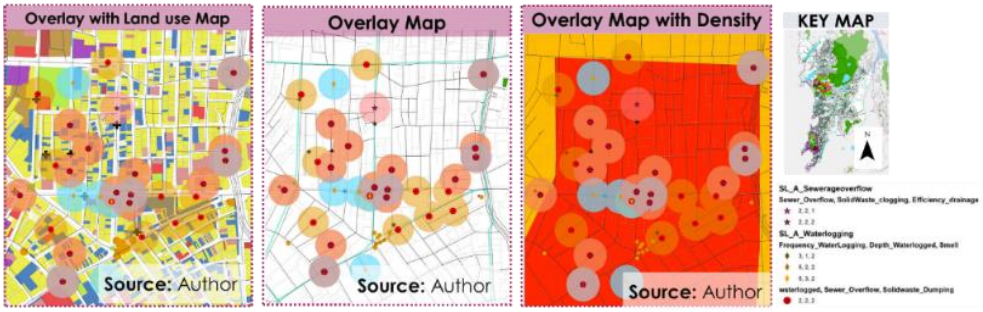


Figure 15. Overlay of Perception, Drainage Efficiency, Waterlogging- Land use and density

Overlaying all three considerations and with the previous history of flooding we can determine reasons for waterlogging is due to the dumping of solid waste and inefficient drainage most Residential Followed by commercial are majorly affected most of the ground floor, Density ranges from 600- 870 pp sq.km which is the most critical is in the city.

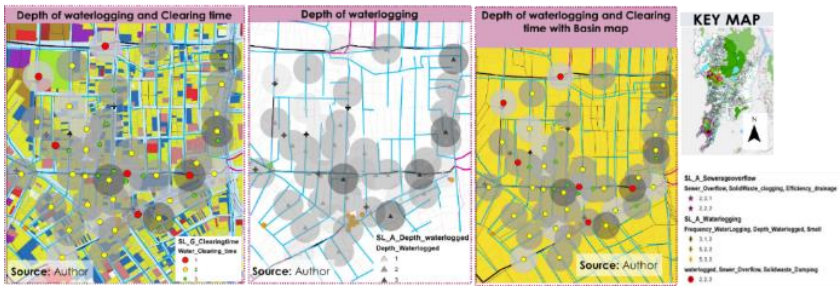


Figure 16. Showing Depth of waterlogging and Clearing time - Landuse and Basin

Depth of waterlogging and Clearing time - Critical points were red dots and dark grey buffers. Where major depth of waterlogging and less clearing. Yellow is a moderate cleaning time of less than a day and Green is those which takes less than 12 hours to clear. Commercial, and industrial land use, and an Institution are majorly affected. Depth of waterlogging - The dark greys show a severe flooding depth of more than 5mts of height. Depth of waterlogging and Clearing time with Basin map- On overlaying with the basin and contour shows the terrain being constrained.

4.5 PSR Model- Pressure, State and Response Model

Comprehensive Evaluation Index System (Urban Infrastructure Resilience Evaluation)

The Three-stage Resilience Level Assessment involves evaluating the pressure, state, and response stages. A higher score on the stress index (Upressure) indicates a greater risk to the infrastructure, while a higher score on the state index (Ustate) indicates a healthier state of the infrastructure. Similarly, a higher score on the response index (Uresponse) indicates a more timely and effective response to any crises or risks, which contributes to the overall health of the infrastructure system.

Table 4. Showing Urban Infrastructure Resilience Evaluation - Functional Parameters

Function Layer	Criterion Layer		Factor Layer	Description	Properties	A_Values	G_Values	A_Hij	G_Hij	A_Wj	G_Wj	A_U_pressure_state_Response	G_U_pressure_state_Response
Pressure	Natural Pressure		Torrential rain days	Number of days of rainfall above 50mm for 24 h	Negative	6.23	6.23	0.09	6.23	0.08	0.08	0.48	0.48
			Extremely hot days	Days with maximum temperature above 32 °C	Negative	1.89	1.89	0.04	1.89	0.06	0.06	0.11	0.11
			Magnitude of near-source earthquakes for city	Risk of earthquake disaster	Negative	0.86	0.86	0.02	0.86	0.06	0.06	0.05	0.05
			Days above strong gale	Days with wind speed between 3.7 m/s to 11 m/s	Negative	1.52	1.52	0.04	1.52	0.06	0.06	0.09	0.09
			High Tides	Average tide height 2.7 m to 3.2 m	Negative	6.66	6.12	0.09	6.66	0.08	0.08	0.53	0.54
	Human Pressure	Catchment Data	Population Density	The degree of population aggregation in limited land	Negative	5.09	5.09	0.08	3.54	0.07	0.06	0.36	0.23
			Urbanization rate	The degree of population aggregation to cities	Negative	3.25	3.25	0.06	3.95	0.06	0.07	0.21	0.26
		Land Use	Change in land use from agriculture to urban	Degradation of agricultureland and More concretization	Negative	1.52	1.52	0.04	1.52	0.06	0.06	0.09	0.09
			Increase in density of housing	Housing as a major factor of development	Negative	5.31	4.31	0.08	5.31	0.07	0.07	0.39	0.39
		Hydrogeology	Low transmissivity and storage of aquifer	The surface drainage systems	Negative	2.48	2.48	0.05	3.48	0.06	0.06	0.15	0.23
		Strom Water Drains Coverage	Percentage area Covered	Standard of Infrastructure	Negative	**2.54**	**2.46**	**0.05**	**2.46**	**0.06**	**0.06**	**0.16**	**0.15**
			Drain length (Open and Closed Pipe Lines Drains)		Negative	**1.32**	**1.26**	**0.03**	**1.26**	**0.06**	**0.06**	**0.08**	**0.07**
			Network		Negative	**1.52**	**1.52**	**0.04**	**1.52**	**0.06**	**0.06**	**0.09**	**0.09**
		Water Logging	Conflict Points Locations	Effectiveness of Infrastructure	Negative	**3.85**	**4.78**	**0.07**	**4.78**	**0.07**	**0.07**	**0.25**	**0.34**
			Number of Flood Prone Points (Ponding Points)		Negative	**2.66**	**3.87**	**0.05**	**3.87**	**0.06**	**0.07**	**0.16**	**0.26**
		Strom Water Drains Discharge	Outlets of Treated Waste water	Rate of Recycling and reuse of storm water	Negative	**1.87**	**1.87**	**0.04**	**1.87**	**0.06**	**0.06**	**0.11**	**0.11**
			Quality of Waste water		Negative	**3.55**	**1.75**	**0.06**	**1.75**	**0.06**	**0.06**	**0.23**	**0.10**
			Decrease in pipeline leakage	Risk of polluting ground water	Negative	**1.22**	**2.56**	**0.03**	**2.56**	**0.06**	**0.06**	**0.07**	**0.16**
State	Social Benefit		Per capita area of paved roads	Quality of life of urban residents	Positive	2.85	2.85	0.11	2.85	0.14	0.14	0.41	0.41
			Water coverage rate	Living standard of urban residents	Positive	1.5	1.5	0.08	2.1	0.12	0.13	0.18	0.27
			Gas coverage rate		Positive	0.88	0.88	0.05	0.99	0.12	0.12	0.10	0.12
	Economical Benefits		Losses by Flooding	Reduce disaster(accident) losses	Negative	2.93	2.93	0.12	2.87	0.15	0.14	0.43	0.41
			Losses by Death		Negative	1.22	1.22	0.07	1.22	0.12	0.12	0.15	0.15
			Density of drainpipe density in the built-up area	Long-term effectiveness of Infrastructure	Positive	4.03	4.03	0.13	4.03	0.17	0.17	0.70	0.70
			Length of highway		Positive	6.15	6.15	0.16	6.15	0.30	0.29	1.82	1.81
	Resource Environmental Benefit		Urban green space per capita	Resource possession of urban residents	Positive	4.22	4.22	0.14	1.35	0.18	0.12	0.76	0.16
			Water resources per capita		Positive	0.78	0.78	0.05	0.78	0.12	0.12	0.09	0.09
			Power consumption per capita	Resource consumption of urban residents	Negative	1.25	1.25	0.07	1.54	0.12	0.12	0.15	0.19
			Gas consumption per capita		Negative	1.5	1.5	0.08	1.5	0.12	0.12	0.18	0.18
Response	Recovery and adaptability		Sewage treatment rate	Ability to respond to the pressure of resources environment	Positive	3.25	3.25	0.15	3.25	0.23	0.23	0.73	0.73
			C&D Waste treatment rate		Positive	3.15	3.15	0.15	4.45	0.22	0.32	0.69	1.44
			Urban infrastructure maintenance and construction funds	Post-disaster emergency rescue	Positive	3.22	3.22	0.15	3.22	0.22	0.22	0.72	0.72
			Hospital beds per 10,000 population		Positive	2.87	2.87	0.15	2.87	0.21	0.21	0.59	0.59
	Learning ability		Mobile phone coverage rate	Ability of urban residents to acquire and learn information	Positive	1.23	1.23	0.09	1.23	0.16	0.16	0.19	0.19
			Internet coverage rate		Positive	1.46	1.46	0.10	1.46	0.16	0.16	0.24	0.24
			Research and Development (R&D)	Government investment in innovation and learning ability	Positive	4.17	4.17	0.17	3.11	0.29	0.22	1.22	0.68

A_Value / G_Value- Normalized Value (A_- Andheri/ G_- Gol Deval)

i-Value of the Area(Andheri/Gol Deval)/ j-Indicators

A_Hij/ G_Hij – Enthrophy of Indicators (A_- Andheri/ G_- Gol Deval)

A_Wj- Weight of Evaluation Indicators (A_- Andheri/ G_- Gol Deval)

U_Pressure, U_state, U_response -

R*- Urban Infrastructure Resilience levels (R*)

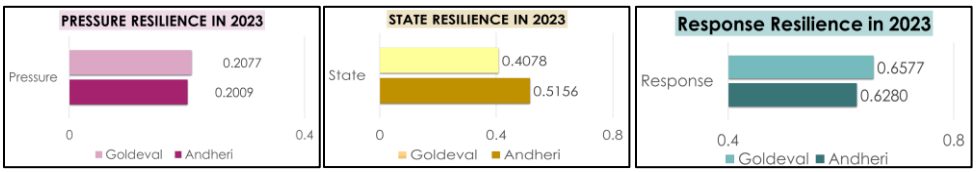


Figure 17. Showing Pressure, State and Response Resilience in 2023

The pressure is 0.2 for both areas where the stress is prevalent and in serious Pressure which is near to '0'. State Resilience in 2023 The state is 0.4 and 0.5 for Gol Deval and Andheri catchments respectively are Fragile. Response Resilience in 2023 The response is 0.65, 0.62 for Gol Deval and Andheri catchments respectively moderate response as initiatives are taken in BRIMSTOWAD Master Plan II.

Table 5. Urban Infrastructure Resilience levels - (PSR Model)

Category	[0, 0.3]	[0.3, 0.5]	[0.5, 0.7]	[0.7, 0.8]	[0.8, 1]
U_pressure	Serious	High	Moderate	Slight	Minor
U_state	Damaged	Fragile	Moderately healthy	Healthy	Very healthy
U_response	No response	Slight response	Moderate response	Somewhat positive	Strong response
R*	No resilience	low resilience	Medium resilience	Higher resilience	Highest resilience

The pressure generated is due to Natural which is rainfall 6.23 and High tides 6.6 followed by population density and Density of residential area. The state is influenced by social benefits and Economical benefits, the highway length, and the density of drainpipe density in the built-up area. And urban green spaces from environmental benefits. The

response is by the recoverability and adaptability which are the treatment of sewerage deposition of C&D waste, and Hospitals available in case of emergency with 10,000-bed occupancy. Showing the importance of R&D.

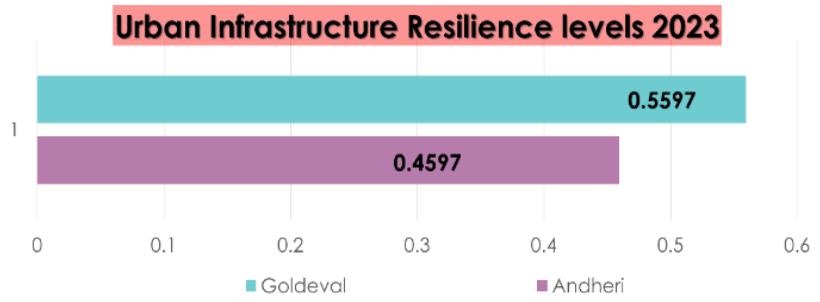


Figure 18. Showing Urban Infrastructure Resilience Levels 2023

Urban infrastructure Resilience levels of 0.55 and 0.45 for the Goldeval and Andheri catchments respectively Medium and Low resilience.

5. Discussion

The Mogra Nallah Catchment in Andheri Subway has the potential for an underground water reservoir project. Sea dike barriers can be planned to protect against flooding and high tides and rainfall situation. Waterbody rejuvenation and urban green spaces recharge groundwater and reduce water demand. Effective drainage systems manage stormwater runoff. Improved sanitation and waste management reduce waterborne diseases. Comprehensive solid waste and sewerage management plans are needed. These measures promote sustainable water management, protecting the environment and public health.

6. Conclusion

The study highlights challenges faced by Mumbai, including polluted drainage systems, population density, non-overlapping stream flow, inadequate sewerage coverage, waterlogging, pollution, vector-borne diseases, and climate change resilience. Recommendations involve constructing diversion drains and detention ponds, enforcing waste management regulations, improving sewerage treatment plants, and enhancing public health measures. In conclusion, this study provides valuable insights into the stress on stormwater infrastructure in Mumbai and proposes viable urban planning solutions. By implementing the proposed measures and considering policy interventions, Mumbai

can enhance its drainage system, mitigate floods and waterlogging, protect critical infrastructure, and achieve sustainable development goals related to health, sanitation, and clean energy.

Acknowledgment. I would like to express my heartfelt gratitude and appreciation to all those who contributed to the successful completion of this research paper. First and foremost, I extend my deepest thanks to my esteemed supervisor for their invaluable guidance and unwavering support throughout the entire research process. I am also indebted to the participants who generously shared their time and insights, enabling me to gather crucial data for analysis. Furthermore, I would like to acknowledge the support and encouragement received from my family and friends, whose unwavering belief in me has been a constant source of motivation. Lastly, I extend my thanks to the academic community for providing a rich environment of learning and inspiration.

References

Beibei Liu 1, C. X. (2022). Effect of Land Use and Drainage System Changes on Urban Flood Spatial Distribution in Handan City: A Case Study. *MDPI*.

Chhabra, A. (2022, July 05). *NDTV*. Retrieved from NDTV: https://www.ndtv.com/india-news/why-does-mumbai-get-clogged-in-the-rain-here-are-5-factors-that-play-a-part-in-mumbai-monsoon-waterlogging-3130560

Dhankhar, V. (2017). “Urban Flooding in India: Lessons Learnt and Roadmap for Future”. *Architecture Time Space and People* .

Hari Ilam Vazhuthi N.1, n. A. (2020). Causes and Impacts of Urban Floods in Indian Cities: A Review. *International Journal on Emerging Technologies 11(4): 140-147(2020)*.

Min Chen 1, Y. J. (2022). Measuring Urban Infrastructure Resilience via Pressure-State-Response Framework in Four ChineseMunicipalities. *Applied Sciences*.

Rahman, M. H. (2021). GIS- Based compactness Measurement of urban form. The Caswe of Dhaka, Bangladesh. *Journal of Urban Management*.

Sengupta, S. (2021, March 29). Haphazard and high-density growth can choke Hyderabad: Experts.

Shakti, M. J. (2017). Mumbai: Mo Jal Shakti.

Tripathi, S. (2017). RELATIONSHIP BETWEEN INFRASTRUCTURE AND POPULATION AGGLOMERATION IN URBAN INDIA: AN EMPIRICAL ASSESSMENT. *Asian Development Bank Institute*.

BEAUTIFUL CITY: PLANNING FOR TRANSFORMATIONS OF THE URBAN LANDSCAPE (1148)

Karen Ray

University College Cork, Ireland; kray@ucc.ie

Abstract. Against the backdrop of increasing needs for compact growth, higher densities, and large-scale energy provisions, planners are challenged with facilitating developments that significantly alter urban and rural landscapes. The level of change is unprecedented (and usually more irreversible) in cities, where major residential and commercial developments, and even renewable energy installations more typically associated with less urban areas, are reshaping the physical character. In rural areas, and despite mounting pressures for major technologies, beauty and the visual components of landscape are still holding substantive weight in planning judgements. The explicit and compelling engagement with landscape significantly weakens as an *urban* discourse, while cities and towns are experiencing levels of change that equate to that of these developments in the countryside. Using cases in Ireland where beauty and the visual landscape were determining factors in planning judgement, this paper teases apart emerging trends in decision-making in both rural and urban areas and raises somewhat ethical questions on accommodating such 'subjective' considerations in the face of global pressures for change.

Keywords: Urban Landscape, Beauty Cities, Visual.

1. The Ethics of Aesthetics:

1.1. The Case of Ireland's National Pediatric Hospital

In 2012 a media frenzy arose when planning permission for what was to be the biggest project in the Irish state was turned down. Aside from its spiralling costs among other earlier concerns, deciding on the proposed new National Paediatric Hospital (An Bord Pleanála, Case PL29S.PA0024) was, at this point, hinging on one overarching issue – its visual appearance on the city skyline.

Previous delays caused by debates and disputes on location, traffic congestion, and the politics around amalgamating three paediatric hospitals into a single leading centre were severely criticised by paediatricians, the public and the media, who questioned the morality of the delays in the face of urgent national childcare. At this point in the process, the proposed development was to be located at the site of the already established Mater Misericordia University Hospital within Dublin's north inner city.

The area has quite a blend of physical characteristics, with several residential streets including three-storey dwellings, two-storey Victorian dwellings, four-storey Georgian protected structures, the expansive Mountjoy Prison, a church, commercial and shopping facilities, and a mix of other uses. The area also includes a linear 1930s park along the historical Royal Canal Bank and another small urban park, originally part of the Mater site.

The major proposal, which was to hold 392 inpatient beds and 53 day-care beds, included a range of buildings, facilities, and ancillary developments, with the core linear structure effectively comprising a number of inter-related 'stacked' elements" distinguished by a rectangular cuboid form, an eight-storey central podium and a number of glazed 'pavilions' of five to six stories, with one wrapping around the central podium.

Figure 1. A photomontage of the proposed new hospital at the Mater Site, Dublin
Source: An Bord Pleanála, PL29S.PA0024.

After a lengthy oral hearing which included 29 applicant representatives (from architects to health consultants), seven participants from Dublin City Council (planners, architects, traffic and drainage representatives), representatives from four prescribed bodies (National Trust, Heritage Council, Railway Procurement Agency, and the Government), and 23 observers (individuals and representatives from a wider range of bodies), there were high expectations that this project, marked by a decade of discussions, plans and delays, would finally commence.

Two months later the national planning board delivered what was described in the media

as a ‘bombshell’ decision when it refused permission. The recommendation at the end of a substantial report by inspector Una Cross was upheld by the board and noted four reasons; the first three of which centred around landscape/ streetscape character, visual appearance, and visual amenity (the fourth focused on car parking).

Figure 2. A sample ground-level photomontage of the proposed hospital as viewed from the historical streets. In their proposal, the applicants suggested that “there is an inherent conflict of scale which can only be resolved by contrast”, implying that that the development was of a necessary scale and was never going to by sympathetic to its surroundings.

1.2. Landscape Versus Medical Care

It was inevitable that the likely wider perception of ‘one versus the other’ (that is to say landscape versus medical priorities) would need substantive addressing by the board. No one was about to deny the critical and urgent need for the development, yet an overly simplified ‘think of the children’ styled narrative was in danger of breaking its way into the media. It was therefore a pressing responsibility of the planning inspector to justify any recommendation to delay further the progression of the development.

The scale of the priorities was also of interest. The sheer nature of the proposal saw it classified as ‘strategic infrastructure’, thereby going straight to the national planning and appeals board rather than through the local authority. Dublin City Council were nevertheless a key stakeholder and statutory consultee, with a direct involvement in accommodating more incremental alterations to the Mater site over the years. Unlike the

board, the Council were more in favour of the proposal in their submission, though noting in their report to the Board a 'key issue is the appearance and impact of the building's form on Dublin's skyline and on its historic setting'. Against national childcare needs, the aesthetics of how something looked on the Dublin skyline could be seen as of less strategic importance. Being the capital, however, the city's landscape has a wider significance and identity, along with having policies on visual character, urban landscape, views and prospects in the area's local development plan and larger city plan. It would be misguided to describe the consideration as 'local', even if the immediate impact would be felt at this level.

In her recommendations, the inspector immediately addressed this dichotomy with conviction, evidently aware of the pressing need to make the position of the board (and her own humanity) very clear in such a sensitive case:

The matter of whether the hospital in principle is necessary is not a matter which I consider is in dispute. I consider it essential that our country's children are provided with a facility of exceptional standard, a centre of excellence. Dublin City Council considered that the compromise necessary to achieve development in inner urban areas is outweighed by the positive contributions which this scheme would make to the city centre. In my opinion, the necessary compromises in this instance should be made on the basis of the achievement of a world class paediatric hospital. However, I do not consider that the compromises necessary would be outweighed by the provision of the subject facility such are their significance. The proposal as it comes before the Board on the subject site would, in my opinion, give rise to a number of residual environmental effects of such significance in respect of their adverse impact that they cannot be reconciled with the need for the proposed facility.

Following the inspector's conclusions and recommendations, the proposal was rejected, with the board deeming "it would have a profound negative impact on the appearance

and visual amenity of the city skyline" due to its significant bulk and height.

Figure 3. A sample wider view photomontage depicting the impact of the proposal on the city skyline, as viewed from Blessington Street Park approximately half a kilometre from the site. The original proposal was described as "a cloud form enveloped in a skin of glass . . . chosen because of its soft ethereal shape". Contrastingly, the board described it as dominant, visually incongruous structure [that] would have a profound negative impact on the appearance and visual amenity of the city skyline"

Despite the controversial nature of the proposal for the hospital, the final decision of the board was supported by the national trust among others who deemed the site highly unsuitable for such a development and that it should never have been pursued. Much has changed since the decision, with the as-yet-unnamed new national children's hospital under construction at another site, over three kilometres south on the opposite side of the river. The design was completely overhauled, with many of the visual and aesthetic issues resolved.

2. 'Looks' Versus 'Serious Matters'

2.1. Relevance of the Case of the Children's Hospital

In his text on Irish landscape, retired planning consultant, Brendan McGrath (2013: 76) references an astute insight of a senior inspector in the Irish national planning board who "has observed how 'landscape' is often a prominent issue at the start of oral hearings but disappears into the background as *real* reasons come to the fore". This has certainly been the reality in a large number cases where landscape ought to have had a greater presence in discussions (another peri-urban case ahead in explores the dismissal of landscape aesthetics as 'subjective'). Planners are required (by law and in line with the *European Landscape Convention* (ELC) 2000) to include objectives for urban and rural landscapes in development plan policies to accommodate the fair inclusion of landscape as a key consideration (where relevant) in decision-making. While this paper firmly supports these now established European objectives, it also reflects on the statement above 10 years after McGrath's publication on landscape and planning, and how landscape, especially the visual aesthetic component, should (or should not) trump other 'serious matters' in light of pressing societal needs.

The fact that this case saw the landscape argument considered at the same level as urgent national medical care made it a striking example within Irish planning and is quite contrasting to the observation of the senior inspector referenced by McGrath. According to the national trust, the board made "one of the most significant planning decisions in its history in refusing the application by the National Pediatric Hospital" (Archiseek, 2012, p.2).

In an era of mounting pressures to build large developments not only critical for sustainable development but part of a moral and very human conversation on things like housing needs and climate change, discussing 'looks' might seem, not only trivial and subjective, but inherently wrong. And yet, the case above could not have placed 'looks' against a more sensitive and deeply human need to provide essential childcare to some of the most vulnerable in society.

2.2. Back to Basics: Embracing the Visual Aesthetic

The ELC's interpretation of landscape as "an area as perceived by people, whose character is the result of the action and interaction of natural and/or human factors' (Council of Europe, 2000, p.2) serves as a conscious reminder of landscape as being more value-laden and complex than mere scenery. It has responded to nearly a century of rich literature which advocated the recognition of the deeper cultural associations and hidden values (Ray, 2021); how a landscape's essence is often rooted in the more intangible layers and the experience of the landscape beyond the visual (O'Regan, 2008). This touches on both sensory and cognitive elements of landscape engagement, but it is important to acknowledge that the cognitive in particular is still driven by a visual presence – even if the aesthetic is less in focus.

In more rural locations for instance, developments such as telecommunications masts and major transport infrastructure can come under planning scrutiny when their visual presence (among other concerns) in an unromantic setting causes obtrusion to what Newman describes as 'the archaeological landscape' (2009). Valuing (often subterranean) monuments in terms of their symbolic and holistic relationship with their wider landscape setting was a central theme to Newman's work and the protests on the internationally and historically significant Hill of Tara, County Meath, in 2010. The controversial proposal involved the construction of a new M3 Motorway passing through the archaeologically rich, but visually unassuming, Tara-Skryne Valley. The impact went beyond the visual, to the sensory and the cognitive, with Newman (2015) asserting the intangible layers of the importance associated with history, folklore, myths and legends, identity and spiritual relevance of such landscapes. According to McGrath (2015), had the countryside around the Hill of Tara possessed the physical attributes of more outstanding and romantic scenery like the Killarney Lakelands, it seems doubtful that the decision in 2003 to route motorway through the valley would have been so casually taken.

At the same time, the visual aesthetic remains a critical component of how we engage with landscape. It is the fundamental and original idea to which we attach landscape understanding. Arguably there is an over-emphasis on the non-visual in contemporary discourses and, while this enriches our understanding of the landscape, it can also dilute the impact of a direct discussion about appearances. It is also much more difficult to make

a case for the aesthetic when major an important developments in both urban and rural environments threaten a valued visual character. For this reason, the previous case is of particular interest as an exception, and even more so in the context of the urban environment.

2.3. Recognising the 'Urban' Landscape

Apart from the children's hospital being in the heart of the urban environment, the decision embraced this fundamental interpretation of landscape as predominantly visual. While the role of Dublin's skyline and historical character in the city's identity were key concerns, the discourse strayed very little into the more intangible and cultural layers landscape. Going back to the basics of landscape meaning, the visual aesthetic held its own.

It is extremely rare to see the visual aesthetic thrust into the epicentre of a deeply sensitive case such as the children's hospital. Yet even within everyday planning practice, it is uncommon for aesthetic landscape considerations to have such a critical role within the decision-making processes for developments in major urban centres. This is despite the spatially inclusive interpretation of the ELC to include urban, peri-urban, and ordinary landscapes as well as the typically rural and scenic. Such an interpretation responds to nearly a century of rich literature on how best to think about, engage with, and manage landscape.

With the acceleration of physical change in our cities, the obliteration of views and prospects with increased densities, tall buildings, and even renewable energy installations, it is somewhat surprising that the case above is again more the exception than the rule when it comes to engaging with the fundamental interpretation of landscape as predominantly visual and with aesthetic appeal. While landscape is much more than this, these components are still at the heart of its sustained meaning. Despite this, the urban landscape remains under-analysed in literature and best practice.

And yet the concept of the urban landscape is not 'new'. In and around the nineteenth century, as landscapes began to experience accelerated change, replacing what was once rural space for more industrial and built-up environments, portrayals of the urban landscape also began their imposition. Art, photography, poetry and literature began to firmly adopt the concept of the urban landscape as a deeply aesthetic and visual entity. Rubin (2008) offers the most highly detailed analysis of the gradual artistic overlay of 'landscape' onto a setting of urbanisation and development. A major body of Impressionist landscape painting, in Rubin's view, represented a new wave of economic and productive activities that began outside the domain of pastoral leisure.

Figures like Monet, Lowry and Constable began to depict the often-harsh reality of

industrial life into their 'landscape paintings' from the second half of the nineteenth century. First, the urban was depicted as truth, as in Monet's *Impression: Sunrise* in 1872, before it came to be depicted in ways which captured and elevated its unique beauty and interest, encouraging a fresh mindset of artistic landscape perspectives, yet which still embraced the fundamental interpretation of landscape as having a visual and aesthetic existence.

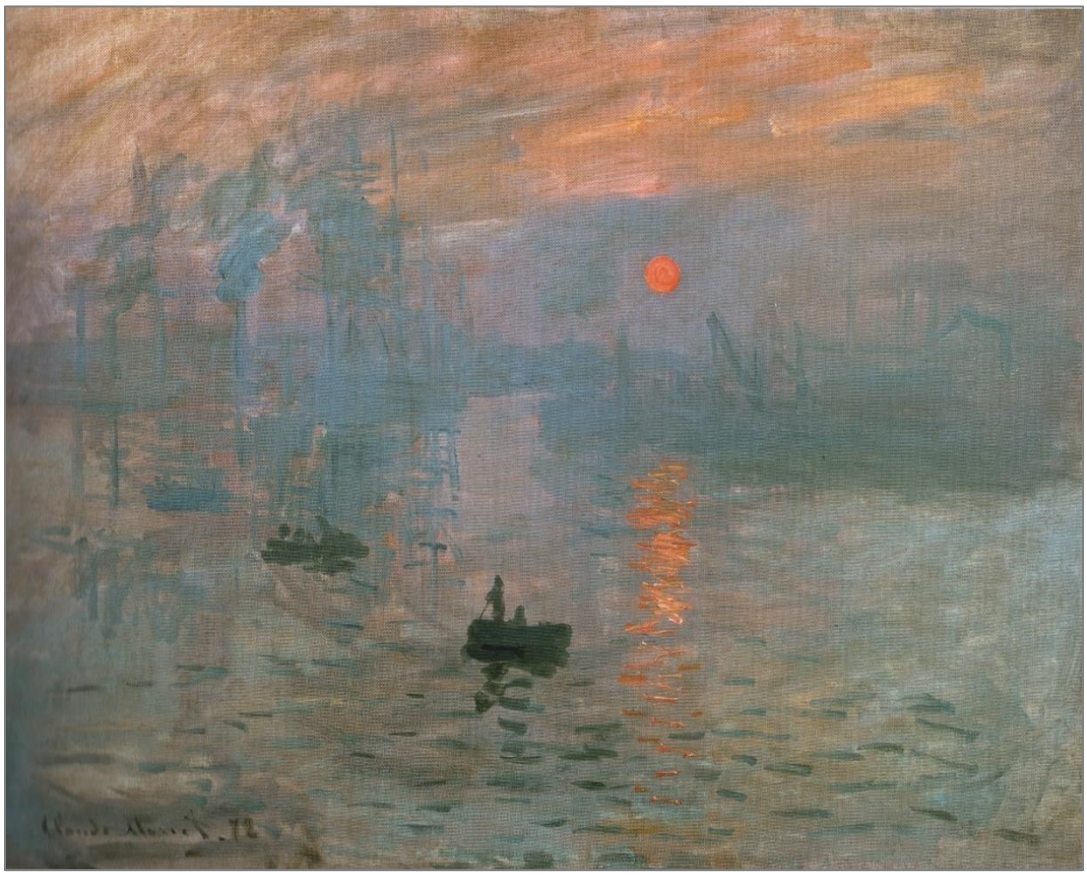


Figure 4. Claude Monet's Impression: Sunrise, 1873, Musée Marmottan, Paris. (Source: Kuhl, 2009: 9).

As the picture that defined the start of the Impressionist movement, it does not represent traditional 'fine art' or traditional landscape depictions. It is, on the contrary, a simple painting, created through a series of quick and careless brush strokes, with the sole purpose of capturing the 'impression' of the landscape at that moment in time (conscious of its changing and dynamic nature) through colour and light, free from ideals and romanticism. Not only was it heavily urban in nature, but traditional aesthetics regarding what was considered beautiful or interesting were challenged, with the landscape presented just as it was. In this way, Monet and the Impressionists brought landscape interpretations out of the rural and sublime and into the urban and ordinary.

3. Think Global Act Local? Lessons from Rural Contexts

Planners have always had to wrestle with how proposals for major developments might significantly alter the visual character and the character of established (and sometimes protected) views and prospects. In most everyday cases, the ethical dimension of what constitutes the more serious matter is less of an issue than that of the financial gain or loss of key stakeholders with an invested interest on the outcome. In more rural locations, if a controversial case is refused on visual grounds, the 'losers' are often big developers with a substantial financial cushion to land on. The ethical dimension does not quite come into it, but when it does, it usually relates to cases where much more people are affected, and where two deeply conflicting interests are at play.

Aesthetic landscape concerns in the rural environment have not experienced the same level of ethical dilemmas as that of the children's hospital proposal. Not only do changes to the countryside affect less people, but resistance to change tends to be driven by an 'unselfish' desire to protect the more natural environment, the holistic character of the countryside, the unspoilt ridgelines, picturesque views with water bodies and a charming heritage feature like an old castle ruin. In the not-too-distant past, the dominant discourse emerging from local communities against wind energy development in the countryside was very much about saving beautiful landscapes from these industrial 'monstrosities'. Communities felt they were doing some good by advocating for the protection of the rural landscape for their and future generations.

And yet the last year has recorded a dramatic change in attitudes towards such developments. The most recent annual survey on public attitudes conducted by Wind Energy Ireland (2022) found that support for wind farms in Ireland is at an all-time high, with four out of five people backing the development. The report noted how Irish people are becoming increasingly aware of the need for greater energy independence and energy security, for which wind energy is critical. The survey found that 80% of people supported wind farms, with opposition falling to just 5%. Most interestingly, 58% of respondents said they would support such development in their local area.

This data can be correlated with the substantial decrease over the last decade (and more notably in the last few years) in the type of headlines that had been dominating the renewable energy discourse (Figure____).

Figure 5. Examples of the typical (often heavily 'punned') headlines throughout Irish media sources in the earlier years of the last decade in relation to divergent opinions on some of Ireland's windfarm proposals

Sources: Clockwise from top left – Martin, 2013: 21; The Irish Times, 2013a: 10; Hickey, 2013:14; Lynott, 2013:10; Finegan, 2013: 10; Carley, 2015:16; O'Regan, 2013:8; O' Connell, 2013: 30; Clifford, 2013b: 6; Corcoran, 2015: 19; Clifford, 2013a: 11; Carley, 2015:16; The Irish Times, 2013b:15; Doyle, 2013: 16; O' Brien: 2013: 9; Myers, 2013: 13)

Again this resurrects questions around ethics, this time in relation to local 'looks' versus global awareness and the urgent infrastructure needed to secure a sustainable future. While landscape has always been a primary driver of unease around past wind energy proposals, this recent study is a testament to how pioneering planner and conservationist, Sir Patrick Geddes' 'Think Global Act Local' message is more relevant now than it was in the early 20th Century.

Nevertheless, there are still instances where the visual aesthetic holds more weight than the need for critical energy infrastructure.

4. Weighing Up Priorities: Beauty and Climate

4.1. The Case of Gougane Barra

Hidden in a discreet, rural location within approximately 50 kilometers west of Cork City, the intimate yet striking glaciated wooded cradle valley of Gougane Barra appears almost out of nowhere. On the deep, winding approach road, a sense of visual anticipation is gently prompted by intermittent views of the highest and most rugged slopes, illuminated in any weather by the contrast of light from the darker, enclosed surroundings. The characteristic celestial interplay of atmosphere and terrain, among other things, means that the valley's special qualities go far beyond its visual appeal, and beyond what many would deem its beauty. It is an immersive sensory experience; from the vacuum-like tranquility and distant white noise of numerous waterfalls to the challenging terrain of the upland wooded tracks. Regardless of belief (the area is steeped in religious history), there is a sense of spirituality that generates a restrained behavior among its visitors, who are more likely to whisper than talk.

Figure 6. The view looking northwest across the lake at Gougane Barra, shortly after 'entering' the valley on the main yet modest country approach road. This iconic view is one of the most frequently depicted in artistic representations, most of which are anchored by the presence of the nineteenth century oratory built on a small island and accessed by a stone causeway. The valley sits within a wider Gaeltacht area where Irish is recognised at the main spoken language. It is a deeply rural area, with the valley itself holding almost no contemporary developments beyond a handful of dwellings and a small hotel. It is designated as a landscape of high value, high sensitivity and of national importance.

Source: Ray, 2018.

Like many rural locations, the wider area has been experiencing increased pressure to facilitate wind energy development. This has been reflected in the evolving relaxation of the language of planning policy, where categorisations such as 'strategically unsuitable' are no longer used and replaced by principles such as 'normally discouraged' or 'open to consideration'. Understandably it is part of a global necessity to mitigate the worst effects of climate change and increase energy security. It is important to state that the case ahead is not about recycling established and now unoriginal discourses around the impact large scale renewable energy has on the landscape. Instead, the example of a recent high-profile case of a proposed wind farm near Gougane Barra is presented as a lens through which to explore the (ethical) role of old-fashioned landscape beauty within the urgent contemporary need for planners to accommodate green energy infrastructure.

On 26th August 2020, Cork County Council decided to refuse permission to Wingleaf Ltd for a what was to be the biggest wind farm ever proposed in the county, with seven 178.5 metre turbines located between two and three kilometres from the lakeshore of Gougane Barra. It was concluded that the highly scenic area could not absorb the height of the turbines when viewed from the Wild Atlantic Way, from scenic routes and from High Value Landscape areas, with the proposal having the potential to negatively affect tourism. Throughout the case, particular reference was made to the visual and scenic appeal of the Gougane Barra landscape, while policies which explicitly accounted for scenic beauty were frequently drawn upon in the reports (Cork County Council, Case 20350, 2020). In its refusal, the council said the development would materially contravene the objectives of the Cork County Development Plan and "would be excessively domineering from very many vantage points over a wide area" (Planners Report [Primary], p.51).

While the proposal was not within the main valley itself, the visibility of the top of one turbine from the lakeshore and of several other turbines from the adjacent forest park, as well as from the approach routes to Gougane Barra (Figure___), became central to the discussions. This visual impact was also the key concern of the local community and many other members of the public who drove a major campaign to protect the beauty spot from such change. An online petition to save the beauty and tranquility of Gougane Barra' attracted more than 12,000 signatures from forty countries (Ó Liatháin, 2022).

When the decision was appealed to the national planning board, and subsequently granted, it exposed the tensions, not just the familiar tensions between rural landscape and large developments, but between the role of visually sensitive landscapes of local, regional, and even national value and international energy targets, and the accelerating nature of the discourse around how such receiving environments could and should accommodate these developments. Even more intriguing, was how the board overturned the recommendation of its own inspector to refuse permission on visual landscape grounds. What emerged was the weight of scale in such competing priorities, with the

board choosing international energy targets above all else, ruling that the windfarm would "make a positive contribution to the implementation of Ireland's national strategic policy on renewable energy and its move to a low energy carbon future" (An Bord Pleanála, 308244-20, Board Order, p.7).

However, shortly after the local community secured the right for a judicial review of the board's decision in the High Court, a dramatic announcement was made by the board's legal team that the planning body would not be continuing its defence, thereby conceding to the original decision of the local authority, Cork County Council. It was a landmark case for landscape (particularly scenic landscape and beauty) in the context of urgent green energy targets and heightened awareness of global environmental issues.

In a somewhat similar perception to that emerging during the Children's Hopsital case, the campaign's spokesman made the following statement in the local media:

> There are several wind farms in the area. It's not as if the people in the Lee Valley are opposed to renewable energy – they are not – but in this case it is simply in the wrong place.
>
> (Forsythe, 2022, p.na)

Political discourses inevitably filtered into the campaign, with local councillors condemning the proposal: "We won't be able to find another Gougane Barra but we will be able to find another location for these wind turbines" (Forsythe, 2022, p.na) – an unfortunate misinterpretation of the spatial flexibility to not only accommodate the volume of turbines needed, but of the close to impossible time frame within which to meet 2030 targets.

Nevertheless, the visual, scenic, landscape argument bookended the decisions in this case, maintaining a solid weight in the face of critical energy infrastructure needs.

Figure 7. Photomontage of the proposed wind farm to the left of the image, with Gougane Barra evident by the topographic hollow to the right. Only the top of one of the turbines would have been visible from the lakeshore, while some of the others from the forest park within the cradle valley. Nevertheless this was enough for visual impact (particularly on the skyline), landscape aesthetics and scenic amenity to have a major bearing on the local planning judgement (Source: Cork County Council, Case 20350, 2020).

5. Justifying the Visual Aesthetic: Theoretical Reflections

Cases like this where landscape arguments triumph over a major development are still predominantly associated with rural areas, renewable energy and telecommunications infrastructure, and very traditional ideas of beauty. The explicit and confident engagement with landscape changes when we turn our focus to the urban environment, even though these landscapes are now experiencing dramatic levels of change that equate to that of major technologies in the countryside. This is most certainly partly because of the differences with how we experience city landscapes; closer horizons, shorter view duration and less visual control over our surroundings mean 'images' can be more fleeting. And yet there are also striking similarities in what we value and why. Protecting views and prospects, character, intimate scales, for instance, has an established history within strategic policy formation for cities as well as rural areas. This largely comes down to an appreciation of the age-old concept of beauty and 'the picturesque', embedded in the roots of city planning and worthy enough to trigger the City Beautiful Movement in the late 19th century.

The case of the children's hospital is a compelling example of how the language of the visual aesthetic can be used to great effect in the urban landscape. Similarly, the case of the wind farm proposal near Gougane Barra is an example of how old-fashioned landscape beauty can be a powerful argument when articulated with conviction and clarity. In both cases, strong local development plan policy also served the planners in their recommendations, but this is not always the case.

While the urban landscape is of most interest here the Gougane Barra case provides an engaging example whereby the preservation of beauty surpassed the need for critical green energy, even though attitudes are shifting towards being more accepting of major changes. This shift suggest that we will begin to see more and more renewable energy developments in urban contexts. Yet just like in the case of the children's hospital, relying on changing attitudes may not be enough for those hoping to secure a positive outcome for their proposals.

This paper presented a light-touch exploration of cases where the visual aesthetic held up against what were deemed essential developments for very different reasons. Despite their differences, they both prompt questions on the degree to which the visual aesthetic should have a bearing on such decisions. With the stark reality of the accelerating impacts of global warming, the need to provide city homes for a huge proportion of our populations, and the need to provide large developments like critical healthcare facilities to support these populations, is it time to rethink how we really value landscape change?

References

Archiseek (2012), Irish Architectural News: Design Rejected for Children's Hospital, . [Online] Available from: https://www.archiseek.com/2012/design-rejected-hospital/ [Accessed 20/05/2023]

Council of Europe (2000) *European Landscape Convention.* Florence: Council of Europe.

Forsythe, David (2022) 'Row over planned wind farm at Cork beauty spot Gougane Barra', *The Irish Times,* Dublin

Irish Wind Energy Association (2022), *Wind Energy Ireland Public Attitudes Monitor.* Dublin*:* IWEA

McGrath, Brendan., 2013. Landscape and Society in Contemporary Ireland. Cork: Cork University Press.

Newman, Conor (2009) 'Re-composing the archaeological landscape of Tara' In: *The Kingship and Landscape of Tara*, pp. 15-438, Dublin: Four Courts Press.

Newman, Conor, *et al.* (2015) 'In the way of development: Tara, the M3 and the Celtic Tiger'. Defining events: Power, resistance and identity in twenty-first century Ireland. Manchester: Manchester University Press.

Ó Liatháin, Concubhar (2022), 'No wind farm for Cork's Gougane Barra as An Bórd Pleanála concedes to Gaeltacht community', *Irish Independent,* Dublin.

O' Regan, T. 2008. *Position Paper on Proposed National Landscape Strategy.* Cork: Landscape Alliance Ireland.

Ray, Karen (2013) Where a European Convention Meets a European Directive. In: Newman, C. et al (eds). *Landscape and Imagination: Towards a new baseline for education in a changing world.* Florence: UNISCAPE

Ray, Karen (2021) *'Changing Contexts for Planning Education: Embedding Landscape into the Education of Young Planners'*. Transactions of the Association of European Schools of Planning, 5 (2):95-112

RESEARCH ON THE WORKER COMMUNITY GOVERNANCE TRANSFORMATION AND RESIDENTS' SELF-ORGANIZATION: A CASE STUDY OF PINGDINGSHAN CITY, CHINA (1132)

Guangyu Li [1]*, Yi Huang [1]

[1] College of Architecture and Urban Planning, Tongji University, Shanghai, China; *957855653@qq.com

Abstract. In China, state-owned enterprises used to responsible for building workers' houses and providing public services such as education and medical treatment for their employees. However, in recent years, the governance of worker community has been transformed from "unitary management" (managed by the enterprise), to "multi-governance" (managed by the government, property company and residents' organizations). State-owned enterprises are not responsible for community management anymore. Instead, residents' self-organization is seen as an important governance force. This research takes a traditional coal resource-based city as an example, through methods of data review, field survey and semi-structured interview, analyzing the main types of residents' self-organization and the challenges during the autonomy process. Furthermore, this paper indicates that social capital and official supervision should be strengthen in autonomic practice.

Keywords: state-owned enterprise; worker community; governance transformation; residents' self-organization

1. Introduction

China has an economic and political system that is different from Western countries. In China, state-owned enterprises were responsible for building employee houses and providing education, medical care, cultural, entertainment, and property services for employees. From the establishment of the Chinese government in 1949, especially in twentieth Century, almost each state-owned enterprise in China build kindergarten, middle school, hospital, retail store, and even funeral parlor within or around the worker community for workers and their families, supplying all the services workers need.

However, in the past two decades, in order to promote a rapid growth of economic and reduce the burden on enterprises, China has undergone a continuous and complete economic reform and social transformation. Chinese government decided that it is not

appropriate anymore for state-owned enterprises to continue their management on the worker communities, and the phenomenon of "enterprises are managing the whole community" has been gradually withdrawn from the historical stage. In 2016, the Chinese central government issued a policy to separate and transfer the responsibilities of providing water, electricity, heating, and property services for worker communities from state-owned enterprises to local government and related organizations. The governance of worker community is undergoing a transformation from "unitary management" by enterprises to "multi-governance" by the local government, market-oriented property company, and social organization.

As one of the most important mining city being constructed in 1950's, Pingdingshan City now is facing a series of difficulties and challenges in governance transformation. At the same time, it has also accumulated valuable practical experiences of community self-organization. This article will take worker communities in Pingdingshan City as examples, introducing their practical experiences, summarizing these examples into different types of self-organization practice, and analyzing their specific characteristics. Besides, this article aims to deeply understand the existed challenges and problems within autonomy process and propose effective suggestions for the local government to promote governance transformation smoothly.

2. Literature Review

Worker community has a different spatial and social type compared with ordinary residential communities. Research in China focusing on the transformation of worker community governance began gradually from 1990s. From the perspective of local social governance system, Chen Weidong (2017) took a community in Wuhan as an example to introduce the possibility of transforming the enterprise management mode into the social governance mode. Chai Yanwei (2013), Guo Fengying (2007) and other researchers took communities in Beijing, Hubei, Changchun and other places as examples, analyzed the difficulties encountered in the governance transformation process, and showed the diversification trend of governance subjects during this process. Researchers in China also emphasized the importance of government intervention, reorganization of social capital, and joint administration in the transformation process (Du et al., 2021; Lu et al., 2015; Li et al., 2017).

Except the researches about governance transformation, analysis focusing on the community self-organization also has been emphasized by sociologists and urban planners in China. Because of its regional and social attribute, community's self-organization is based on the residents' common concern for public interests and their urgent aspiration to participate in public affairs within their own community (Wei, 2003).

Since the late 1980s, the process of economic and social transformation has occurred in China. During this process, in response to the problems caused by the "lose efficiency" of the omnipotent government and the "out of order" of the market, residents self-organization has been evaluated as a possible way by many experts and scholars (Xu, 2001; Fei, 2002). Researchers such as Yang Guihua (2007) analyzed the construction path, subject cultivation, and development trajectory of community self-organization. They believes that self-organization is an effective method to optimize social governance structure and strengthen the coordination of multi-governance (Yang, 2007; Xu et al., 2014; Xie, 2002). Yuan Qing (2020), Tao Chuanjin (2021), and others elaborated on the important role of platforms such as homeowners' committees, and believed that the support, guidance, and supervision from local governments are important for the establishment of the self-organization system.

Currently, researchers in China have different opinions on the concept of community self-governance. In this article, community's self-organization refers to the process in which residents are driven by their own attentions, utilizing community resources, choosing appropriate approaches, independently managing public affairs through equal consultation, and finally achieving public interests (Liu, 2016). Except the property management committee registered to local government, other social organizations are also important platforms for community self-organization (Xie, 2021).

Although there have been a series of discussions on community self-organization in the field of urban issues research, there is still a lack of relevant exploration focusing on worker communities in the current background of governance transformation. This article will take worker communities in Pingdingshan City, Henan Province as examples to analyze the practical cases of community self-organization, elaborating on the problems and challenges that worker community need to deal with following the process of self-organization. Besides, it also explores the necessary methods for local government to meet with these challenges.

3. Methodology

This research is mainly conducted through qualitative research methods, including data review, field survey, and semi-structured interview. Researcher visited more than 20 coal-based mining communities in Pingdingshan City in 2022. The communities investigated include five worker communities invested and constructed by the enterprise group headquarter (known as Pingdingshan Coal Mine Group, hereinafter referred to as "Ping-coal Group") and other worker communities independently constructed by different enterprises under the group headquarter, such as The First Coal Mine Company and so on (Figure 1, 2). This study obtained 74 interview recordings from different kinds of people, mainly community residents, others including government officers, social organization staff, and people work in property management company. Related records have been encoded, translated, and analyzed. About 30% of the interviewees were recommended by acquaintances, while the majority in-depth interviews were conducted randomly with community residents.

Figure 1. Map of Pingdingshan City

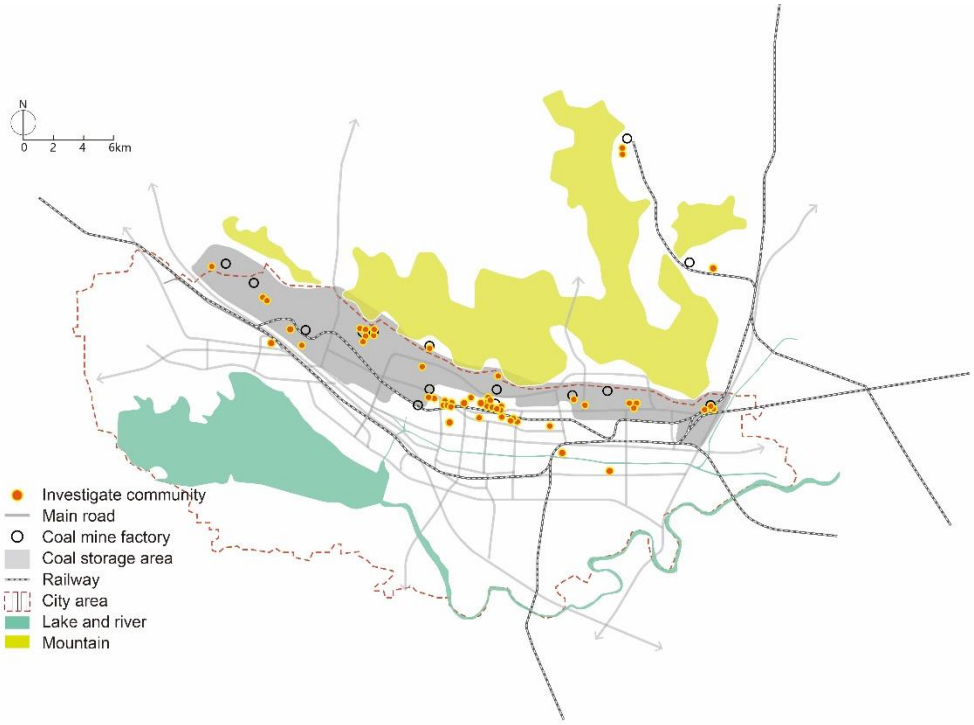


Figure 2. Map of Investigation Worker Communities

4. Background Of Community Governance Transformation

4.1 Pingdingshan City And Worker Community

Pingdingshan City is located in the central region of China, and its development originated from the coal mining industry. According to the " Master Plan of Pingdingshan City (2011-2020)", the central urban area of Pingdingshan city was planned to have a population of 1.1 million people and a total construction land of 106 square kilometers in 2020. The Pingdingshan mining area was the first large-scale coal base that China independently explored, designed, developed, and constructed after 1949. At the same time, it is also one of the thirteen most important national coal bases in China. As a state-owned enterprise, Ping-coal Group dominates the coal mining industry in this city, with nearly twenty coal mining companies under the headquarters. Mainly of the mining area are in the northern part of the city. The coal mining industry remaining has the highest economic contribution rate in Pingdingshan city.

According to relevant data, the population related to Ping-coal Group was approximately 350 thousand, including employees and their families (as of 2019, there were 88000 employees), accounting for about one-third of the urban permanent population. The coal workers' community occupies an undeniable proportion in the total number of residential community in Pingdingshan city.

4.2 Policy about Governance Transformation

In order to enhance the market competitiveness of state-owned enterprises as well as reduce their financial burden, the construction and management responsibilities of worker community have gradually been separated from the duty of enterprises. In June 2016, the General Office of the State Council issued the document of "Guiding Opinions on the Separation and Handover of the 'Three Supplies and One management (which means the supplement of water, electricity, heating, and management of property services)' in the worker community belonging to State-owned Enterprise ". Following this document, a series of guiding policies were introduced by the central and local government. The relevant policies required that the governance transformation of worker communities should be basically completed by the end of 2018, and from 2019 onwards, state-owned enterprises would no longer bear any fees for community management work and services such as the works mentioned within this paragraph before. State-owned enterprises are no longer responsible for the daily management of worker communities, their financial funds and human resources used to be invested in the communities were stopped. Worker communities are implemented to multi-governance instead of be managed by only the enterprise.

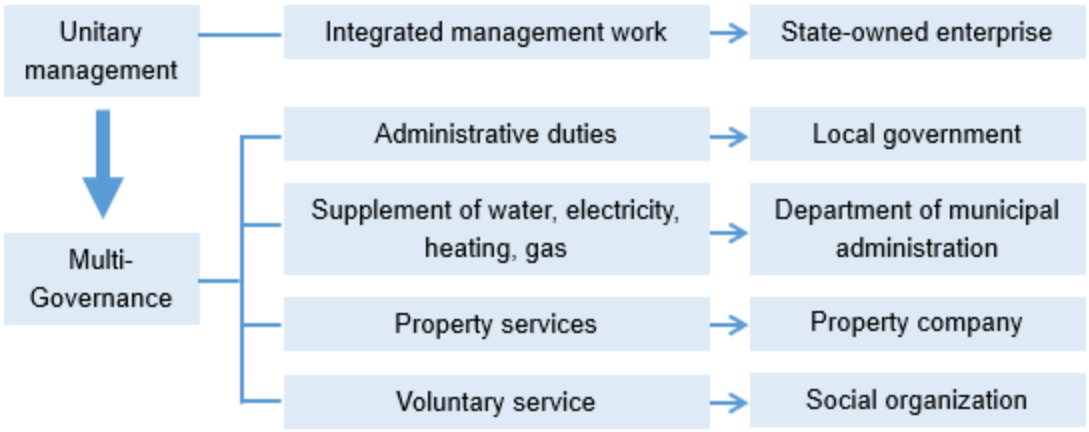


Figure 3. Path of Community Governance Transformation

These policies have brought about huge changes in community governance. Before the separation and handover of the "three supplies and one management", the logistics department of the enterprise was responsible for the management work, including daily cleaning, greening maintenance, safety guard, and so on. Residents only need to pay a small portion of management fees (less than one fifth of the whole fees) to get a complete property management service. However, after the promoted of governance transformation, the daily management works of the worker community were changed from "unitary management" by enterprises to " multi-governance" by the local

government, market-oriented property company, and social organizations. (Figure 3).
Different types of management work have different path to be taken over. The management of municipal facilities such as water, electricity supplement are taken over by different department of local government. While, the property management is supposed to be taken over by market-oriented property companies. According to government documents, there are three choices of property management for worker communities. Firstly, it could be taken over by a strong state-owned property company; secondly, a professional market-oriented property management company could be appointed to take over; thirdly, for those communities which cannot import property management companies through market channels, they can apply to residents' self-organization.

In the process of worker community governance transformation, there is a problem that it is difficult for market-oriented property companies to join in the management work within a short period of time, which leading to a large number of worker communities "out of order". Lack of reliance make community residents cannot quickly adapt market-oriented property services, believing that property companies only collect money and do not work well. Residents also believing that the property company do not align with residents. The conflict between residents and property management companies ultimately led to the withdrawal of marketable property services, which also make it possible for the emergence of community residents' self-organization.

5.Different Types Of Self-organization In Worker Community

The worker communities investigated in this research are mainly divided into two types: communities constructed by Ping-coal Group (which residents come from different subsidiary mining companies belonging to Ping-coal Group) and worker communities independently constructed by each single subsidiary mining company (which residents come from the same subsidiary enterprise). Due to different social background and population composition, worker community in Pingdingshan city have different types of residents' self-organization mode. The following analysis relies on practical experiences in Pingdingshan city in China.

5.1 Type 1: Organization Fight against Property Management Company

In order to combat issues such as rising property management costs and inadequate property service quality, some worker community residents have organized preliminary residential committee organization to fight for their own rights. Community residents select representatives to communicate and coordinate with relevant stakeholders such as property management companies, enterprises, and local government departments, and to express their own opinions through complaints, petitions, non-violence resistance

and other forms.

Taking GaoYang Community (hereinafter referred to as GY community) in Pingdingshan City as an example. The community was built in 2013, covering an area of 31.5 hectares, with over 4800 households and a permanent population of over 10000. GY community is home to employees and family members of multiple subordinate enterprises under Ping-coal Group. The majority of residents are low income families, and more than half of them are elderly population aged 50 and above. The annual income of a family is around 4500€, which need to be used to maintain the daily consumption of 2-3 family members, including the education and nutrition expenses for their grandson (nearly 1500€ per year).

After the governance transformation, enterprises no longer pay the fees for community property management service, and newly takeover property company doubled the charging fees for management service. Previously, the enterprise only charged 0.03€ per square meter per month for community management. After the governance transformation, the marketable property company charged 0.06€ per square meter per month (based on the charging standard of the "Guiding Price Standard for Residential Property Service Fees in Pingdingshan Urban Area"). At the same time, the property management company wish to charge the parking space rental fee of 90€ per year (have not been charged previously), which is a considerable large fixed expense for each employee family.

The rise in property service costs has caused strong dissatisfaction among residents. They formed a protest organization to express their opinions. Community residents use online social media to establish residential committee (with over 2000 members) and elect representatives to express their demands to the enterprises and local government departments. At the same time, in order to delay payment time, residents' organizations and property management companies engaged in a "battle of wits and courage". More than eighty percent of homeowners did not pay property service and parking fees during the past 1-2 years. It is very difficult for the property management company to continue management work without financial support. Although the struggle and rights protection of residents' organizations have achieved many results, the residents' self-organization practice in GY community is still in its infancy stage and has not yet formed a comprehensive autonomous system. Community organizations have only undertaken the work of reflecting problems and fighting for rights, and have not yet established a platform to manage the work of community daily service.

5.2 Type 2: Self-organization In Preliminary Status

The preliminary status of residents' self-organization can undertake part of community management work, but it is still incomplete. Following the evacuation of market-oriented property management company, the preliminary mode of residents' self-organization was emerged in some small-scale (less than 1000 households) communities which have

relatively simple population composition (such as all residents come from a same enterprise).

In those worker communities, residents elect enthusiastic, responsible, prestigious, and capable homeowners as representatives to jointly solve basic daily management issues through regular meetings and consultations. In addition to the leader team of the self-organization, residents also selected the "unit-building leader" for each residential building to responsible for the coordination of the specific unit. This kind of residents' self-organization has formed a preliminary system of manager structure, and it has a clear leadership collective and task division. It also can maintain the basic daily work of the community management.

Taking five worker communities on both sides of Sanqi Street in Pingdingshan City as examples. After community governance was separated from state-owned enterprises, there have two property management companies taken over the management work of these five worker communities in 2019, but both of them withdrew within a year. In the second year after governance transformation, the communities maintained a state of residents' self-organization.

"We have selected the unit-building manager for each building to collect a sanitation fee (0.6€ per household per month). This money is used to invite municipal workers to carry off the garbage from the trash cans every day, and there is no need to spend money on other places. The sanitation of public areas is cleaned by the elderly residents who have free time, most of the time, they are retired elderly people. This kind of management can maintain the basic operation of the community with a lower quality. " (Interview with residents)

For the immature residents' self-organization, only the basic services such as garbage cleaning are carried out. There are still some other services need to be done according to the community management. Although the cost is very low, services such as sanitation maintenance and daily cleaning, greening maintenance, and security guard in public

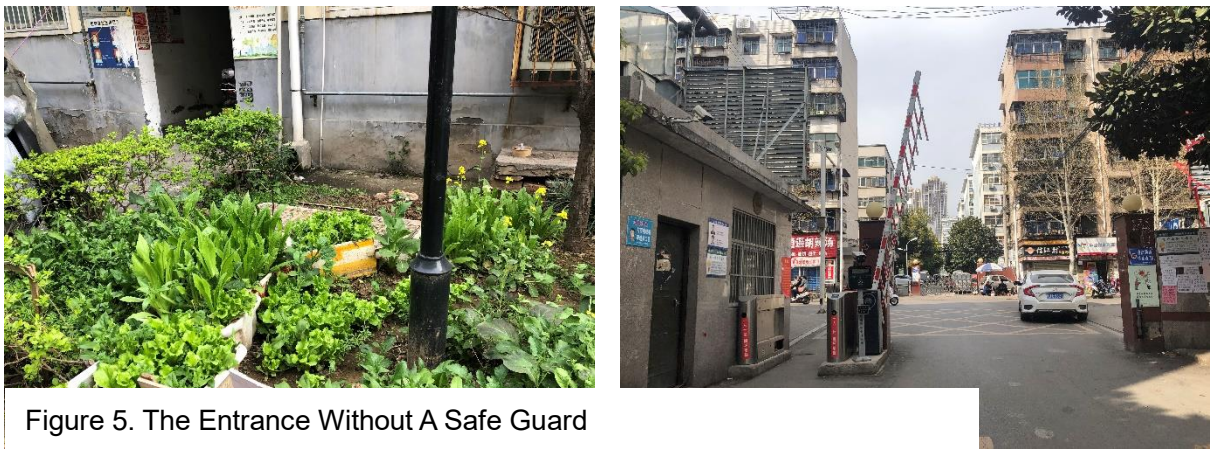


Figure 5. The Entrance Without A Safe Guard

spaces are all in a state of scarcity. For examples, public spaces such as roads, squares, and staircases within the community usually are not cleaned by anyone. Also, the public green space is covered with weeds. Many residents plant vegetables in the open space in front of their own buildings, and privately set up fences to divide the public green space (Figure 4). Landscape trees are not regularly treated and watered, and even pulled out and discarded by residents on the grounds of attracting mosquitoes. Residents privately occupy parking spaces and park indiscriminately. Furthermore, there are no security guards at the entrance of the community. Outsiders and vehicles can enter in the community and exit at will, lacking necessary supervision (Figure 5). These issues have had a negative impact on the quality of life of residents.

The residents' self-organization in this mode is still in an incomplete status and cannot implement comprehensive and effective community management. Residents in worker communities have varying attitudes towards this situation. Due to different levels of education and life experiences, elderly people hope to maintain this low-cost management mode, and the concept of *"there is no need to pay a penny to go through the daily life, cleaning by ourselves is complete enough"* is deeply rooted within their mind. However, younger people generally says that the poor environment, chaos, and lack of safety guard have effected their life quality negatively, and it is better to have a professional property management company to governance the community.

5.3 Type3: Self-organization With Well Established Services

In worker communities with relatively small population size and relatively simple population composition, residents' self-organizations are more likely to operate stably and continuously improve themselves. The following will take Pingdingshan worker community as an example to introduce and analyze the practical experiences of two types of comprehensive community autonomous organizations.

5.3.1 Self-organization in Acquaintance Community

In the worker communities with acquaintance social background, a more comprehensive autonomous organizational system has been formed by residents themselves. These self-organizations can undertake a diverse range of community service, improving the quality of property management service, and meeting the daily requirements of community residents. At the same time, these organizations are relatively stable and can be operated sustainably for a long term.

Taking the worker community of a power plant as an example. The community was built in 1999 and consists of four multi-story residential buildings. More than 80% of community residents are retired employees of the power plant. After the withdrawal of the property management company in 2020, residents in this community began to develop self-organization and gradually established a relatively mature organization

system. Community residents elect residents representatives to form a leadership team to responsible for formulating various management rules, and to arrange financial personnel to keep expenditure records. Residents also select the unit manager to be responsible for fee collection and information transmission in each building. The community pays a fixed monthly salary and hires around 10 people (most of whom are employees' family members) to undertake works including security, public area cleaning, greening maintenance, and facility maintenance. Community residents pay management fees every six months. The fees are collected by financial personnel and regularly disclosed as expenditure details every month. The residents' self-organization in this community were operated smoothly. Residents only need to pay a very minimal expenses (about one-third of the normal property fee standard) to enjoy a high quality property service. This mode has received unanimous recognition from community residents.

The ability of this worker community to form a stable and comprehensive autonomous system is closely related to its limited population size and simple population composition. Firstly, the community is relatively small in scale, with only 4 multi-story residential buildings and a total of 150 households. A small population size makes it easier for residents to reach consensus. Secondly, the community was built in the 1990s, and the vast majority of residents are employees and colleagues of a same enterprise (the power plant), making it a typical acquaintance society. Community residents have lived together for many decades, getting to know each other and trust each other. Therefore, the social cohesion of the community is much more stronger than other worker communities. When encountering problems, residents are more likely to closely united together and tolerate differences, thereby achieving effective self-management.

5.3.2 Self-organization under the Leadership of a Capable Man

Under the leadership of someone with strong social capital and organizational abilities may help worker communities to achieve autonomy effectively. Taking Beiyuan community in Pingdingshan City as an example, it was built in 2015 including three twelve-story residential building. It has about 200 permanent households, all of whom

Figure 7. Details Of Financial Expenditures Posted On The Wall Of The Community

are employees of the same enterprise. According to local government staff, the residential committee of this community was established in April 2020 and took over the community's management work from May 2020. It is "the community with the best effect of self-organization work in nearby areas". There are five main members in the leadership group. They organize discussions with residential representatives regularly to negotiate and solve problems faced by the community. The leadership decided how to collect management fees. In addition, it is also responsible for hiring people for cleaning and security protection, negotiating elevator maintenance matters, and ensuring that the community could be governed in a healthy and stable state (Figure 6, 7).

In this example, the leader of the autonomous organization is also a leader in the enterprise. He is forty years old, currently in the golden period of personal career. Due to his better ability in organization work, he is required by the superior leadership of the enterprise to be responsible for the organizing management work of the community in order to help the community avoid disorder after the property company run away. Since the community was built for workers of the enterprise, the leader of the self-organization and majority of community residents work in the same unit. His leadership position in the enterprise has extended to community management affairs. Therefore, residents are also more inclined to accept the opinions and suggestions of the responsible person. This relationship between the leader and residents has laid the foundation for the community management work.

From the practice of this community, it can be seen that one or more capable managers are one of the most important factors for residents' self-organizations. The leader in this case not only possesses good communication and coordination skills, but also has considered social resources. Taking over community autonomy work is not only his basic living needs, but also a task assigned by his superiors, which make it has special significance. The results of community governance work are related to his personal image in front of his enterprise leaders, which largely urges him to complete the governance tasks better. At the same time, this case also reflects that in the process of governance transformation, although the enterprise is no longer responsible for community management on the surface, it still exerts tremendous potential effects in various forms. In other words, with the assistance of enterprise, community organizations have more financial and material resources to carry out their self-organization work more effectively.

5.4 Type 4: From Autonomy Organization to Property Company

In Pingdingshan City, a phenomenon that community residents independently establish professional property management companies to take over property services has occurred. This mode is expected to improve the quality of property services, and at the same time, to achieve residents' satisfaction with a charging standard lower than the market value. Limited by financial and social resources, this phenomenon only occurs in

a very small number of worker communities.

For example, in the "Nantuan Community", in order to take over community management work, a property management company was established by a retired employee of the state-owned enterprise. Before establishing the property company, he has been responsible for community governance work as the unit leader of one building for nearly a year. He organized and carried out work such as collecting fees and recording accounts, and was enthusiastic about helping the neighbors to solve daily problems. This experience gave him a better understanding of community issues and residents' needs. He maintains a good interactive relationship with community residents, which to some extent eliminates residents' resistance and lays the foundation for the subsequent development of property management work.

The advantages of this mode are as follows. First of all, the newly established property management company consists of more than 20 people, with priority given to hiring local community residents, including retired employees and their families, to undertake tasks such as cleaning and security. This mode reduces the operating costs while providing jobs for residents. Secondly, the company charges only half of the market fee standard, which has increased the acceptance and recognition of community residents. At the same time, this mode has also been recognized and encouraged by local government. Although the low-cost operation strategy still faces the problem of low service quality, it is undoubtedly one of the optional paths for the governance of property services in the worker community during the transformation period.

6. Problems within the Process of Self-organization

6.1 Restriction of Population Scale and Composition

It is difficult for worker community to implement self-organization beyond a population size. The autonomy of residents in worker communities is influenced by differences in population scale and population composition. According to research data, communities with a large population scale (usually over 1000 households) or a complex population composition (mixed residence from multiple enterprise) are difficult to smoothly implement residents’ self-organization.

Taking "Xinxin Community" as an example. The community was built in 2014, with employees from four companies under the head of Ping-coal Group. It has twelve high-rise residential buildings with a population of about 1400 households. After the evacuation of the original property management company, the community was unable to establish an effective resident autonomy organization by itself. Residents in this community come from different companies, and they are not familiar with each other. It is difficult for them to achieve mutual trust. It has been also difficult for autonomous

organization gain recognition from all residents. Many residents believe that the current residential representatives were not personally elected by themselves, and the autonomy plan proposed by the representative meeting did not obtain their consent.

Due to a lack of trust in autonomous organization, although there are a system of managers such as the committee leader and unit manager, the autonomous working group still faces difficulties in collecting fees from residents. “We are not familiar with the unit managers and do not want to listen to them”. (Here the managers were elected by the leaders of the enterprise who were originally responsible for community management work. When the enterprise withdrew from community management, they designated specific person to be responsible for community management work). Excessive population size or complex population composition greatly increase the difficulty of residents' self-organization. Lack of trust among residents and lack of community cohesion make it difficult to implement residents' autonomy.

6.2 Monopoly of Opinion Expression

In the process of promoting resident autonomy, some residents' opinions are coerced. When the opinions of the residents are inconsistent and unable to reach a consensus, problems occurred that some residents' opinions cannot be expressed and are then coerced by the opinions of a few residents. This issue arises in some community self-organization practices, especially in communities that have not yet formed a complete autonomic system and lack of comprehensive governance process.

Taking GY community as an example. This worker community has formed a residents' organization for the purpose of confrontation and rights protection, attracting more than two thousand people joined in. However, compared to the permanent population of over ten thousand people in the community, the proportion of people participating in resident organization is only twenty percent. Residential organization can only represent the opinions of part of residents, which means the representatives elected by the organization are cannot represent the opinions of all residents, even can only represent the opinions of some special radical residents. The autonomous organization hopes to drive out the current property management company and introduce a new one to manage daily work. However, their governance advocacy lacks the supervision of all homeowners, making it difficult for the community to recognize and accept it. Furthermore, part of residents in this community believe that

"there are several leaders in autonomous organization may privately contact with some property management companies, and it is possible for them to involve in corruption cases. There might be an exchange of interests in the process of rights protection activities. Leaders of residential organization are more concerned with seeking for their own welfare rather than fairly handling community affairs." (Interview with a resident)

This type of community self-organization practice indicates that irregular resident organizations are likely to become tools for some individuals to profit from, leading to the infringement of their own interests.

6.3 Lack of Supervision

The safety hazards and fund management issues caused by the lack of supervision have appeared in some cases of community self-organization practices. Compared to multi-story communities, the property services in communities with high-rise buildings are more complex due to the involvement of elevator maintenance, fire control and other contents. Besides, the management costs rise considerably. Therefore, the negative impact of lack of supervision in high-rise communities is more serious.

Because of the lack of supervision, it is difficult for the residents' self-organization to meet the requirements of professional standards. Taking a worker community as an example. There are three high-rise residential buildings in this community, each of them has approximately 120 households. According to the agreement of community autonomic organization, each household needs to pay a fee of 4€ per month to cover the fees of public area cleaning, garbage removal, elevator maintenance and other contents. This price is far below the charging standard of market-oriented property companies (about 10.5€ per household per month). However, there are many safety hazards in the process of autonomy, such as the lack of professional guidance for elevator maintenance and fire protection facility maintenance, which is not conducive to timely resolution of problems and have negative impact on ensuring the safety of residents.

At the same time, there is a lack of necessary regulatory procedures for fund management in the residents' self-organization. In this community, all of the homeowners are required to pay a management fee, and the total amount of money is approximately eighteen thousand euro per year, which is about five times the amount of multi-story community. Currently, this large amount of financial funds are concentrated in the hands of an enthusiastic resident. There is no complete supervision mechanism to monitor the expenditure and usage of these money. Although this enthusiastic resident is required to regularly disclose expenditure accounts, lack of supervision can easily lead to corruption.

7. Suggestions For Local Government

7.1 Develop Community Cohesion

Community cohesion is an important foundation for improving community autonomy. Worker community has a different social background and population composition from ordinary urban community. In communities in which most residents are employees of a same enterprise, a relatively simple population composition occurs and similar work

experiences and lifestyle habits happened to every resident. Residents are familiar with each other and trust each other, having close social relationships making it easier for them to maintain consistent opinions. Strong community cohesion can help the community reach consensus. When conflicts arise, residents can quickly unite together to fight for their rights and protect their own interests.

Therefore, in the process of community governance transformation, it is important to guide the inheritance and develop community cohesion, realizing the effective use of social capital and making up for the absence of managers caused by the withdrawal of enterprises. These suggestions could help community access a healthy transition of community governance from "unitary management" by enterprises to "multi-governance" by different stakeholders.

7.2 Regulate The Process Of Self-organization

In China, the law stipulates that community residential committee should be established through voting by all residents and be registered in the local government. Unregistered residential autonomous organizations probably lack supervision from both local government departments and community residents. Lack of supervision may lead to problems such as opinion monopoly and opaque financial transactions. According to the latest version of the Henan Provincial Property Management Regulations (2013), community residents need to hold a general meeting of all homeowners under the guidance of local government, voting formally to elect residential representatives, establishing the residential committee, and then comprehensively presiding over the management work of the community. Usually the management work includes the invitation of a suitable property company. Within the community management, important decisions made by the committee require the consent of more than half of all residents. The whole process should strict adherence to legal process regulations. Although relevant policies have been formulated, it is temporarily difficult to implement them in practice, which has led to a series of problems.

Therefore, in the process of governance transformation, strengthening supervision can help community self-organization form a complete and standardized workflow, and prevent the occurrence of related problems. In the follow-up practice of community autonomy, it is necessary to enhance the guidance and supervision of local government departments, ensuring that autonomous organizations carry out community governance within the scope of the law, and making it possible that problems in the work of self-organization could be found and solved at the first time.

8. Conclusion

In general, worker community residents' self-organization in China at this stage is mostly to make up for the lack of governance caused by the withdrawal of state-owned enterprises. Due to the low acceptance of marketable property company and the difficulty in collecting property fees, it is difficult for market-oriented property companies to take over the management work in a short period of time. Residents' self-organizations effectively make up for this defect, assuming the main responsibility for community governance and helping community avoid disorder.

This article takes coal mine worker communities in Pingdingshan City, Henan Province as examples, summarizing the practical experiences of different types of community residents' self-organization and analyzing the existing problems. This research believes that the current community autonomy practices in Pingdingshan City can be divided into four types based on their main characteristics, including the type of rights protection organization, organization with initial status, organization with a comprehensive system and the professional property company. The comprehensive autonomy type includes two categories, acquaintance social autonomy and autonomy with competent people. In addition, this article indicates that population size restrictions, opinion monopolies and lack of supervision are common issues in the current process of residents' self-organization. Local government departments should make reasonable use of community social capital to encourage residential autonomy, and strengthen supervision to guide autonomous organizations being further improved and legalized.

Reference

Chen Weidong, Chen Ai (2017) Cultivation of residents' subjectivity: the direction and path of community governance. Research on Socialism, 234 (4), pp. 88-95.

Du Shi, Chen Jie (2021) State led and worker community governance transformation - take the automobile factory community in the old industrial city of Northeast China as an example. Journal of Harbin Institute of Technology (Social Sciences Edition), 2021 (2), pp. 57-64.

Fei Xiaotong (2002) Resident Autonomy: A new goal of urban community construction in China. Jianghai Academic Journal, 2002 (3), pp.15-18, 206.

Guo Fengying (2007) The end of unit community and the transformation of community governance -- Taking three communities of L Group in X City, Hubei Province as cases. Hubei Social Sciences, 251 (11), pp. 59-62.

Li Yan, Fan Yongzhong (2017) Courtyard community governance: community evolution model and governance typology - a comparative case study based on three types of courtyard communities in Beijing. Journal of Beijing Institute of Administration, 109 (3), pp. 108-115.

Liu Jianjun (ed.) (2016) Typological analysis of resident autonomy and community co governance in urban grassroots governance. Shanghai: Gezhi Publishing House.

Lu Heng, Cai Chongyang (2015) Reorganization of "Unit People": Governance innovation in urban community reconstruction: A case study of C community in Changchun city. New Horizons, 192 (6), pp. 39-45.

Mao Zidan, Chai Yanwei (2013) The transformation path and future trend of China's urban unit community governance model -- take Beijing Maofangnan Community as an example. Urban Development Research, 20 (3), pp. 17-22.

Tao Chuanjin, Xu Xinyu (2021) The support of resources within the system and the development of grassroots society - Taking the topic of the industry commission as an example. Journal of Social Sciences of Jilin University, 61 (2), pp.106-115, 237.

Wei Na (2003) Urban community construction and the development of community autonomous organizations. Journal of Beijing Institute of Administration, 2003 (1), pp. 69-74.

Xie Biao (2021) Research on the forms of community residents' autonomy in the new era. Yangtze River Forum, 166 (1), pp.80-83.

Xie Lizhong (2002) Urban residents' autonomy: Actual meaning, analysis model, and historical trajectory. Journal of Jiangsu University of Administration, 2002 (3), pp.65-72.

Xu Yong (2001) Research on community residents' autonomy in urban community construction. Journal of Central China Normal University (Humanities and Social Sciences Edition), 2001 (3), pp. 5-13.

Xu Yong, He Lei (2014) Cultivating autonomy: Exploring the effective forms of resident autonomy. Southeast Academic, 243 (5), pp.33-39, 246.

Yang Guihua (2007) Self organization and the mechanism of community communities. Southeast Academic, 200 (5), pp.117-122.

Yuan Qing (2020) Breaking the dilemma of autonomy: Practical logic and optimization of homeowner autonomy in residential communities. Journal of Hunan University of Administration, 126 (6), pp.22-31.

TRACK 12: TERRITORIAL GOVERNANCE AND COHESION

THE TALE OF TWO REGIONS: PLANNING FOR RESILIENCE IN FINNISH REGIONAL PLANNING, DOES PLANNING CULTURE MATTER? (1051)

Hossam Hewidy[1*], Susa Eräranta[2]

*corresponding author

[1] Department of Architecture, Aalto University, Espoo, Finland; *hossam.hewidy@aalto.fi

[2] Department of Built Environment, Aalto University, Espoo, Finland

Abstract. Cities and regions encounter growing complexities in their operational environment, requiring an ability to acknowledge the accelerating change dynamics and uncertainties in their planning processes. Being formed of different municipalities and cities, regions are complex territories for planning by nature. This research builds on case studies of two neighbouring Finnish regions: Helsinki-Uusimaa and Southwest Finland. The research sets out to explore the role of planning culture in enabling a region that is sensitive to the increasing complexities and the consequent need for resilient knowledge practices in processes. The study combines semi-structured interviews with officials in regional planning bodies with document analysis. The findings highlight major questions of procedural resilience on regional level by simultaneously showing how available resources can affect integrating resilience in regional planning.

Keywords: Finland, Regional Planning, Planning Culture, Resilience

1. Introduction

Planning, in its different scales, is a future-oriented action by nature. Cities and regions encounter growing complexities in their operational environment, requiring an ability to acknowledge the accelerating change dynamics and uncertainties in their planning processes. Accordingly, dealing with uncertainty is essential, and the planning system should be equipped to adapt to constraints and shocks, be they economic, environmental, or social (e.g., Ahern et al., 2014). Thus, resilience has become a frequently discussed attribute in planning.

Thus far, resilience has been defined mainly as a substance-related concept, but it also has a procedural dimension with both of its sides influencing each other. The need for

procedural resilience increases in dynamic multi-actor settings. Being formed of different municipalities and cities, regions are complex territories for planning. In fact, conventional regional planning has been lately criticised to be defunct (Harrison et al., 2021). On the one hand, regions are spatially multifaceted and constantly in a state of flux (Allen et al.,1998). On the other hand, regional planning lays between two governmental scales, the national and the local, thus setting the agenda for regional planning is problematic (Friedmann & Weaver, 1979). With such a territorial and governing heterogeneity, regional scale is under-researched in planning studies (Purkarthofer et al., 2021). Therefore, research on system-centred and practice-oriented regional planning can provide valuable insights.

This research aims to open discussion of the diverse interpretations of procedural resilience in the context of regional planning. By focusing on the planning processes in two neighbouring regions in Finland: Helsinki-Uusimaa Region (HUR) and Southwest Finland Region (SFR). The paper contributes to the scholarly body studying regional planning by combining the perspectives of resilience and planning culture. Resilience includes properties such as connectivity, robustness, flexibility, persistence, and diversity (Ribeiro and Gonçalves, 2019), whereas planning culture is a multi-scale amalgamate of deep-rooted practices (Stead et al., 2015). The paper addresses the relation between procedural resilience, regional planning, and planning culture by raising the following question:

> *Can planning culture, in both regions, contribute to or hinder the integration of resilience properties in regional planning?*

The paper first explores the different definitions of resilience and planning culture. After that, it describes the methods and the cases and addresses the research questions. The paper concludes with implications for acknowledging procedural resilience as a key theme in regional planning.

2. Resilience: A Metaphor or a Theory?

Holling (1973) was the first to introduce the concept of resilience into ecology and described it as a measure of a system's ability to absorb disturbances applied to them without losing their relationships with their essential elements, and thus their attributes, prior to the disturbance. Disturbance applied onto systems can be sudden events, or gradually evolving (Pendall et al., 2010). Holling suggested that 'Resilience […] is a measure of the ability of these systems to absorb changes [...] and still persist' (Holling, 1973, p. 17). This was later referred to as ecological resilience (e.g., Holling, 1996). Swanstrom (2008, p. 2) states that 'resilience is more than a metaphor but less than a theory. Davoudi et al. (2013, p. 310) elaborate on this calling it 'conceptual framework'

that helps us think about processes such as climate adaptation in new ways that are more dynamic and holistic. However, in the paper at hand, the authors are not concerned with specific spatial/thematic processes, but approach resilience-oriented practices on a regional scale of planning as a procedural phenomenon.

In an economic crisis, the concept of regional resilience typically attracts attention. Thus, a few studies have urged an evolutionary approach to regional resilience, focusing on the long-term capacity of regions to construct their socio-economic structure (e.g., Christopherson et al., 2010; Simmie and Martin, 2010). Lessons from history can explain the ways regions have developed through new growth paths from pre-existing industrial and institutional structures towards regions providing opportunities but also still limiting the process of diversification (Boschma, 2015).

Social scientists understand resilience as the responsiveness of systems, or individuals and organizations, to shocks (Boschma, 2015). However, the concept of resilience raises a few debates. For social economists, the concept has little to add to the current concepts such as path dependence and lock-in (Hassink, 2010; Pike et al., 2010; Davies, 2011). Other scholars consider resilience not well-defined and fuzzy (Pendall et al., 2010) and thus need a concrete definition and clarity (Martin, 2012). In such a context, a question to be raised is how to relate resilience to regions? (Boschma, 2015).

2.1 Cause vs Effect

The other question to be raised about regional resilience is the definitions of ’what is the cause’ and ’what is the effect’ (Boschma, 2015). The literature on regional resilience commonly discusses three approaches: the engineering-based concept of resilience (Fingleton et al., 2012), the ecological concept of resilience (e.g., Reggiani et al., 2002; Zolli and Healy, 2012) and the evolutionary approach to regional resilience (e.g., Christopherson et al., 2010; Clark et al., 2010; Pike et al., 2010; Simmie and Martin, 2010) (Appendix 1). Engineering-based resilience examines the ability of a system to return to an equilibrium state after a shock. The ecological concept of resilience refers to a new equilibrium state where a region can change its structure and function in the face of an external shock. Thus, there is ambiguity in such an approach that is based on multiple equilibria (Swanstrom et al., 2009; Zolli and Healy, 2012). To acknowledge the dynamic nature of the current operational environment, this paper defines resilience through its third conceptualization, the evolutionary approach. In the evolutionary approach, ‘resilience is considered as an ongoing process rather than a recovery to a (pre-existing or new) stable equilibrium state […]’ (Simmie and Martin, 2010, p. 31). Resilience thus refers to the ability of regions to create new growth paths as a counterbalance of decline or/and stagnation in their economy (Saviotti, 1996). In fact, regions cannot rely on their historical legacy to achieve successes in their futures (Swanstrom, 2008, p. 1).

2.2 Urban & Regional Oriented Resilience

The literature on regional resilience has mainly focused on the industrial composition of regions. For example, the dynamics of fall in demand and sensitivity of regions to shocks are sector-specific; thus, specialized regions are less vulnerable to sector-specific constraints due to being dominated by one principal industry (Boschma, 2015). The evolutionary resilience literature tends to associate regional resilience with adaptability (e.g., Pike et al., 2010). However, other scholars argue that adaptability is essential but not the sole condition for regional resilience; it is rather the capacity of regions to overcome the tension between adaptability (openness) and adaptation (control and efficiency) that measure resilience (Boschma, 2015).

Resilience-thinking has contributed to long-term regional research focusing on the performance of territories and their adaptability when exposed to extreme pressure and damaging events (Bailey & Turok, 2016). The major concerns of such research discuss how and why regional economies and local communities can respond to disturbances, namely the critical balance between change and continuity in the system (Turok, 2014). Mykhnenko (2016) examined how institutional capacity can be improved to allow regions, firms, and organisations to be better prepared for anticipated problems or disasters. There is a difference between a region's 'ability to respond' (resistance and recovery) and its 'adaptability and adaptive capacity' (related to reorientation and renewal) (Eraydin, 2016).

Planning authorities should be prepared for risk by developing adaptative and innovative planning strategies (Ahern et al., 2014). Resilience thinking challenges the suitability of blueprint planning (linear and static) for its rigidity to adapt with uncertainties and continuously changing risk profile (Appendix 2); thus, an essential paradigm shift is needed from blueprint planning to adaptive planning (Sharifi & Yamagata, 2018).

However, such a shift is conditional to an adaptive management strategy enhancing the collaboration between different stakeholders, getting them continuously involved in processes, and allowing feedback loops of learning and adaptation (Crowe et al., 2016). Such an institutional reform may enable the complex interrelationship in the structure of urban systems that interweave a wide spectrum of actors, functioning on multiple spatial and temporal scales (Sharifi & Yamagata, 2018). The paradigm shift and institutional reformation is simply what can be recognised as resilience-oriented planning.

To achieve urban resilience, the planning process should integrate the following principles: 'robustness, diversity, redundancy, flexibility, efficiency, modularity, and innovation (creativity)' (Sharifi & Yamagata, 2018, p.19). These were later extended by Ribeiro & Gonçalves (2019) to eleven characteristics in their more comprehensive and systematic literature review for urban resilience conceptual framework (Table 1).

Table 1. The main characteristics of urban resilience (adapted from Ribeiro & Gonçalves, 2019, p.7).

Characteristics	**Description**
1.Redundancy	Existence of several functionally similar components, allowing the system to avoid failing when one of the components collapse.
2. Diversity	Existence of several functionally different components to protecting the system against the different pressures. The more diversity the system possesses, the better the ability to adapt to a wide range of diverse circumstances.
3. Efficiency	Positive relationship between the functioning of a static urban system in relation to the operation of a dynamic system.
4. Robustness	Ability to resists to attacks or other external forces. Robust design anticipates potential system failures, ensuring that failures are predictable, secure and not disproportionate to the cause.
5. Connectivity	Connected system components for support and mutual interaction
6. Adaptation	Ability to learn from experience and be flexible in the face of change.
7. Resources	Existence of resources that can be rapidly displaced to respond to disruptions and their effects.
8. Independence	Ability to operate for a continuous post-disaster period without relying on external physical intervention.
9. Innovation	Ability to quickly find different ways to achieve goals or meet their needs during a sock, or when a system is under stress. Innovation is critical to developing a city's ability to restore the functionality of critical systems under severely limited conditions.
10. Inclusion	Development of broad consultation and involvement of communities, particularly of the most vulnerable groups in the development of processes and plans. An inclusive approach contributed to a joint vision to build the city's resilience.

11. Integration	Integration and alignment between urban systems promotes stronger decision-making and ensures that all users / components mutually support each other for a common outcome. The exchange of information between systems allows them to function collectively and respond quickly through shorter response cycles across the city.

2.3 Obstacles Facing Resilience-Oriented Planning

The concept of regional resilience has been criticised for several reasons. First, there is a need to integrate both short-term and long-term capacity, the former enabling the system to absorb the shocks and the latter to develop new paths of growth (Martin & Sunley, 2013). Accordingly, understanding of how a region develops new growth paths is essential (Boschma, 2015). Second, there is a need for revisiting the understanding of the capacity of regions to overcome the differentiation between adaptability and adaptation (Boschma, 2015). Third, 'resilience' has been further criticized for being more descriptive than explanatory (Christopherson et al., 2010). In such context, literature can be misleading if regional adaptability is associated with new growth paths detached from their past considering that the path dependency will only cause problems of adjustment (Magnusson & Ottosson, 2009; Henning et al., 2013). Fourth, there is a disproportionate focus on hastily responding to the consequences of crises and the subsequent recovery, with ignoring the fundamental factors producing or sustaining crisis-inducing conditions (Davidson, 2010; Mckeown et al., 2022). Fifth, most frequently resilience plans are firmly bound to both political and institutional dynamics that could take over enduring civic engagement procedures and endorse selective visions anticipating the future, departing from the existing power relations and ignoring community voices (Pitidis at al., 2023). Sixth, a few scholars call for research informing the practice to investigate the contextual governance particularities and pre-existing governance models that sustain reproduction of traditional and obsolete planning approaches, ignoring the resilience narratives as a transformative agent of change (Porto de Albuquerque et al., 2021). Finally, there is an extensive agreement that the resilience literature has hardly drawn the attention to the role of institutions and the state (e.g. Swanstrom et al., 2009; Bristow, 2010; Hassink, 2010; Wolfe, 2010; Pike et al., 2010; Davies, 2011).

3. Planning Culture

Spatial planning policies and processes across Europe are experiencing reforms in response to a range of challenges such as, economic reforms, demographic change, economic globalisation, sustainable development, and climate change (Healey and Williams, 1993; Stead, 2013). Thus, it is important to discuss planning culture to

understand the reflectivity of spatial planning bodies to these challenges. Recently, a scholarly body has emerged with an interest in examining planning cultures and traditions in relation to the planning system evolution (Stead et al., 2015). Some scholars have drawn the attention to the relationships between planning cultures and planning systems to demonstrate how culture may influence planning practices in terms of decisions and outcomes (Stead et al., 2015; Knieling & Othengrafen, 2009; Othengrafen, 2010; Othengrafen & Reimer, 2013; Taylor, 2013). Other authors have explored planning systems and the existence of different traditions or styles of planning in Europe, and whether such traditions can affect the choice of distinctive sets of policy or/and instruments (Albrechts & Balducci, 2013; Faludi, 2000; Nadin & Stead, 2013). Interestingly, Knieling & Othengrafen (2015) issued their triad 'culturized planning model' of three planning dimensions: 'planning artefacts', 'planning environment' and 'societal environment'. The first dimension refers to the scope of planning, the organisation of the planning process and the physical urban developments. The second dimension refers to the core values and conception of planning, and accordingly the type of actors who may access the planning process. The third dimension underlies norms, and perceptions of a particular society; thus, it is more general.

In studying spatial planning, systems, policies and processes in European countries, it is obvious that the concept of culture specifies supplementary knowledge as it mostly focuses on the 'taken-for granted assumptions' or/and 'unwritten patterns of power' underlying such policies, and their outcomes (Booth, 1993; Knieling & Othengrafen, 2015). Thus, 'planning culture' as a notion can be considered a unique subculture because the involved actors and processes are conditioned by the planning system, acting through several aspects such as addressing problems, using certain rules, interpreting planning tasks, recognising and addressing problems as well as following specific procedures, and methods of public participation (Neuman, 2007). However, it is not only the institution that draws and creates the planning culture but also the culture of individual planners, as humans. For example, Sanyal (2005, p. xxi) states that the term planning culture 'means the collective ethos and dominant attitudes of planners regarding the appropriate role of the state, market forces and civil society in influencing social outcomes.' Therefore, it could be argued that planning as a profession is understood as the cultural community of a subculture of the 'built environment professionals', 'who produce and share cognitive frames, practices, knowledge, beliefs, norms and rules, values and codes' (Othengrafen, 2010, p. 89). However, a couple of important criticisms can be addressed in the body of literature studying urban culture. On the one hand, the studies that have considered the issues of planning cultures or traditions in relation to planning systems have primarily focused on the implications for the process of planning (e.g., policy instruments, governance modes) rather than the outcomes of planning in terms of spatial development or/and physical patterns that can be witnessed in reality (Stead et al., 2015). On the other

hand, there is a lack in studying planning histories and their impact on the nature of planning and its evolution (ibid.).

This paper interlinks to the main characteristics of the Finnish planning system to its specific subculture: 'the planning environment'. In Finland, the rational planning approach witnesses an ongoing process to be replaced by communicative planning (Eräranta et al., 2015). However, current operationalisation of communicative planning concerns mostly negotiations with landowners and developers; risking ignoring users' demands (Hewidy, 2022). Furthermore, planning culture in some parts of Finland can still be described as a mixture of rationalist and collaborative planning (Bäcklund & Mäntysalo, 2010). Therefore, influential participation is not built into the culture of planning (Kahila, 2013). Moreover, the embeddedness of the dominance of expert knowledge over citizen knowledge noticeably positions the lay people as an object of planning, not as an active participating subject (Niitamo, 2020). Furthermore, planning bodies should reorganise their resources to empower participatory planning (Mattila, 2018; Niitamo, 2020). Mattila et al. (2021) argue that there is a gap between participatory methods and scientific knowledge in Finnish planning. This paper has no intention to offer a meticulous restatement of discourse on planning culture. The planning culture, as a concept, can still clarify (1) the reflectivity of Finnish spatial planning to resilience and (2) the difference between the approaches used by each region under study.

3.1 Municipalities, Regions & State

The balancing of the regional structure in Finland has been emphasised by major political forces aiming to support the peripheral regions and promote equal opportunities across the country (Pelkonen, 2016). Thus, studies show the result of such regional balancing policy as the levels of gross domestic product (GDP) and income per capita converged between Finnish regions between 1930s–1980s. However, since the 1990s, such indicators have started to diverge and the regional disparities have grown (e.g., Ezcurra & Rapún, 2006; Kangasharju and Pekkala, 2004). Furthermore, Finland as a Nordic welfare state has witnessed another major shift through transformation towards a more competitiveness-oriented, market-, and economy- state model (e.g., Julkunen, 2001; Patomäki, 2007). Another major effect on the regional structure is the displacement of the political centre of gravity towards the right. Finally, there is no harmonised policy interlinking state and municipal level, specifically in the capital region (Pelkonen, 2016) where calls have been made for the state to accelerate the metropolitan policy and set measures promoting the region's international position and growth (Hautamäki & Ranta, 2011). Earlier signals of such a conflict already emerged in the late 1990s between the state and the capital region cities (Pelkonen, 2016). Thus, it could be briefly stated that there is

- a realistic perception towards the regional disparities
- a relevant switch from welfare state to a more market-, and economy- state model
- different pace of the performance of the state and municipalities and thus variation in priorities.

In recent years, instruments for Strategic land use, housing and transport planning on city-regional scale (MAL) have been established as a response to the identified needs.

4. Methods

Often, there are no direct guidelines to follow, but addressing procedural resilience is driven by planning culture, which is embedded in and structured by each context of planning. For this reason, this research used content analysis of relevant planning documentation together with nine semi-structured interviews to explore and compare the perspectives of procedural and cultural resilience of regional planning processes in two regions of Finland: Helsinki-Uusimaa Region (HUR) and Southwest Finland Region (SFR). The two regions were selected based on their relevance to the theme as major growth hubs in Finland. Comparing the two neighbouring regions allows acknowledging the impacts of differences in circumstances, localities and contexts to explore how resilience-related practices in each planning organisation are driven by their planning culture.

In this research, focus is put on the analysis of the expert interviews. The interviewees represented civil servants and elected officials in the two regions. The experts were identified through a snowball sampling technique, expanding the sample through referrals from interviewees. All interviews lasted between 60–120 minutes, were held online, recorded, and transcribed. The interview questions were developed based on a review of the literature and considered the definitions, institutional settings, and substance-related issues of resilience in each region. The interviews aimed to gather insights from experts with a range of perspectives and experience in regional planning processes - either as organisers, planners, decision-makers, or users of the plans.

Data from the case studies and expert interviews were analysed using content analysis. To protect the confidentiality of the participants, pseudonyms were used in all transcripts and publications. Data was stored on a password-protected computer and only accessible to members of the research team.

5. Case Description

In Finland, regional councils are legally mandated, with their primary source of funding being their member municipalities. The country has a total of 18 regional councils, charged with the tasks of long-range regional land-use planning, as well as promoting local and regional interests. The highest decision-making bodies within the councils are the Regional Assembly and the Regional Board to which all officials are politicians elected by the member municipalities for a fixed term of four years. Regional councils are responsible for the regional land use plans that serve to establish the guiding principles for urban structure and the use of areas designated for specific purposes.

This study is based on case studies of two Finnish regions, Helsinki-Uusimaa and Southwest Finland, which are adjacent to each other (Figure 1, Appendix 3). Uusimaa comprises 26 municipalities and has a population of a little over 1.7 million while Southwest Finland has 27 municipalities and a population of approximately 481,000. Both regions have coastline along the Baltic Sea and encompass diverse spatial areas, including major urban centres, smaller towns and villages, agricultural areas, and islands.

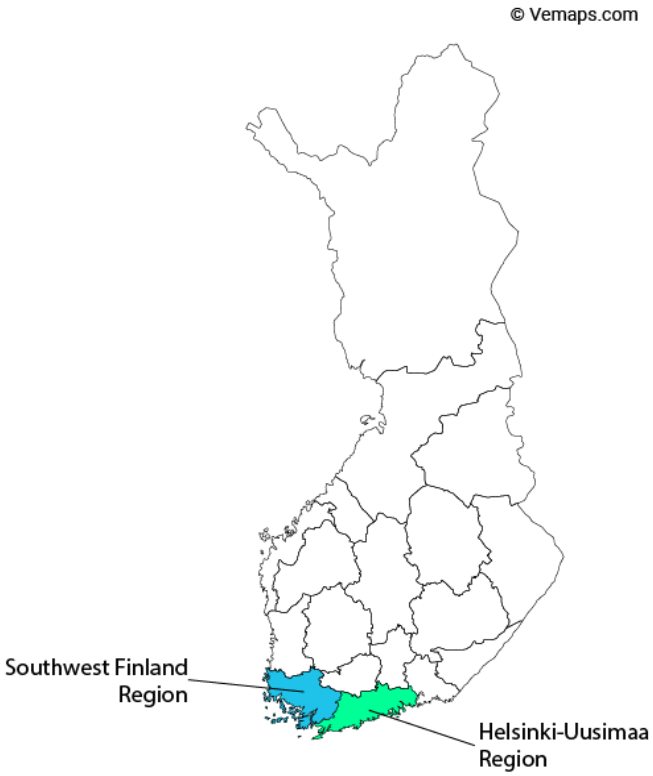


Figure 1. Location of the case areas in Finland.

5.1 Helsinki-Uusimaa Region (HUR)

The Helsinki-Uusimaa region is currently experiencing rapid growth due to migration, making it one of the fastest-growing regions in Europe. As the location of the country's capital city, Helsinki, the region has long been recognised as a hub for international competitiveness, research, and development.

The Helsinki-Uusimaa Regional Land Use Plan extends until the year 2050 (Figure 2). The plan has four primary targets: steering sustainable growth and a regional balance, facing climate change and the sustainable use of nature and natural resources, increasing welfare and attractiveness, and enabling sustainable competitiveness. The plan is structured into two levels: a strategic structural plan that covers the entire Helsinki-Uusimaa region, which is then complemented by three phased regional land use plans for the Helsinki Metropolitan Region, as well as Eastern and Western Uusimaa.

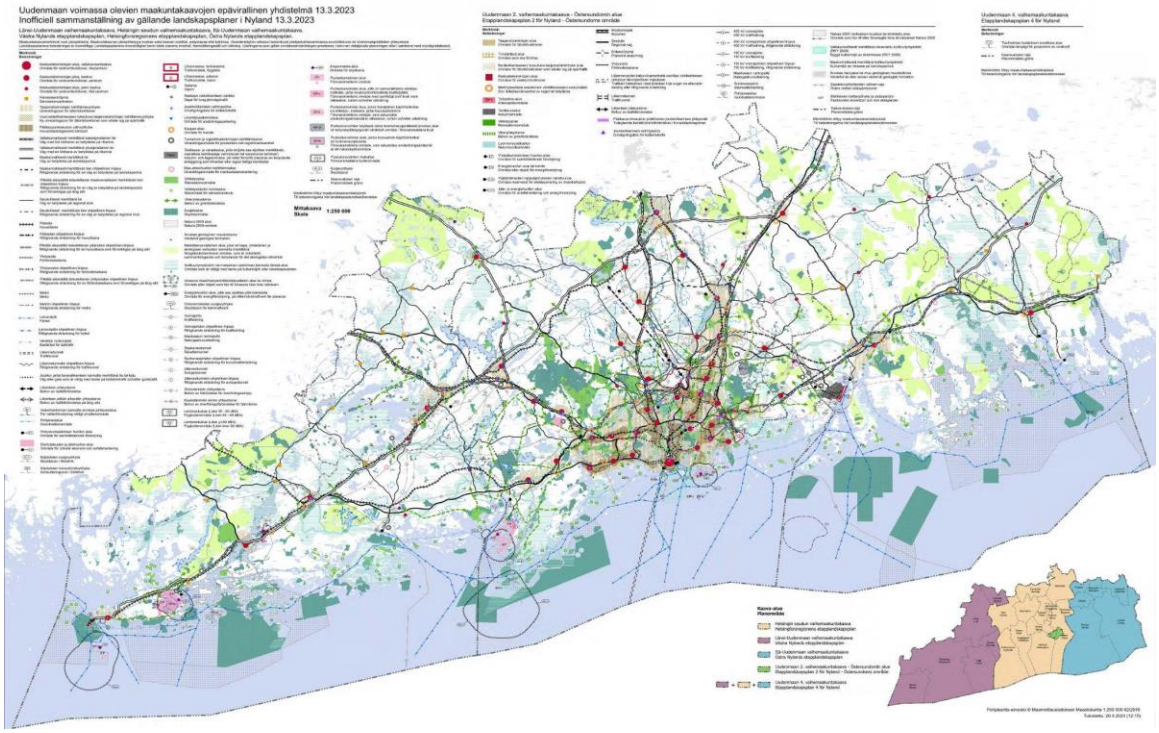


Figure 2. Unofficial combination of current regional plans of the Helsinki-Uusimaa Region (Helsinki-Uusimaa Regional Council, 2023).

5.2 Southwest Finland Region (SFR)

Southwest Finland Region is projected to experience population growth in the near future as one of the four regions in Finland expected to do so. Southwest Finland is a typical European medium-sized region, characterized by a larger city region surrounded by a more rural-like area of influence.

The Regional Land Use Plan for Southwest Finland (Figure 3) has been developed in stages based on different areas, supplemented by theme-specific phased regional plans. Currently, the regional plan consists of seven component plans, which are all at least partly in force simultaneously.

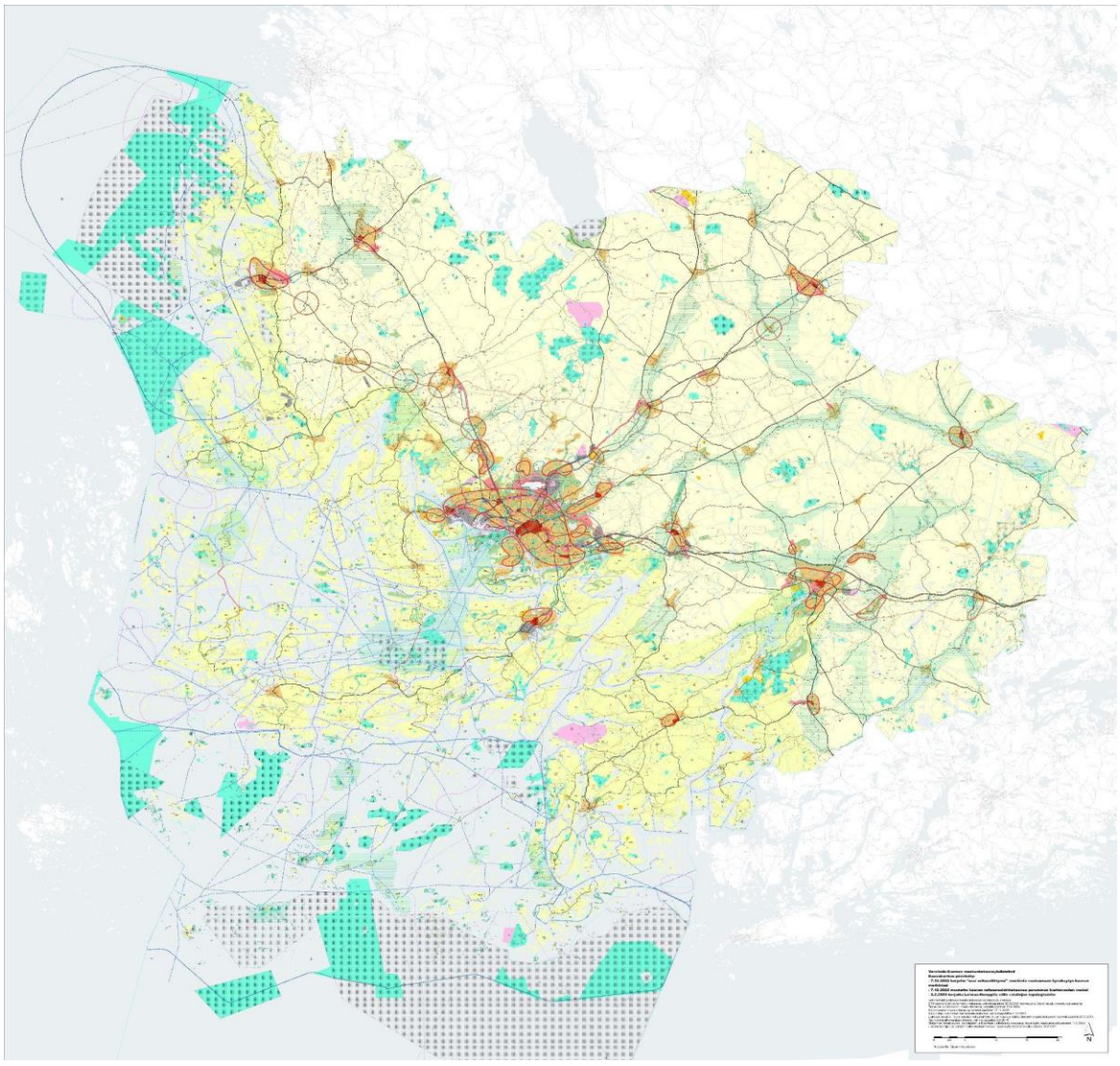


Figure 3. Unofficial combination of current regional plans of the Southwest Finland Region (Regional Council of Southwest Finland, 2022).

6. Findings

The interviews in both cases revealed that there is no well-defined definition of resilience in common use. Whereas the broad definitions of resilience usually entail perspectives beyond environmental sustainability, interviewees from both HUR and SFR considered resilience mostly as an environmentally aligned concept that deals for example with adaptation to climate change and measures taken to prevent biodiversity loss. Some of the interviewees even suggested that resilience is currently utilised more as a tool for regional and city branding and organisational identification than as a way of steering the actual planning solutions and processes. This was also suggested as a reason for not having an acute interest in defining the concept in a more precise manner. Similarly, interviewees from HUR suggested that resilience is strongly intertwined with the targets and indicators of planning. A plan can only be as resilient as the indicators chosen to measure the solutions.

6.1 Resilience as a Process of Systematic Foresight and Iteration

Despite the differences in the context, the interviewees from both HUR and SFR shared an understanding of resilience as a future-driven concept that requires iterations over time. Interviewees from both regions described that regional planning itself is an iterative process, as it is never started from scratch, but is always founded on already existing areas and infrastructure. Due to the systematic iterative practices, the process also stays resilient as it can acknowledge changes in the operational environment as they take place, also providing adaptive capability for planning through the ability to learn from experiences. Concerning foresight, the importance of willingness to change and learn was highlighted as an important factor in addition to institutional practices and planning culture:

> I always want to start about the mentality, mindset, and governance. What do those mean. Because those explain what has happened and what can be achieved even when there is a need to make giant leaps. (Elected official 1, HUR)

Based on the information gathered from the interviews, HUR has systematic and robust practices for including foresight, iteration, and peer learning during their regional planning processes. For example, the impact assessment process is built in a manner, which enables more detailed assessment in each round of planning. The iteration process is strongly linked to the strategic nature of the regional plan. During the iterations, a balance between target-oriented steering and strategic flexibility is sought and tested through concrete cases, as well as experiences from previous rounds of planning. HUR explained that they invite external experts to evaluate the existing and ongoing plans to identify outdated elements in the plans as well as to improve the quality and credibility of the plan through external revisions, future panels, and shadowing at multiple phases of the process.

In SFR interviews, the conclusions differed suggesting that in the future especially comprehensive plans are needed to bring together all themes, avoid suboptimisation and ensure resilience. Moreover, the discussion focused more on the interpretation of already existing plans, of how to interpret old plans through the new strategic targets in a way that they would stay strategically resilient over council terms without a need to reopen the plan every time the operational environment changes.

SFR further pointed out that iterations also have restrictions and especially themes that were difficult to decide in previous rounds, should not be reopened in the near future:

> Of course, we have themes that cannot be opened. Should not be opened. Already approved. For example, some new rail corridors. It is there [in the plan], fixed. It is better not to open for discussion until it is built. (Civil servant 5, SFR)

6.2 Resilience as Nurturing of Trust, Acceptability and Solidarity

In addition to the collaborative practices during iterations, interviewees from both regions pointed out that collaborative practices support procedural resilience, acceptance, and solidarity.

Regarding procedural resilience, the ability to share and store information was mentioned as an essential element. For example, HUR has well established methods for steering the process as well as making memos and storing information so that the process is not dependent on single individuals and their knowledge. The situation in SFR is considerably different due to scarce resources. In SFR, the interviewees explained that having such 'safety' practices in place is not possible due to the low number of individuals and resources available. However, what was missing in resources, was compensated through close and trustworthy relations with other actors.

In contrast to the interviews in HUR, which emphasised diversity of resource-intensive and systematic collaborative practices, those in SFR provided examples of how to cope with systematic foresight and iteration procedures with scarce resources. In SFR, the scarce resources were also mentioned as a benefit, as everyone already knows everyone, and scarce resources force the experts to focus on collaboration instead of conflict-seeking. In fact, the interviewees were not able to remember many actual arguments between conflicting interests in the region:

> Are we not doing ambitious enough work? Or is it more that we have so scarce resources that we cannot waste them in arguing. So, we really need to cooperate, as we have so few experts here. We do not get anything done if we just argue about issues [with experts from the state level and other municipalities]. (Civil servant 2, SFR)

In relation to acceptance over time, interviewees from HUR explained that the collaborative multi-value sphere is a central element. For example, the interviewees described that it is important that the same elected officials decide on the start of a plan, set the goals for the process, steer the process and finally accept the plan so that the whole process is done according to the values set in the beginning. Another key issue regarding the acceptability of the plans was the language utilised. It is important to support the participants in finding relevant information in an understandable form to improve the justice of the process.

Furthermore, one interviewee suggested that resilience is not only about getting things done as efficiently as possible, but also about building a culture of solidarity to support more long-term change and resilience:

> I feel that it is important that people feel they are a part of the environment and a part of the society and have the feeling that they can influence. The feeling of having an influence in this society is important because that makes you support long term resilience. You will give your best to it. You will build, not destroy. I think we should do everything for that. (Civil servant 3, HUR)

Both regions agreed that municipalities are the main stakeholders as the owners of the regional planning body. However, the views on this differ at the municipal level. HUR municipal level representatives referred to good collaboration at the MAL (abbreviation of the Finnish terms: Land-use, Housing and Service Provision) level where experts from different organisations and backgrounds regularly discuss with each other in an equal manner without a formal hierarchical structure. It was further pointed out in the interviews that more collaboration with the regional level would be needed to increase the capability of the regional organisation to acknowledge the local needs and conditions.

6.3 Resilience as Integration, Persuasion and Commitment

Inadequate resources were mentioned as a reason for limited integration in SFR. Although having multiple experts join collaboration meetings would be ideal for overall knowledge co-creation, integration and testing of ideas, only one expert can typically attend due to scarce resources. Consequently, the discussion typically remains at a very concrete level and around themes that the participants themselves are working with at that specific moment, and does not extend to more holistic themes:

> Resources are very thin outside of the Helsinki metropolitan area. In the metropolitan region, there are loads of humans working on these [strategic planning issues]. There is always someone who is ready to take responsibility, but outside of that there is no time for strategic thinking. (Civil servant 6, SFR)

Both regions explained that resilience in regional planning is essentially about integrating

the various pieces of information, differing targets and values, and expectable changes with each other into a single plan. However, when describing the integration, both regions mainly referred to coordination. For example, in HUR, the previous planning process included almost 200 studies, which were mainly utilised for filling in identified knowledge gaps in the process. Many of the studies were done by external consultants and steered by the regional planning organisation. As the HUR representatives explained, the steering of this multi-actor information process is a delicate act:

> The general plan is like a piano. And then this regional plan… It has a huge number of participants, themes, and scales. It is like organs that are in the cathedral. You are all the time playing and have all those little things that you have to pour out like this and then you have to step with your legs and remember also to turn the page. (Civil servant 1, HUR)

This coordination act was further described by the interviewees, suggesting that it is not as much about integrating knowledge between diverse experts but about coordinating the pieces of information that come from the experts:

> As a consultant, you are in a way sitting under the table. The clients are eating on the table and the pieces of bread are dropping on the floor. You get these pieces of information for the work you need to do. And you do it. But it is just a small part, a piece of the whole bread that is actually there on the table. But you cannot see it when you are a consultant. You just do your part as well as you can and give it back to the table where this one little piece is added. (Civil servant 1, HUR)

Hence, whoever has the coordinating role has also relational power in how the pieces are finally fit together, and much of the resilience resides in these coordination posts. It was pointed out that integration and boundary-crossing is not only a technical act, but also requires curiosity and willingness to learn new at the individual level as the operational environment is dynamically changing and the education and practices of the past do not offer needed skills for addressing the dynamics of the system.

For long-term resilience, this would also require that the integration and combination is done in the multi-actor sphere so that the values and targets cross the realm of planning also in a vertical manner - reaching beyond the regional scale. Interviewees from SFR provided an example of what might happen if the combination and integration is not done through a process that would also commit other actors to the stated targets and provide direction for their interpretation:

> You can do these plans and things like that, but then you have the operational level and if there is a gap in the information, then the tree is cut. Even if the decision is that the tree is not cut. (Civil servant 4, SFR)

7. Discussion and Conclusions

In this study, we explored the role of procedural resilience and planning culture in the context of regional planning in Finland. The research focused on the cases of two neighbouring regions to examine the difference in planning culture of each region and thus the institutional sequence of actions and reflectivity to the knowledge complexity as well as the increasing need for resilience in the midst of the accelerating multiscale change dynamics that the regions need to acknowledge. The findings suggest that there is no established definition of resilience, but it is mainly interpreted as an environmental, sustainability or climate issue. The vague definition and operationalisation of procedural resilience suggests three main conclusions.

First, resources (such as experts, expertise) (Ribeiro & Gonçalves, 2019; Sharifi & Yamagata, 2018) act as one of the main vulnerabilities and catalysts for procedural resilience. Time as a resource acts as a second main constraint for resilience in regional planning; the expectation that the same elected officials should steer the process from initiating the ideas to the ratification. Combined with the time factor, the lack of resources preventing communication and effective coordination between the different governing levels imposes another layer of complexity to procedural resilience in regional planning. Thus, the possible contextualisations of regional planning are not exposing the interpretations to cultural dimensions. Furthermore, evolutionary resilience is not a recovery mechanism for stabilising the system, but rather a continuous state (cf. Simmie & Martin, 2010). Accordingly, there should be a thread or backbone between the different rounds of elected officials to assure the continuous integration of resilience attributes into the planning processes and the new regional visions. Otherwise, the absence of such a thread combined with the vagueness of resilience's 'procedural' definition may lead to merely utilising the notion for city branding instead of steering the actual planning.

Second, specific properties of procedural resilience such as iteration, independency, redundancy, integration, inclusion, and diversity (Crowe et al., 2016; Pitidis at al., 2023; Ribeiro & Gonçalves, 2019) are vulnerable to a lack of resources. When resources are scarce, it is easier to commit to old decisions, since opening up the processes regarding challenging questions would be too resource-intensive, as the findings suggested. Due to scarce resources, collaboration is strongly target-oriented, reducing inclusion and diversity in the processes. As well, when resources are scarce, integration is more likely to turn towards coordination of concrete short-term (rather than strategic long-term) issues.

Third, the lack of resources is not only a hindrance, but may further enforce cultural settings that support procedural resilience by generating efficiency, trust, connectivity, acceptability, long-term robustness, and solidarity between actors (Martin & Sunley, 2013; Ribeiro & Gonçalves, 2019). When resources are scarce, collaboration is more based on building a culture of solidarity to support long-term change and resilience.

The findings indicate that despite their differing contexts, the main elements of resilience are similar in both regions. However, the operationalisation of resilience and the meaning of planning culture differ depending on the availability of resources. The less resources available, the larger the importance of culture.

The paper calls for further research that rigorously studies two complexities. On the one hand, the question of power, especially between the state, regions and municipalities, needs to be addressed. There is a need for a harmonised and synchronised actionable knowledge flows between different governing levels. Some of the themes cannot be opened in the discussions between the different governing levels, which is based on an embedded power rooted in and structured by a dominant idea born to be implemented. On the other hand, although the literature informs of the rescaling of regions, none of the interviewees talked about the economic side of resilience. The literature mentions the growth of regional disparities; however, the topic is not among the possible interpretations of resilience understood in planning bodies. The taken-for-granted assumptions (cf. Knieling & Othengrafen 2015) motivate planners to think of resilience from the side of environment and mitigation but not economy.

References

Ahern, Jack, Sarel Cilliers, and Jari Niemelä (2014) The Concept of Ecosystem Services in Adaptive Urban Planning and Design: A Framework for Supporting Innovation. *Landscape and urban planning* 125, pp.254–259.

Albrechts, Louis, and Alessandro Balducci (2013) Practicing strategic planning: In search of critical features to explain the strategic character of plans, 49 (3), pp.16–27. doi:10.1080/02513625.2013.859001

Allen, John, Doreen B. Massey, and Allan Cochrane (1998) *Rethinking the region*. Routledge.

Bäcklund, Pia, and Raine Mäntysalo (2010) Agonism and Institutional Ambiguity: Ideas on Democracy and the Role of Participation in the Development of Planning Theory and Practice – The Case of Finland. *Planning Theory* 9 (4), pp.333–350. doi:10.1177/1473095210373684.

Bailey, David, and Ivan Turok (2016) Editorial: Resilience Revisited. *Regional Studies*, 50 (4), pp.557–560. doi: 10.1080/00343404.2016.1146478

Beauregard, Robert A. (2020) *Advanced Introduction to Planning Theory.* Cheltenham: Edward Elgar Publishing Limited.

Booth, Philip (1993) The cultural dimension in comparative research: Making sense of development control in France. *European Planning Studies*, 1 (2), pp.217–229. doi:10.1080/09654319308720210

Boschma, Ron (2015) Towards an Evolutionary Perspective on Regional Resilience. *Regional Studies*, 49 (5), pp.733–751. https://doi.org/10.1080/00343404.2014.959481.

Bristow, Gillian (2010) Resilient regions: re-'place'ing regional competitiveness. *Cambridge Journal of Regions, Economy and Society* 3, pp.153–167. doi:10.1093/cjres/rsp030

Christopherson, Susan, Jonathan Michie, and Peter Tyler (2010) Regional resilience: theoretical and empirical perspectives. *Cambridge Journal of Regions, Economy and Society,* 3, pp.3–10. doi:10.1093/cjres/rsq004

Clark, Jennifer, Hsin-I Huang, and John P. Walsh (2010) A typology of 'innovation districts': what it means for regional resilience. *Cambridge Journal of Regions, Economy and Society,* 3, pp.121–137. doi:10.1093/cjres/rsp034

Crowe, Philip R., Karen Foley, and Marcus J. Collier (2016) Operationalizing urban resilience through a framework for adaptive co-management and design: five experiments in urban planning practice and policy. *Environmental Science & Policy* 62, pp.112–119. https://doi.org/10.1016/j.envsci.2016.04.007

Davidson, Debra J. (2010) The applicability of the concept of resilience to social systems: Some sources of optimism and nagging doubts. *Society & Natural Resources*, 23 (12), pp.1135–1149.

Davies, Sara (2011) Regional resilience in the 2008–2010 downturn: comparative evidence from European countries. *Cambridge Journal of Regions, Economy and Society,* 4, pp.369–382. doi:10.1093/cjres/rsr019

Davoudi, Simin, Elizabeth Brooks, and Abid Mehmood (2013) Evolutionary Resilience and Strategies for Climate Adaptation. *Planning Practice & Research*, 28 (3), pp.307–322. https://doi.org/10.1080/02697459.2013.787695

Eraydin, Ayda (2016) Attributes and Characteristics of Regional Resilience: Defining and Measuring the Resilience of Turkish Regions. *Regional studies*, 50 (4), pp.600–614. https://doi.org/10.1080/00343404.2015.1034672.

Eräranta, Susa, Maarit Kahila-Tani, and Pilvi Nummi-Sund. "Web-Based Public Participation in Urban Planning Competitions." International journal of e-planning research 4.1 (2015): 1–18. Web.

Ezcurra, Roberto, and Manuel Rapún M (2006) Regional disparities and national development revisited: the case of Western Europe. *European Urban and Regional Studies,* 13 (4), pp.355–369. https://doi.org/10.1177/0969776406068590

Faludi, Andreas (2000) The European spatial development perspective—what next? *European Planning Studies*, 8 (2), pp.237–250. doi:10.1080/096543100110866

Fingleton, Bernard, Harry Garretsen, and Ron Martin (2012) Recessionary shocks and regional employment: evidence on the resilience of U.K. regions. *Journal of Regional Science*, 52, pp.109–133. doi:10.1111/j.1467-9787.2011.00755.x

Friedmann, John, and Clyde Weaver (1979) *Territory and function: The evolution of regional planning*. University of California Press.

Harrison, John, Daniel Galland, and Mark Tewdwr-Jones (2021) Regional Planning Is Dead: Long Live Planning Regional Futures. *Regional studies*, 55 (1), pp.6–18. https://doi.org/10.1080/00343404.2020.1750580

Harrison, John, Daniel Galland, and Mark Tewdwr-Jones (2021) Regional Planning Is Dead: Long Live Planning Regional Futures. *Regional studies*, 55 (1), pp.6–18. https://doi.org/10.1080/00343404.2020.1750580

Hassink, Robert (2005) How to unlock regional economies from path dependency? From learning region to learning cluster. *European Planning Studies* 13, pp.521–535. doi:10.1080/09654310500107134

Hassink, Robert (2010) Regional resilience: a promising concept to explain differences in regional economic adaptability? *Cambridge Journal of Regions, Economy and Society* 3, pp.45–58. doi:10.1093/cjres/rsp033

Healey, Patsy, and Richard Williams (1993) European planning systems: Diversity and convergence. *Urban Studies*, 30 (3/4), pp.701–720. doi:10.1080/00420989320081881

Helsinki-Uusimaa Regional Council (2023) *Helsinki-Uusimaa Regional Land Use Plan 2050*. [Online] Available from: https://uudenmaanliitto.fi/kaavoitus-ja-liikenne/maakuntakaavat/tulkinta-voimassa-olevasta-maakuntakaavatilanteesta/ Accessed [04/05/2023].

Henning, Martin, Erik Stam, and Rik Wenting (2013) Path Dependence Research in Regional Economic Development: Cacophony or Knowledge Accumulation? *Regional studies,* 47 (8), pp.1348–1362. https://doi.org/10.1080/00343404.2012.750422

Hewidy, H. (2022) The hidden city of immigrants in Helsinki's urban leftovers – the homogenization of the city and the lost diversity. Aalto University.ISBN: 9789526408378 Dissertation/Thesis

Holling, Crawford Stanley (1973) Resilience and Stability of Ecological Systems. *Annual Review of Ecology, Evolution, and Systematics,* 4, pp.1-23. http://dx.doi.org/10.1146/annurev.es.04.110173.000245

Holling, Crawford Stanley (1996) Engineering resilience versus ecological resilience. In Schulze, Peter C. (ed) *Engineering Within Ecological Constraints*. Washington DC: National Academy Press, pp.31–45

Julkunen, Raija (2001) *Suunnanmuutos: 1990-luvun sosiaalipoliittinen reformi Suomessa*. Tampere: Vastapaino.

Kahila, Maarit (2013) Soft GIS Development Process as a Trading Zone: Challenges in Implementing a Participatory Planning Support System. In Balducci, Alessandro, and Raine Mäntysalo (eds) *Urban Planning as a Trading Zone*. Dordrecht: Springer Netherlands, pp.75–93.

Kangasharju, Aki, and Sari Pekkala (2004) Increasing regional disparities in the 1990s: the Finnish experience. *Regional Studies,* 38 (3), pp.255–267. https://doi.org/10.1080/003434042000211097

Knieling, Joerg, and Frank Othengrafen (eds) (2009) *Planning Cultures in Europe: Decoding Cultural Phenomena in Urban and Regional Planning.* Farnham: Ashgate.

MacKinnon, Danny, and Kate Driscoll Derickson (2012) From Resilience to Resourcefulness: A Critique of Resilience Policy and Activism. *Papers in Evolutionary Economic Geography*

No. 12.12. Utrecht University, Utrecht.
Magnusson, Lars, and Jan Ottosson (eds) (2009) *The Evolution of Path Dependence*. Cheltenham: Edward Elgar.
Martin, Ron (2012) Regional economic resilience, hysteresis and recessionary shocks. *Journal of Economic Geography,* 12, pp.1–32. doi:10.1093/jeg/lbr019
Martin, Ronald, and Peter Sunley (2013) On the Notion of Regional Economic Resilience: Conceptualisation and Explanation. *Papers in Evolutionary Economic Geography No. 13.20*. Utrecht University, Utrecht.
Mattila, Hanna, Pia Olsson, Tiina-Riitta Lappi, and Karoliina Ojanen (2021) Ethnographic Knowledge in Urban Planning – Bridging the Gap Between the Theories of Knowledge-Based and Communicative Planning. *Planning theory & practice, pp.*1–15. https://doi.org/10.1080/14649357.2021.1993316.
Mattila, Hanna (2018) Public Participation and Legitimacy Management in Planning: A Habermasian Perspective to Finnish Welfarist Planning Tradition. *Geografiska Annaler: Series B, Human Geography,* 100 (4), pp.309–328. doi:10.1080/04353684.2018.1481347.
McKeown, Anthony, Dang Hai Bui, and John Glenn (2022) A social theory of resilience: The governance of vulnerability in crisis-era neoliberalism. *European Journal of Cultural and Political Sociology*, 9(1), pp.112–132. https://doi.org/10.1080/23254823.2021.1997616
Mykhnenko, Vlad (2016) Resilience: A Right-Wingers' Ploy? In Springer, Simon, Kean Birch, and Julie MacLeavy (eds) *The Handbook of Neoliberalism*. London: Routledge.
Nadin, Vincent, and Dominic Stead (2008) European spatial planning systems, social models and learning. *disP—The Planning Review*, 44 (172), pp.35–47. doi:10.1080/02513625.2008.10557001
Neuman, Michael (2007) How we use planning: Planning cultures and images of future. In Hopkins, Lewis D., and Marisa A. Zapata (eds) *Engaging the Future: Forecasts, Scenarios, Plans, and Projects.* Cambridge MA: Lincoln Institute of Land Policy, pp.155–174.
Niitamo, Annaliina (2020) Planning in No One's Backyard: Municipal Planners' Discourses of Participation in Brownfield Projects in Helsinki, Amsterdam and Copenhagen. *European Planning Studies,* 29 (5), pp.844–861. doi:10.1080/09654313.2020.1792842.
Othengrafen, Frank (2010) Spatial planning as expression of culturised planning practices: The examples of Helsinki, Finland and Athens, Greece *Town Planning Review*, 81 (1), pp.83–110. doi:10.3828/tpr.2009.25
Othengrafen, Frank, and Mario Reimer (2013) The embeddedness of planning in cultural contexts: Theoretical foundations for the analysis of dynamic planning cultures. *Environment and Planning A*, 45 (6), pp.1269–1284. doi:10.1068/a45131
Patomäki, Heikki (2007) *Uusliberalismi Suomessa*. Helsinki: WSOY.
Pelkonen, Antti (2016) Rescaling and Urban-Regional Restructuring in Finland and in the Helsinki Region. *European urban and regional studies,* 23 (2), pp.149–166.
Pendall, Rolf, Kathryn Foster, and Margare Cowel (2010) Resilience and regions: building understanding of the metaphor. *Cambridge Journal of Economic and Society*, 3 (1), pp.71–

84.
Pike, Andy, Stuart Dawley, and John Tomaney (2010) Resilience, adaptation and adaptability. *Cambridge Journal of Regions, Economy and Society,* 3, pp.59–70. doi:10.1093/cjres/rsq001
Pitidis, Vangelis, Jon Coaffee, and Aphrodite Bouikidis (2023) Creating 'Resilience Imaginaries' for City-Regional Planning. *Regional studies,* 57 (4), pp.698–711. https://doi.org/10.1080/00343404.2022.2047916
Porto de Albuquerque, João, Liana Anderson, Nerea Calvillo, Jon Coaffee, Maria Alexandra Cunha, Livia Castro Degrossi, and Giovanni Dolif (2021) The Role of Data in Transformations to Sustainability: a Critical Research Agenda. *Current opinion in environmental sustainability,* 49, pp.153–163.
Purkarthofer, Eva, Alois Humer, and Hanna Mattila (2021) Subnational and Dynamic Conceptualisations of Planning Culture: The Culture of Regional Planning and Regional Planning Cultures in Finland *Planning Theory & Practice*, 22 (2), pp.244–265. DOI:10.1080/14649357.2021.1896772
Reggiani, Aura, Thomas de Graaff, and Peter Nijkamp (2002) Resilience: an evolutionary approach to spatial economic systems. *Networks and Spatial Economics,* 2, pp.211–229. doi:10.1023/A:1015377515690
Regional Council of Southwest Finland (2022) *Maakuntakaavayhdistelmä*. [Online] Available from: https://varsinais-suomi.fi/suunnittelu/maakuntakaava/voimassa-oleva-maakuntakaava/varsinais-suomen-maakuntakaavayhdistelma/ Accessed [04/05/2023].
Ribeiro, Paulo Jorge Gomes, and Luís António Pena Jardim Gonçalves (2019) Urban Resilience: A Conceptual Framework. *Sustainable cities and society,* 50.
Sanyal, Bishwapriya (ed) (2005) *Comparative Planning Cultures.* New York: Routledge.
Saviotti, Pier Paolo (1996) *Technological Evolution, Variety and the Economy*. Cheltenham: Edward Elgar.
Simmie, James Ron Martin (2010) The economic resilience of regions: towards an evolutionary approach. *Cambridge Journal of Regions, Economy and Society*, 3, pp.27–43. doi:10.1093/cjres/rsp029
Stead, Dominic, Jochem de Vries, and Tuna Tasan-Kok (2015) Planning Cultures and Histories: Influences on the Evolution of Planning Systems and Spatial Development Patterns. *European planning studies,* 23 (11), pp.2127–2132.
Stead, Dominic (2013) Convergence, divergence or constancy of spatial planning? Connecting theoretical concepts with empirical evidence from Europe. *Journal of Planning Literature*, 28 (1), pp.19–31. doi:10.1177/0885412212471562
Swanstrom, Todd (2008) Regional Resilience: *A Critical Examination of the Ecological Framework*. Working Paper No. 2008–07. Institute of Urban and Regional Development, University of California – Berkeley, CA.
Turok, Ivan (2014) The resilience of South African cities a decade after local democracy. *Environment and Planning A*, 46, pp.749–769. doi:10.1068/a4697

Wolfe, David A. (2010) The strategic management of core cities: path dependence and economic adjustment in resilient regions. *Cambridge Journal of Regions, Economy and Society*, 3, pp.139–152. doi:10.1093/cjres/rsp032

Yamagata, Yoshiki, and Sharifi, Ayyoob (eds) (2018) *Resilience-Oriented Urban Planning Theoretical and Empirical Insights.* 1st ed. Cham: Springer International Publishing.

Zolli, Andrew, and Ann Marie Healy (2012) *Resilience. Why Things Bounce Back*. London: Headline.

Appendix 1

Table A1 based on Yamagata & Sharifi (2018) Evolutionary* as in Davoudi et al. (2013).

Type of resilience	**Description**
Engineering	Accentuates reducing vulnerability to disasters by improving robustness of the physical infrastructure.
Ecological	Entails a more flexible & dynamic approach that recognises inadequacy of resistance and robustness characteristics for building urban resilience. It further promotes structuring safety margins into the design of the system allowing it to absorb initial shocks, retain functionality, and minimise overall losses.
Adaptive (also called Evolutionary*)	Facilitates appropriate interactions between slow and fast variables in the system allowing the system to smoothly alternate between long periods of stability and short periods of chaotic change, without losing its integrity and functionality. Social-ecological memory, self-organisation, and learning from the past are essential characteristics for achieving adaptive resilience. Transformability is what distinguishes evolutionary resilience from engineering and ecological resilience. It broadens the description of resilience beyond its meaning to incorporate the dynamic interplay between persistence, adaptability and transformability across multiple scales and time frames in ecological (natural) systems.

Appendix 2

Table A2 adapted from Table 1.1 in Yamagata & Sharifi (2018, pp. 23-24).

Planning Theme	**Conventional planning**	**Resilience-oriented planning**
Vision & Strategy	- Linear Static (blueprint) - Emphasis on eliminating risks - Recovery from disaster by equilibrium approach - Predict & Prevent approach	Adaptative through regular and iterative processes of monitoring and scenario making
Institutional Reform	- Sector-based - Using high technical language in communication - Top-Down - Limited share of private investment in urban infrastructure management (obvious in developing counters)	- Interactions between sectors (Interconnected and interdependencies) - Decentralized planning - Promotion of collaborative culture - Incremental and learning by doing approaches - Recognizes the significance of behavioural changes - Transparent decision making process - Communication using commonly understandable language - Strong public-private partnerships
Sectoral, spatial, and temporal interlinkages	- Failure to address interlinkages between different sectors and dimensions - Silo-based - Lack of understanding of spatial and temporal dynamics	-Not carried out in silos - Efforts to understand interconnections between different sectors - Emphasis on understanding spatial and temporal dynamics

Appendix 3

Table A3. Comparison of the case regions.

		Helsinki-Uusimaa Region (HUR)	**Southwest Finland Region (SFR)**
Region	**Inhabitants**	1,723,000	481,403
	Size	9,568 km²	10,910 km²
	Nr of municipalities	26	27
Organisation	**Employees**	appr. 80	appr. 70
Regional Assembly	**Nr. of elected officials**	83	104
	Largest parties	The National Coalition Party (23), The Social Democratic Party (14), The Greens (14)	The National Coalition Party (26), The Social Democratic Party (19), The Finns Party (16)
Regional Plans	**Plans in force (year of ratification)**	Helsinki-Uusimaa Regional Land Use Plan 2050 (2023); Regional Land Use Plan for the Östersundom area (2021); Phased Regional Land Use Plan 4 – only markings for wind power (2020)	Regional plan for natural values and resources (2021); Phased regional plan for land use, services and transportation in urban areas (2018); Phased regional plan for wind power (2014); Regional plans of Loimaa region, municipalities of the Turku region, Turunmaa and Vakka-Suomi (2013); Regional plan for Salo region (2008); Regional plan for the Turku city region (2004)

THE SOCIAL PERFORMANCE OF NATURE IN THREE BRAZILIAN CITIES: TERRITORIAL SYSTEMS AND SOCIAL INNOVATION IN THE HISTORICAL PROCESS OF VISUALIZING AND IMAGINING NATURAL PLACES (1057)

Camilo Vladimir de Lima Amaral

Polytechnic of Turin, Federal University of Goias DIST, Torino, Italy; camilo.delima@polito.it

Abstract. This paper aims to explore the social performance of nature, investigating the interplay of nature, subjectivities and visions for the future. The main challenge is to denaturalize our conceptions of nature and to understand science as techniques of phenomena, thus grounding a paradigm for the right to nature as a right to produce nature as a work of design. For that, we will investigate the evolution of the imaginary of urban nature in a regressive-progressive history of urban rivers in the cities of Goias, Goiania and Caldas Novas, thus visualizing the social dimensions in different attitudes, appropriation and future plans for its urban nature. This aims to contribute for building a reflexive and design-thinking approach to nature and unveiling the politics of environmental perception.

Keywords: Regional Design; Nature; Denaturalizing; Urban River; Urban Political Ecology

1. Introduction

In 1937 the capital of the state of Goiás was transferred from the colonial times city of Goiás to Goiania, a modern city that started to be built in 1933. In 1937, the famous French structural anthropologist Claude Lévi-Strauss visited the region and, in his 1955 book Tristes Tropiques, he gave a staggering first person account of the dynamics he saw between nature and these cities:

> […] the little town of Goyaz […] eked out a sleepy existence some seven hundred miles from the coast, from which it was virtually cut off. It stood among a mass of greenery and was dominated by an erratic skyline of palm-topped hills. Streets of low houses ran down the hillsides green with gardens. […] The colonnades, the use of stucco, the sumptuous porticos freshly painted in white or pink or ochre or blue all reminded me of Spanish country-town baroque. On either side of the river were moss-grown quays that had caved in, here and there, under the weight of the lianas, the banana-trees, and palm-trees that had run wild among the unoccupied

properties; but this superabundant vegetation did not so much underline the decrepitude of those properties as add a note of silence and dignity to their dilapidated façades. (Lévi-Strauss, 1961, p. 128)

With Goiania a greater risk was taken, because the original plan was to build up from nothing at all the future federal capital of Brazil […] there are an enormous plateaux which we have left untouched for the last two hundred years […] they could get on with the enormous undertaking that they had in mind. This was to be found sixty-odd miles to the east, on a plateau where nothing grew but rough grass and thorny shrubs, as if some plague had swept across it and destroyed all living creatures and all other vegetation. […] Its architects, untempted by any natural advantages, could proceed as if on a drawing-board. […] Suddenly every newspaper was full of the news. The city of Goiania was to be founded: and along with the town-plan, which could not have been more complete if Goiania had been already a hundred years old […]

I visited Goiania in 1937. Among endless flatlands half dead ground, half battlefield with telegraph poles and surveyors stakes all over the place, a hundred or so brand-new houses could be seen at the four corners of the horizon. The biggest of these was the hotel, a square box of cement, with the look of an air-terminus or a miniature fort; one might have called it the bastion of civilization in a literal, and, therefore, a strangely ironical sense. For nothing could be more barbarous, more essentially inhuman, than this way of grabbing at the desert. This graceless erection was the contrary of Goyaz. It had no history. It had neither lived long enough nor acquired any of the associations which might have concealed its emptiness or softened its awkward outlines. One felt as one feels in a station or a hospital: always in transit. Only the fear of some catastrophe could have justified the erection of this square white fortress. And indeed that catastrophe had occurred: silence and stillness served only to heighten its menaces. Cadmus the civilizer had sown the dragon's teeth. The earth had been torn up and burnt away by the dragon's breath: Man would be the next crop. (Lévi-Strauss, 1961, pp. 128-130)

In this account we can see many layers of dialectics between nature, city and different subjectivities. It does not only reefers to a complex dynamic between territory, nature and artificial spaces, but also between different cultures and spirits of times. In a political context of modern dictatorship in Brazil, Lévi-Strauss noticed an emergent instrumental modernist enlightenment. Nonetheless, perhaps what is more staggering is to notice how he approaches with tenderness the 'Spanish country-town baroque' city with its medieval gardens, and on the other hand demonizes the landscape of the Cerrado as a 'desert' of

‘half dead ground, half battlefield’ ‘where nothing grew but rough grass and thorny shrubs’. On the one hand, the old city had a very complex and cultural relationship with nature, as we will try to untangle. On the other hand, the modern subjectivity had an instrumental logic of domination towards nature, making it a *tabula rasa* for massive concrete objects. But, in a third hand, the anthropologist could not show his notable sensibility towards the Cerrado ecosystem itself, a harsh landscape, but rich in its own terms if one has an open eye for it.

On this paper we aim to disentangle how different subjetivities and landscapes were built in these 3 cities silencing this ecosystem. With that we aim to denaturalize the perspectives towards nature, and unveil how cultural aspects guided decisions and structured not only space but also ways of seeing the world. Furthermore, we also aim to explore how scientists, planners and city authorities were seeing and intervening in that dynamics.

Here we will focus on the relation between the cities and its main rivers, and we will use each city to explore one main aspect of that dynamics. In the city of Goiás and the Vermelho River, we will investigate how a landscape that remained essentially frozen for centuries, actually, saw its nature to metamorphose. In the city of Caldas Novas and the Ribeirão de Caldas we will see how ideas of hygiene and health interplayed a complex game in the valuation of nature, and how a dangerous simulacra of nature points to the need of a new dialectics of artificialization and naturalization. Finally, in Goiânia and the Meia Ponte, we will further explore the aporias of modern instrumental logics, that points to the need of de-alienating the city from nature, and overcoming its expropriation with a process of cultural appropriation. Those points aim to build a critical and political approach to nature as an object of social design.

Michel Serres (1995) asserted, approximately 30 year ago, that we need a new ‘natural contract’ for society. If Rousseau conceived civilization as a ‘social contract’, in which people agree in playing different and mutually beneficial roles, Serres argued that, given the ecological emergency we have been facing, we would need a contract that must include nature. This idea has met its recent momentum in the European Green (new) Deal, which set the main goal of making Europe climate neutral by 2050. We need a new view of urban environment: a process of human and non-human performances that work together based on the possibilities machined by our social-environmental systems. In this matter, Milton Santos (1996) argued that nature becomes a second society, as ‘nature becomes a real system of objects (...) and ironically, it is the ecological movement itself that completes this process’.

In this paper we aim to explore how social systems and the systems we see in nature interacted in different places, times and cultures. When we see nature as a second society,

what does it mean to think about the social performance of environmental planning? Rather than focusing on the establishment of new social-environmental structures, we will investigate social reality as a continuous and complex process constantly changing; thus, approaching plans, social values and actions as moments of 'structuration into social reality' of ideas of 'what nature should be'.

For that, we need to approach the performance of nature by firstly denaturalizing our ideas of nature, and that should be based on the long tradition of denaturalizing our understanding of "things". Some centuries ago, Marx (1990) took important steps towards denaturalizing the idea that a "commodity", revealing how it is not just a thing, but it is full of social relations. Friedrich Nietzsche was another key player in this game and all his effort (to go beyond good and evil, and to 'transvalue' social values trough the genealogy of how moral ideas were built) could be seen as strong efforts to denaturalize all our concepts and to reveal their human aspects. Although in his *The Will to Power* (Nietzsche, 1968, p. 24, 119, 126, 165, 168, 169, 234, 235) – a fragmented and incomplete edition of notes, Nietzsche clearly mentions the question of "denaturalizing" (mainly for morality issues). But, not even he, himself, could take the last radical step; in his own words: 'one cannot "*dénaturer la nature*"' (Nietzsche, 1968, p. 362).

Nonetheless, the classical essay by Judith Butler (1988) aimed at denaturalizing the understanding of our own body, sought to understand gender as performance, or as a socially constructed phenomenology. Helene Shugart (2001) also explored how femininity in women and masculinity in men can be understood as social performance by de-fetishizing their mechanisms based on parody studies. She sees the possibility of denaturalizing the nature of gender and, consequently, of reconstituting desire, by doing so. The interrelation of these fetishizing mechanisms and what we see as nature is fundamental to depict reification and social desire inside nature's social performance.

In addition, the recent studies by Neil Smith (1998), David Harvey (2000) and Jason Moore (2017) have taken significant steps towards researching the "production of nature" as constitutive part of human relationship with the environment. Nonetheless, these authors remain limited to the idea that nature is a "social construct", an image or representation detached from the "real thing" that lives inside our "re-presentative" minds and culture. Maria Kaika et al. (2020) explored the idea of Urban Political Ecology to show how initial knowledge produced by the environmental sciences have further political consequences to 'the way it is put into practice'.

Marco Armiero (2019) took one step ahead and made the attempt to escape the discipline of the environmental sciences based on a humanist approach to the relationship between nature and society. His research points towards the understanding of nature as a "project" (i.e. the *poiesis* of nature). This act of projecting can also be understood as the projection of ideas onto the world. In order to further explore these ideas, we shall briefly establish

our approach to Nature as Design, and then explore a regressive-progressive analysis of how nature was designed in the dialectics of Goias, Goiania, and Caldas Novas with its rivers.

2. Nature as Design: about systems and phenomena creation

We nowadays take “ecosystems” as synonym of nature, but the two parts of this word have a political aesthetics of their own. Juan Martinez Alier (1988) explored how both economy and ecology are rooted in the Greek word *Oikos*. He showed that the neoclassical economics practices have been corresponding to what Aristotle defined as "*crematistic*" (the study of price formation in the market), and that the broader sense of economics should take into account the meaning of *Oikos* (the space of life), which encompasses family and community life, as well as the territory endowed to it. Ecology is the knowledge about this space of life, whereas economy should be the management and regulation of it. Thus, ecology and economy are ultimately intertwined with the productive dimension of nature.

On the other hand, “systems” are theoretical instruments; Adam Curtis’ documentary *All Watched Over by Machines of Loving Grace* charmingly captures how the systems’ theory prevail in contemporary culture, mainly through a specific branch of ecological thinking. The 1972 Club of Rome report titled *Limits to Growth* was based on a cybernetic-system model composed of 1,000 equations aimed at helping to view all mankind’s issues as an interconnected system. This algorithm of all resources, processes and consumption of the world supposedly reveals the natural limits of our current global social performance.

System are theoretical frameworks, they are a way of seeing reality as a set of interdependent elements, among which one finds a set of dynamic relationships that altogether form the whole. A car, or a frog, can be both seen as a system. By doing so, one has to read and set the parts of reality together. First, it is essential deciding what is the goal of the system, then one must collect empirical data, model mathematical formulas to enable the interaction of the parts with the feedback of the system – which is nowadays, increasingly formed by computer algorithms – as well as to predict future variations to select the best model, and, finally, to monitor and control the evolution of the assessed variables. Therefore, a system can help understanding how things work together within an interconnecting mechanism and in networks (Oliveira and Portela, 2006; Macedo et all., 2008; Kasper, 2000).

On the developments of truths about nature, Bruno Latour (Latour and Woolgar, 1986) made an anthropological investigation on a famous molecular laboratory by analyzing how abstractions would acquire life when they were reified into technical apparatuses. According to him, when a scientist uses an apparatus to observe phenomena, what he

sees on the other side of the apparatus is framed by past theories and hypothesis. This theories were discussed in papers and conferences and were used to produce these apparatuses, i.e. 'black boxes'. Thus, he argues: (1) the phenomena these scientists see exists only through the mediation of that machine, and (2) the machine only existed through theories reified in it (i.e. past social labour inscribed in this material basis).

Accordingly, Bruno Latour explains these lab 'black boxes' by using Bachelard's idea that scientific equipments are 'reified theories': 'When another member handles the NMR spectrometer (…) to check the purity of his compounds, he is using spin theory and the outcome of some twenty years of basic physics research' (Latour and Woolgar, 1986, p. 66). These ideas inscribed and configured in machines were based on arguments and theories that have resulted from discussions in conferences and from disputes in journals and articles, before they were finally accepted as 'facts'. Thus, the 'so-called material elements of the laboratory are based upon the reified outcomes of past controversies' (Latour and Woolgar, 1986, p. 87).

That means the phenomena observed as scientific truths were produced by techniques and theories firstly inscribed in the apparatuses, i.e. techniques creating phenomena. Thus, we can investigate these phenomenon techniques to open the mechanisms of urban and environmental planning for action. We can think of urban and environmental plans as black boxes of both past and contemporary controversies. The culture of environmental planning is a long scientific tradition triggered by many assumptions about elements that matter when we regulate and produce cities.

For that, we will investigate the relationship between cities and rivers in the three cities as if it was a work of regional design. This is an experimental tool aimed to explore the principles that structures those realities. It is inspired by the retroactive manifestos of Rem Koolhaas (1994), such as the one he developed to Manhattan as if it was conceived by an architect, or how he investigated the walls of Berlin as a work of intentional design. In this sense, using Grounded Theory (Guest et alli, 2011; Glaser & Strauss, 1967) we coded the main aspects of the relationship of those cities to nature, exploring how these relations were designing nature in three aspects: by revealing and visualizing hidden and supposed properties; by imagining and conceiving future scenarios (design-thinking and imagination); and by refunding and articulating virtual seeds for future shared social realities (i.e. creativity and social innovations).

3. Metamorphose of a *Natura Morta*: the Dialectics of Subjectivities and Nature

A Unesco's World Heritage Site, the city of Goiás, in the very heart of Brazil, started to be built around 300 years ago; it clearly shows how nature has performed different social roles over the years. The city was nearly abandoned for decades keeping its landscape

frozen, and that was later reinforced by the protection of a heritage status. Thus, we could argue that the city was frozen as a *Natura Morta* picture*,* keeping its natural elements passively still, open only to the imagination and the gaze of its observers. Nonetheless, this still life painting kept metamorphosing, changing from inside out, without changing any of its superficial aspects.

When Thomas Ender depicted a packed set of houses and four streets in the middle of a wild natural landscape of dramatic mountains and exotic trees, approximately 200 years ago, Vermelho River did not even participate in this landscape. Nonetheless, the river was the main economic resource of the city, since it was used for gold mining. Furthermore, there was no place for nature in the Portuguese colonial urban space. Cities were, actually, anthropocentric and in opposition to the wildness, which was to be conquered during the Brazilian colonization process. Brazilian cities, at that time, had no trees on the streets and no green spaces on their main squares. Officials in one of these municipalities have even argued that:

> Trees are pumps that put air into the soil and retain its moisture, but, while this moisture is useful, leaves that rot on the ground make them all more harmful, as it is certain that when they rot they carry impure exhalations into the air. That is the reason why naturalist Philosophers claim the woods are constantly harmful to health. [our translation] (apud Pereira, 1999)

As far as we can believe in the political rhetoric from colonial times, it is amazing to see how daily practices were connected to the political discourse and with science, if we take the 'naturalist philosophers claim' as nowadays counterpart to current scientific theories. Furthermore, this statement evidences how landscape is interconnected with politics, daily practices and institutions through discourse. However, the big picture is not that simple.

If we turn our sight from the public space to urban landscape, as a whole, including the private realm, we will find that the city was meshed with green patches. Houses in Goiás had big backyards that account for an additional, and very specific, articulation of nature. Yi-fu-Tuan (1984) argues that in the Christian tradition, humans had the sanctifying power of being the "vice-regent" of God at Earth. Although this power is expected to be found in transcendence, humans are actually imperfect and sinful, so divine will must be contemplated in nature, where it is up to man to impose the divine will to the wilderness by sanctifying it. As such, these backyards create a series of enclosed gardens that mimic the harmony of the Gardens of Eden. When Christians were isolated in a hostile world, they would endow nature only if it had this divine order.

Here, the natural elements can be understood as "artifacts", once they also were symbols of "spiritual truth". Such a truth was not a simple adaptation to each place, nor an organization of nature's local forces, but the instrumental control of these spaces by the

reinforcement of the Church truths. In other words, these intimate landscapes formed a coordinated picture of a harmonic nature. This symbiotic interaction had no place in the catholic city of Goiás; the separation of the enclosed from the wild nature is also the separation of the sacred from the profane. Here, truth is transcendent, and it is only achievable through God, and humans must purify nature by making it holy in order to contemplate the divine will inherent to it, its potential, rather than its actual profile.

Surprisingly enough, it is astonishing that in 1803 another depiction of the city of Goiás[1] showed two rows of threes in the main square, and two more rows of them recently planted in the way to a chapel. This shift in the local landscape actually highlighted a shift in the global geopolitical landscape. As the English Empire advanced its economic power, it also spread its cultural subjectivity, and the English Garden style emerged all around Brazil; not only in the coastal cosmopolitan cities, but also in the hinterlands. The space of the city became a white canvas for picturesque interventions, changing the value of nature. Nature became, altogether, profane.

Nature, even inside the cities, became a way of countering the excessive urbanization of a new industrial era that was being born. It become a refuge from the harmful rotting exhalations of modern cities, now drawing a new picturesque compositions in contrast to rational, formal and symmetrical shapes of Renascence and Baroque. Nevertheless, it also brought along some changes in costumes. In Brazil's colonial and slavery society, public spaces were not to be enjoyed – civic life happened indoors, whereas outdoor spaces were reserved for slaves and vagabonds. By constrast, this new picturesque landscapes of the English Empire had to be delighted by experience, by people gathering in public spaces and by wonders about their variations and sublime compositions.

This new nature inserted in the urban landscape played the complex social role of interacting with both social practices and mind sets. According to Maria Faggin Leite (1986), although the Brazilian 19th century Romantic landscape acknowledged that beauty was also present in wild landscapes, rather than just in the domesticated ones, such acknowledgement was observed in a very particular way, namely: by valuing nature as antithesis to cities. As Jellicoe (1995) asserted, it was the desire to escape the oppressive rationalism featuring the 18th century metropolises. It was also the consequence of the repudiation to England's industrial environment, its high pollution, environmental degradation and urban density levels. Therefore, in paradox, the value given to nature had nothing to do with its full experience.

Actually, these apparently natural landscapes were carefully-built ambiances that played key role in modern society. Uredale Price's 1794 "Essay on The Pictouresque" boosted this

1 First published in Reis, 2000.

approach by arguing against “monotony” and “stereotyped artifices”. He believed that emotions came from both sudden changes and extreme variations, so that the whole composition of the landscape was carefully built to create a sense of sublime: the feeling of reaching an untouchable, impenetrable or unaccountable beauty. These landscapes seemed to be untouched by man, but they were carefully-drawn pictures of nature.

Moreover, it is astonishing to see how these artifices hidden inside the pictures of nature played a role at the birth of capitalism. As described in the first part of the *Utopia* by Thomas Morus, in the last chapter of *Das Kapital* by Karl Marx, or in the play *The Cheviot, the Stag and the Black, Black Oil* by John McGrath, the enclosure of the common land in the United Kingdom triggered the creation not only of the private property of nature and a new set of capitalist relationships between humans and nature. But it also recreated the UK’s landscape into a beautiful picturesque scenario – for the bourgeoisie – based on the bloody expulsion of the poor population from it. The large-scale interventions in the landscape, and the carefully-arranged natural elements, lawns, sheep and deer in sublime compositions, were only possible because of this primitive expropriation. The common land and its way of living were disrupted, large fortunes rose and the scene for the bourgeois delight of nature was built.

According to Rabelo (1997), we can also observe the change from the colonial mind set to the new subjectivity resulting from the hegemony of the British Empire, in Goiás. The shift towards the capitalist mindset will derive from two main processes: the hygiene and moral discourses. On the one hand, the technical discourse based on the medical science influenced the way natural spaces of the cities should be dealt with. City councils discussed sanitation issues, the relocation of market places and the construction of slaughterhouses. On the other hand, new social behaviors were introduced towards the city and the natural resources. Although slavery was set to an end, labor remained a degrading task for the general population. As such, new free men enjoyed idleness and begging, which was an activity treated with compassion by Christians. According to Rabelo (1997), hunting became a means of survival and these men also bathed naked in the rivers. For introducing a new capitalist social order, a series of decrees and bills criminalized these behaviors and reinforced new forms of labor. The aesthetic contemplation of this new sublime nature could not be experienced as a non-capitalist way of living into the wild. It came alongside with new forms of labour and accepted moralities.

As time went by, Britto (2014) analyzed how in recent decades the river became part of both the urban imaginary and the daily habits of the city expressed by local artists and poets. According to these artists, thinking about the sonority of the city was to talk about water flow in Vermelho River. Laundresses became one of the most popular expressions of the working people in the city, they were a mix of tradition and daily struggles. The river was also a major character in many poems by Cora Coralina, who was the most prominent

poet in the city. It was used as epigraph in a sentence of fellow writer José Mendonça Teles, who represented this new symbiosis among the city, the river and subjectivity with the sentence 'there is a river inside me'.

Not by coincidence, in 1999 the city hosted the first International Environmental Film and Video Festival (FICA), which became one of the biggest environmental movie festivals in the world. This annual event reinforced the role played by nature in the city by bringing contemporary culture to the very heart of local society. The festival, as a counterpart of an annual religious (meta)ritual, reinforced now the abstract and scientific values of nature (as ecology) in the city subjectivity. That was a great shift underway in how we relate to nature is underway.

Milton Santos (1996), asserted that traditional communities, or what he called 'slow people', had a very tight relationship with the place that was carefully built by tradition and culture over long time, as well as reinforced by daily rituals. These people had a long-lasting and collective connection to the place; they could read all the city's rich symbolic structure in a distracted way. By contrast, modern 'fast people' relate to the place mediated by knowledge. The steep social and cultural continuous changes do not allow long-term symbols to operate inside these modern subjectivities. The place is just a confirmation of what people already know about it within a techno-science society. Nature is valued by the acknowledgement of our ecological crisis and rivers are valued by their ecosystem services and sustainable principles shared by contemporary knowledge. Therefore, the 'patrimonialization' of the city, and the Environmental Festival, are just parts of these abstract mechanisms shaping new experiences in this place.

As we have demonstrated so far, even this still life landscape was, under its frozen appearances, suffering a process of continuous (meta)morphose, integrating social aspects, subjectivities and nature. It was not simply that values towards nature changed, nature itself came to be completely different things. From a wilderness to be opposed by anthropocentric urban space, patched by contemplating divine gardens of Eden, to a picturesque landscape of capitalist, urban and bourgeois pleasures and alienations, to a contemporary landscape of ecological systems mediated by knowledge, we have seen multiple natures residing inside one only river.

Accordingly, we should now talk about 'the right to nature', rather then simply the right to the city. Henri Lefebvre (2003) defined his concept of "the right to the city" based on factors that go beyond the simple access to urban consumption and services. He started from the relationship between *polis* and the Greek philosophy, according to which, Philosophy founded the basis for the polis. Lefebvre proposed an urban condition of diversity and multiplicity, whose meta-philosophy would provide the basis for a new relationship with the city as artwork. If we take on account our main contemporary paradox – the conflict between environmental collapse and social performance of nature

and the incomplete social awareness of the magnitude of the challenge – we will need a similar meta-philosophical approach towards nature, i.e. to see nature as a work of design.

4. Inside-out Natural Aporias: Unfoldings Towards a New Right to Nature

The city space was for long considered a "dead" space or a space opposite to the rural space, where nature remained as the dominating factor. Natural spaces inside the cities were discussed as 'spaces to be preserved', since they were conceived in opposition to, and distinct from, anthropological spaces. Under the contemporary condition of global urbanization, where the boundaries of human space and the natural environment are diluted in, and expanded to, the whole Earth, we argue that this is a wrong way of formulating the problem of nature and the city.

Thus, for exploring the metamorphose of nature further we will investigate the intertwine between the social and natural systems by exploring briefely two other contemporary examples. In the city of Caldas Novas, the river Ribeirão de Caldas can help highlighting how the borders of natural and artificial are complex and intertwined. In the City of Goiânia and the Meia Ponte River we want to further explore the modern instrumental relation with nature, and how different forms of knowledge establishes different relations to nature. And we want to explore how in contemporary society we can conceive and overcome expropriation and alienation paradigm towards an appropriation and collaborative approach to nature.

The Ribeirão de Caldas is a river with thermal waters in the city of Caldas Novas, that today has one of the biggest hotel networks in Brazil, receiving over 3 million visitors a year. This story started when a state governor in the early 1800s claimed to have been cured from a disease with its waters, starting a national campaign to promote the city. In that early beginning, a first paradox emerged: while its waters were seen by outsiders as a place for cure, local community fought against the presence of these visitors, as they were bringing new diseases to its waters. Thus, a same natural element was seen as a way of cure and a cause of new diseases.

Furthermore, after the 1960's the city started to increasingly change the focus from health treatments to theme park resorts of thermal water. This process continued to build a segregated city, one for the tourists and other for the locals. In this new dynamics the city resorts recreated the local nature into disneyfied simulacras of nature, with artificial mountains, artificial waterfalls and fake historical elements. These simulacra of nature act as creators of realities that poorly copy the original. These phenomena, allied to the construction of market scenarios, are consistent with a system of mass consumption, based on the continuous production of lack and frustration. Thus, the experience of nature here becomes a fetishising device, which acts producing a consumers'

subjectivation. Thus, this disneyfication of the city and its nature creates an ephemeral mold detached from the actual place, transforming its identity into a commodity. The resulting urban experience is of a programmed consumption of place, the nature as a simulated commodity to be consumed and disposed.

In this context, the Public Prosecutor and the Association of Miners of Thermal Waters of Goiás (AMAT) agreed to develop an environmental compensation plan for the City of Caldas Novas. Its touristic activities were built along the thermal river of the city and had strong environmental impact on the environment. Consequently, a plan for revitalizing the urban river valleys in the city was developed by Architecture professors at Pontifical Catholic University of Goiás and at Federal University of Goiás (including the author of this manuscript).

In the revitalization plan for the Ribeirão de Caldas, the proposed aims to build a new interface between the city and the natural environment. Therefore, the natural and urban spaces were not conceived as separated from, and incompatible to, each other. Actually, the overall strategy was to take the city to the river's protected areas and to bring nature to the city. This proposal resulted in the reconfiguration of the traditional institutional context of planning in the city. This synthesis developed a new dynamic framework that directly interfered in the sense of place and in citizens' appropriation of the city.

Arguably, the city has a major challenge to overcome the spatial segregation between locals and tourists, and to overcome the commodification of the city through simulacra. For that one should not deny the intertwine of artificiality and naturality. On the contrary, we should explore the politics behind this intertwining, and open its black boxes in order to intervene on it. For that we need to overcome the abyssal separation of nature and artificial. Bruno Latour (2004) has made great theoretical advancements in assessing nature and artificial relationships by taking into consideration that things are natural and artificial hybrids. Thus, he considered scientists as political representatives of nature (i.e. spokesmen of the interests of non-humans), but he failed to further develop this theory to understand its dialectics with social subjectivities.

If we take into account the complex relationship between subjects and their environment, the whole environment can be understood as a set of systems that were partially projected onto reality. Simondon (2013) calls pre-individuality (what comes before the operation of individuation) this field of partially actualized and potential elements that exists in the environment before the indivituation of the individual. Thus, nature can be seen as past subjectivities that were materialized in our social and natural performance, i.e., in our daily experience of nature. What we can learn of this example is that we can take three steps ahead to picture nature as part of our human and urban daily experiences, namely: seeing nature as a dialectical mirror room; seeing nature within us; and seeing the diverging nature inside ourselves.

Natural Mirrors: In the classic *The Metropolis and Mental Life,* Georg Simmel (1950) explored how the modern metropolis creates new forms of personal behavior and environmental experience. The step forward in a new paradigm yet to be built (of nature as design) we should try to envision how our political aesthetics of nature can reproduce social behaviors and experiences by addressing how our ideas of nature have a material social performance.

Within Nature: Neil Theise and Menas Kafatos (2013, 2016) explored the intertwining of inner and outer sentience and the imbricated relationships of the universe as a self-organizing system. They pointed out the remarkable truth that less than 1% of our cells are human. If we take a closer (very closer) look at our frontier with the world, we will see a microbial flora living in synergistic mutualism with us (this phenomenon is also actually indispensable for the health of our gut's functioning, i.e. the intestinal flora). Humans are an ecosystem, themselves.

Diverging Nature: Nature is inside us; nonetheless, we diverge from it in many cultural and creative ways. Timothy Taylor (2010), who is an anthropological archaeologist, argued that artificiality is changing humans not only in modern times, but, also since the very beginning of our species. This statement can be supported by the fact that evidences for the first stone tool dates back to 190,000 years before the evidence for the first specimen belonging to genus *Homo*. The same goes for the control of fire dating about 1 million years before *homo sapiens* (and many of his peculiar traits such as week teeth, lack of fur, short guts, among others). All these tools pointed towards a protein-rich and processed-food diet, allowing to the evolution to bigger brains. In other words, culture (in all its forms such as technological or gastronomic) changed our very nature; therefore, according to Taylor, there are no natural humans; we are 'artificial apes'. And we could add, the reified elements of our whole environment dynamically interact with our possible social performances.

In the case of Goiânia and its Meia Ponte River, the problem starts with overcoming the instrumental logic of a colonial mentality towards nature. As we saw, Claude Lévi-Strauss was very incisive in critiquing the instrumental logic of the first settlement. But, not even him was able to overcome the prejudices of a colonial mentality that saw the Cerrado landscape as a 'desert' of 'half dead ground, half battlefield' 'where nothing grew but rough grass and thorny shrubs'.

As the modern city conceive in the early 1930s, the project had an instrumental approach to nature. A dam was built on the river, so it could become a lake for producing energy, an airport for seaplanes and a place for human leisure. Its surrounding green area was

conceived as a Botanical Garden, almost in the sense of a catholic Garden of Eden, but now mediated by scientific knowledge. The rivers of the city were to become Parkways, just as it was in fashion at Mose's New York, where the experience of nature was mediated by the car's machinic way of fruition. Thus, in the City of Goiânia and the Meia Ponte River the relation with nature was mediated by a modern instrumental logic.

This form of knowledge established a linear alienation from nature, where human needs were imposed to nature. Later, a new environmental legislation would stablish an abyssal line between natural preservation and human activities. The result was that the natural areas of the city remained abandoned for decades. Neither the imposed uses nor the strict division worked out. Arguably, an approach that counts on the dialectics of nature and artificiality could solve those aporias.

In this context, a series of workshops organized by UFG's Studio Unit 'Pr7' in partnership with the municipal environmental agency developed a diagnosis of the social-natural conflicts of the river. It concluded that it was impossible to develop a single project to solve all the issues concerning the river (namely: environmental degradation, exotic vegetation, vacant and abandoned areas, occupation by favelas, and the fact that virtually all the pollution of all rivers of the city flow into the Meia Ponte). The problem of the river is the problem of a whole unsustainable city and basin development. In order to save the river, one sould change the whole city. Thus, when students were asked to develop Utopias for the river, they turned out to develop dystopias: it is easier to imagine the collapse of society than to imagine any alternative to current scenarios.

At that point, the students developed the proposal of creating an Open-Source Platform of Design aimed at raising awareness and building collaborative environmental alternatives. So, the design solution was to create a collective-design NGO in an online platform. It developed the proposal of using a collaborative and collective design methods, according to which the group of 30 students would work collaboratively to develop a single project. In this sense, the social-natural dilemma of our times is also the problem of the aesthetics of city and nature. Any solution for the Meia Ponte River should deal with the *copoiesis* of *Urbis* and nature, in a continuous redesign of nature.

According to Herbert Marcuse (1981), the aesthetic dimension is the way through which mankind can escape and transform reality. Therefore, thinking about the contemporary aesthetics of the nature and the city is also rethinking the idea of the utopian city. As for Marcuse, thinking about the world in an aesthetically way is promoting a radical transformation in the reality we live in (a negative dialectic of our corrupted existence) by constructing and viewing other possible worlds. This role of reinventing, transforming and revolutionizing is understood by Marcuse as the main function of art. Perhaps, the same is true for the paradigm of nature as a work of design.

5. Final Considerations

As we investigated the evolution of the imaginary of urban nature in a regressive-progressive history of urban rivers in the cities of Goias, Goiania and Caldas Novas, we were able to visualize the social dimensions in different attitudes, appropriations and future plans for its urban nature. With that we could point out to the need of building a reflexive design-thinking approach to nature. That suposes to overcome the ideas of a new natural contract or a new green deal, we need to thing a Right to Nature as the right to deal with nature as a work of design.

For that, we will need to deal with the contemporary subjective relationship between humans and nature, where our estrangement from nature creates an unsettling feeling. We are still thinking through an absolute division line between both the artificial and natural worlds. On the one hand, we have artificial things and, on the other hand, the natural things; humans, on the one hand, and animals, on the other hand; the city, on the one hand, and the environment, on the other hand; or, yet, as Kant has put it, we have "thing-in-itself" on the one hand, and reason, on the other hand. Alternatively, we can think of a dynamic dialectic of artificiality and nature. Similar to fair interactive Mirror Room, there can be interchangeability of positions, dissolution of the self in the environment and the complex configuration of the environment as a series of interactive reflections.

As we have seen in our object of discussion, nature has played different mechanic roles in the ordinance of social behavior; our awareness of nature is a complex and collective social construct, a second society, itself (to repeat Milton Santos' argument). New paradigms, such as Ecosystemic Services and the complex multidimensionality of the ecological crisis, set different relationships between man and the world, and we can barely know all intricated elements of the image of nature we have built. We are detached from the very images we build of our reality.

As we investigated the social performance of different natures, we regressively dug into the different social dynamics played by our ideas of nature. These ideas did not simply represent nature in a different way, they also created different ideas of ourselves, set us in different places in the world, and established different performances we could have to interact with nature. Thus, ideas of nature bring along different blind fields and virtual potentials. As our society becomes increasingly complex, nature becomes a complex set of social systems.

It is not the case that systems are simply bad representation of nature, they might be actually the best tools we have so far to represent nature. Nonetheless, different system theories also have different potentials and blind fields. Thus, the bigger picture we tried to depict is that nature is paradoxically a 'natural artefact' with three distinctive dimensions: we are within nature, we diverge from nature and nature is a sort of mirror

room for ourselves.

Acknowledgements. Funding from the Italian MUR in the context of the PNRR was provided for the research project D-NATURE.

References

Armiero, Marco. (2019) The Environmental Humanities and the Current Socioecological Crisis. in: Humanities and Higher Education. Barcelona: GUNi. pp. 426-432.

Britto, Clovis (2014) A terceira margem do patrimônio: o rio Vermelho e a configuração do habitus vilaboense. Diálogos (Maringá. Online), v. 18, n.3, p. 975-1004, set.-dez./2014.

Butler, Judith. (1988) Performative acts and gender constitution. An essay in phenomenology and feminist theory. Theatre Journal, vol. 40, no 4, p. 519-531.

Curtis, Adam (dir). (2011) All Watched Over by Machines of Loving Grace. Production: BBC Television. 3 episodes. 180min.

Glaser, B. and Strauss, A. (1967) The discovery of grounded theory. Chicago: Aldine.

Guest G., MacQueen, K., and Namey E. (2011) Applied Thematic Analysis. Thousand Oaks: SAGE .

Harvey, D. (2000) Justice, Nature and the Geography of Difference. 2a edição. Oxford: Blackwell.

Jellicoe, Geoffrey and Suzan. (1995) La Paisaje del Hombre. Barcelona: Ed. G.G.

Kaika, Maria; et all. (2020). Moving urban political ecology beyond the 'urbanization of nature', Progress in Human Geography, Vol. 45(2), pp. 229–252.

Kasper, Humberto. (2000) O processo de pensamento sistêmico. Dissertação de mestrado. 291p. PPGEP - UFRGS. Porto Alegre.

Koolhaas, R. (1994) Delirious New York. New York: Monacelli Press.

Latour, B. (2004). Politics of nature. How to bring the sciences into democracy. Harvard: Harvard. University Press

Latour, B. and Woolgar, S. (1986) Laboratory Life. New Jersey: Princeton University Press.

Lefebvre, H. (2003) The Urban Revolution. London: University of Minnesota Press.

Leite, Maria A. Faggin. (1986) A Paisagem, a Natureza e a Natureza das Atitudes do Homem. in Paisagem e Ambiente, São Paulo, FAU-USP.

Levi-Strauss, C. (1961) Tristes Tropiques. *New York*: Criterion Books.

Macedo, M.; SILVA, A.; COSTA, M. (2008) Abordagem sistêmica da mobilidade urbana. São Carlos: STT/CETEPE/EESC/USP.

Marcuse, H. (1981) A dimensão estética. São Paulo: Martins Fontes.

Martinez Alier, J. (1998) Economia e Ecologia. Revista Brasileira de Ciências Sociais. n. 7, vol. 3, june. p. 99-115.

Marx, K. (1990) Capital – Volume 1. London: Penguin.

Meadows D. H. et. All. (1972) The Limits to Growth. New York :Universe Books.
Moore, Jason. (2017) The Capitalocene, Part I, The Journal of Peasant Studies, 44:3, pp. 594-630.
Morus. T. (2009) Utopia. London: Penguin Books.
Nietzsche, Friedrich. (1968) The Will to Power. Edited by Walter Kaufmann, Translated by Walter Kaufman and R J Hollingdale, Vintage Books.
Oliveira, J.; Portela, L. (2006) A cidade como um sistema. Perspectivas Contemporâneas, Campo Mourão, v. 1, n. 2, p. 164-182, nov./maio.
Pereira, M. (1999). De Árvores e Cidades, in SOLLER, M, Matos, M. (orgs.). A Cidade em Debate. Olho dágua: Belém.
Rabelo, Danilo. (1997) Os Excessos do Corpo. Dissertação de Mestrado. FCHF/UFG. Goiânia.
Reis Filho, N. G. (coord.) (2000). Imagens de vilas e cidades do Brasil Colonial. São Paulo: EDUSP/IMESP/FAPESP.
Santos, Milton. (1996) A natureza do Espaço. Técnica e Tempo - Razão e Emoção. São Paulo.
Serres, M. (1995) The Natural Contract, Ann Arbor: University of Michigan Press.
Shugart, Helene (2001) Parody as subversive performance. Text and Performance Quarterly, Volume 21, 2001 - Issue 2. Pp 94-113.
Simmel, G. (1950) 'The Metropolis and Mental Life', in Wolff, K. (ed.) The Sociology of Georg Simmel. New York: Free Press, pp. 409-424.
Simondon, G. (2013). L'individuation à la lumière des notions de forme et d'information. Grenoble: Millon.
Smith, Neil. (1998) Nature at the millennium. in: Braun, B. and Castree, N. (ed) Remaking Reality. London: Routledge.
Taylor, T. (2010) The artificial ape. New York: Palgrave Macmillan.
Theise, N.D. & Kafatos, M. C. (2013), Sentience Everywhere: Complexity Theory, Panpsychism & the Role of Sentience in Self-Organization of the Universe. Journal of Consciousness Exploration & Research| April2013 | Volume 4 | Issue 4 | pp. 378-390
Theise, N.D. & Kafatos, M. C. (2016) Fundamental awareness: A framework for integrating science, philosophy and metaphysics. COMMUNICATIVE & INTEGRATIVE BIOLOGY, VOL. 0, NO. 0, e1155010 available from: http://dx.doi.org/10.1080/19420889.2016.1155010 Accessed [20/12/2022].
Tuan, Yi-Fu. (1984) Espaço e Lugar. São Paulo: Difel.

THE THIRD SECTOR AS A NEW URBAN ACTOR IN THE TERRITORIES OF FUNCTIONAL INEQUALITIES (1090)

Ludovica Simionato

SAAD Unicam and REDI - Reducing Risk Disaster, Italy; ludovica.simionato@unicam.it

Abstract. Italy's inland areas are strongly affected by the lack of essential services, their territorial absence and the low quality offered to citizens. In addition to this, it has emphasised the practices of central administration -far from marginal places- and local administrations -often locked in particularistic dynamics for mere consensus-.

How can European (extraordinary) and national (ordinary) resources be activators of processes that follow general guidelines but are place-based?

With the Code of the Third Sector a new approach to fund management is opening up. The novelty of these processes that are being promoted in some Italian cities could be a testbed to be monitored for inland areas, with less and less administrative capacity and more and more need for networking skills and experimentation.

Keywords: Urban planning, Third Sector, Cohesion, Risk, Inland inequal areas.

1. Places of lack of opportunity

Italy's inland areas are affected by an ever-increasing functional, spatial and socio-economic inequality of opportunity with the cities. The policies promoted must take into account a reality that is very different from that of the large centres, and equip the territory to enhance this diversity. (Oliva, 2022)

Aggravating this scenario are the physical-morphological conditions of these inland areas, composed by ecosystems that are sensitive and vulnerable to natural risks, disasters, and ecosystem changes, be it through the appearance of fast mass movements, such as landslides, or via slow land degradation due to human activities, with all the attendant socio-economic consequences (Messerli et al., 1997).

Numerous studies show how a calamitous event can trigger a vicious circle in which disaster is followed by depopulation, emergency reconstruction and increased inequalities. This tendency in areas already marked by inequality is even more pronounced, so that external disruption has more devastating effects because it attacks an already compromised urban, social and economic fabric. It therefore leaves a more complex reconstruction phase, aggravating territorial criticalities. If we consider that disasters are of a different nature -and increasingly frequent with the advance of the

climatic emergency- a circle closes in which external and internal conditions limit the possibility of recovery in these territories. (Fussel et al., 2006)

The relationship between physical, natural and socio-economic systems is studied in the context of disasters as *resilience thinking* by delving into the relationships and effects that one system has on the other. In the case of environmental disasters, this link is marked by the effects that the hazards (environmental system) has on the vulnerabilities of the socio-economic system (Fig.1).

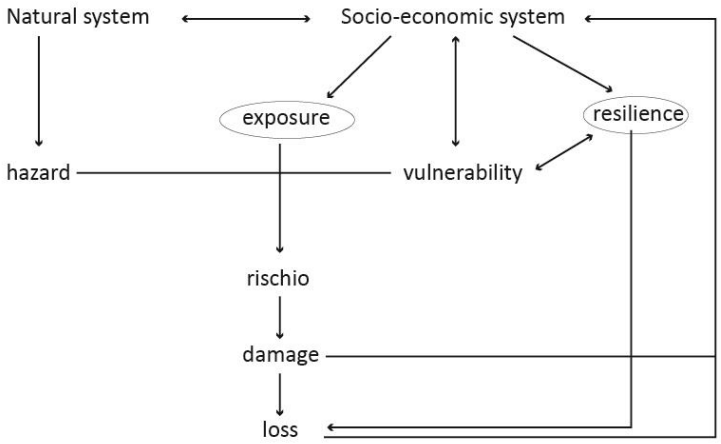


Figure 1. Revision of the conceptual map of the Erasmus+ Arch project, coord. Prof. Dall'Asta

Thus, a disaster is not the hazard itself (not necessarily destructive) but is the result of the physical vulnerability of an area and its exposure. None of the three factors alone generates damage, but all can contribute to the reduction or elimination of risk. Intervening on the vulnerability of the economic and social fabric, therefore, can be considered as a risk mitigation measure, inserting itself in the vicious circle and thus putting in place all the tools to favour mitigation and adaptation. Transformation actions would thus act not only on the potential destructive effects of catastrophes, but would also be aimed at improving the city's conditions of liveability and inequality on a broader scale. Attempting to better manage the recovery phase.

$$\text{risk} = \frac{\text{hazard x exposure x vulnerability}}{\text{resilience}}$$

Vulnerability in this equation is almost always associated with physical vulnerability. By understanding it as the vulnerability of communities, it is possible to conceive of risk in terms not only of material effects but above all of structural effects. If in fact it is empirically studied how to mitigate physical vulnerability, reinforce building structures and design urban escape routes, dealing with the relationship between territories and

communities is more topical and more urgent, in a scenario in which disaster-stricken centres turn out to be, at the end of reconstruction projects, well rebuilt but empty.

Addressing inequalities in access to resources, goods and services, as well as participation in decision-making processes is essential to mitigate risk factors. The negative effects of inadequate policies to tackle inequalities and unequal development between people produce the most pernicious effects. On the occasion of the pandemic this relationship was even more evident and it was shown how a backwardness on the issue of essential services produces its effects throughout the country, effects that become unacceptable, real emergencies in the most marginal contexts such as inland areas, where even in peacetime the condition is already suffering (Bianchi, 2022).

2. Towards evolutionary resilience

It is necessary to ensure that urban adaptation and reconstruction interventions include measures to counter current and future impacts and vulnerabilities, as well as the variability that occurs in the absence of trauma in the context of a changing society (Word Bank 2011). In this way, this phase does not only mean protection against negative impacts but, in a virtuous perspective, it also represents the predisposition towards greater flexibility to change itself, taking advantage of its possible benefits (Galderisi A., 2014; Magni et al., 2020). It is the same international institutions (Oecd, 2013; Unisdr, 2015) that underline how the greatest challenge of reconstruction is not only financial, but also concerns "how" to carry out reconstruction so that the affected area and its population are less vulnerable, more resilient and stronger than in the past (Pattaro A.F. et al. 2017; Fera G., 2020).

Reconstruction then becomes an opportunity to stay, to build new visions of the future, according to the well-known Sendai Framework principle of *Building Back Better*.

In order to do this, risks must not be recognised as a sectoral problem, to be entrusted to technical experts, but rather as a 'constant', the result of cross-sectoral fragilities present beyond the possible event, with which to deal both in the training of those called upon to operate on the territory, and in the construction of plans and projects for the territories aimed at reducing the vulnerabilities of the exposed territories (Galderisi A. 2020).

Davoudi (2012), Amin (2013) and Yamane (2009), among others, emphasise that resilience strategies are not necessarily predisposed to a mere rebound to pre-event normality, nor are they predetermined to privilege the status quo and support asymmetrical social and economic circumstances. 'Engineering' and 'ecological' resilience is based on a return to equilibrium (Simmie and Martin, 2010), while contemporary discussions of 'evolutionary' resilience are about more transformative adaptation (Davoudi, 2012).

This conception opposes the desirability of a return to equilibrium or an increase in the ability to cope with perturbations and instead advocates a new form and function better equipped to cope with shocks or stresses (Simmie and Martin, 2010).

Evolutionary resilience is adaptive, it achieves a new normal, a transformation and requires a flexibility of the state of the land. In particular, the idea of resilience referred to in the research shifts the focus from the capacity to return to a point of equilibrium to the capacity to adapt to change, which characterises the phases that Shumpeter called 'creative destruction' (Graziano P., 2012).

Sampson (2017) and others refer to the role of collective efficacy in social dynamics, including the degree of social cohesion and shared expectations for informal enforcement and control of social norms. In other words, levels of trust and mutual care are integral to social resilience in these contexts, to be taken into account if one is to aim for a resilience project that is transformative of territories in a structural manner.

The hypothesis that intend to be supported is that the emergency situation can represent an opportunity to relaunch territories and question the forces and places that, as resources, can actively intervene to break the vicious circle of territories marked by inequalities, according to the principles of Building Back Better. Indeed, disasters sharpen shared awareness of risks and development policies, based on the empowerment of local communities, and often generate new collaboration networks that can activate economies and changes in the use of urban centres.

2.1. The Italian funds for resilience

Many resources have been introduced in the last decade to mitigate inequalities, increasingly in the form of calls for action. In fact, it is the 2030 Agenda itself that recalls these principles through the goals: '10. Reduce inequalities'; '11. Make cities and human settlements inclusive, safe, durable and sustainable" by ensuring access to essential goods and services for all citizens; "12. Ensuring sustainable patterns of production and consumption' through efficient (re)construction processes that meet real needs without wasting resources.

The emerging question is how European (extraordinary) and national (ordinary) resources can be activators of processes that follow general guidelines but are place-based? In the latest calls for proposals there is an opening towards subjects other than companies and municipalities, but an increasing involvement of local associations is hoped for.

The Snai - *Strategia Nazionale Aree Interne*[1] (2014) has produced an interesting mosaic

[1] In English: National Strategy for Inner Areas

of framework programme agreements at district level, which intervenes first and foremost on the provision of primary services (health, education, mobility, internet connection) decidedly fundamental for the survival of these centres, but also introduces new figures: the 'social and health workers' for the reception, orientation and taking charge of the user in difficulty, in the figures of the community animator and nurse.

In participation policies, the figures of 'community animators' or 'territorial animators' are emerging as the new frontier of civic protagonism in public policies.

These figures are not entirely new to the Italian scene. In the Bologna case, 'territorial animators' were introduced by the *Fondazione Innovazione Urbana*[2]. The Fundation consider them as 'bearers of social capital', working with the associative capital for which they elaborate maps and data to provide to public administrations. Their intermediary work has proved important and has given a decisive boost to urban regeneration policies in Bologna.

However, the strategy for internal areas considers them to be strongly linked to the social-health field, as almost 'right arms' of community nurses, although it is made clear that 'The agreement with the actors of the third sector and local associations will be the determining factor for the integration and cohesion of social relations' (Apq Giovenco-Roveto, 2021). The non-implementation in practice of these figures does not allow a full understanding of the actual tasks they could have received, but it does suggest a need to get closer to the territories by seeking figures who can intercede between the bottom-up and upside-down levels, which are often too distant.

The PNRR, with the Complementary Fund, financed the Earthquake Package, increasing the resources already earmarked for the reconstruction of houses and public works, and the other investments included in the Recovery Plan. The Call for Proposals (30/06/2022) in this field is the "PNC Next Appennino", which allocated 1.780 billion euro from the National Complementary Fund for the "implementation of macro-measure B "Economic and social recovery". Interventions for the areas of the 2009 and 2016 earthquake that hit the central Italian Apennines, of the National Plan complementary to the National Recovery and Resilience Plan." In this sense, the PNC Call for Proposals introduces a novelty in the field of reconstruction. In fact, its structure is organised according to two axes "A" and "B" that specifically deal with material reconstruction and socio-economic reactivation, thus envisaging projects that can (albeit in parallel) deal with affecting the multi-scalar resilience of small centres affected by earthquake and pandemic. We can therefore have new cities or parts of them that are safer, more inclusive, more sustainable and thus more attractive, with the aim of reversing the negative trend currently affecting inland areas. However, in order to have any chance of success in achieving the objectives

[2] Experience available at: https://www.fondazioneinnovazioneurbana.it/fondazione-innovazione-urbana-home

of *Building Back Better* (Esposito et. al., 2017), and of the *Next Generation EU*, which have seen in Central Italy the intersection of the post-earthquake reconstruction programmes with the *Complementary Plan* to the *National Recovery and Resilience Plan* of the *Recovery Fund* extended to the entire country, there are conditions to be observed: favouring the introduction of new ways of imagining projects and proposing solutions. These calls for proposals in fact come to an area already under-resourced, with very tight deadlines, risking participation with old projects that are ineffective for today's specific needs.

We are aiming at new visions of organisation of cities and the territory that are holistic and comprehensive, propaedeutic to the punctual translation into projects of major strategic directions already shared in which the public plays a strategic role in enhancing listening and community involvement. In this regard, the importance of listening to communities in the development of participatory redesigning of territories affected by natural disasters and co-design processes, through communication tactics and tools adopted in urban planning and regeneration processes, is being increasingly recognised. It is a question of bringing into play a new participatory role for the inhabitants of places, who must be placed in a position to make a proactive contribution to the overall design, rather than an assertive or disagreeing opinion, to be introduced only downstream of a completed decision-making process. Thus, there are no shortcuts or possible simplifications of the irreducible interactions between science, government and local communities. (Polci)

In this sense, the pandemic tragedy offered an opportunity, bringing to attention the importance of combating inequalities and protecting the most fragile so that the whole community improves. This was realised in the PNRR, which, however, raised the fears of many scholars that the legitimisation of public intervention will lead to the reproduction of old faults, but on a greater scale because there are more funds (Gori C. 2022). The big issue is thus on the ability to translate general guidelines into place-based actions.

3. The need for place-based and territorial cohesion policies

Snai has already activated the political and strategic recognition in the lack of essential services, their territorial rarefaction and the low quality offered to citizens. In addition to this, it has emphasised the practices of central administrations (far from marginal places) and local ones (often locked in particularistic dynamics for mere consensus) (Lucatelli, 2022). The picture of a dismembered and insufficient welfare is clear to administrations, as described in the previous chapters.

Considering the territorial dimension in cohesion makes it possible to identify the peculiar development potential of individual territories. The use of their potential and competitive

advantages, however, must take place using local experiences, knowledge, specialisations and relations occurring between different stakeholders

According to the IPCC, future human vulnerability will continue to be concentrated where the capacities of local, municipal and national governments, communities and the private sector are least able to provide basic infrastructure and services. In rural areas, vulnerability will be exacerbated by combined processes including high out-migration, reduced habitability and high dependence on highly place-based and climate-sensitive livelihoods. Key infrastructure systems, including sanitation, water, health, transport, communications and energy, will be increasingly vulnerable if design standards do not take changing climatic conditions into account. Future exposure to climate risks is also increasing globally due to socio-economic development trends, including migration, growing inequality and urbanisation (Ch8 IPCC, 2022).

In this framework, welfare has a decisive role to play in addressing inequalities and ensuring continuity of the resident social fabric. According to A. Briggs, the objectives pursued by welfare are basically threefold: to ensure a minimum standard of living for all citizens; to provide security for individuals and families in the face of adverse natural and economic events of various kinds; and to enable all citizens to enjoy certain basic services. The role of town planning in this may seem marginal. However, it is important to note that it is the task of the urban planner to listen to the specific needs of the territories and not to produce well-made, empty areas. Physical reconstruction and endowment reconstruction must go hand in hand. Therefore, if it is not the sociologist's task to localise development possibilities, just as it is not the urban planner's task to identify the specific needs of the populations, it is the task of both to listen to each other in order to produce truly place-based projects that can make a contribution to the welfare endowment of the affected territories.

Different capacities and possibilities are linked to socio-spatial variation and existing inequalities in terms of income, education, age and access to services and assistance. Ignoring this socio-spatial variation may not provide adequate support for the diverse range of citizens in cities - in essence, reinforcing and exacerbating existing socio-spatial inequalities (S.A. Forrest, et al., 2020).

Today, it is the case that individuals find themselves alone to cope with the lack of services, of possibilities in the centres where they reside. They are thus required to have a quasi-entrepreneurial capacity in the area, while administrations prove to be too rigid and constrained. Individuals are thus more inclined to work in a network than with administrations, which are too slow and inflexible to produce concrete changes in their life projects. These forces can unite and feed off each other, thus configuring Third Sector entities.

4. The role of the Third Sector

The third sector brings together a rather wide range of non-profit organisations (social cooperatives, voluntary associations, non-governmental organisations, foundations, social enterprises, etc.) that represent with their work an unquestionable effective response to the progressive loosening of the welfare state, occupying market niches (such as the social, welfare and socio-educational services sector) that for-profit companies find it unlucrative to cover.

With the Third Sector Code[3], which came into force in Italy in 2017, a new approach to fund management is growing. Third Sector entities[4] carry out activities of general interest, like administrations, whose restrictions they do not share. This is why forms of relationship are envisaged between the two entities that do not presuppose, as in the case of market entities, different and opposing interests, but a partnership to pursue a shared purpose together. What the third sector can do is to co-programme and co-design and thus offer itself as a subject that can to all intents and purposes dispose of funds to promote place-based approaches and multi-level governance, bridging the gap between national and individual policies. (Pallucchi, 2022)

The Third Sector is a variegated and complex world, embracing the practices of the voluntary sector and approaching social work alongside institutions. Embedded permanently in welfare, it favours innovation and the professionalisation of social work. The reform path of the Third Sector has highlighted the potential of re-inscribing individual suffering in a collective horizon of meaning that gives a supra-individual meaning to personal experience (Fiorillo 2021). In the contemporary globalised world, associationism is recognised as a structured and stable organisational form of civil society and is publicly identified as a strategic subject for the survival of communities and the European Union itself (Chanial 2001).

Interest is focused on the functions that non-profit organisations perform within society and especially on the relational aspects that characterise their relationship not only with the community and individual users, but also with local authorities and other third sector organisations.

[3] The Code of the Third Sector with Legislative Decree no. 117 of 3 July 2017 and subsequent amendments provided for the overall reorganisation and revision of the regulations for the Third Sector and, in a homogeneous and organic manner, the entities that are part of it.

[4] In this paper we will also refer to Third Sector entities as associations, non-profit entities and forms of associationism, indistinctly, since this is not a research on the nature of these entities but on their effects in the territories

The latest Istat[5] census on the Third Sector entities shows the strong involvement of stakeholders (77.2% for consultation activities, 53.7% for planning, 47.9% for implementation) and the rate of involvement of public stakeholders such as public services, schools and research bodies, local public bodies is also significant, 41.6% of these involve research bodies, highlighting a vocation for innovation (on average 34.7% for consultation activities, 23.3% for planning, 28.1% for implementation) (ISTAT 2023)

This paper will consider forms of associationism that are concerned with generating services and transforming places with their activities. This type of bottom-up activity is closely linked to listening to the needs of territories, which are too often at the mercy of the time and funds of administrations and central government too far removed from the punctual needs of the centres. It is a 'gentle force', as statesmen call it, capable of generating cohesion and economy. It activates interactions between volunteers, stakeholders and recipients, creating a participatory model for the governance of the country. The presence of associations can promote a 'local, responsible and shared' welfare (ISTAT 2023) that overcomes the slowness of administrations and acts for and with the territories, in times of peace and crisis, working for its social resilience. In this sense, the European Union's cohesion policy emphasises the use of multi-level management of development processes, the development of new local institutions and the creation of new partnerships. In fact, the programming documents emphasise the importance of territorial networks and, in the guidelines, call for their increasing involvement.

These subjects have already entered public policies, calls for tenders and national strategies (which take the form of funds and guidelines for small centres) to generate concrete effects in terms of housing attractiveness (considered a macro-indicator for these strategies). Suffice it to say that with Covid, aid has been given to families, businesses but also to Third Sector entities. A sign that it is now considered part of the national economic system.

In this sense, volunteering does not replace public services, but rather complements the offer by managing public spaces, expanding the possibilities and vitality of territories. By its very nature, volunteering is itinerant and services are sedentary. The former responds to a specific and temporary need, the latter can listen to these 'gentle forces' and monitor their effects on welfare in order to decide to intervene with more structured measures even on physical assets.

The great work with communities makes these bodies a very important source of data that is little systematised and shared. In fact, while administrations do not always involve

[5] Istat is the Italian National Statistical Institute

associations in the planning and design stages, they do not have the resources and (rarely) the skills to systemise the data they access through their actions.

The Third Sector, an experimental site of new relational networks, is increasingly called upon to manage the transformation and to structure the articulation between informal and institutional networks. The integrated welfare model, which is based on mixed public-private organisation, is consolidating as the main organisational form of personal services. This type of territorial organisation is highly resilient because it stems from a bottom-up approach of listening to the forces present among citizens and asking administrators to intervene in needs. In this way, reconstruction projects can count on a strongly place-based outlook that allows them not to disperse energy and funds with top-down projects blindly replicated in all the small municipalities. The PNC approach in this sense is, in its intentions, effective: the range of proposed strategies on which to participate, the openness to Third Sector entities and the design support offered in many cases by the Foundations.

However, results in hand, applications were received for less funds than those allocated in many categories, one of them being B 2.3, aimed at Third Sector entities. In fact, their participation was hampered by a format designed for companies and not facilitated for smaller entities with different capacities, one wonders whether the better approach was not that of measure B 2.2 where Third Sector entities could be involved by administrations in projects as non-lead partners.

The difference between the two approaches lies in the nature of these entities, which can more easily become involved as facilitators of larger processes stimulated by central funds. This approach moves in two directions: on the one hand, the administrations grasp from the agencies the needs of the territories and incorporate their demands within long-term planning objectives and projects; on the other hand, the agencies interface with the administrations to collaborate in the active management of the territory through co-programming and co-designing.

Co-programming and co-designing[6] are modes of relations between public bodies and the Third Sector inspired by the principle of collaboration. In fact, the Third Sector entity is characterised by carrying out activities of general interest that make it homologous in terms of purpose to the public entity: for this reason, forms of relations between the two entities are envisaged that do not presuppose, as in the case of market entities, different and opposing interests, but a partnership to pursue a shared purpose together.

Unlike traditional planning, which eventually engaged the public and the third sector in analysing problems and defining objectives, but then left full discretion to the public

[6] Art 5 Cod. Terzo Settore D. leg 3 luglio 2017, n117

entity to contract out services, the new collaborative practices are based, at least on a theoretical level, on a sharing of both intentions and responsibilities in the implementation of interventions.

Co-designing, co-programming and collaboration are increasingly included in governance processes: the Third Sector is the most representative entity in this.

The key concepts of community programming are real watchwords around which shared intentions and concrete interventions are built. In this field, a progressive coherence emerges in the delegation to the Third Sector (Fiorillo 2021). The concept of active citizenship, which chronologically follows that of social cohesion, precedes reflection on the concepts of 'community' and 'common good', real theoretical tools designed to connect individual and collective action to the idea of community.

4.1. Experimentations

Although the field is still experimental and examples of application are not many, the Third Sector is certainly not new to actions that actively act for local welfare. (Accorinti M., 2008)

Open and participatory schools[7], a project promoted by MoVI (lead partner) and Labsus, deserve a mention in this type of practice. These experiences have highlighted how the open school gives rise to inclusive processes and generates social ties, which make it possible to build a broad and cohesive educating community, aware of the needs of its constituents. "The involvement of families and children in the planning of activities and in the co-management of the school space is a pivotal element in activating resources and capacities, designing a new way of conceiving the school: a school as a Common Good to be cared for and enjoyed in a creative and shared manner." (Labsus, 2020)

In Italy there are widespread experiences of 'Open Schools' that have the characteristic of opening the school after school hours to the territory, involving students/former students, parents, citizens of the school's territory, third sector bodies as co-managers of the common good (Fig.2). In this practice there is the functional idea of building around the building real "civic poles" intended as "places of participation" where the citizens of a territory support their school and at the same time the school helps a territory to have a project for the future. This is a subsidiary vision where the state school service managed by school workers is joined by the use of the school building as a common good of the territory managed with the voluntary and free action of citizens, starting with the students and parents of the schools themselves. These experiences have been able to

[7] Available at: …..

build a bridge between School and Territory, making the concept of Educating Community concrete and experimenting with new administrative tools such as territorial 'Collaboration Pacts' or 'Community Educational Pacts'.

Figure 2. An Open School experience in Pescara, promoted by OCA, credits: Simionato L.

In this wake, Labsus promoted the 'Schools Proximity Territories' [8] project, which investigated the relations between schools and territories in small towns in the Italian provinces. The hypothesis is that, through a comparative look, it is possible to highlight some specificities of the relations between schools and territories where differentiated needs of conceiving a public service such as a school emerge.

The foundations were laid for an integrated model of co-design between school and territory. The school building has strong roots in the territories, it is the first garrison of the State. In small schools, diversifying the offer and uses in these structures is essential to ensure their survival, to intercept the educating community and to propose themselves

[8] Available at: https://www.labsus.org/2022/02/piccole-scuole-patti-e-comunita/

as a service to all citizens. In the case study of the “Istituto Omnicomprensivo Bobbio”, an approach to the school as an educational centre was experimented with flexible school agreements allowing for greater customisation and community involvement. The centres are functional for the organisation of multiple configurations and local and global resources. The opening of school walls to the community, even beyond canonical hours, fostered forms of learning, civic engagement and social innovation.

On a different scale, but with an equally relevant impact, are the activities of the 'villa library' and 'community wood-burning oven' in Villa San Sebastiano, in a hamlet of Tagliacozzo in Abruzzo, strongly characterised by lack of services and socio-spatial inequalities (Fig.3). Here, the association 'Gli amici' was formed to keep the village library open, where writers are sent to present books, events are organised and the village is kept active. On the fifth anniversary of the birth of the library in Villa, in 2022 the association built the Anfiteatro Aureo, a self-built theatre made of hay bales in which they host meetings, debates, book presentations, screenings and food.

Figure 3. The hamlet of San Sebastiano, reworked by the author, credits: Google Earth

The re-appropriation of places and the residents' imaginations that materialise are an element of resilience that sees in these forces the key to the survival of these places. Open space thus bends to new uses that administrations may or may not take up.

5. Conclusions

The novelty of these processes that are being promoted could be a testbed to be monitored for internal areas, with less and less administrative capacity and more and more need for networking skills and experimentation. The third sector makes it possible to go beyond the traditional boundaries of formal administrative divisions, allowing practices tried and tested in other projects to spread and support local welfare, promoting the capacity of communities to carry out projects.

Enhancing the social capital offered by Third Sector organisations towards increasingly desired and tested processes of open governance is increasingly in demand. In this way, projects are based on the synergy of different institutional actors and other proponents through implementing agreements of understanding and collaboration pacts for the care of common goods, for an integrated and place-based approach to reconstruction.

Although there are public engagement policies activated by local institutions to involve citizens, they often highlight several critical issues related to processes and effective listening to communities. Many of the project initiatives investigated limit themselves to promoting the trust and consensus of local administrations on the policies implemented through the transparency of information, encountering difficulties in the development of more inclusive forms of territorial development. In this sense, the Third Sector must be considered as a guarantor and promoter of know-how and interests that actually pertain to its community of reference.

All official documents (Senday framework, Ipcc, Undr) refer to the concept of resilience, with this research the importance of Third Sector actors in its construction was analysed. Recalling the principles of the City Resilience Framework for resilience (Arup 2014), it can be stated that a cohesive territory in which the levels of Third Sector participation is relevant will be:

- reflective: accepting of the inherent and ever-increasing uncertainty and change in today's world. They have mechanisms to continuously evolve, rather than seeking permanent solutions based on the status quo. The presence of associations that are ready to listen to the new needs of the territories allows administrators to have reference points to look to, in order to study long-term interventions generally slowed down by bureaucracy. As a result, people and institutions examine and systematically learn from their past experiences, and leverage this learning to inform future decision-making;

- redundant: It includes diversity: the presence of multiple ways to achieve a given need or fulfil a particular function. Networks promoted by third sector organisations generate resilient systems of service provisioning, as they are generally not rooted in a defined establishment, but often operate in the public spaces offered to them, they are the part of welfare most easily reactivated in the event of disaster;

- flexible: a system that can change, evolve and adapt in response to changing circumstances. The activities of associations are generally scattered throughout the territory, they are offered in public spaces such as schools, sports halls and squares. The spaces that host these activities remain open beyond canonical hours, remain manned and become real commons. They thus transform 'traditional' spaces and uses in new ways;

- resourceful: implying that people and institutions are able to rapidly find different ways to achieve their goals or meet their needs during a shock or when under stress;

- inclusive: emphasising the need for broad consultation and engagement of communities, including the most vulnerable groups. Addressing the shocks or stresses faced by one sector, location, or community in isolation of others is anathema to the notion of resilience. In this sense, the Third Sector has the capacity to generate community, including the most vulnerable groups and promote territorial re-appropriation. An inclusive approach contributes to a sense of shared ownership or a joint vision to build city resilience;

- integrated;

- robust.

References

Accorinti M. (2008), *Terzo settore e welfare locale*, Carocci, Roma.

ARUP, supported by The Rockefeller Foundation (2017) *City Resilience Index. (Arup publication) [PDFs (6 research Volumes & 1 Brochure)*] Available at: www.cityresilienceindex.org

Chanial P. (2001) Société civile, société civique? Associationnisme, libéralisme et républicanisme, in Laville J.L., Caillé A., Chanial P. (a cura di) Association, démocratie et société civile, La Découverte, Paris, pp. 141-161

City Resilience Program (2020) *Annual Report July Washington, D.C.* World Bank Group. http://documents.worldbank.org/curated/en/343941611599652517/City-Resilience-Program-Annual-Report-July-2019-June-2020

Consiglio dei Ministri (2021) Piano Nazionale di Ripresa e Resilienza (PNRR). [Online] available at: https://www.italiadomani.gov.it/it/home.html

Constable, A.J., S. Harper, J. Dawson, K. Holsman, T. Mustonen, D. Piepenburg, and B. Rost (2022) *Cross-Chapter Paper 6: Polar Regions*. In: Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment

Dall'Asta A., Morici M., Roselli G., Enrica Petrucci E., Giovinazzi S., Giordano L., Sciortino M. (2021) ARCH D5.2 Handbook on Heritage Asset Vulnerability

Davoudi S., Shaw K., Haider L. J., Quinlan A. (2012) Resilience: A Bridging Concept or a

Dead End? “Reframing” Resilience Challenges for Planning Theory and Practice Interacting Traps. In Planning Theory and Practice. DOI: 10.1080/14649357.2012.677124

Esposito F., Russo M., Sargolini M., Sartori L., Virgili V. (2017) *Building Back Better: idee e percorsi per la costuzione di comunità resilienti*. Roma, Carocci ed.

Fera G. (2020). *La gestione dei rischi: settorialità e logiche emergenziali versus integrazione e nuove visioni di futuro*. In A. Galderisi, M. Di Venosa, G. Fera, S. Menoni (A cura di), Geografie del rischio. Nuovi paradigmi per il governo del territorio (pp. 133-145). Roma: Donzelli Editore

Fiorillo A. (2021) Dono e desiderio. L’associazionismo tra volontariato e lavoro. Verona, Ombre corte ed.

Forrest S.A.; Trell E., Woltjer J. (2020) *Socio-spatial inequalities in flood resilience: Rainfall flooding in the city of Arnhem*. Cities Journal Vol.105

Galderisi A. (2014) *Climate Change Adaptation. Changes and Opportunities for Smart Urban Growth*, in Tema. Journal of Use, Mobility and Environment, 7. pp. 43-67

Galderisi A. (2020). *Introduzione*. In A. Galderisi, M. Di Venosa, G. Fera, S. Menoni (A cura di), Geografie del rischio. Nuovi paradigmi per il governo del territorio (pp. 133-145). Roma: Donzelli Editore

Galderisi A. (2020). *Per una metamorfosi dell’agire urbanistico*. In A. Galderisi, M. Di Venosa, G. Fera, S. Menoni (A cura di), Geografie del rischio. Nuovi paradigmi per il governo del territorio (pp. 3-5). Roma: Donzelli Editore

Gori C. (2022) *Fragilità*. In Le parole dell’uguaglianza (pp. 85-90). Roma, Donzelli ed.

Graziano P. (2012) Rischio, vulnerabilità e resilienza territoriale. In Quaderni del dipartimento di scienze economiche e sociali. Quaderno N. 87. Serie Rossa: Economia disponibile al sito: https://dipartimenti.unicatt.it/dises-wp_rossa_12_87.pdf

IPCC (2022) *Annex II: Glossary*. In: Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. In Press.

ISTAT (2022) *Rapporto annuale, capitolo 4*. Reperibile al sito: https://www.istat.it/storage/rapporto-annuale/2022/Capitolo_4.pdf

Istat (2023) Censimento permanente delle istituzioni non profit. I primo risultati. Available at: https://www.istat.it/it/files//2023/05/Censimento-non-profit-primi-risultati.pdf

Labsus (2020) Seminario web promosso l’11 novembre 2020 dal progetto con Marco Rossi Doria. Available at: https://comune-info.net/scuole-e-territorio-incontro-con-marco-rossi-doria/

Lucatelli S. Luisi D. Tantillo F (2022) *L’Italia lontana. Una politica per le aree interne*. Roma, Donzelli ed.

Lucatelli, S., Luisi, D., Tantillo, F. (2022) L’Italia lontana. Una politica per le aree interne. Roma: Donzelli ed.

Magni, F., Magnabosco G. (2020). *Verso un approccio quantitativo a supporto dei processi*

di pianificazione costiera climate proof. In A. Galderisi, M. Di Venosa, G. Fera, S. Menoni (A cura di), Geografie del rischio. Nuovi paradigmi per il governo del territorio (pp. 149-157). Roma: Donzelli Editore

OECD (2013) *After the Disaster. Who cares?* OECD publishing, Paris

Oliva, D. (2022) Welfare. In Associazione di Fondazioni (eds.) Le parole dell'uguaglianza (pp. 217-224). Roma: Donzelli ed.

Pallucchi, V. (2022) Terzo settore. In Associazione di Fondazioni (eds.) Le parole dell'uguaglianza (pp. 213-216). Roma: Donzelli ed.

Pattaro F. Ranuzzini M. (2017) *Amministrazioni locali, ricostruzione e riorganizzazione: tra vincoli normativi e necessità contingenti.* In Esposito F., Russo M., Sargolini M., Sartori L., Virgili V. (a cura di) *Building Back Better: idee e percorsi per la costuzione di comunità resilienti*. Roma, Carocci ed.

Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. In Press.

Sampson RJ (2017) *Urban sustainability in an age of enduring inequalities: Advancing theory and ecometrics for the 21st-century city*. Proceedings of the National Academy of Sciences 114(34): 8957–8962.

Sargolini M. Pierantoni I. Polci V. Stimilli F (2022) Progetto rinascita centro Italia. Nuovi sentieri di sviluppo per l'Appennino Centrale interessato dal sisma del 2016

SNAI (2013) Strategia nazionale per le Aree interne: definizione, obiettivi, strumenti e governance. [Online] available at: https://www.miur.gov.it/documents/20182/890263/strategia_nazionale_aree_interne.pdf/d10fc111-65c0-4acd-b253-63efae626b19

UNISDR (2015) Sendai Framework for Disaster Risk Reduction 2015-30, United Nations Office for Disaster Risk Reduction, Geneva

Word Bank (2011) *Guide to climate Change Adaptation in Cities: Executive Summary*, Word Bank, Washington

ECONOMIC POLICY AND SPATIAL PLANNING. THE CASE STUDY OF THE SPECIAL ECONOMIC ZONE (1112)

Vasiliki Charalampidou
Urban & Regional Planner, National Technical University of Athens, Athens, Greece; vacharala1992@gmail.com

Abstract. Regional policy, which basically lies in the balancing of spatial disparities, combined with the optimization of the efficiency of placements, make up the spatial development policy, which is implemented through planning. This proposal is about incorporating, coordinating, and attempting to balance economic policies and spatial planning in the European Union and Greece.

The most widespread tool is the Special Economic Zone (SEZ), which is based on economic policy and spatial agglomeration theories. SEZ involves issues of urban development, such as location, size, the distance from the existence of resources and raw materials, connection to networks and infrastructure, etc.

The effectiveness resulted from a study of three examples; Ireland, China and the most active in Europe, the Polish Zone. In Greece, there is no institutionalised SEZ, even though the issue is not unprecedented and returns to the debate at regular intervals.

In conclusion, three (3) pillars are recognised for the achievement of the SEZ in a country: (i) the correlation of the strategic approach of the SEZ and the development policy; (ii) the strategic dynamism, regarding the risk of such a venture both for business investors and for the state; and (iii) implementation. To the above, a fourth pillar the integrated approach to spatial planning outside the zone could be added.

Keywords: Special economic zone, spatial planning, spatial agglomeration, economic policy, free taxes.

1. Special Economic Zones As An Investment Location Tool

Regional development strategies in different countries are converging towards cohesion policy and reducing disparities. This is why integrating investment attraction these strategies is a one-way street.

The most widespread tool in the world regarding the location of investments are the Special Economic Zones, which basically come from economic policy. According to the definition provided by the United Nations, a Special Economic Zone is defined as a geographically demarcated area within which certain tax and development incentives

apply to boost industry and investment in general (UNCTAD, 2019).

Special Economic Zones (SEZs) are subject to differentiated economic regulations from other areas in the same host country, with the aim, of course, of attracting investments. In some sectors of economic activity that are lagging behind. Their characteristics essentially lie in two parameters, innovation and the institutional framework. The differentiated economic and tax policy that governs them offers direct benefits to companies or individuals that operate within them, while at the same time, it attracts other companies and individuals to operate there, making it an attractive place.

Special Economic Zones are widely used in most developing and developed economies. Globally, the latest 2018 figures show the existence of 5,400 Special Economic Zones of various types (export processing, industrial centers/parks/free zones, free trade zones, business zones, agricultural zones, and investment zones) in 147 economies, compared to 4 million that existed in 2014 (UNCTAD, 2019).

2. Historical And Institutional Framework

These zones are the evolution of the "Free Zones" or "Free Trade Zones" (free trade zones) of the 1970s and 1980s, the directions and standards of which were defined in the revised version of Kyoto, the World Customs Organisation. A "free zone" is defined as an area of variable size in which established companies are exempted from the common regime applicable in the host country, in particular with regard to customs and/or taxation, in exchange for the creation of jobs, the encouragement of domestic exports, and the mobilization of the economy in new areas of activity (Bost, 2010). Free Zones remain at the heart of Special Economic Zones, but are a subcategory of them, that of areas with different customs policies.

At the community level, the provisions governing the destination of Free Zones are articles 166 – 181 of the Regulation of the Council of the EEC with number 2913/1992 on the establishment of the Community Customs Code (L 302/19.10.1992) and articles 799 - 814 of the Regulation of the Council of the EEC with number 2454/1993 for the determination of certain implementing provisions of Regulation (EC) no. 2913/92 of the Council on the establishment of the Community Customs Code (L 253/11.10.1993). According to the above, there are two types of Zones, as follows:

- Type I Free Control Zone: It is based on the existence of a fence, whose perimeter and entry-exit points, determined by the Customs Authority, are subject to customs surveillance. Within the said Zone, it is permitted to carry out activities of an industrial, commercial nature or the provision of services with prior notification to the customs authorities.

- Type II Free Control Zone: For this type, fencing is not mandatory and thus, it is mainly indicated in the cases of Ports with many activities, as well as in the case of the utilization of existing industrial zones, not subject to a future regime of Special Economic Zones.

The various types and definitions given from time to time, Special Economic Zones, Free Trade Zones, Free Zones, etc., are used to describe geographically defined and specially managed areas within a country, created to attract direct local and foreign investment, enhancing trade, employment, industrial development and entrepreneurship. The incentives used may vary significantly from country to country and from zone to zone. In addition, they can be managed by national, regional or local authorities, the public sector or public-private partnerships. More generally, the legal status and administrative procedures for the conditions and means of operation of the Special Economic Zones are determined by the national legislation of each state, with the result that the differences are enormous.

However, at the level of the European Union, the creation of a Special Economic Zone contradicts the Authority with the basic legislation of the EU and in particular, with the Treaty of the European Economic Community (EEC) of 25/03/1957, as amended by the Treaty of Lisbon of 13 December, 2007. The incompatibility is due to the purpose of establishing and ensuring the smooth operation of the internal market (article 60 EEC), as well as the right to free movement of goods within the customs union (article 28 EEC).

Despite this, Article 28 of the Treaty of the EEC allows deviations from the conditions governing the operation of the internal market, provided that these are of a temporary nature and cause the least possible disruption to its operation. It also provides for the legislative integration of the internal market, with regard to the customs union, competition policies and conservation measures, which fall under the exclusive competence of the Union, as well as a common commercial policy as an external dimension of the internal market (Article 3 EEC). The creation of such a new zone must comply with the General Block Exemption Regulation (Karakas et. al., 2020), while also falling within the State Aid definitions.

3. The Role Of Spatial Planning

Special Economic Zones are becoming increasingly popular as a means of promoting economic development. Over the past two decades, most states in developing and transition economies have made the promotion of Special Economic Zones central to their economic policy. They are promoted to stimulate economic development both within the zone by attracting investment and new businesses that will create jobs and facilitate the transfer of technology and know-how, and outside the zone by creating networks and synergies, knowledge diffusion and promotion of the complementarity of

economic sectors (World Bank Group, 2017). Despite this, there are also reactions from other business sectors, which argue that, because of them, unfair competition and lower environmental and social standards are created.

Throughout this process, spatial planning, although it should have been the tool for implementing such investments attraction policies, mostly follows them and works in addition to other approaches. From a spatial point of view, the Special Economic Zone, although an economic concept involves issues of urban development. Location, size, distance from the existence of resources and raw materials, connection to networks and infrastructure are some of them. Devadas and Gupta (2011) describe it as various systems which are in direct connection with the Special Economic Zone, which in turn activates the dynamic functions of the urban system and the investment functions of development.

Their entire logic is based on economic and spatial agglomeration theories. Economists and geographers have argued that economies benefit from the clustering of industries and businesses, either as companies in the same sector (localization economies), or as different businesses in the same location (urbanization economies). These types of businesses have been proven to have many benefits, such as spillover profits, economies of scale and cost efficiencies. The concentration of economic activity allows the transfer of knowledge and technology more easily. This philosophy is followed by most European countries, which, while they have not instituted and implemented Special Economic Zones, the direction of their regional and spatial planning policy is the concentration of businesses and industries in a certain area.

The design and development of Special Economic Zones involves a range of partners and stakeholders whose coordination is essential for the organization and operation of the zone. Firstly, it must be ensured that the Zones are aligned with national and local objectives, planning strategies, maximizing synergies and promoting cooperation. The governance of the Zone must be subject to transparent, efficient, consistent and safe procedures for all (Wyman, 2018).

At the national level, competent bodies can be either ministries for spatial planning, economic development and fiscal matters, or sectoral ministries or specialized organizations, including those responsible for public-private partnerships. In addition, investment promotion organizations at national, regional and local level are strategic partners and can play an important role in attracting and facilitating investment within the zones. Finally, the SEZ also establishes strategic relationships with the local private sector, including business associations (UNCTAD, 2020).

4. Case – studies of SEZ

In order to contribute to regional development and increase competitiveness, some

Eastern European states, such as Poland, Slovenia, Croatia, etc. have created Special Economic Zones, which offer an attractive combination of tax and tariff incentives, improved customs procedures, infrastructure provision and the creation of business clusters. In the countries of Western Europe, such as Great Britain, France, Italy, Denmark, etc. there have been institutionalized and operating Free Zones for several years, in which packaging and storage processing activities are allowed, due to the relevant EU regulations, with the exception of the export-processing zones of Hamburg (Germany), the Azores and Madeira (Portugal) and the Canary Islands (Spain). The rest operate as Free Control Zones type II, located within ports.

Apart from the theoretical background, however, it is necessary to investigate this tool in practice. Thus, three examples are chosen to be presented. The case of Ireland which is considered the beginning of the implementation of the Zone has had very good results. China relied on the positive consequences of Ireland, which, after much criticism, also applied the tool of the Special Economic Zone, as analysed in the second example. The last case study concerns the most recent, active and first in activity in Europe today, as it has been characterized, the Polish Zone. Since then, similar policies have been established in more than 130 countries worldwide, most of which are located in the developing world, because there they seek to promote industrial development, attract foreign investment and create jobs (Cheesman, 2012).

4.1 Shannon – Ireland

The first successful case study concerns Shannon Airport in Clare, Ireland, an area of 2650 acres. In 1947 the Irish Parliament passed a new Customs Act, which exempted the passage and embarkation of passengers, goods and aircraft from normal customs procedures. The idea was pioneered by businessman Brendan O'Regan, who proposed the creation of a small zone just outside the airport where foreign investors could be exempt from central Irish government regulation and taxation.

The Shannon Free Zone offered companies tax breaks and VAT exemptions on imported goods and goods used in the production of exports. Corporate taxes were reduced and grants were offered to companies to support research and development within the zone. In addition to the first zone, a second one was created, Smithstown, an industrial area developed as a satellite location for domestic businesses that became suppliers to the larger companies.

Since 2005 the Zone has had the same tax rate as the rest of Ireland, while most businesses have been services. The incentives offered are no different from those of the rest of the Irish economy, as EU rules on state aid have made it illegal to provide special laws or exemptions from regulations in certain areas.

Recently, urban regeneration and re-engineering of this area have been proposed, with the core concept being a center of excellence for aerospace, advanced manufacturing, industry and commerce.

4.2 Shenzhen – China

The second successful case study is in China, where in 1979, three Special Economic Zones were created in the southeastern coastal region of Guangdong Province (Guangdong), Shenzhen, Zhuhai and Shantou, and one in Fujian Province, Xiamen. Shenzhen was founded in 1979. A year later, the Special Economic Zone was established, including the areas of Luohu, Futian, Nanshan and Yantian, 327 sq km. south of Shenzhen. There, however, things were different because the entire development was combined with the implementation of an expanded spatial development plan.

Between 1982 and 1985, 85 km were built after the establishment of the Shenzhen Special Economic Zone in 1980. Then, many spatial development structures emerged inside and outside the Zone. In addition, the Municipality proceeded to formulate the Shenzhen Special Economic Zone Masterplan in 1982, which was revised in 1986 with a target year of 2000, adopting a policy of cluster, node and axis spatial arrangement to control urban development (Deng et al., 2018), an element that is followed and expanded to this day. However, the lack of systematic planning and development outside the Zone had far-reaching consequences, resulting in the conflation of Zone policy with urban planning. The actions until then revealed the negative correlation of the land development policies and the spatial policies of the Zone (Yuan, 2020).

The fact that the practice of Special Economic Zones has worked in China is a novelty in terms of its political landscape, as it is the first time that liberal economic environments promote innovation and progress. Many economists agree that this was also the motivation for its successful national reform. Today, after more than forty years since the operation of the first Zone (1980 – 2020), the Chinese government still offers tax incentives to foreign investors within the Zones, to further develop the infrastructure and the areas in general.

4.3 Łódź – Poland

The Łódź Special Economic Zone was established in 1997, occupies 17,750 hectares, covers the entire Łódź Region, part of the Mazowieckie Region and the eastern part of the Greater Poland Region and includes companies involved in production, IT services and research and development.

This is an excellent location, as the Zone is located at the junction of the two main highways of the Region, close to the two international airports of Warsaw and Łódź and has access to an extensive railway network. These advantages, combined with tax exemptions, industrial tradition with the utilization of abandoned shells and integrated services for the implementation of investment projects, made the Special Economic Zone

an ideal place for investors interested in developing their activity (Polish Investment & Trade Agency, 2021).

In fact, according to the Foreign Direct Investment Markets Company (2020) of the Financial Times Group, the Special Economic Zone of Łódź has been characterized as the best in Europe and the third in the world in the recent ranking of 2020. In the global ranking, the first place is held by the Special Economic Zone in the United Arab Emirates and the second by Morocco.

To date, it has made progress in its efforts to become a center of the 4th Industrial Revolution in Central and Eastern Europe. Foreign investors committed to a new investment project worth 530 million euros in 2019, which is underway. Advanced manufacturing and research and development activities are included in the new business licenses issued in 2019, as Polish economic zone legislation has been revised to boost investments with higher value-added content. The Łódź Special Economic Zone continues to this day, offering a wide range of services aimed at technology start-ups and small and medium-sized enterprises, with a special emphasis on, among other things, the development of 5G industrial use cases and connectivity, with the expectation of becoming a start-up park -ups.

4.4 The case study of Greece

Concerning Greece, there is no institutionalized Special Economic Zone, even though the issue is not unprecedented, and returns to the debate at regular intervals.

The beginning was made in 2011, a decade ago, when it was first discussed in the midst of Memoranda and proposed by the then German Deputy Minister of Finance and the European Commissioner for Finance, the creation of a Special Economic Zone in the five Regional Units of the Region of Eastern Macedonia and Thrace, for which tax rates were envisaged at Irish levels, i.e. fast licensing procedures, and a 'premium' for businesses to create jobs, use local raw materials and transfer know-how.

The constitution, operating conditions and the final form of the legislation for the creation of the Special Economic Zone is a decision of the EU (Makryianni, 2015). According to the current institutional framework, as mentioned above, the establishment of a Special Economic Zone primarily requires special legislation, taking into account the Union's fundamental principles and policies on state aid, foreign trade and customs law. As long as it is documented to the Commission, the possibility of granting an exemption for a period of time and the EU and Greek Government the required fiscal and financial tools, the creation and operation of the Zone is possible.The study prepared by Capital Markets Expert S.A. (2012) on behalf of the Economic Forum of Thrace, the business world and local bodies, proposed the creation of thematic SEZ, with the aim of exploiting the comparative advantages of each region with special incentives, while the creation of a central Management Authority of the Zone in the form of the Public Company, in which

51 percent (%) would be owned by state bodies and 49 percent (%) by private individuals or legal entities. It is essentially a "product - region", as it names it, which in total yields twelve (12) regional SEZ, grouped as follows:

1. Agricultural Products of Orestiada, for companies processing and packaging agricultural products with an export orientation. The operation of a trans-Balkan Agricultural Products Exchange is proposed.
2. Soufli Silk, for companies that will deal exclusively with the processing and export of silk and its products.
3. Services of Alexandroupoli, with the aim of attracting international banks, insurance and investment companies.
4. Industry & Technology of Avanta, Komotini and Xanthi, with state guarantee on loans for RES projects, zero VAT for services, maintenance of duty-free stock of raw materials.
5. Logistics of the Ports of Alexandroupoli and Kavala, for the needs of handling goods produced in the EEZs, with a provision for zero VAT. for the purchase of equipment, configuration of facilities and services.
6. Marble and Winery of Drama, with exclusively export orientation and duties of more than 3 percent (%) in the internal market, for reasons of equality in internal competition.
7. Tourism and Leisure Kavala – Thassos, Porto Lagos and Samothrace

Their duration would be at least fifteen years, while there was provision for the utilization of the organization and its infrastructure after the end of its operation as a Real Estate Project. The proposed incentives were horizontal for all the thematic-regional SEZ, but also vertical depending on the special needs that arise in the context of their operation.

The project in question did not proceed due to government hesitancy and resident resistance. A year later, in 2012, the then Minister of Development expressed his intention to establish a Special Economic Zone, however, the International Monetary Fund as well as the European Central Bank were strongly against the creation of such Zones, due to the public debt and the process of lending. Instead, the recapitalization of banks, privatisations and the institutionalisation of investments through fast-track procedures were proposed and some of them were subsequently adopted.

The counterargument that is being developed for the creation of a Special Economic Zone or management of the Free Zone in Greece concerns the privileges granted in favor of other states or multinational companies, with a corresponding limitation of national sovereignty and indeed, in special categories of areas, such as islands or border areas Regions.

5. Conclusions

Some interesting issues emerge from the study of the application of this economic policy tool:

- Separation between the Free Zone, which is part of the customs approach and the Special Economic Zone, which is an economic and development tool for export policy and investments attraction.
- The exclusive economic planning of these Zones is not enough, if it is not part of a single investment attraction policy, which takes into account both spatial factors and the effects of these Zones on the area.
- Spatial planning and development outside the Zones is equally important, as complementary functions and activities are attracted to those within the Zone. Therefore, the integrated spatial planning of the wider area in which it is located is necessary.
- Thorough examination of the causes of regional disparities, before the zoning and institutionalization of such Zones. Connection of regional policies and economic - fiscal incentives, with the aim of decongesting large urban centers (decentralization of business activity).
- Analysis and correlation of strategies and tools used by regional agencies to maximize investments recruitment and its benefits for the region (job creation, employment, economic development and research and innovation) as well as the interaction between the territorial dimension and the R&D strategies in the areas under analysis.
- European countries that did not follow the practice of these Zones, further strengthened their regional policies (agglomeration) with tax incentives, in order to achieve the integration of investments attraction in the regional development strategies of selected areas.
- The experience of implementing this tool has proven that in the wider area outside the Zone, complementary activities are attracted, with the result that development within the Zone also implies development outside it. Thus, the benefits spread throughout the wider region, with multiple important social consequences (combating unemployment, increasing living standards, etc.).
- Legislative regulation is required in a European context for the establishment of a Special Economic Zone in Greece.

In conclusion, Aggarwal (2019) recognizes three pillars for the success and achievement of the development results of the Special Economic Zones in a country: (i) the correlation of the strategic approach of the Special Economic Zones and the development policy, (ii) the strategic dynamism, regarding the risk of such a venture both for business investors

and for the state and (iii) implementation. To the above, a fourth pillar could be added, that of the integrated approach to spatial planning inside and outside the Zone.

References

Aggarwal, A. (2019) SEZs and economic transformation: towards a developmental approach. *Transnational Corporations.* 26 (2), p. 27-47.

Bost, F. (2010) *Atlas mondial des zones franches*. Paris: La Documentation Française/CNRS

Cheesman, A. (2012) Sp*ecial Economic Zones and Development: Geography and Linkages in the Indian EOU Scheme*. Development Planning Unit – The Bartlett, University College London.

Deng, Y., Bojie Fub, B, and Sun, C. (2018) Effects of urban planning in guiding urban growth: Evidence from Shenzhen, China. *Cities.* 83, p. 118-128

Devadas, V. and Gupta, V. (2011) Planning for Special Economic Zone: A Regional Perspective. *Journal of Institute of Town Planners*, 8 (2), p. 53 – 58.

fDi Markets (2020) Global Free Zones of the Year 2020. *Recognising the world's best free zones for FDI.* fDi Intelligence. [Online] Available from: https://www.fdiintelligence.com/article/78955 Accessed [26/04/2023].

Karakas, C., Stamegna, C. and Zachariadis, I. (2020) *Public economic support in the EU. State aid and special economic zones*. European Parliamentary Research Service.

Makrigianni, X. (2015) Looking for growth: Free Economic Zones in Greece. A critical approach. Master Thesis. Department of Geography. Harokopio University.

Polish Investment and Trade Agency (c2021) *Łódź Special Economic Zone*. [Online] Available from: https://www.paih.gov.pl/investment_support/sez/lodz Accessed [29/04/2023].

Shannon Commercial Properties (c2021) *The History of the Special Free Zone Shannon - the world's first free trade zone.* [Online] Available from: www.shannonproperties.ie/shannon-region/sfz-history/ Accessed [01/05/2023].

UNCTAD (2019) World Investment Report 2019. Special Economic Zones. Key messages and overview. [Online] Available from: https://unctad.org/system/files/official-document/wir2019_overview_en.pdf Accessed [25/04/2023].

UNCTAD (2020) Special Economic Zones and Urbanization. In 10th World Urban Forum. Abu Dhabi, United Arab Emirates, July 11th.

World Bank Group (2017) *Special Economic Zones. An operational review of their impacts. Competitive Industries and Innovation Program*. Washington: World Bank Group.

Wyman, O. (2018) *Special Economic Zones* as a tool for economic development. Over-hyped white elephants or valuable economic enabler in today's increasingly globalised market place? Marsh and McLennan Companies. [Online] Available from: https://www.oliverwyman.com/content/dam/oliver-wyman/ME/banners/Special%20Economic%20Zonesdigitalrev.pdf Accessed

[04/05/2023].
Yuan, Y. (2020) Studies on China's Special Economic Zones 3, Singapore: Springer & Social Sciences Academic Press.

PLACE IN PLACE-BASED APPROACHES: A FRAMEWORK FOR ANALYSING INTEGRATION, AGENCY OF PLACE, ACTORS AND INSTITUTIONS (1114)

Saskia Ruijsink

TU Delft, Delft University of Technology, Faculty of Architecture and the Built Environment, Department of Management in the Built Environment, Delft, The Netherlands; s.m.ruijsink@tudelft.nl

Abstract. Urban planning, design and place-based approaches have regained importance on the Dutch policy agenda. Especially integrated place-based approaches are promoted to address complex intertwined societal and environmental challenges at various scale levels, in urban and rural contexts. However, there is limited understanding about how integration comes about. This paper addresses this gap by focusing on agency of place. It develops an analytical framework for assessing the role of agency of place, actors, institutions and their interactions in integration. This framework is applied to two Dutch place-based processes: 1) National Programme for Rotterdam South (NPRZ) and 2) Area-Deal Alblasserwaard-Vijfheerenlanden. This application results in a refined, empirically informed and theoretically substantiated framework where the dimension of time appears of critical importance for realising place-based integration.

Key words: place-based approach, place agency, integration, transdisciplinary, place-based transformative capacity

1. Introduction

The Netherlands has a long history and strong tradition of urban planning, design and integrated place-based approaches for addressing societal and environmental challenges. Since 2000 the Dutch National Government reduced its focus on spatial policy, emphasised decentralisation and reduced also its national funding, for example national programmes and support for neighbourhood improvement was minimised. The dismantling of the Ministry for Housing, Spatial Planning and Environment (in Dutch: Ministerie van VROM) in 2010 marked this change (RLI, 2021). Recently there is renewed attention for spatially oriented approaches within the National Government, since 2022 there is a new Minister for Housing and Spatial Planning (Koninkrijksrelaties, 2022) and especially integrated place-based approaches are being promoted to address complex intertwined societal and environmental challenges at various scale levels (see for example: Ministerie van Landbouw, 2022; Volkshuisvesting en Ruimtelijke Ordening, 2022). While

there are high expectations of applying a place-based approach, that uses the place of concern as a platform for integration of various policy objectives and concerns (Runhaar, Driessen and Soer, 2009; Mirti Chand, 2018; Agger, 2021), there is still limited understanding about how integration works. In this research I seek to enhance this understanding by developing a perspective that gives place a central position in the integration process and where place has agency (this understanding is in line with: Larsen & Johnson, 2016). I build on academic, professional and local knowledge about place and place-based approaches in the Netherlands, Europe and beyond and use empirical data for refining the understanding. This results in an empirically informed and theoretically substantiated, analytical framework that can be used to assess the role that agency of place plays in integration. Furthermore, it can form a basis for the design of capacity development interventions (e.g. in follow-up (action) research), within and beyond the Dutch context, as is discussed in the conclusions section.

1.1 The Importance and Challenge of Integration

Place-based approaches promote collaboration across different actors, sectors and policy fields with the goal to develop a place in a coherent manner (Schell, Hilmi and Hirano, 2020; Agger, 2021). While it includes cooperation, coordination and integration of policy (Barca, McCann and Rodríguez-Pose, 2012), it is a distinct form of policy integration (Nadin *et al.*, 2021) since it is concerned with the specifics of a locality or a *place*. Despite its integrative potential, applying a place-based approach is not straightforward, it involves struggle, learning and negotiation (’t Hooft, Uyterlinde and van der Ham, 2021; van der Velden, Fokkema and van Tol, 2021; Ruijsink, 2023). This struggle can partly be explained by our motivation for integration within place-based approaches. In the Netherlands it is consistently argued that spatial claims (for realising housing, energy transition restoring nature, etc.) are larger than the amount of space that is available. An integrated and place-based approach needs to be applied so we can realise a ‘smart combination of functions’ within the space available (Volkshuisvesting en Ruimtelijke Ordening, 2022). While the importance of the ‘bearing capacity’ of nature, including water and soil systems is increasingly recognized in Dutch policy (Rijksoverheid and Ministerie van Algemene Zaken, 2022), it primarily employs an anthropocentric perspective on place. Human beings develop places to enhance the spatial quality and to provide human beings with a safe and comfortable living environment. This is supported or hindered by institutionalized agreements. In a place-based process different actors struggle and negotiate around materializing their (individual) spatial claim. Additionally they engage in a collective process focusing on identifying and realising synergies between different spatial claims that can be innovative and focused on (transformative) learning (Horlings *et al.*, 2020; Ruijsink, 2023). Understanding how integration comes about within place-based approaches is concerned with understanding the dynamics between actors and institutions, primarily in their interaction with the place.

1.2 Hypothesis and Research Questions

My understanding of place is inspired by the work of various (decolonization of knowledge) scholars and that is grounded in local and traditional forms of knowledge (see: Bawaka Country et al., 2016; Larsen & Johnson, 2016; Robertson, 2018; Till, 2012; Watts, 2013), arguing that place has agency. Place is not merely the stage of a place-based process, but plays an active role: it speaks, creates and teaches (Larsen and Johnson, 2016). I use this perspective to gain new insights on the integration mechanisms within place-based approaches and for enhancing the transformative capacity of places in the Netherlands.

In this research I will elaborate on how place plays an integrative role in place-based approaches, and how it facilitates the integration of knowledge, resources, viewpoints, needs and stakes of actors. This results in the following central research question**:** How does integration come about within place-based approaches?

This question is broken down in sub-questions which are answered by reviewing academic literature, practice oriented knowledge and an empirical contextual analysis focusing on the Netherlands.

- What are key characteristics (in terms of: decision-making, networking, resourcing, learning and innovation, etc.) of various place-based approaches and how do those approaches understand place?
- What is the role of place in the process of integrating knowledge, resources, viewpoints, needs and stakes of actors?
- What influences the integrative role of place in place-based approaches?
- What are insights from applying an analytical understanding of the place-based integration process to the Dutch context?

2. Theoretical Background

2.1 Framework Development and Transdisciplinary Research

In this research I develop an analytical framework for analysing how integration comes about in a place-based process. Following Ostrom (2019) and Schlager (2019), I understand a framework as “a foundation for inquiry by specifying classes of variables and general relationships among them” (Schlager, 2019, p. 293). This analytical framework will increase our understanding, but it is not a model or theory for explaining and predicting outcomes (Nilsen, 2015; Ostrom, 2019; Schlager, 2019).

This framework is developed with an transdisciplinary research approach that is

summarized by Hoffman *et al.* (2017) as a product by actors from science and practice, addressing real life problems and resulting in knowledge that is useful for both science and practice. Transdisciplinary research brings the realm of science -that includes rigour and understanding- and the realm of practice -that includes relevance and design- together (Pohl *et al.*, 2021) since different forms of knowing are complementary (Dieleman, 2012). I apply this reasoning and combine it with insights around (transdisciplinary) framework development (Nilsen, 2015; Nilsen and Bernhardsson, 2019). The framework development process is specified in the section on methodology.

2.2 Place-based Approach and Process

The first step in developing a framework that explains how integration comes about in place-based approaches is to clarify what a place-based approach is. Place-based approaches are used in different disciplines and there are different 'labels' that refer to processes in which 'place' plays a central role. A rather intuitive understanding of a place-based approach is a policy or governance approach that is concerned with the development of a specific place, in other words it is place-shaping. There are numerous and diverse policy and governance approaches that match with this description. I have identified and reviewed several, as described in text box (figure 1) that all inform this research. This list in the textbox is a colourful collection of diverse approaches. The depth and breadth of knowledge that is behind the different 'categories' or 'labels' shows strong variation.

Based on this review and on the elegant definitions of Cees Anton de Vries and Jannemarie de Jonge given in an interview (see: Ruijsink, 2023) I define a *place-based approach* as an approach that uses the place of concern as its starting point, places is a platform for integration that brings together and mediates between various needs and resources including knowledge from different actors primarily from within, but also from outside the place. It is a deliberate approach that is structured by formal and informal institutional agreements and that aims to develop and or transform a place, it can include material and immaterial change of the place (Ruijsink, 2023). A *place-based process* refers to the process that has evolved and/ or was designed around the application of a place-based approach.

Place based approaches

Area development is "the art of connecting functions, disciplines, stakes, funding streams for (re)developing an area" (translated by author from Dutch) (de Zeeuw, 2017). The approach is part of the domain of spatial development (Verdaas, 2019).

The *area-based approach* is applied in humanitarian relief. It is characterized by a focus on 1) geography, and by being 2) multi-sectoral, 3) inclusive and 4) participatory (Schell et al., 2020).

The *Landscape approach* is an approach that addresses both *place* and *ecosystem* and thus has strong emphasis on nature (Arts *et al.*, 2017). It focuses on integration as a response to a traditional sectoral approach and it aims at generating social, cultural and environmental benefits (Sayer *et al.*, 2013; Buizer, Arts and Westerink, 2016; Arts *et al.*, 2017).

Neighbourhood and urban policy are understood as a cluster of policies concerned with addressing (public) problems in urban areas neighbourhoods and with improving the lives of people in those areas (Wang, 2018; Cochrane, 2020). The Netherlands have a long tradition of neighbourhood urban policy, also known as 'urban renewal policy' stimulating social mix and area-based interventions (Musterd and Ostendorf, 2021)

In *place-based innovation* place is the starting point for (economic) innovation and learning and research activities take place within a specific location, creating an agglomeration of (industrial and public) knowledge partners that fosters innovation (Grillitsch and Asheim, 2018; Morisson and Doussineau, 2019).

Place-based transformative learning is concerned with learning in processes that evolve around place and it includes transgression, connection, compassion and creativity (Pisters, Vihinen and Figueiredo, 2020).

Place-based leadership is a form of leadership that 'cares about' place and its citizens (Hambleton, 2021, 2021; Hambleton, Sweeting and Oliver, 2022). It draws on the interactions between various actors and on collective rather than individual agency (Vallance, Tewdwr-Jones and Kempton, 2019). It includes multi-scalar, dynamic and interactive governance processes (Sotarauta and Beer, 2017).

Place-based policy is applied within the EU and it is promoted by the EU. It's narrative emphasizes justice elements and addresses the spatial dimension of social inclusion, but also economic potential and efficiency (Barca, 2009) and more recently sustainability has a central role (JRC, 2020).

Place-based research is concerned with how exploring how places, understood as multi-scalar social–ecological systems, evolve over time and how those places are influenced by policy interventions addressing place-based sustainability challenges. It works across

disciplinary boundaries and includes a wide range of stakeholders of the place (Balvanera *et al.*, 2017).

Spatial and urban planning (urban planning is considered synonymous to spatial planning in this text) are "acknowledged to pay particular attention to spatial development and the material setting of distinct regions and places" (Balz and Zonneveld, 2018, p. 364). It is concerned with regulating space and place and hence with managing conflicts over its use as well as with enhancing place qualities, or place-making (Healey, 1998).

Territorial governance is concerned with the governance of territories and thus addresses decision-making including vertical and horizontal coordination, engaging public and private participation actors, addressing the levels and distribution of power and responsibilities focusing on territorial dynamics and territorial cohesion, territorial impacts and working across policy boundaries (Stead, 2013)

Figure 1. Overview of place-based approaches
Source: own construct, based on literature review

2.3 Place has agency

Tim Creswell emphasizes in 'Place: an introduction' that the literature that uses place is endless (Cresswell, 2014) hence a disclaimer is appropriate: this research has developed an understanding of place that is based on merely a selection. I do not attempt to 'define' what place is, rather I develop a *perspective* on place that can be used to increase our understanding of challenges and possibilities around its integrative potential.

Every *place is unique* and differs in history, culture, physical and ecological characteristics, human interactions; in how power, resources and capacities can be mobilized and in the emergence of collective and individual meaning (Horlings *et al.*, 2020). Place is also *relational*, it is a somewhat coherent spatial unit, but is also dynamic and muti-scalar. Balvanera *et al.* (2017) explain: "A place (..) is not only a territorially bounded spatial unit with features that make it unique or distinguishable from other areas, but it is also where social, economic and political influences converge, as well as where multiple biophysical and societal flows and networks meet**"** (Balvanera *et al.*, 2017, p. 2). A place is part of larger spatial units and comprises smaller spatial units and spatial relationships and the (fuzzy) spatial boundaries and place-meanings are dynamic and change over time, connected to their ecology and infrastructure and material & immaterial flows (Pisters, Vihinen and Figueiredo, 2019). Furthermore place is an arena and platform that creates and crosses boundaries and conflict, collective action, co-creation and new connections (Horlings *et al.*, 2020). This relational nature of place has also influenced the institutional understanding of spatial units (see for example the notion of soft and hard spaces by

Allmendinger & Haughton (2009) and Allmendinger *et al.* (2015)).

Places are thus unique and relational, but most importantly, place has *agency*. There is increasing attention for rethinking agency beyond human agency, by including Non-Western knowledge and agency of place (Robertson, 2018). This local knowledge is not new. Currently it is especially prevalent in communities that continued to have a strong relationship with nature and where knowledge is understood differently than in 'Western Science' and where attachment to place is important. Knowledge development is considered to be place-based and the understanding of human survival is place-based (Jessen *et al.*, 2022). Principles of recognition, consent, and continuity are important elements of caring for places, including planet Earth as a whole (Atleo, 2012). Based on insights from Bawaka Country in Arnhem Land, Australia human beings are connected beings and our existence is defined by relationships that are constantly in a process of co-becoming with place, we interact with places and are part of them (Bawaka Country *et al.*, 2016). Watts (2013) explains place-thought from the perspective of Haudenosaunee and Anishnaabe cosmology and confronts it with a Euro-Western understanding where human beings aim to control place. From the Haudenosaunee and Anishnaabe perspective places have a spirit, and they are alive. By inhabiting places human beings and human societies become part of the place and the place becomes part of human society. Rather than controlling the places that they are part of, human beings can learn from it, live with it and care for it (Watts, 2013). Larsen and Johnson (2016) worked with the Māori and explain how place has agency and how it speaks, creates and teaches. The relational nature of place is recognized within this understanding of place: we are part of, engage in and thus co-exist with many different places (Larsen and Johnson, 2016) at different scale levels. While this perspective on place is primarily drawn from knowledge around non-urbanised communities and places, the notion of agency of place exists in urban contexts. Using other wording, Till (2012) develops a place-based ethics of care and argues that cities can be wounded, they can be cared for *and* they can offer care to actors in the city. This perspective also puts place at the centre of human survival, it is our living environment, it cares for us and we need to care for it too. This idea resonates in the reciprocal relationship with land in practices of urban agriculture: taking care of land, nature and place results into places that feed and increase the autonomy of its residents (Giraud, 2021).

I embrace the perspective that place has agency to better understand the integrative potential of place in place-based approaches. This perspective offers a lens to understand the power, the value and potential of place (Watts, 2013; Bawaka Country *et al.*, 2016; Larsen and Johnson, 2016), and to see where it is wounded and needs care (Till, 2012). Place constantly evolves, due to the interactions between humans and nature and other places and flows (Balvanera *et al.*, 2017). But places also show us that certain interactions between human beings and nature result in overshooting planetary boundaries and

challenging basic human needs (Raworth, 2017). A perspective of agency and care for places is of special interest to the Dutch context where 'developing places' by and for humans has a long-lasting tradition.

2.4 Place-based integration

Integration within transdisciplinary research is concerned with the synthesis of knowledge, resources, viewpoints, needs and stakes of different thought-collectives (Pohl *et al.*, 2021). Place-based integration includes the synthesis of different human thought-collectives and place functions as integration-platform (Runhaar, Driessen and Soer, 2009; Balvanera *et al.*, 2017; Mirti Chand, 2018; Horlings *et al.*, 2020; Agger, 2021). At the same time it is more than a platform. I understand *place-based integration* as a form of integration that acknowledges the agency of place. The history, identity, challenges, possibilities and potential future(s) of the place are the integration-backbone. Place itself represents a thought collective and the extent to which actors and institutions in place-based processes can engage with it determines the quality of integration. Integration results in jointly produced insights, practices, frameworks (Pohl *et al.*, 2021), visions, designs, actions, etc., that are based on an understanding of how places take care of actors and how the place can be cared for. This form of integration is a pre-condition for enhancing the transformative capacity of places towards a restored balance between humans and nature. *Place-based transformative capacity* concerns the "abilities, resources, capacities and practices" (Witzell *et al.*, 2022, p. 721) of actors, institutions and places to transform themselves and society in a deliberate, conscious way (Ziervogel, Cowen and Ziniades, 2016), aiming at "path-deviant change towards sustainability within and across multiple complex systems that constitute" (Wolfram, 2016, p. 126) the place.

2.5 Actors and Institutions

Place-based integration is also concerned with actors and institutions. In this research I define humans and their organisations, as well as flora and fauna as actors. This research applies a post-humanistic interpretation of actors and hence actors refers to both *human and non-human actors*. More precisely I focus on human actors and non-human ecological actors and their role in place-based processes. This resonates with the idea of 'nature as a stakeholder' (Laine, 2010) and recognizes the importance of non-human agency (Contesse *et al.*, 2021; Kortetmäki, Heikkinen and Jokinen, 2022).

Repetitive human actions become patterns, or even norms or rules, hence an institutionalized, "established way of addressing certain social issues" (Healey, 1999, p. 113). In line with Healey (1999) and following Ostrom (2019) I understand *institutions* as "the shared concepts used by humans in repetitive situations organized by rules, norms,

and strategies (see Crawford and Ostrom 2005)" (Ostrom, 2019, p. 23). Rules and norms refer to shared prescriptions. Rules are "are mutually understood and predictably enforced in particular situations by agents responsible for monitoring conduct and for imposing sanctions" (Ostrom, 2019, p. 23). Norms, tend to be enforced by communities themselves. Strategies are the "(..) plans that individuals make within the structure of incentives produced by rules, norms, and expectations" (Ostrom, 2019, p. 23) and affected by behaviour and actions of actors and by the (material) conditions of place (Ostrom, 2019). Institutions can be formal(ized) e.g. in legally binding rules, and informal, e.g. in common ways of doing things.

In agreement with Healey *et al.* (2002) I argue that institutions can positively and negatively influence place-based integration, as they can bring together and separate policy agenda's from different departments and levels. The degree to which rules, norms and strategies influence integration in place-based processes, in other words the institutional capacity, depends on how institutions enable access to knowledge, relational and mobilization resources (Healey *et al.*, 2003) and this how they interact with human actors. The interaction with non-human actors is also important as is illustrated by the pioneering efforts in Ecuador towards giving institutional rights to nature (Akchurin, 2015). Additionally, institutions interact with places. Environmental and planning acts are examples of institutions that shape places. Places also shape institutions, an isolated place, with a low population density and limited connectivity to other places produces different norms and strategies than a place with different characteristics.

2.6 Analytical framework for place-based integration

Summarising the above, there is an interdependency and thus continuous interaction between actors, institutions and place and place-based integration comes about as a result of this. The characteristics, type, role and number of actors and institutions and the characteristics of the place always differ and make every process of place-based integration unique. A place-based approach or process can be better understood by qualifying the actors, institutions and place and by assessing how they interact and how this results in place-based integration, this is visualised in figure 2.

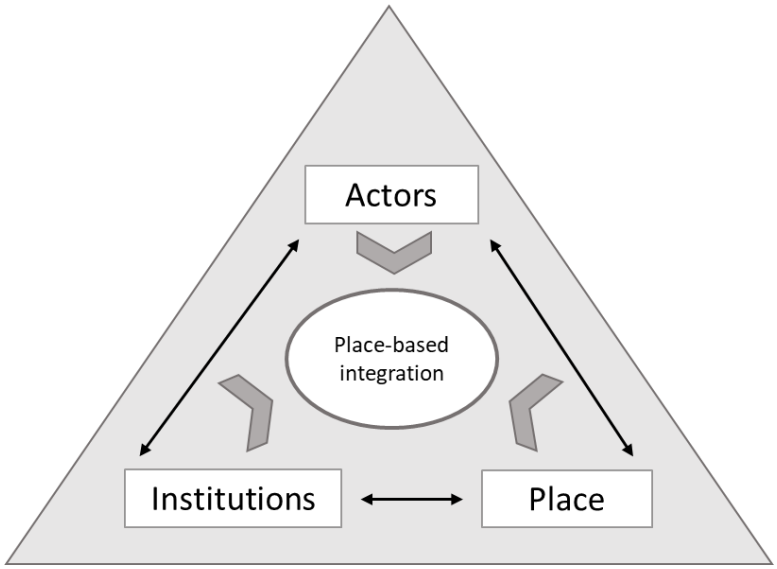


Figure 2. Analytical Framework I, how integration comes about in a place-based approach

Source: developed by author, building on the work of (Horlings *et al.*, 2020; Mehmood *et al.*, 2020)

The theoretical frames and approaches developed by Horlings *et al.* (2020) and Mehmood *et al.* (2020) resonate with this analytical framework. They address the importance and interplay of deliberate social-cultural processes (relates to human actors), ecological processes (relates to non-human actors) and the political-ecological processes (relates to institutions) in sustainable place shaping (Horlings *et al.*, 2020) and between experiencing place (relates to human actors and place), regenerative action (relates to interaction between actors and place) and transformative learning (relates to integration) (Mehmood *et al.*, 2020). The analytical framework presented here thus further builds on their work, but differs in purpose and focus. It is not an approach, but it is analytical and can thus be used to analyse (ongoing) place-based processes. It focuses on integration and includes the perspective that place has agency. It can be applied to understand why, how and to what extent place-based integration has materialized by analysing elements as elaborated in table 1.

Element	Question	Dimensions
The place-based approach	How can the place-based approach be characterized/ described?	Key characteristics: purpose and goals, narrative of change, decision-making and deliberation, networking, resourcing, learning and innovation, timeframe, etc.
Place	How is place understood?	Understanding of unique features of the place Importance of material (physical, ecological) and immaterial (social, economic, cultural) characteristics Scale of the place Relations between various scales Importance of / attention for agency of the place Place-based integration mechanism(s)
Actors	What actors are engaged, what is their role?	Identification and role of actors from: – private sector – public sector – community – knowledge sector – nature/ ecological actors Actor-based integration mechanism(s)
Institutions	What institutions play a role, what is their role? What are institutional barriers and enablers?	Role of formal and informal institutions that include: – Rules – shared prescriptions, externally enforced – Norms - shared prescriptions, enforced by community – Strategies – plans Institutional enablers and barriers that influence access to: – Knowledge resources – Relational resources – Mobilization capacity Institutional integration mechanism(s)
Place-based integration	What is the role of place-based integration in the approach? How does it come about? How do the interactions	Understanding and role of place-based integration in approach Interaction mechanisms between place-actors-institutions Coming about of place-based integration

	between place-actors-institutions influence integration?	

Table 1. Operationalisation of the Analytical Framework I

Source: own construct

3. Application of the framework

3.1 Methodology

The framework (version I) presented in the former section is developed based on the review of a diverse range of knowledge (academic, practical and local) and professional experience of the researcher. In this section I present the application to two different contexts. The underlying research design of the framework development is visualized in figure 3 .

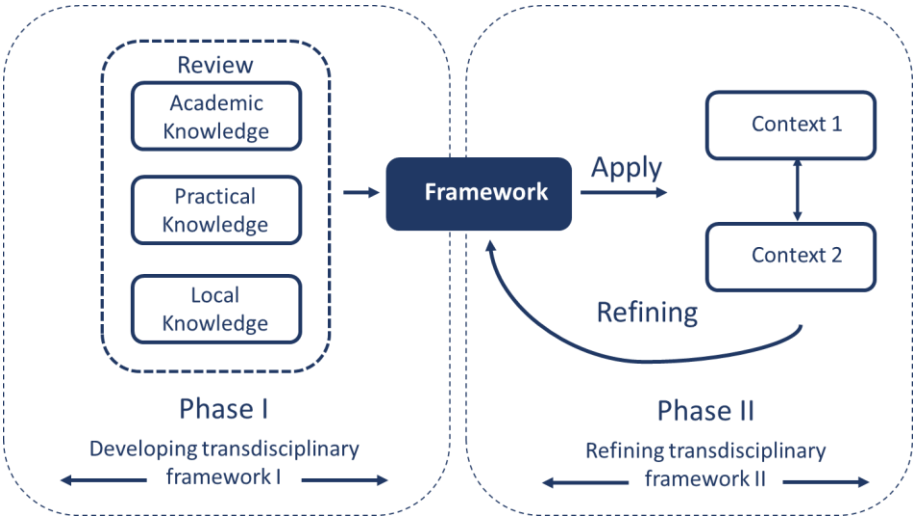


Figure 3. Overview of Research Design

Source: own construct

The second phase of the framework development has a comparative dimension since I apply the framework to two different contexts (or explorative case studies) with the aim to test and further refining it (see: Htun & Jensenius, 2021). One selected context is urban, the other is rural. The urban-rural dichotomy (even if contested) seems the most prominent contextual difference for place-based approaches. The two contexts comprise different academic and professional thought-collectives, including theories and approaches. For example, the landscape approach (see: Arts et al., 2017) typically applies to rural areas and neighbourhood policy (see: Musterd & Ostendorf, 2021) to urban areas. One Dutch ministry develops national spatial policy that focuses on urban areas and

neighbourhoods (in Dutch: grote stedenbeleid) another develops agricultural policy, focusing on the countryside at large (in Dutch: landelijk gebied). Despite differences, both policy domains are influenced by European policy and both apply and promote place-based approaches with the aim to facilitate integration across (policy) domains.

The place-based approaches in the selected contexts are the National Programme in the South of Rotterdam, or NRPZ (in Dutch: Nationaal Programma Rotterdam Zuid) and the Area-Deal Green Blue Connects (gebiedsdeal 5 Groen Blauw Verbindt) in Ablasserwaard-Vijfheerenlanden (referred to as Area-Deal A5H). The two contexts are briefly described in table 2. The framework is applied based on a document review, a field visit and 2-3 interviews per context with key informants.

Characteristics	**NPRZ**	**Area-Deal A5H**
Urban/ Rural	Urban	Rural
Region within the Netherlands	South West of the Netherlands	
Complex challenges	Social, economic & physical resilience challenges	Ecological, social & economic sustainability challenges
Diversity of actors	Residents (including dwellers of owner-occupied and rental units), public and private sector, knowledge institutions and intermediaries (employment, housing)	Residents (including farmers), public and private sector, knowledge institutions and intermediaries (nature, farming)
Diversity of institutions	Policy, strategies and rules of different levels of governments Diverse norms and strategies among different actor groups	
The place-based approach	Long term programme focusing on socio-economic challenges of place-based inequality	Sequence of place-based deals to address ecological challenges in connection to cultural history of landscape

Table 2. Context selection for framework application
Source: own construct

3.2 Place-based Approaches: NPRZ and Deal A5H

The empirical analysis focuses on how integration comes about, by applying the framework developed in the former section to place-based approaches in Rotterdam (see

plan area in figure 4) Alblasserwaard-Vijfheerenlanden (see plan area in figure 5).

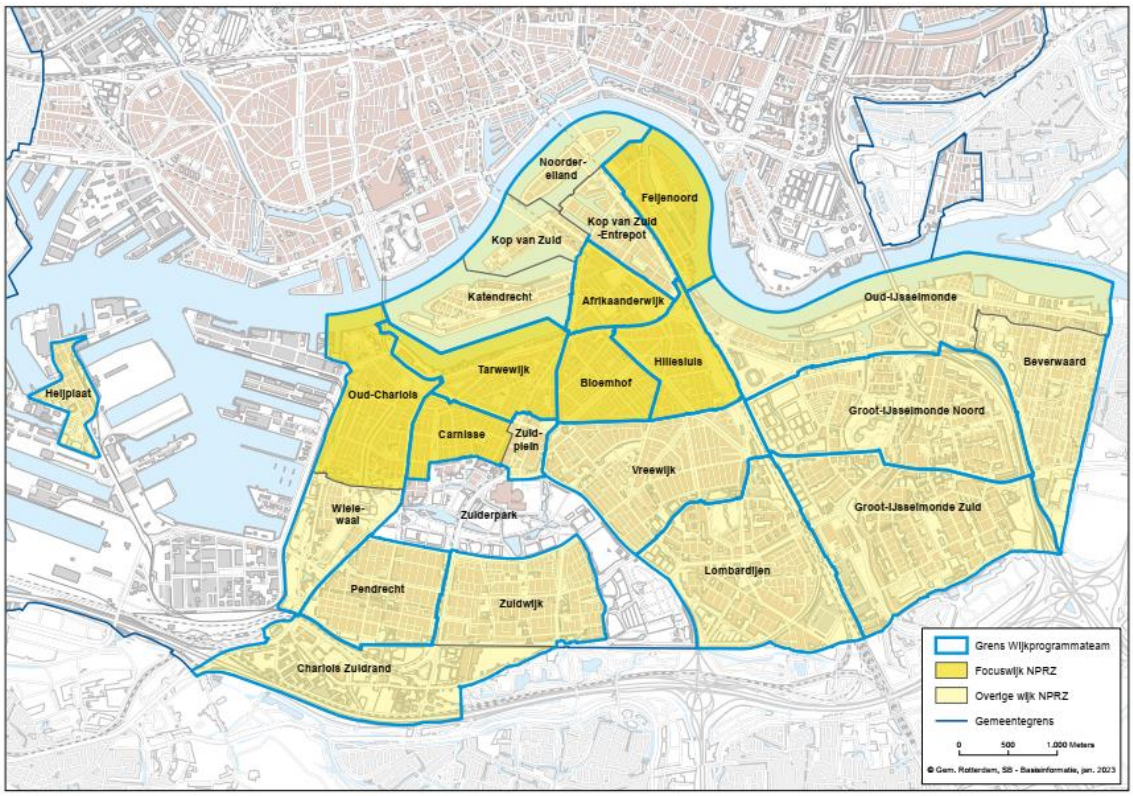


Figure 4. Area covered by NPRZ
Source: (NPRZ, 2023, p. 120)

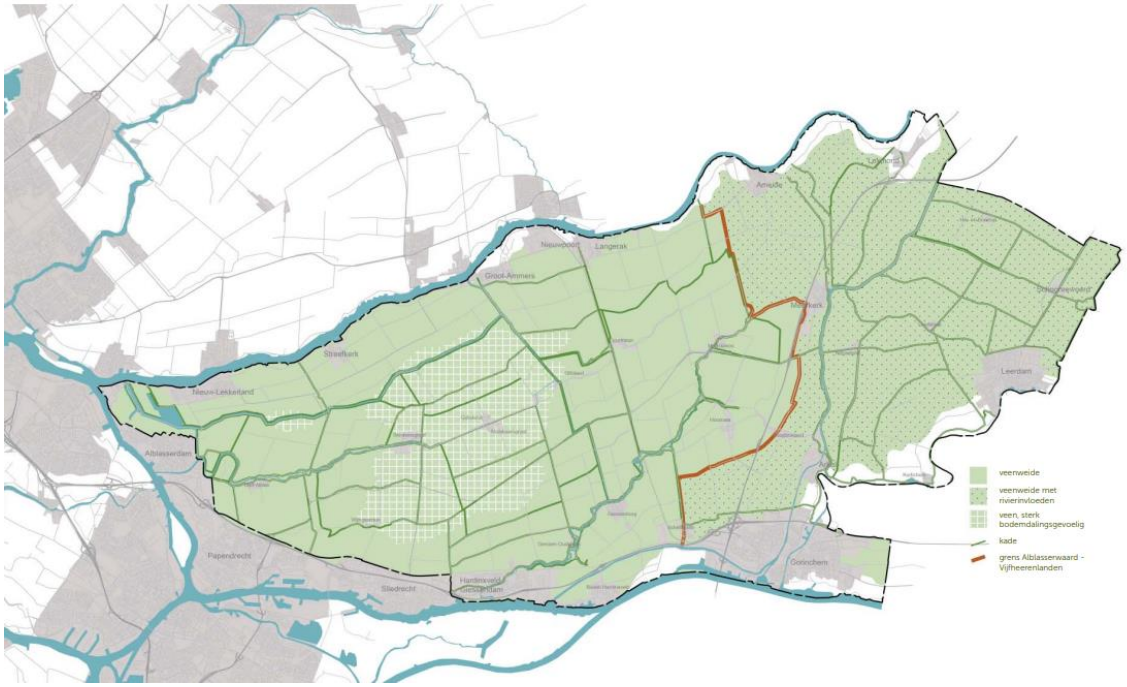


Figure 5. Area covered in Area-Deal Alblasserwaard-Vijfheerenlanden
Source: (Provincie Zuid-Holland, 2012, p. 21)

Both NPRZ and the Area-Deal A5H are long-term, multi-stakeholder processes that focus on improving a place. But they also differ. NPRZ is a flexible and rather top-down, long-term (20 years) programme, focusing on addressing persistent socio-economic challenges in the South of Rotterdam. It aims to improve housing, education, work and safety conditions. It has a clear theory of change: invest in households (education, work, housing) so they can take care of themselves and improve their lives, and this requires commitment and perseverance. It focuses on creating strong bonds with co-implementing partners who need to partially resource and fund the programme, which is complemented with additional national government funding. The Area-Deal A5H has a less clearly specified time horizon and is part of a sequence of Area-Deals that started off in 2014. The Area-Deal A5H is primarily a bottom-up initiative of a coalition of actors (from different organisations: provincial governments, local governments, region, place-platform, education) and has mobilised funding for a period of 4 years. Alblasserwaard-Vijfheerenland consists of peat land in which water levels have are managed so the land can be used for agricultural production and housing. The Area-Deal A5H focuses on improving the ecosystem. Table 3 summarizes the application of the framework to the place-based processes.

	NPRZ	Area-Deal A5H
The place-based approach	Formally committed, long-term programme (20 years), flexible, top-down programme with national funding Focus on social-economic challenges of residents in the South of Rotterdam, aims to improve the quality of life and housing of residents by addressing work, education, safety and housing quality	Bottom-up area-deal within a long-term sequence of area-deals (including more top-down deals), supported by various layers of government Focus on ecological challenges in Alblasserwaard-Vijfheerenlanden, aims to realise sustainable area development by addressing biodiversity, sinking peat and landscape identity and quality
Place	An urban area at the south bank of the river New Meuse, known for socio-economic deprivation and challenges related to work, education, safety and housing quality +/- 200.000 inhabitants, total area +/- 66 km2 Linkages between scale levels in NPRZ is mostly based on formalized and administrative boundaries with three districts and seven focus neighbourhoods, a children's zone focusing on schools and links to city-wide and national programmes Narrative around the place-based challenges ties the programme together, a negative and narrow form of place agency that does not take its ecology into consideration: the place amplifies challenges of households who reside there and as such teaches the professionals that a place-based approach is key The place-based narrative is the most prominent integration mechanism, bringing actors, resources and institutions	A polder with ingenious water management, sinking peat soil and intertwined ecological, economic and cultural challenges +/- 170.000 inhabitants, total area +/- 250 km2 Linkages between scales are based on ecological and socio-economic and characteristics: it is part of a larger area (of fields on peat land) and nested in two provinces. It comprises three distinct subset-places: 1) urbanized corridor; 2) fields on peat (Alblasserwaard); 3) fields on peat with rivers (Vijfheerenlanden) Activities of the Area-Deal A5H take place at various scale levels A place-narrative is constructed around how nature and humans interact in the place, place has agency here as it teaches residents and professionals that nature needs to be re-prioritised in connection to humans The focus on sustainable area development, with a strong emphasis on place-characteristics of water and green

	together	structures is part of the place-narrative and functions as the most prominent place-based-integration mechanism
Actors	All programme activities are primarily led by professionals from various (policy) sectors at various scale levels. The private sector is well-connected The community sector (residents) is represented, but does not have a strong role, while this is deliberate, there is pressure to change this The actors are organized in a programme office and in a coalition of partners The people who run the office and form the coalition and their competences are key for success Emphasis on working together, being loyal to the NPRZ objectives, and prioritizing collective success over personal success are integration mechanisms	Led by combination of professionals from various (policy) sectors and scale levels and committed residents Especially the small-scale initiatives are developed and implemented by volunteers, nevertheless, there is also a large group of residents and entrepreneurs (including farmers) that is not engaged There is a place-based coalition that includes a place-based platform, initiated by actors (some of them professionals) without prior institutional support The networked leadership and facilitation of learning allows actors to take initiative and responsibility and to make connections and this results in integration
Institutions	Programme is initiated following from a national policy prioritisation (top-down) and then designed and institutionalized as city-level programme Supported and hindered by formal institutional arrangements including funding schemes, and sectoral policy and regulations related to work, income, education, housing and area development, at different scales primarily national, regional, city wide and neighbourhoods The institutionalization of the programme is deliberately light and the office is not positioned within an existing	Supported and hindered by various formal top-down institutional arrangements at different scales: EU, national and provincial rules, regulations and programmes concerning nitrogen deposition, water and soil quality, CO2, etc., including possibilities for funding Strong bottom-up place-based coalitions who institutionalize their ambitions in plans and strategies, the Area-Deal A5H is one of those and as such manage to mobilize support and tap into resources and networks, the institutionalization emerges as interaction between bottom-up and top-down processes

	organisation, this gives neutrality and is a mechanism for integration, it allows and forces the office and coalition to mobilize support and tap into resources and networks	Strong and institutionalized (included in strategy) focus on learning and networked leadership where the region is seen as a living lab, also links to institutionalized possibilities for funding of research The networked approach links different institutional contexts and functions as a mechanism for integration
Place-based integration	The commitment of professional actors to care for the South of Rotterdam by making it a socially resilient place, so it can also better care for its residents, forms the backbone of the place-based integration	The commitment of professional actors and actors from within the place to care for the place in terms of sustainably developing Alblasserwaard-Vijfheerenlanden and to address future problems residents, forms the backbone of the place-based integration
Other	Perseverance is key in NPRZ: it takes time and long-term commitment to tackle complex intertwined socio-economic challenges and to realise integration	Timing and long-term commitment are key for integration in the Area-Deal A5H for addressing interconnected ecological and socio-economic challenges, and to timely tap into opportunities since institutional and societal support fluctuate

Table 17 Application of Framework to NPRZ and Area-Deal A5H

Source: own construct, based on desk study and fieldwork

4. Conclusions

4.1 Place-based integration

In *place-based integration* the agency of place is acknowledged. It results in jointly produced insights, practices, frameworks (Pohl *et al.*, 2021), visions, designs, actions, etc., that are based on an understanding of how places care for human and non-human actors and how they can care for the place. The framework and analysis in the former sections forms the basis for how I understand that integration comes about within a place-based approach. Following Till (2012), in NPRZ the South of Rotterdam is understood as a wounded (part of the) city that needs to be healed. While NPRZ is considered successful (van Spijker and Tops, 2021), it has limited engagement of the residents of the place and hardly any focus on nature and ecology. NPRZ developed a strong narrative around the wounded South, but a narrative of care for and the potential of the place is virtually missing. In the Area-Deal A5H place has historically been cared for, but without addressing the needs of the soil and water system to the extent that was needed. A coalition of local and professional actors is searching for a new balance. This is a new form of care, focusing on co-becoming (Bawaka Country *et al.*, 2016) and listening to the place (Larsen and Johnson, 2016). The socio-economic characteristics and challenges are not strongly developed in this narrative, while 'controlling the peat land' is motivated socio-economically. In both NPRZ and the Area-Deal A5H the importance of leadership, networking and team play become evident for mobilizing and connecting actors and for tapping into the institutional context in which the place-based approach is applied. Additionally the time dimension plays a key role in realizing integration.

4.2 Refining the framework

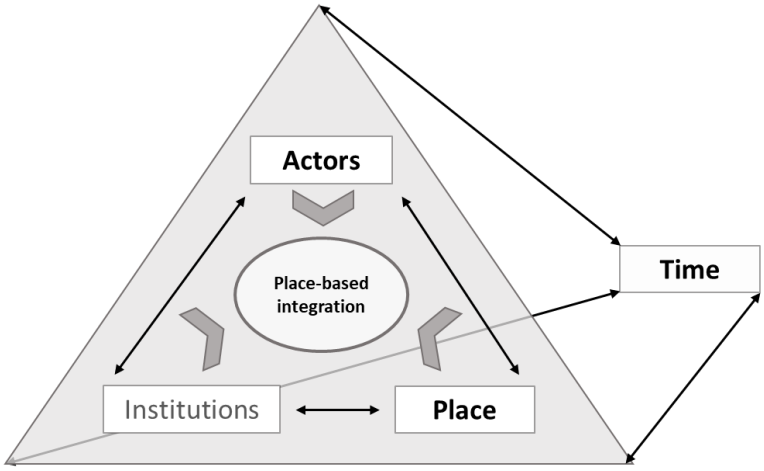


Figure 6. Analytical Framework II (refined version), how integration comes about in a place-based approach

Source: own construct, based on Analytical Framework I

The empirical application of the framework confirms that the interaction between place, actors and institutions determines how place-based integration comes about. Actors and place, including place-agency, seem more decisive than institutions. Norms, rules and strategies can be used smartly to enhance place-based integration. Institutional barriers such as institutionalized silo's, or counterproductive regulations exist, but it is possible to redress those if actors have the capacity to do what is right for the place, at the right time. Time appears a major influencing factor, giving the integration process enough time and acting at the right time is crucial. In figure 6 the modifications are visualised into a second, modified version of the analytical framework.

5. Reflections

The framework is developed relating to the context of place-based processes and approaches in the Netherlands. This context is unique in its strong tradition of place-based approaches and strong focus on integration in urban and rural contexts. The lens of place-based integration and the perspective of agency of place shed another light on the Dutch place-based approach. Historically place-based was concerned with how the Dutch can use and control place to satisfy human needs. It is becoming increasingly prevalent that this perspective has its limitations. Acknowledging the agency of place provides an opportunity to apply less anthropocentric perspective to place-based approaches. This seems very relevant for the Dutch context and beyond and it is worthwhile to further explore this relevance.

This framework also sparks reflection on the role of spatial planning as a discipline and institution (see figure 1) and the spatial planner as a professional. Various disciplines, institutions, actors and even places themselves can play complementary and sometimes overlapping roles in place-based processes. What is the planners role in processes with many place-based companions?

Agency of place goes beyond agency of non-human ecological actors since it understands that places co-become and are formed by interactions between diverse actors and institutions, that change and evolve over time. Nevertheless perspectives on human and non-human agency (e.g. Westley *et al.*, 2013) and insights concerning (place-based) transformative capacity (Wolfram, 2016; Ziervogel, Cowen and Ziniades, 2016; Witzell *et al.*, 2022) can be useful for enhancing the potential of place-agency and place-based integration. It is a plausible hypothesis that enabling the agency of place and the capacity of actors and institutions to perceive it will strengthen the capacity to sustainably transform (from within) places. How the agency of place can be further enabled and how actors and institutions can learn to be taught by and listen to places seems a promising avenue for future (action) research.

Acknowledgement. This paper is the product of a research that has received financial support from the Resilient Delta Initiative of the TU Delft, Erasmus MC and Erasmus University Rotterdam Convergence.

References:

Agger, A. (2021) 'Democratic innovations in municipal planning: Potentials and challenges of place-based platforms for deliberation between politicians and citizens', *Cities*, 117, p. 103317. Available at: https://doi.org/10.1016/j.cities.2021.103317.

Akchurin, M. (2015) 'Constructing the Rights of Nature: Constitutional Reform, Mobilization, and Environmental Protection in Ecuador', *Law & Social Inquiry*, 40(4), pp. 937–968. Available at: https://doi.org/10.1111/lsi.12141.

Allmendinger, P. and Haughton, G. (2009) 'Soft spaces, fuzzy boundaries, and metagovernance: the new spatial planning in the Thames Gateway', *Environment and Planning A*, 41(3), pp. 617–633.

Allmendinger, P., Haughton, G. and Knieling, J. (2015) 'Soft spaces, planning and emerging practices of territorial governance', in *Soft Spaces in Europe*. Routledge.

Arts, B. *et al.* (2017) 'Landscape Approaches: A State-of-the-Art Review', *Annual Review of Environment and Resources*, 42(1), pp. 439–463. Available at: https://doi.org/10.1146/annurev-environ-102016-060932.

Atleo, E.R. (2012) *Principles of Tsawalk: An Indigenous Approach to Global Crisis*. Ubc Press.

Balvanera, P. *et al.* (2017) 'Interconnected place-based social–ecological research can inform global sustainability', *Current Opinion in Environmental Sustainability*, 29, pp. 1–7. Available at: https://doi.org/10.1016/j.cosust.2017.09.005.

Barca, F. (2009) *AN AGENDA FOR A REFORMED COHESION POLICY- A place-based approach to meeting European Union challenges and expectations*. Independent Report prepared at the request of Danuta Hübner, Commissioner for Regional Policy. Available at: https://www.europarl.europa.eu/meetdocs/2009_2014/documents/regi/dv/barca_report_/barca_report_en.pdf (Accessed: 9 December 2022).

Barca, F., McCann, P. and Rodríguez-Pose, A. (2012) 'The Case for Regional Development Intervention: Place-Based Versus Place-Neutral Approaches*', *Journal of Regional Science*, 52(1), pp. 134–152. Available at: https://doi.org/10.1111/j.1467-9787.2011.00756.x.

Bawaka Country *et al.* (2016) 'Co-becoming Bawaka: Towards a relational understanding of place/space', *Progress in Human Geography*, 40(4), pp. 455–475. Available at: https://doi.org/10.1177/0309132515589437.

Buizer, M., Arts, B. and Westerink, J. (2016) 'Landscape governance as policy integration "from below": A case of displaced and contained political conflict in the Netherlands', *Environment and Planning C: Government and Policy*, 34(3), pp. 448–462. Available at: https://doi.org/10.1177/0263774X15614725.

Cochrane, A. (2020) 'Urban Policy', in A. Kobayashi (ed.) *International Encyclopedia of Human Geography (Second Edition)*. Oxford: Elsevier, pp. 93–96. Available at: https://doi.org/10.1016/B978-0-08-102295-5.10229-X.

Contesse, M. *et al.* (2021) 'Unravelling non-human agency in sustainability transitions', *Technological Forecasting and Social Change*, 166, p. 120634. Available at: https://doi.org/10.1016/j.techfore.2021.120634.

Cresswell, T. (2014) *Place: An Introduction*. John Wiley & Sons.

Dieleman, H. (2012) 'Transdisciplinary Artful Doing in Spaces of Experimentation and Imagination', *Transdiscipl J Eng Sci*, 3, pp. 44–57. Available at: https://doi.org/10.22545/2012/00028.

Giraud, E. (2021) 'Urban Food Autonomy: The Flourishing of an Ethics of Care for Sustainability', *Humanities*, 10(1), p. 48. Available at: https://doi.org/10.3390/h10010048.

Grillitsch, M. and Asheim, B. (2018) 'Place-based innovation policy for industrial diversification in regions', *European Planning Studies*, 26(8), pp. 1638–1662. Available at: https://doi.org/10.1080/09654313.2018.1484892.

Hambleton, R. (2021) 'Place-based leadership beyond place: the rise of international city diplomacy', *Handbook on City and Regional Leadership*, pp. 131–151.

Hambleton, R., Sweeting, D. and Oliver, T. (2022) 'Place, power and leadership: Insights from mayoral governance and leadership innovation in Bristol, UK', *Leadership*, 18(1), pp. 81–101. Available at: https://doi.org/10.1177/17427150211028122.

Healey, P. (1998) 'Collaborative Planning in a Stakeholder Society', *The Town Planning Review*, 69(1), pp. 1–21.

Healey, P. (1999) 'Institutionalist Analysis, Communicative Planning, and Shaping Places', *Journal of Planning Education and Research*, 19(2), pp. 111–121. Available at: https://doi.org/10.1177/0739456X9901900201.

Healey, P. *et al.* (2003) 'Place, identity and local politics: analysing initiatives in deliberative governance', in H. Wagenaar and M.A. Hajer (eds) *Deliberative Policy Analysis: Understanding Governance in the Network Society*. Cambridge: Cambridge University Press (Theories of Institutional Design), pp. 60–87. Available at: https://doi.org/10.1017/CBO9780511490934.004.

Healey, P., Cars, G. and Madanipour, A. (2002) 'Transforming Governance, Institutionalist Analysis and Institutional Capacity', in *Urban Governance, Institutional Capacity and Social Milieux*. 1st edn. Newcastle University, pp. 6–28.

Hoffmann, S., Pohl, C. and Hering, J.G. (2017) 'Methods and procedures of transdisciplinary knowledge integration: empirical insights from four thematic synthesis processes', *Ecology and Society*, 22(1). Available at: http://www.jstor.org/stable/26270124 (Accessed: 23 July 2022).

't Hooft, S., Uyterlinde, M. and van der Ham, J. (2021) 'Balanceren en bijeenbrengen - Verbinders in de gebiedsgerichte aanpak', *Platform31 Magazine*. Available at:

https://www.platform31.nl/publicaties/magazine-balanceren-en-bijeenbrengen (Accessed: 19 July 2022).

Horlings, L.G. *et al.* (2020) 'Exploring the transformative capacity of place-shaping practices', *Sustainability Science*, 15(2), pp. 353–362. Available at: https://doi.org/10.1007/s11625-020-00787-w.

Htun, M. and Jensenius, F.R. (2021) 'Comparative Analysis for Theory Development', *Rethinking Comparison: Innovative Methods for Qualitative Political Inquiry*, pp. 190–207.

Jessen, T.D. *et al.* (2022) 'Contributions of Indigenous Knowledge to ecological and evolutionary understanding', *Frontiers in Ecology and the Environment*, 20(2), pp. 93–101. Available at: https://doi.org/10.1002/fee.2435.

JRC (2020) *Handbook of Sustainable Urban Development Strategies*, *JRC Publications Repository*. Available at: https://doi.org/10.2760/32842.

Koninkrijksrelaties, M. van B.Z. en (2022) *Meer regie op Volkshuisvesting en Ruimtelijke Ordening - Nieuwsbericht - Rijksoverheid.nl*. Ministerie van Algemene Zaken. Available at: https://www.rijksoverheid.nl/actueel/nieuws/2022/02/14/meer-regie-op-volkshuisvesting-en-ruimtelijke-ordening (Accessed: 12 May 2023).

Kortetmäki, T., Heikkinen, A. and Jokinen, A. (2022) 'Particularizing Nonhuman Nature in Stakeholder Theory: The Recognition Approach', *Journal of Business Ethics* [Preprint]. Available at: https://doi.org/10.1007/s10551-022-05174-2.

Laine, M. (2010) 'The Nature of Nature as a Stakeholder', *Journal of Business Ethics*, 96(1), pp. 73–78. Available at: https://doi.org/10.1007/s10551-011-0936-4.

Larsen, S.C. and Johnson, J.T. (2016) 'The Agency of Place: Toward a More-Than-Human Geographical Self', *GeoHumanities*, 2(1), pp. 149–166. Available at: https://doi.org/10.1080/2373566X.2016.1157003.

Mehmood, A. *et al.* (2020) 'Transformative roles of people and places: learning, experiencing, and regenerative action through social innovation', *Sustainability Science*, 15(2), pp. 455–466. Available at: https://doi.org/10.1007/s11625-019-00740-6.

Ministerie van Landbouw, N. en V. (2022) *Startnotitie Nationaal Plan Landelijk Gebied - Publicatie - Aanpak Stikstof*. Ministerie van Landbouw, Natuur en Voedselkwaliteit. Available at: https://doi.org/10/startnotitie-nplg.

Mirti Chand, A.V. (2018) 'Place Based Approach to plan for Resilient Cities: a local government perspective', *Procedia Engineering*, 212, pp. 157–164. Available at: https://doi.org/10.1016/j.proeng.2018.01.021.

Morisson, A. and Doussineau, M. (2019) 'Regional innovation governance and place-based policies: design, implementation and implications', *Regional Studies, Regional Science*, 6(1), pp. 101–116. Available at: https://doi.org/10.1080/21681376.2019.1578257.

Musterd, S. and Ostendorf, W. (2021) 'Urban renewal policies in the Netherlands in an era of changing welfare regimes', *Urban Research & Practice*, pp. 1–17. Available at: https://doi.org/10.1080/17535069.2021.1983861.

Nadin, V. *et al.* (2021) 'Integrated, adaptive and participatory spatial planning: trends across Europe', *Regional Studies*, 55(5), pp. 791–803. Available at: https://doi.org/10.1080/00343404.2020.1817363.

Nilsen, P. (2015) 'Making sense of implementation theories, models and frameworks', *Implementation Science*, 10(1), p. 53. Available at: https://doi.org/10.1186/s13012-015-0242-0.

Nilsen, P. and Bernhardsson, S. (2019) 'Context matters in implementation science: a scoping review of determinant frameworks that describe contextual determinants for implementation outcomes', *BMC Health Services Research*, 19(1), p. 189. Available at: https://doi.org/10.1186/s12913-019-4015-3.

NPRZ (2023) *NPRZ Uitvoeringsplan 2023-2027*. Available at: https://www.nprz.nl/over-nprz/onze-documenten/uitvoeringsplan (Accessed: 3 May 2023).

Ostrom, E. (2019) 'Institutional rational choice: An assessment of the institutional analysis and development framework', in *Theories of the policy process*. Routledge, pp. 21–64.

Pisters, S.R., Vihinen, H. and Figueiredo, E. (2019) 'Place based transformative learning: a framework to explore consciousness in sustainability initiatives', *Emotion, Space and Society*, 32, p. 100578. Available at: https://doi.org/10.1016/j.emospa.2019.04.007.

Pisters, S.R., Vihinen, H. and Figueiredo, E. (2020) 'Inner change and sustainability initiatives: exploring the narratives from eco-villagers through a place-based transformative learning approach', *Sustainability Science*, 15(2), pp. 395–409. Available at: https://doi.org/10.1007/s11625-019-00775-9.

Pohl, C. *et al.* (2021) 'Conceptualising transdisciplinary integration as a multidimensional interactive process', *Environmental Science & Policy*, 118, pp. 18–26. Available at: https://doi.org/10.1016/j.envsci.2020.12.005.

Provincie Zuid-Holland (2012) *Gebiedsprofiel Alblasserwaard-Vijfheerenlanden*. Available at: https://gebiedsprofielen.zuid-holland.nl/Gebiedsprofielen/website/index.html?webmap=b6eecfce384f40818d5988a3a901af6d (Accessed: 20 March 2023).

Raworth, K. (2017) *Doughnut economics: seven ways to think like a 21st-century economist*. Chelsea Green Publishing.

Rijksoverheid and Ministerie van Algemene Zaken (2022) *Kabinet maakt water en bodem sturend bij ruimtelijke keuzes - Nieuwsbericht - Rijksoverheid.nl*. Ministerie van Algemene Zaken. Available at: https://www.rijksoverheid.nl/actueel/nieuws/2022/11/25/kabinet-maakt-water-en-bodem-sturend-bij-ruimtelijke-keuzes (Accessed: 12 May 2023).

RLI (2021) *Geef richting, maak ruimte!* Raad voor de leefomgeving en infrastructuur, p. 92. Available at: https://www.rli.nl/sites/default/files/advies_geef_richting_maak_ruimte_-_def.pdf (Accessed: 9 March 2022).

Robertson, S.A. (2018) 'Rethinking relational ideas of place in more-than-human cities', *Geography Compass*, 12(4), p. e12367. Available at: https://doi.org/10.1111/gec3.12367.

Ruijsink, S. (2023) *Waarom vrije ruimte nodig is voor uitvoeringskracht in gebiedsprocessen*, *Gebiedsontwikkeling.nu*. Available at: https://www.gebiedsontwikkeling.nu/artikelen/waarom-vrije-ruimte-nodig-is-voor-uitvoeringskracht-in-gebiedsprocessen/ (Accessed: 13 February 2023).

Runhaar, H., Driessen, P.P.J. and Soer, L. (2009) 'Sustainable Urban Development and the Challenge of Policy Integration: An Assessment of Planning Tools for Integrating Spatial and Environmental Planning in the Netherlands', *Environment and Planning B: Planning and Design*, 36(3), pp. 417–431. Available at: https://doi.org/10.1068/b34052.

Sayer, J. *et al.* (2013) 'Ten principles for a landscape approach to reconciling agriculture, conservation, and other competing land uses', *Proceedings of the National Academy of Sciences*, 110(21), pp. 8349–8356. Available at: https://doi.org/10.1073/pnas.1210595110.

Schell, J., Hilmi, M. and Hirano, S. (2020) 'Area-based approaches: an alternative in contexts of urban displacement', p. 4.

Schlager, E. (2019) 'A comparison of frameworks, theories, and models of policy processes', in *Theories of the policy process*. Routledge, pp. 293–319.

Sotarauta, M. and Beer, A. (2017) 'Governance, agency and place leadership: lessons from a cross-national analysis', *Regional Studies*, 51(2), pp. 210–223. Available at: https://doi.org/10.1080/00343404.2015.1119265.

van Spijker, W. and Tops, P. (2021) *Het verhaal van NPRZ - Rapport - Rijksoverheid.nl*. rapport. Ministerie van Algemene Zaken. Available at: https://www.rijksoverheid.nl/documenten/rapporten/2021/04/30/het-verhaal-van-nprz (Accessed: 1 May 2023).

Stead, D. (2013) *The Rise of Territorial Governance in European Policy*. Available at: https://www.tandfonline.com/doi/epdf/10.1080/09654313.2013.786684?needAccess=true&role=button (Accessed: 20 May 2023).

Till, K.E. (2012) 'Wounded cities: Memory-work and a place-based ethics of care', *Political Geography*, 31(1), pp. 3–14. Available at: https://doi.org/10.1016/j.polgeo.2011.10.008.

Vallance, P., Tewdwr-Jones, M. and Kempton, L. (2019) 'Facilitating spaces for place-based leadership in centralized governance systems: the case of Newcastle City Futures', *Regional Studies*, 53(12), pp. 1723–1733. Available at: https://doi.org/10.1080/00343404.2019.1598620.

van der Velden, J., Fokkema, M. and van Tol, A. (2021) *Domeinoverstijgende gebiedsgerichte aanpakken in kwetsbare wijken*. Platform31. Available at: https://www.platform31.nl/thema-s/thema-leefbare-wijken-en-buurten/domeinoverstijgende-gebiedsgerichte-aanpakken-in-kwetsbare-wijken (Accessed: 30 January 2023).

Verdaas, C. (2019) *Op zoek naar een ontsnappingsroute uit de gevangenis van rationaliteiten*. Available at: https://www.gebiedsontwikkeling.nu/artikelen/op-zoek-naar-een-ontsnappingsroute-uit-de-gevangenis-van-rationaliteiten/.

Volkshuisvesting en Ruimtelijke Ordening (2022) 'Programma Novex'. Ministerie van Binnenlandse Zaken en Koninkrijksrelaties. Available at: https://open.overheid.nl/repository/ronl-4f4cc9e4ca36babcb05a661dc5859b723d24a3d2/1/pdf/programma-novex.pdf (Accessed: 10 July 2022).

Wang, J. (2018) 'Urban Policy', in A. Farazmand (ed.) *Global Encyclopedia of Public Administration, Public Policy, and Governance*. Cham: Springer International Publishing, pp. 6070–6078. Available at: https://doi.org/10.1007/978-3-319-20928-9_226.

Watts, V. (2013) 'Indigenous Place-Thought and Agency Amongst Humans and Non Humans (First Woman and Sky Woman Go On a European World Tour!)', *Decolonization: Indigeneity, Education & Society*, 2(1). Available at: https://jps.library.utoronto.ca/index.php/des/article/view/19145 (Accessed: 6 March 2023).

Westley, F. *et al.* (2013) 'A Theory of Transformative Agency in Linked Social-Ecological Systems', *Ecology and Society*, 18(3). Available at: https://doi.org/10.5751/ES-05072-180327.

Witzell, J. *et al.* (2022) 'Transformative capacity for climate mitigation in strategic transport planning – principles and practices in cross-sectoral collaboration', *Journal of Environmental Policy & Planning*, 24(6), pp. 719–732. Available at: https://doi.org/10.1080/1523908X.2022.2037414.

Wolfram, M. (2016) 'Conceptualizing urban transformative capacity: A framework for research and policy', *Cities*, 51, pp. 121–130. Available at: https://doi.org/10.1016/j.cities.2015.11.011.

de Zeeuw, F. (2017) 'Zo werkt gebiedsontwikkeling, zonder voodoo'. TU Delft. Available at: https://frisodezeeuw.nl/wp-content/uploads/2018/07/publicatie-uittreerede_3005.pdf.

Ziervogel, G., Cowen, A. and Ziniades, J. (2016) 'Moving from Adaptive to Transformative Capacity: Building Foundations for Inclusive, Thriving, and Regenerative Urban Settlements', *Sustainability*, 8(9), p. 955. Available at: https://doi.org/10.3390/su8090955.

TERRITORIAL GOVERNANCE IN MARGINAL AREAS: LEARNING FROM AN INTEGRATED PROJECT FOR LANDSCAPE REGENERATION AND PLACE-BASED DEVELOPMENT IN SOUTHERN SALENTO (1134)

Angela Barbanente[1], Laura Grassini[1*]

[1] Department of Civil, Environmental, Land, Building Engineering, and Chemistry (DICATECh), Politecnico di Bari, Via Orabona 4, 70125 Bari, Italy; [*]laura.grassini@poliba.it

Abstract. The paper discusses premises, development and contents of an integrated initiative for landscape regeneration and place-based development promoted by the Apulia Region, Italy. It took place in the rural area of Southern Salento, in the southmost part of the region, which not only suffers from deep marginality - so to be included among the targeted areas of the SNAI policy - but has recently been hit by the so-called Olive Quick Decline Syndrome, an environmental disaster connected to the Xylella epidemic, which has turned that area into a ghostlike place. The integrated initiative proved to have interesting potential for filling in some gaps in the effectiveness of existing public policies in the area because of its capacity to mobilize, support and offer long-term perspectives to vibrant bottom-up processes and collaborative practices promoting sustainable rural economies. The analysis of this experience may thus give interesting suggestions for future public policies supporting place-based development in marginal territories.

Keywords. place-based development; multi-level and multi-actor processes; marginal territories; landscape; integrated projects for territorial governance.

1. Introduction

Marginalization of cities and regions is the result of multiple processes and asymmetric relations that overexploit some territories or neglect them in favour of others. It is a complex process that has been exacerbated in recent decades by the development of new global hierarchies of cities and regions (Sassen, 1994; Castells, 1989), as the concentration of major economic processes within core areas has been strictly connected to the peripheralization and marginalization of vast territories and large communities. As a result, a multiplicity of formerly important areas across the territory or within cities have lost their functions, giving rise to a new geography of centrality and marginality. In such processes, the role of extractive local elites, fostering overexploitation of the territory for their own benefit, becomes increasingly evident (Servillo et al., 2012), entailing high social costs (Wilkinson, Pickett 2009; Stiglitz, 2013). A crucial question, therefore, arises. How to foster the development of those areas in such a way that deeper sources of

marginalization are contrasted and local potential nurtured?

Within the European Union, cohesion policy is entrusted with the task of reducing regional economic and social disparities between EU states and regions. This objective has been on the policy agenda of the European Community since the early 1970s, but it came into full effect in 1989 (Brunazzo, 2016). Since this date, it has gone through five consecutive periods of multi-year programs or funding, undertaking a series of changes in strategies and management. In this paper, it is worth highlighting two aspects: the first concerns the recent reform of the European cohesion policy, and the second the impact of such a policy on Italian initiatives for marginal areas.

The European cohesion policy has been reformed in the 2014-2020 programming cycle. The objectives of competitiveness, sustainability and social inclusion have been better focused, with a strong emphasis on institution-building. The crucial relevance of the territorial dimension, as opposed to the conventional sectoral and spatially blind policy approach, to counter the marginalisation of peripheral areas, has been relaunched through the assumption of a 'place-based' policy approach to local development. According to Barca (2009), a place-based policy is 'a long-term strategy aimed at tackling persistent underutilisation of potential and reducing persistent social exclusion in specific places through external interventions and multilevel governance' (Barca, 2009, p. vii).

The place-based approach is essentially founded on two key premises. The first is the importance of the spatial context – in its entanglements of social, cultural, and institutional characteristics – for being, at the same time, the result of, and an agent of, social inequalities (Harvey, 1973; Lefebvre, 1974; Soja, 2010). The second is the importance of knowledge as a key resource for development – whose knowledge counts and how? – because of its capacity to perpetuate or contrast social exclusion exerted by extractive elites and institutions (Servillo et al., 2016). The inability of local elites to act is a factor that inhibits the growth potential of regions or perpetuates social exclusion: the purpose of a development policy is to promote new knowledge and ideas through the interaction between local groups and external elites involved in policy making (Barca et al., 2012, p. 139). Drawing from an institutional framework, the place-based approach thus calls for the promotion of deep interactions between local and external knowledge, as well as between endogenous and exogenous actors, in the design and implementation of public policies (Barca, 2009; Barca et al., 2012).

With respect to place-based interventions implementation, three key elements were deemed necessary to ensure the alignment of incentives with the behaviour of all partners involved: first, 'conditionalities', which are binding agreements that govern the principles which underpin the relationships between the different partners; second, a clear ex ante definition of the aims and intended outcomes in terms of well-being and socioeconomic progress of the interventions and appropriate outcome indicators; third, a

space for public debate by all local actors open to dissent and alternative views, and coordination and collaboration between different governance and institutional levels (Barca et al., 2012, p. 148).

As for Italian national policies for marginal areas, for long time these have been largely focusing on solving the long-standing problem of socioeconomic disparities between Northern and Southern (Mezzogiorno) regions. In the 2000s, regionalisation and the increase in the European Union's role in development policies have to some extent weakened national policies aimed at reducing North-South gap. The Regional Operational Programmes (ROPs) became the primary programming instrument of the European Cohesion Policy for Objective 1 and Objective 2 regions until the 2000-2006 programming cycle, Convergence/Competitiveness regions in 2007-2013, and Less-developed/Transition/More-developed regions in 2014-2020 and 2021-2027. The national policy level has thus tended to give way to proposals for development plans and projects largely entrusted to local players, not always being placed within a coherent planning framework at a larger scale. Moreover, funding mechanisms based on a competitive basis have favoured the strongest and most capable local authorities, with the consequent downsizing of the redistributive action in support to disadvantaged areas (Martinelli, 2022).

In a context where the public debate has long focused on the convergence/divergence of macro-regional growth trajectories, and especially on North-South divide, the unequal economic development between central and peripheral areas, that is between mountains and lowlands, coasts and hinterlands, metropolitan agglomerations and depopulated villages, remained in the shadows and were addressed as a local or regional issue.

These disparities assumed national prominence with the establishment of the National Strategy for Inner Areas (henceforth SNAI) starting with the 2014-2020 programming cycle. The strategy strongly relied on the multi-level and multi-actor dimensions of the place-based approach to support local development in specific marginal territories (Barca et al., 2014). An in-depth screening process that began in 2015, following the signing of the Partnership Agreement between the European Commission, the Italian national government (through the Inner Areas Technical Committee) and the regions, in 2017 led to the selection of 72 SNAI ‘project areas’ (see Figure 1). These, altogether, cover 17.0 percent of Italy's territory and 3.4 percent of its population, and account for 60 percent and 22 percent of Italian inner areas, respectively. Each area includes an average of 15 municipalities and a population of 29,400 (Lucatelli, Tantillo, 2018).

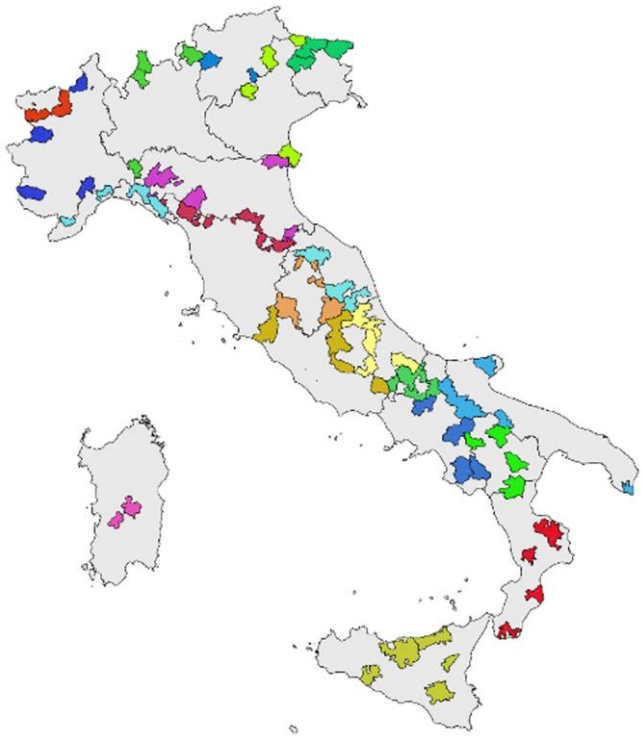


Figure 1. Selected SNAI 'project areas'
Source: Agenzia per la coesione territoriale. SNAI. https://www.agenziacoesione.gov.it/strategia-nazionale-aree-interne/

The SNAI's main innovations can be identified in: the simultaneous consideration, in financial, strategic planning and implementation terms, of interventions for development and citizenship rights (education, health and mobility); the role assigned to municipal associations, both in the definition of the development strategy and in the management of essential services for the future; the focus on a few project areas in each region as opposed to the (usual) scattershot distribution of funds or the tender-based approach favouring the strongest territories (Lucatelli, Tantillo, 2018; Barca et al., 2014). Finally, a key innovation is in the open method adopted, which implies that the resources must be planned during a co-design process, and must be linked to the indication of expected results to be achieved (Carrosio, 2016).

Nevertheless, the actual capacity of this policy to promote innovative ideas, to reduce persistent social exclusion and to enhance territorial capital is critically questioned by some authors (De Leo, Altamore, 2023). Other authors identifies as a weakness their limited extension, which will inevitably lead to modest results with respect to the structural gap addressed (Cotella, Vitale Brovarone, 2020). Further concerns regard the relationship with the institutional elites constituting the engrained local power: engaging

in dialogue with them runs the risk of reproducing and giving legitimacy to opaque well-established practices, while conflicting runs the risk of breaking the fragile institutional local structures without being able to rebuild them (Servillo et al., 2016). In any case, their involvement in project processes reinforces the already existing tendency to develop projects that duplicate pre-existing initiatives (Lucatelli, 2016).

In this paper, we discuss the above issues by drawing on a research experience aimed at developing an area-based 'integrated project' for landscape regeneration and local development in a rural area known as southern Salento, which was promoted by the Apulia Region, Italy, in 2019. That area adds to the typical features of a peripheral context – which justified its inclusion among the SNAI target areas – those of the so-called Olive Quick Decline Syndrome (OQDS), an environmental disaster connected to the Xylella epidemic (Martelli et al., 2016), which has recently transformed a huge part of its traditional landscape of olive groves into a ghostlike place, thus worsening land abandonment and marginality.

The regional initiative drew on the conception of landscape as constituted through the tangible and intangible practices that shape a place, emphasized by the European Landscape Convention (Déjeant-Pons, 2006; Prieur, 2006) and on previous integrated landscape projects developed in the Salento area within the Territorial Landscape Plan (TLP) of the Apulia region (Barbanente, Grassini, 2022). This initiative was able to mobilize, support and offer long-term perspectives, within a multi-level governance tool (Albrechts et al., 2020), to vibrant bottom-up processes and collaborative practices revolving around the promotion of sustainable rural economies. These had been mostly developed in the shadow of mainstream practices but proved to be crucial for the identification of innovative local development paths as well as for dealing with context-specific obstacles for innovation and change.

The paper is structured as follows. In the following section key features and challenges of the Southern Salento area are analysed together with existing policies for local development. In sections 3, the place-based integrated initiative promoted by the Apulia Region for landscape regeneration and local development in Southern Salento is analysed. A critical discussion of that experience and concluding remarks are then placed in the last section, where some lessons learned are derived for future public policies aiming to improve the effectiveness of place-based initiatives in marginal territories (Servillo et al., 2016).

2. The Southern Salento Area: current challenges and policies for local development

The Southern Salento area is located within the Lecce province, in the Southern part of the Apulia region. It is composed by 14 small municipalities, as indicated in Figure 2, with a decreasing and ageing population (the total population was 69,951 in 2011 and 64,875

in 2020).

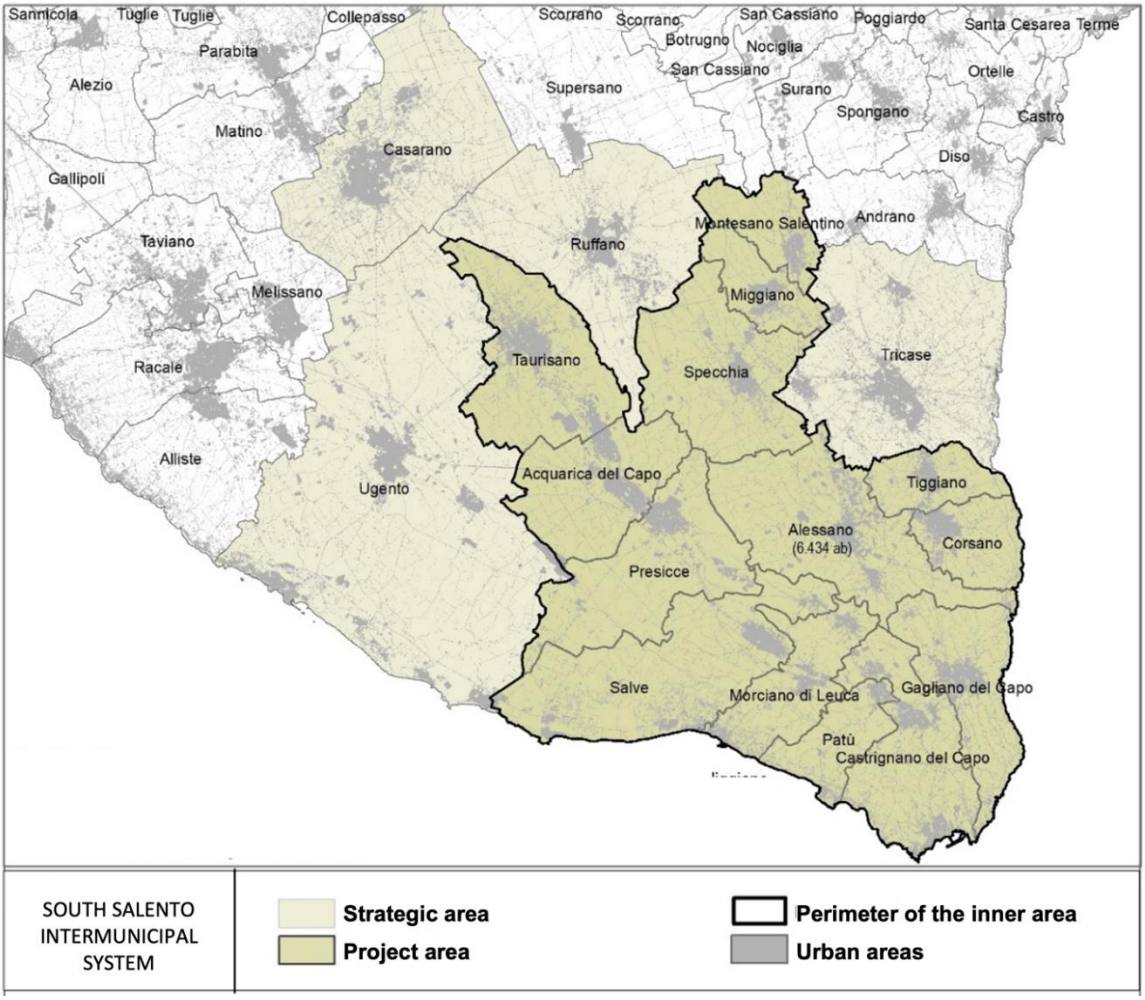


Figure 2. Southern Salento area, with the identification of the SNAI Project area and Strategy area

Source: Adapted from the National Strategy for Inner Areas and new institutional arrangements of inter-municipal solutions. South Salento Inner Area analysis, Presidency of the Council of Ministers - Agency for Territorial Cohesion, April 2019.

It is a rural area, with the old town centres placed in the inner part of the territory, far from the traditionally swampy coastal areas where settlements with second houses and touristic enclaves have been built only recently. Olive groves constitute the predominant agricultural cultivation in the area. They rapidly substituted pre-existing vegetation since the second half of the XVIII century (Bevilacqua, 1996), then becoming the main identity feature of the area. Olive groves are mostly grown in a large and dense mesh or on hilly terraces and include several centennial trees. The intricate network of rural roads and the

widespread presence of stone constructions – including dry-stone walls, small rural churches and traditional rural constructions (pagghiare) used as shelters by farmers after work or during summer – reveals the strong attendance of the countryside by local people.

Almost all families living in Southern Salento own at least a small plot of land with olive orchards or are linked by close family ties with owners. This is also reflected in the high land fragmentation of the area – the average size of agricultural plots with olive orchards is here only 1.27 hectares, against a provincial average of 2.2, a regional one of 4.7 and a national one of almost 8. As a result, in Southern Salento olive tree cultivation is mainly practiced for self-consumption and/or as a supplement to main non-agricultural income of families. Over time, this has contributed to strengthen the relationship between local communities and the countryside, where the small 'olive gardens' were meant as extensions of individual houses. 'Olive gardeners' thus acted for centuries as 'landscape caretakers', although they are now ageing, and their capacity to take care of olive orchards is decreasing.

This situation became dramatic with the spread of the infectious disease known as Olive Quick Decline Syndrome (OQDS), whose main cause has been attributed to Xylella fastidiosa subsp. pauca, a quarantine plant pathogen (Ali et al., 2021). Trees affected by this phytopathology undergo a rapid process of leaf scorching, scattered desiccation of twigs and branches and subsequent mortality (Saponari et al., 2019) as shown in Figure 3; they thus become source of infection through insect-vectors (Martelli et al., 2016).

Figure 3. Areas with seriously damaged olive orchards
Source: Research Report, November 2022.

Since the two predominant olive cultivars of the area – Ogliarola salentina and Cellina di Nardò – are susceptible to this pathogen (Saponari et al., 2019), a huge part of the traditional landscape of olive groves of Southern Salento has been rapidly transformed into a ghostlike place. Figure 4 shows the progression of the infection from Gallipoli towards the northern part of Salento, involving a total of approximately 54,000 hectares of large olive orchards[1] till 2017, of which around 40,000 in the province of Lecce alone (Scholten et al., 2019).

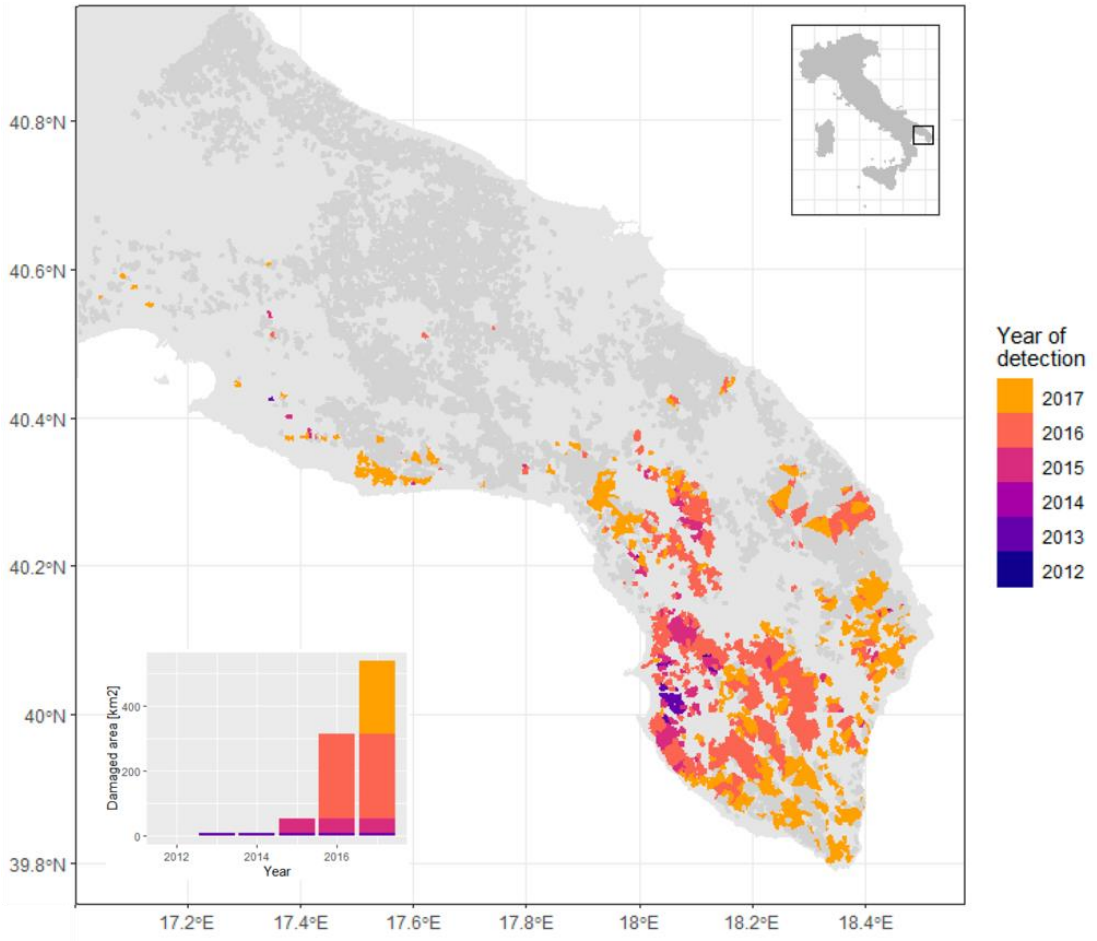


Figure 4. Large olive orchards seriously damaged by Xylella
Source: Adapted from Scholten et al., 2019.

This situation is strengthening territorial grabbing pressures from different sources: new green economies connected to photovoltaic installations on the ground, whose presence in the province of Lecce is already terrific[2]; the building sector, interested in new touristic

[1] Large olive orchards are those encompassing at least 2 MODIS pixel (250m resolution), i.e. covering at least 12.5 hectares.
[2] The Lecce province alone is responsible for 3,7% of the total national solar energy production (GSE, 2023).

settlements in rural areas to balance building restrictions along coastal ones; larger farmers aiming to substitute traditional olive orchards with more profitable – although less sustainable in a drought prone area like Salento – intensive agriculture.

In this context, several public policies have been developed in the last decade to address the manyfold causes of marginality of Southern Salento and to support territorial recovery and local development. Some of them were specifically aimed to contrast the Xylella outbreak, first, and then to support the improvement of the productive potential of affected areas. While the first ones were mainly devoted to contrast the pathogen through its eradication[3] and included measures like uprooting of trees (not only infected ones), chemical applications for vector control, prohibition of planting susceptible species and of transporting plants from infected areas, the second ones were developed after the infected area expanded and the complete eradication of the Xylella pathogen started being considered unfeasible (Ali et al., 2021). Figure 5 represents the derived classification of the region in 'infected areas', 'containment areas' and 'buffer zone', whose boundaries are continuously redefined according to monitoring reports.

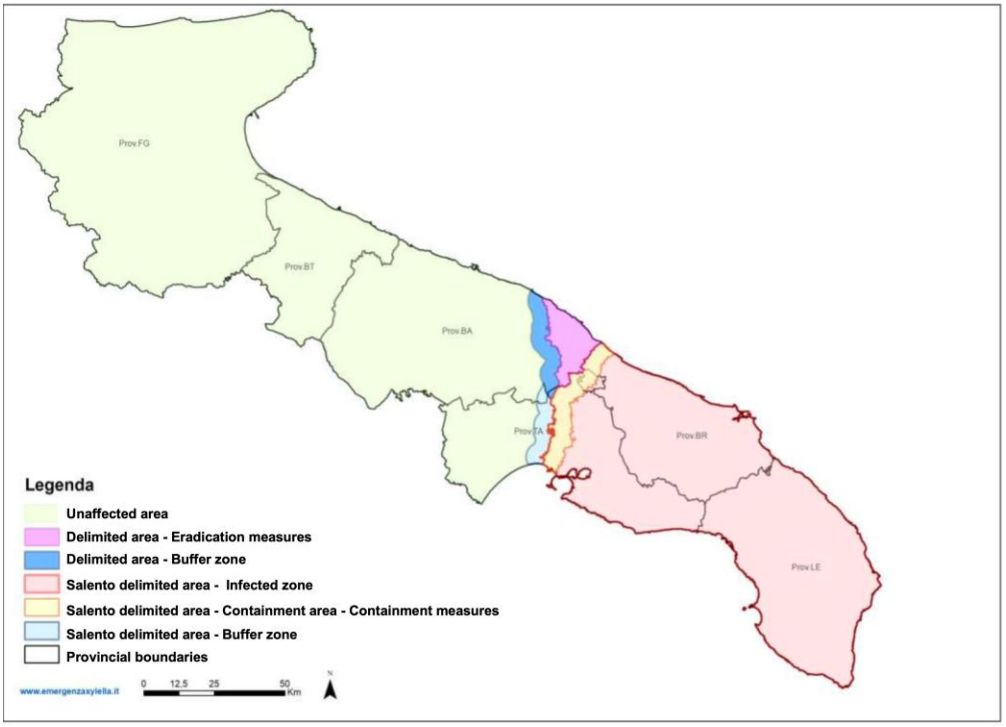


Figure 5. Identification of 'infected areas', 'containment areas' and 'buffer zones' within Apulia

Source: Deliberation of the Regional Executive No. 1866 dated 27/12/2022.

[3] This was done in accordance with the Commission Implementing Decisions 2014/87/EU and 2015/789/EU, with the final aim to prevent the spread of the pathogen within the region and to other areas of the European Union.

Public policies were thus specifically developed to restore the productive potential of the affected areas and to support the olive farming sector. These encompass, at the National level, the National Solidarity Fund established by the Decree-Law No. 15/2015 and, above all, the 'Extraordinary Plan for the olive regeneration of Apulia' passed for the period 2020-2021, which could count on as much as 300 Million Euro, 250 of which for the recovery of the productivity potential (see the Ministerial Decree No. 2484 dated 6/3/2020). At the regional level, public interventions are mainly connected to specific measures of the Regional Rural Development Plan (RDP) for the period 2014-2020.

In relation to these policies, two key issues should be noted. First, while a wide number of species have been allowed, since 2018[4], to be replanted within infected areas, only resistant olive varieties (in the meanwhile identified in Leccino and Favolosa FS-17) are de facto replanted in landscape protected areas, as these are the only species excluded from the landscape authorization procedure. This has led, in practice, to diversified action strategies within infected areas, with a push towards the recovery of traditional landscapes within landscape protected areas and a support to agricultural diversification in the others. This has furthermore posed an unbalanced burden on the weakest section of farmers, i.e. the many old 'garden farmers' taking care of small plots of olive groves, as the costs and efforts connected to strict conservation measures often proved to be unfeasible for them, thus resulting in increased land abandonment and landscape degradation.

Second, financial contributions for the recovery of the agricultural productive potential are basically targeting large farmers; thus non-entrepreneurial landowners growing olive orchards for self-consumption and/or as a supplement for their main non-agricultural income are excluded from the bulk of them[5]. Those financial instruments have thus been unable to support landscape management practices – either aimed at the rehabilitation of traditional landscapes or at the transition to new landscapes – in the largest part of Southern Salento. With the result that the small 'garden farmers', which used to play a pivotal role for landscape caretaking and cultural identity development in Southern Salento, now constitute the weakest part in the complex process of regeneration and rural development of the area. As they manage almost 80% of the olive orchards' extension, the inability of public policies to support their needs may have catastrophic consequences

[4] This possibility was granted by the Executive Decision of the Chief of Phytosanitary Observatory of the Apulia Region No. 274 dated 4/5/2018, which followed the Commission Implementing Regulation 2017/2352/EU.

[5] According to estimates elaborated by the AISS and Regione Puglia (2019), approximately 80% of the olive orchards do not comply with the eligibility requirements imposed by the RDP of the Apulia Region 2014-2020. As far as the Extraordinary Plan is concerned, the bulk of funding for the restoration of the production potential of affected olive orchards is exclusively or primarily for SMEs meeting very restrictive criteria (see Ministerial Decree No. 6703 from 23/6/2020).

in terms of land abandonment and landscape degradation.

The SNAI Action Plan for the Southern Salento Inner Area (Area Interna Sud Salento, henceforth AISS) partly acknowledges this mismatch, although it mainly considered it for its dramatic impacts on the degradation of landscape values, which in turn reduces the competitiveness of rural tourism in the area. In fact, the place-based strategy identified for the AISS aims at contrasting their decline by strengthening multi-functional and identity-based rural development as a means to increase tourism, in connection to the seaside attractions. Moreover, as this strategy fails to engage local actors in an inclusive co-production process, it is not able to increase territorial capabilities, meant as empowering practices strengthening the capacity of territories to act together (Sen, 1999; Dissart, 2012; De Leo, Altamore, 2023). Despite this reveals a narrow conception of the cultural and identity-based value of landscapes, the SNAI Action Plan for the AISS has nevertheless the merit to have highlighted the need for landscape regeneration independently from agricultural production, as well as the key role played for that by small 'olive gardeners'.

3. Premises, development and contents of the Integrated Project for landscape regeneration

The idea of promoting an Integrated Project for the regeneration of the landscape affected by Xylella in Southern Salento originated from the interaction between the AISS, with a leading role of its 'technical referee', the Apulia Region and university research groups. The Integrated Landscape Projects are policy instruments included in the governance tools of the TLP to promote and support local planning in integrated, multi-sectoral and multi-actor forms, i.e. requiring the integration of different disciplinary fields and the coordination of public and private actors belonging to different decision-making and operational spheres.

Some of the innovative contents of the TLP make it suitable to face with the major problems of degradation of landscapes affected by Xylella. The ultimate goal of the TLP is to reconnect inhabitants and producers of the Apulia region in the protection and enhancement of the territory's values as foundations for an alternative development that finds its self-generative capacity and durability in the reproductive rules of local resources (Magnaghi, 2005, p. 69). The TLP outlines desirable futures that are not predefined but should emerge in practice from the fulfilment of the goals, projects and guidelines that constitute its Strategic Scenario. Thus, it opens up the possibility to cope with the deep uncertainties connected to the spread of the Xylella pathogen, and with the value conflict underlying a plurality of legitimate but mutually incommensurable perspectives. In particular, Integrated Landscape Projects aim to activate and broaden the spaces for citizens' active mobilisation in the production and reproduction of their living

environments (Magnaghi, 2011).

The Integrated Project for the regeneration of the AISS was inspired by a conception of landscape as consisting of the tangible and intangible practices that shape a place not only in its remarkable sites but also in ordinary and blighted areas, as highlighted by the European Landscape Convention (Déjeant-Pons, 2006). The main objective was to steer public and private actors towards defining a shared strategy for environment-oriented landscape regeneration consistent with the identity of places and the objectives set out by the TLP. The Project would also identify good practices that could provide guidelines for the design and implementation of 'pilot landscape regeneration public actions'.

In the drafting of the Integrated Project, the Bari Technical University research team, since the early stages, involved the local association LUA[6] , which had been active in the drafting of experimental Integrated Landscape Projects in the Salento area during the TLP elaboration process. In particular, they promoted the so-called 'Paduli agricultural park', which acted as a source of inspiration for one of the five TLP Regional Territorial Projects: the 'City-Countryside Pact' aimed at improving the quality of life in both urban and rural areas through the regeneration of degraded landscapes, through processes of enhancement or rehabilitation, depending on the level of landscape conservation. The Paduli park is actually one of the 14 'multifunctional agricultural parks' for the regeneration of the countryside identified by the TLP (Barbanente, Grassini, 2022).

The design and implementation of the Integrated Project for the AISS comprises six phases (see Figure 6). Three phases actively involved local actors: municipalities, farmers, small landowners, and a number of associations and non-governmental organisations. In these phases bottom-up processes and collaborative practices promoting sustainable rural economies based on agro-biodiversity were identified and given voice. Such practices had often been promoted to fill the gap due to the ineffectiveness of traditional top-down policies, notably the Common Agricultural Policy, in addressing the problems of Southern Salento's agriculture, exacerbated by the Xylella epidemic. In some cases, these took the form of insurgent and even antagonistic practices towards the measures decided by the European Commission, and thus were usually ignored or opposed by government authorities at different levels.

[6] LUA stems for Laboratorio Urbano Aperto (Open Urban Laboratory).

Phases	Preliminary consultation of institutions	Exploring opportunities for regeneration	Context investigation	Turning perspectives into actions	Action implementation / management	Process monitoring / management
Activities	Signing agreement Interaction with institutional representatives Drafting plan of activities	Damage analysis Analysis of needs and aspirations Definition of general objectives	Landscape analysis Analysis of rules in force Analysis of actors Policy analysis Future perspectives	Definition of objectives and strategies Identification of guidelines and recommendations	Implementation of actions Landscape management Maintenance monitoring	Monitoring and evaluation of interventions
Actors involved	Ministry of Cultural Heritage, Apulia Region, University of Bari, Foggia and Salento, Polytechnic University of Bari	Local experts, municipalities, farmers, landowners, associations and non-governmental organisations	Domain experts	Local experts, municipalities, farmers, landowners, associations and non-governmental organisations	State, region, municipalities, farmers, landowners, third sector organisations	Ministry of Cultural Heritage, Apulia Region, University of Bari, Foggia and Salento, Polytechnic University of Bari
Tools	Organisational technical meetings Technical boards	Technical meetings Operational forums Open Space Technology (OST) Interviews	Technical analyses Diachronic analyses Scenario building Technical documents drawn up by experts	Technical and operational meetings Open Space Technology (OST)	Plans, programmes, regulations at various governmental levels Bottom-up initiatives	Follow-up meetings of the working groups and coordination committees Evaluations of the interventions being implemented

Figure 6. Phases of development of the Integrated Project in Southern Salento
Source: Adapted from the Research Report, November 2022.

The approach adopted in drafting the Integrated Project included the organisation of a workshop for the identification of desired and warning scenarios for local landscape development, which that took place in February 2022 in Tiggiano (LE). The Open Space Technology (OST) methodology (Owen, 2008) was used because of its capacity to support co-design of solutions when issues at stake are highly relevant for participants and involve a great deal of complexity, when people have different points of view and a real passion for the debated topic, and when there is a genuine urgency for the discussion (Owen, 2008; Vacik et al., 2014), as it was the case in Tiggiano. In total 47 people participated, either individually or as representatives of community-based organizations and local NGOs. The exploratory scenarios incorporate an explicit analysis of the deep uncertainty that affects post-Xylella landscapes in the area and offer plausible accounts of future events tied to current choices (Barbanente, Khakee, 2004; Avin et al., 2020). The three scenarios, respectively defined as baseline, desirable and warning, are summarised as a whole in Table 1, while Figure 7 depicts such scenarios in relation to the different rural landscapes identified by the TLP in the Southern Salento: deep countryside / inhabited countryside, peri- urban rural areas, multifunctional agricultural parks.

Table 1. Summary of the three scenarios

Baseline scenario	Desirable scenario	Warning scenario
Continuing the present trend with steady uprooting and limited replanting of olive orchards, increased take-up of agricultural land for non-agricultural uses (ground-mounted photovoltaics, etc.), progressive abandonment of fields and removal of communities from their rural roots.	Recovery of Xylella affected plots through olive orchards, also in combination with other Mediterranean cultivations and forestry (permaculture, agro-forestation and food forests' development), reduction in abandonment of fields and removal of communities from their rural roots, with an increase in biodiversity and an improvement in rural attractiveness for inhabitants and tourists.	Increased take-up of agricultural land for non-agricultural uses (ground-mounted photovoltaics, etc.), greater disturbance of the ecosystem with a sharp reduction in the biodiversity of flora and fauna and impairment of water resources, growth in the abandonment of fields with the removal of communities from their rural roots, and reduced attractiveness for tourism.

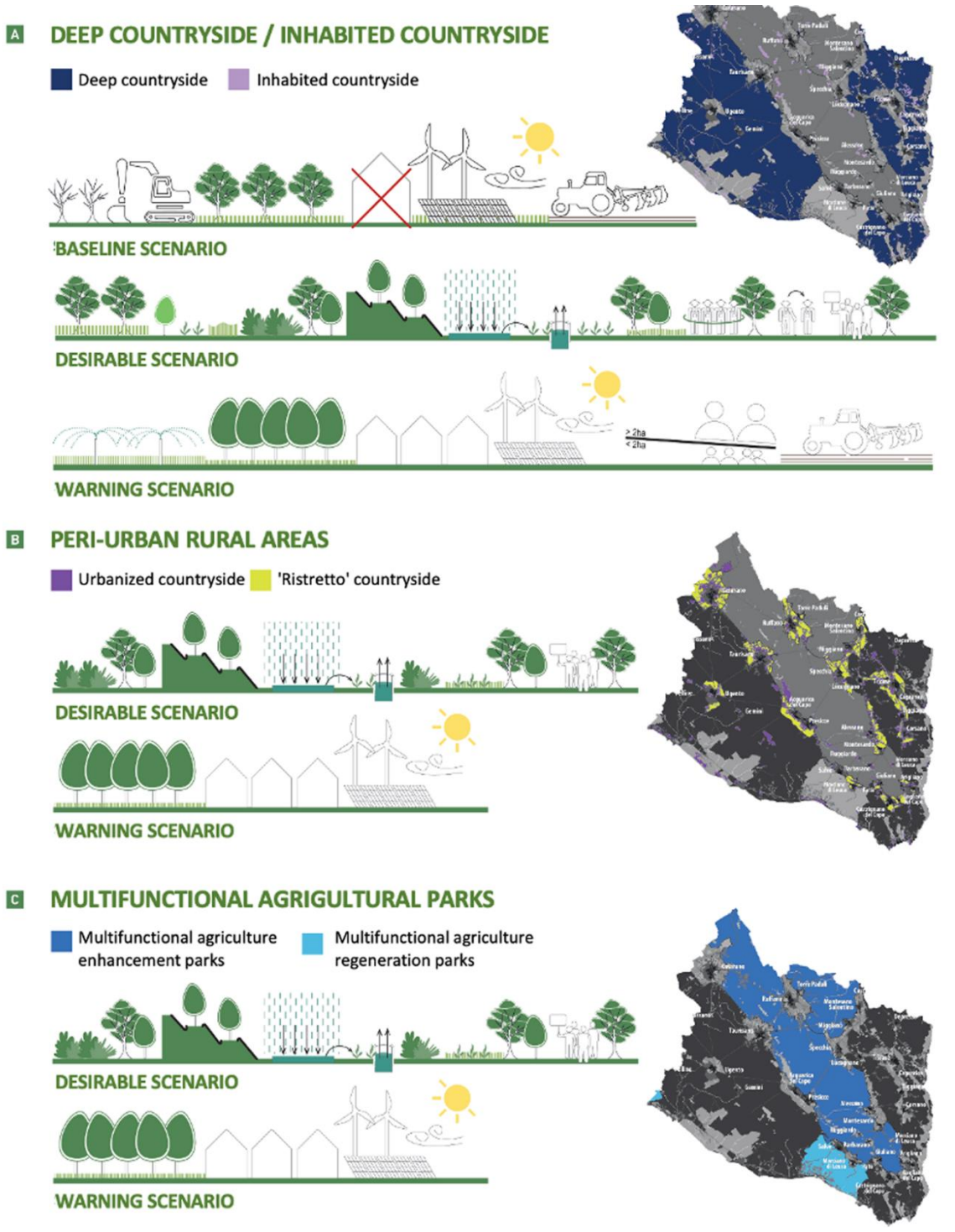


Figure 7. Representation of baseline, desirable and warning scenarios in the three rural landscapes identified by the TLP in the Southern Salento: deep countryside / inhabited countryside, peri-urban rural areas, multifunctional agricultural parks

Source: Research Report, November 2022.

During the OST workshop (see Figure 8), participants, divided into four groups based on the preliminary exploration of the main issues of concerns, outlined eight strategic actions, each aimed at overcoming a critical issue. The strategies, in turn, were broken down into 56 detailed proposals for action (see Figure 9).

GENERAL ISSUE	CRITICALITY RECORDED IN REPORTS	LIST OF PROPOSALS RECORDED IN REPORTS
3. Land fragmentation as an opportunity for a new vision of the role of rural actors	Land fragmentation and land abandonment	1. Public aid for small landowners to encourage self-production. Ensure biodiversification of production not linked to heterodirected production. Giving value to fractionalization as an element of emancipation. 2. Encourage and incentivize land consolidation for sustainable agroforestry projects. Encourage public acquisition of land in protected areas. 3. Extending the agri-environmental measures of the RDP (10.1.4, 10.1.5, 8.1,8.2, 8.4, 5.1.a, 4.4.a, 1.1, 1.2 and 2) also to landowners not organized in entrepreneurial form but engaged in actions of care and regeneration of agricultural land. Drafting a funding measure for the establishment of land associations (simple landowners and ETS) 4. Policies to support the establishment of Land Associations of small landowners. Land Associations are formed among public or private landowners or holders of other real or personal rights of use, in order to group together farmland or wooded areas, currently being managed, uncultivated or abandoned, or to enable their economically sustainable and productive use.
4. Fire risk between monitoring, cooperation and training	Land degradation and fire risk	1. Increasing monitoring and resources for interventions and planning. 2.a. Increasing fire personnel, improving skills, establishing a civic body of land sentinels and equipping an app for geolocated fire reporting. b. Involving ETS to enrol in the national civil protection registry for funded monitoring and prevention activities. c. Checking by superordinate bodies of the obligation of municipalities to include the fire prevention plan in the municipal emergency plan. d. Involving citizens and associations in the drafting of fire prevention plans. e. Extending the fire cadastre to agricultural land f. Establishing a permanent monitoring table between prefecture and municipalities. g. Mandatory annual updating of the fire cadastre.

Figure 8. Phases of the OST workshop and extract from the interpretive matrix of results
Source: OST Report 'The landscape that I am, that I would like'.

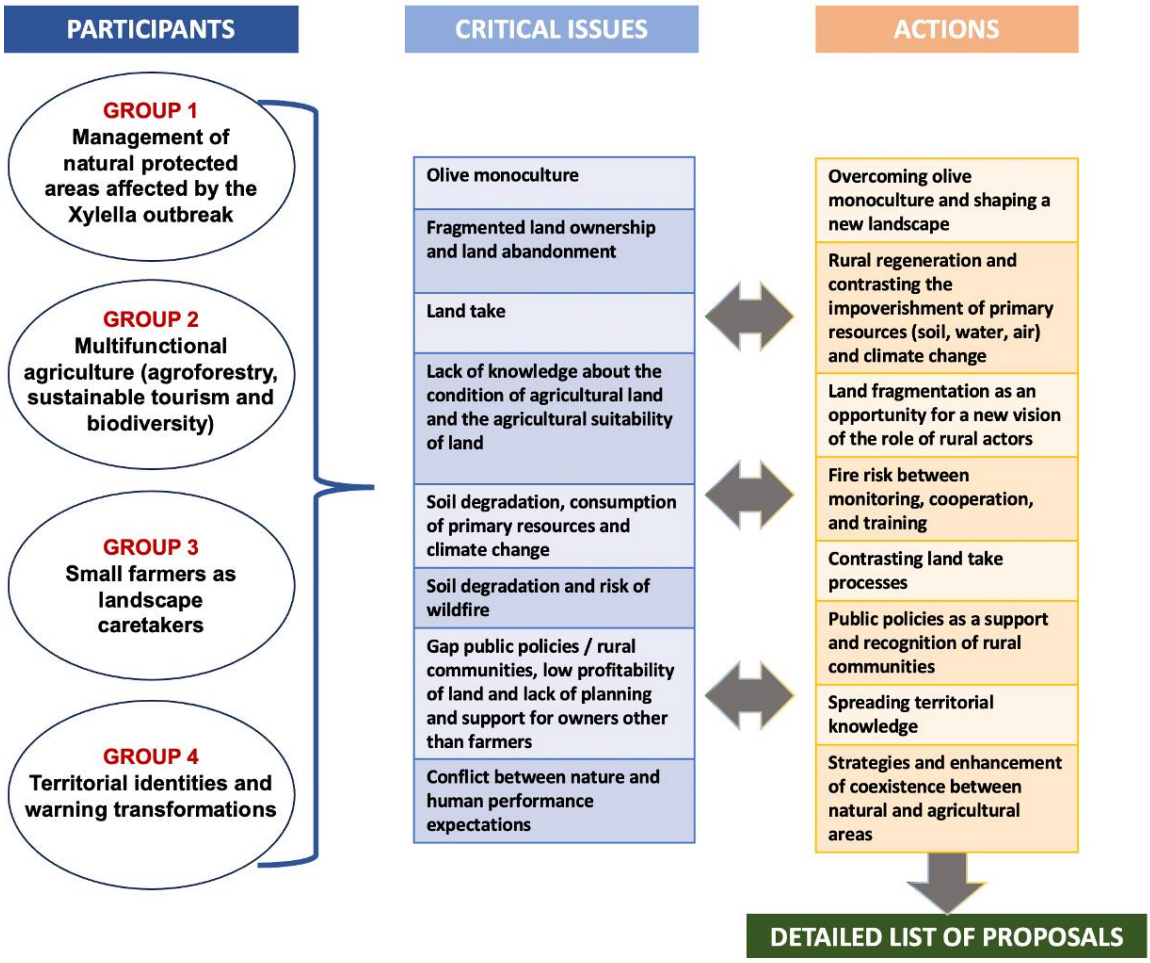


Figure 9. Overview of the essential parts of the OST meeting

Among the most critical issues, the fragmentation of land ownership being held by non-entrepreneurial actors emerged as crucial. Such fragmentation could become an empowering factor if public policies to support small landowners are promoted to encourage self-production and biodiversification as opposed to heterodirected production. The establishment of land associations among small landowners could encourage land reassembly through incentives for sustainable agroforestry projects, public acquisition of land in protected areas, and the extension of the agri-environmental measures under the Regional RDP to non-entrepreneurial landowners engaged in the care and regeneration of farmland.

The three scenarios and the OST's outcomes represent the knowledge base that informs the definition of the Integrated Project guidelines and recommendations. These are summarised and illustrated in 29 sheets (see an example in Figure 10), which identify, in

appropriate locations, specific objectives and strategic lines to be pursued, with respect to those identified by the TLP as well as to action topics (water and soil, environment, cultural heritage, urban-rural interface) and to the rural landscape typology (inland landscape, small hills of Serre Salentine or coastal landscape) to which the strategy refers. Each sheet also identifies the policy instruments that can be leveraged to achieve those objectives, and the actors to whom responsibility can be given for turning strategic lines into actions. Finally, examples of virtuous experiences and initiatives that may be helpful for the implementation of the strategy are presented.

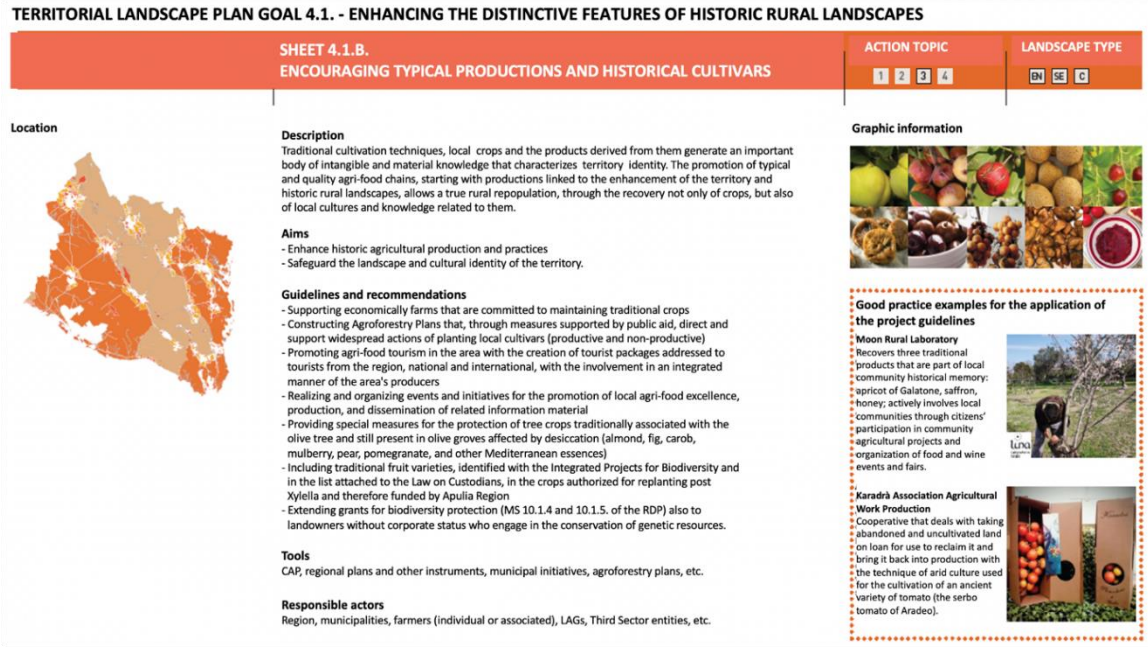


Figure 10. One of the sheets constituting the Integrated Project guidelines and recommendations

Source: Research Report, November 2022.

4. Discussion and conclusions

This paper has analysed a place-based integrated project developed in a marginal area in the southern part of Apulia, where the typical features of a peripheral context are aggravated by the spread of the Olive Quick Decline Syndrome (OQDS) connected to the Xylella epidemic. Because of this, at the time the integrated initiative started, the area was already targeted by several public policies for territorial recovery and local development mostly relying on a place-based approach, which nevertheless were showing several limitations. What differentiates the Integrated project from pre-existing policies and what makes its approach innovative and its results promising?

One innovative feature of the Integrated Project is the use of landscape as trigging point for the development of the place-based strategy. That was meant not only in its heritage dimension, as a driver for regeneration strategies based on the territorial identity and the 'uniqueness of place' (Oppido et al., 2019), but also in its dimension as a commons (Castiglioni et al., 2015; Gerber, Hess, 2017; Gattarulo, 2018) and in the 'commoning practices' producing it (Linebaugh, 2008; Bresnihan, 2016). This dimension is particularly relevant when applied to the landscape (Grassini, 2023), as it allows to focus on the generative potential of landscape for the active engagement of local communities in its production and reproduction (Magnaghi, 2012).

Through the intertwining of these two dimensions of the landscape, the Integrated Project in Southern Salento could thus overcome some of the main drawbacks of existing policies, namely: the dilemma between conservation strategies and the desire for new landscapes; the conception of the landscape as a static resource to be exploited within development strategies; the disempowering role given to local communities linked to a static interpretation of their identity; the inability to counteract enduring forms of spatial injustice connected to extractive elites and institutions.

Another innovative feature of the Integrated Project is the approach employed for multi-actor and multi-governance involvement in the co-design of its strategy, which differed from the place-based approach adopted in the cohesion policy (Barca et al., 2012) for the following reasons: i) instead of predefining clearly the aims and intended outcomes of the strategy, it adopted an exploratory scenario approach; ii) rather than merely promoting a public debate open to dissent and alternative viewpoints, it focussed on and gave voice to ongoing bottom-up collaborative practices experimenting with new sustainable rural economies; iii) rather than emphasising the coordination and collaboration between all the different governance and institutional levels, it involved key local actors who were deemed most capable of stimulating innovative actions and had been mainly excluded by existing public policies for local development.

In this way, the Integrated Project moved away from mere consultation-based forms of participation and governance to open up and broaden the space for citizens' active mobilisation in the development of a counter-narrative to the dominant interpretation of the marginalization drivers of Southern Salento and of possible solution spaces. The Integrated Project thus succeeded in tapping into, and strengthening, vibrant bottom-up processes and collaborative practices for new sustainable rural economies, which had started mushrooming in Salento before the Xylella outbreak. These were aimed to contrast the growing destruction of the territory, made by extractive local elites and external big players, as well as the increasing abandonment of the area, as shown in the case of the Paduli park (Barbanente, Grassini, 2022). These practices highlighted alternative development patterns rooted in a deep 'place consciousness' and in citizens'

active mobilisation in the production and reproduction of their territory-landscape (Magnaghi, 2011). After being ignored or opposed by public policies, these have become examples of 'good practices' and virtuous initiatives in the regeneration strategy of the Integrated Project; this furthermore strengthened the capacity of local communities to act together (Sen, 1999; Dissart, 2012; De Leo, Altamore, 2023).

The potential for change underlying the Integrated Project is also expressed by some pilot public interventions for landscape regeneration in Southern Salento that have been inspired by its guidelines. In May 2023, the Apulia Region approved a disciplinary scheme for the allocation of 400,000 Euro for the development and implementation of experimental projects for the recovery of Xylella affected areas in Southern Salento, including the possibility to fund small landowners.

Moreover, the executive project of one pilot action included in the strategy for the AISS, namely the 'Pioneer Land' project for the recovery of some Xylella affected public area, was deeply transformed thanks to the involvement, as designer of the executive strategy of this project, of the same association, LUA, which has played a key role in the grassroots initiatives promoted in Salento in the last twenty years and has organized the OST workshop in Tiggiano for the Integrated Project. As a result, while the interventions originally included in the SNAI Action Plan were basically aimed at the improvement of the landscape quality to increase tourism potential, with local communities being a mere recipient of communication and sensibilization activities, they now pursue three specific objectives in line with the strategy set in the Integrated Project: the experimentation of polycyclic agroforestry techniques as a means to increase biodiversity and resilience; ii) the support of new bio-economies revolving around agricultural wastes; iii) the support to a local food policy rooted on the use of local agricultural products for the preparation of meals in public canteens. This underline the generative role of local communities both in their active contribution to project objectives and in the identification of the operational actions meant as scaling-up of grassroots experiments included in the Integrated Project guidelines.

Acknowledgements. This paper is based upon the research supported by the Agreement for an 'Integrated Project for the regeneration of landscapes seriously compromised and degraded by the Xylella fastidiosa outbreak in the Southern Salento inner area', signed in July 2020 by Apulia Region, MIBACT, Polytechnic University of Bari, University of Bari, University of Foggia and University of Salento. Special thanks are due to the members of the Polytechnic University of Bari/DICATECh research team: Mariavaleria Mininni (University of Basilicata), Giovanna Costanza, Rossella Mauro, Juri Battaglini, Mauro Lazzari, who shared, with the authors, project developments and results.

CRediT authorship contribution statement.

Angela Barbanente: Conceptualization, Methodology, Investigation, Writing - original draft (sect. 1, 3), Writing - review & editing, Funding acquisition.

Laura Grassini: Conceptualization, Methodology, Investigation, Writing - original draft (sect. 2, 4), Writing - review & editing.

References

Albrechts, Louis, Angela Barbanente, Valeria Monno (2020) Practicing Transformative Planning: The Territory-Landscape Plan as a Catalyst for Change, *City, Territory, Architecture*, 7 (1), pp. 1–13.

Ali, Beshir M., Wopke Van Der Werf, Alfons O. Lansink (2021) Assessment of the environmental impacts of *Xylella fastidiosa* subsp. *pauca* in Puglia. *Crop Protection*, 142, 105519.

Area Interna Sud Salento, Regione Puglia (2019) Strategia Aree Interne Sud Salento. [Online] Available from: https://politichecoesione.governo.it/media/2721/strategia_sud-salento_maggio_2019.pdf [Accessed 13/05/2023].

Avin, Uri, Robert Goodspeed, Lily Murnen (2022) From Exploratory Scenarios to Plans: Bridging the Gap, *Planning Theory & Practice*, 23 (4), pp. 637–646.

Barbanente, Angela, Abdul Khakee (2004) Scenarios as an Exploratory Evaluation Approach. Some Experiences from Southern Mediterranean. In Miller, Donald and Domenico Patassini (eds) Beyond Benefit Cost Analysis, Aldershot: Ashgate, pp. 227–250.

Barbanente, Angela, Laura Grassini (2022) Fostering transitions in landscape policies: A multi-level perspective, *Land Use Policy*, 112, 105869.

Barca, Fabrizio (2009) *An Agenda for a Reformed Cohesion Policy, A Place-Based Approach to Meeting European Union Challenges and Expectations*. Independent Report prepared at the request of Danuta Hübner, Commissioner for Regional Policy.

Barca, Fabrizio, Paola Casavola, Sabrina Lucatelli (2014) A strategy for inner areas in Italy: Definition, objectives, tools and governance. Materiali Uval, 31. [Online] Available from: https://www.agenziacoesione.gov.it/wp-content/uploads/2020/07/MUVAL_31_Aree_interne_ENG.pdf [Accessed 13/05/2023].

Barca, Fabrizio, Philip McCann, Andrés Rodríguez-Pose (2012) The Case for Regional Development Intervention: Place-Based versus Place-Neutral Approaches. *Journal of Regional Science*, 52 (1), pp. 134–152.

Bevilacqua, Piero (1996) *Tra natura e storia. Ambiente, economie, risorse in Italia*. Roma: Donzelli.

Bresnihan, Patrick (2016) The more-than-human commons. From commons to commoning. In: Kirwan, Samuel, Leila Dawney, Julian Brigstocke (eds.) *Space, Power and the Commons. The struggle for alternative futures.* London and New York: Routledge, pp. 93–

112.

Brunazzo, Marco (2016) The history and evolution of Cohesion policy. In: Piattoni, Simona, Laura Polverari (eds.) *Handbook on Cohesion Policy in the EU*. Cheltenham: Edward Elgar, pp. 17–35.

Carrosio, Giovanni (2016) A place-based perspective for welfare recalibration in the Italian inner peripheries: The case of the Italian Strategy for Inner Areas, *Sociologia e Politiche Sociali*, 19 (3), pp. 50–64.

Castells, Manuel (1989) *The Informational City*. Oxford: Blackwell.

Castiglioni, Benedetta, Fabio Parascandolo, Marcello Tanca (ed.) (2015) *Landscape as Mediator, Landscape as Commons. International Perspectives on Landscape Research*. Padova: Cleup.

Cotella, Giancarlo, Elisabetta Vitale Brovarone (2020), The Italian National Strategy for Inner Areas. A place-based approach to regional development. In: Bański, Jerzy (ed.) *Dilemmas of Regional and Local Development*. London: Routledge, pp. 50–71.

De Leo, Daniela, Sara Altamore (2023) Why multi-stakeholder practices don't work: Looking beyond the extent and diversity of actors for co-producing collective action; a case study from an inner area in Italy. *Planning Practice & Research*, 38 (3), pp. 447–463.

Déjeant-Pons, Maguelonne (2006) The European landscape convention. *Landscape Research*, 31 (4), 363–384.

Dissart, Jean-Christophe (2012) Building capabilities and territorial resources in mountain tourist areas. Case study in Oisans. *Journal of Alpine Research| Revue de géographie alpine*, 100-2.

Gattarulo, Mariateresa (2018) Il paesaggio come *commons*. Riflessioni teoriche e analisi empiriche: il caso del Parco Paduli nel Salento delle Serre. B*ollettino della Società Geografica Italiana,* serie, 14, 1 (1), pp. 79–89.

Gerber, Jean-David, Gérald Hess (2017) From landscape resources to landscape commons: Focussing on the non-utility values of landscape. *International Journal of the Commons*, 11 (2), pp. 708–732.

Gestore dei Servizi Energetici (2023) Il solare fotovoltaico in Italia. Stato di sviluppo e trend del settore – Rapporto Statistico. [Online] Available from: https://www.gse.it/documenti_site/Documenti%20GSE/Rapporti%20statistici/GSE%20-%20Solare%20Fotovoltaico%20-%20Rapporto%20Statistico%202022.pdf [Accessed 13/05/2023].

Grassini, Laura (2023) Paesaggio e beni comuni: Processi di commoning nel Sud Salento colpito dalla Xylella. In: Adobati, Fulvio, Luciano De Bonis, Anna Marson (eds.), *Agire sul patrimonio, Proceedings XXIV SIU National Conference, Brescia, 23–24 June 2022, Volume 08*. Roma-Milan: Planum Publisher and SIU.

Harvey, David (1973) *Social Justice and the City*. London: Edward Arnold.

Lefebvre, Henri (1974) *La Production de l'Espace*. Paris: Anthropos; English translation: *The Production of Space*, Oxford, Blackwell, 1991.

Linebaugh, Peter (2008) *The Magna Carta Manifesto: The Struggle to Reclaim Liberties & Commons for All*. Berkeley: University of California Press.

Lucatelli, Sabrina (2016) Strategia Nazionale per le Aree Interne: Un punto a due anni dal lancio della Strategia. *Agriregionieuropa*, 12, 45. [Online] Available from: https://agriregionieuropa.univpm.it/it/content/issue/31/agriregionieuropa-anno-12-ndeg45-giu-2016 [Accessed 13/05/2023].

Lucatelli, Sabrina, Filippo Tantillo (2018) La strategia nazionale per le aree interne. In: De Rossi, Antonio (ed.) *Riabitare l'Italia. Le aree interne tra abbandoni e riconquiste*. Roma: Donzelli, pp. 403–416.

Magnaghi, Alberto (2005) *The Urban Village: A Charter for Democracy and Self-sustainable Development*. London and New York: Zed Books.

Magnaghi, Alberto (2011). The Apulia approach to landscape planning. *Urbanistica*, 147, pp. 8–13.

Magnaghi, Alberto (ed.) (2012) *Il territorio bene comune*. Firenze: FUP.

Martelli, Giovanni P., Donato Boscia, Francesco Porcelli, Maria Saponari (2016) The olive quick decline syndrome in south-east Italy: A threatening phytosanitary emergency. *European Journal of Plant Pathology*, 144, pp. 235–243.

Martinelli, Flavia (2022) Le politiche per il Mezzogiorno dal dopoguerra ad oggi e la convergenza «interrotta». Due paradigmi di policy a confronto. *Rivista economica del Mezzogiorno*, 1-2, pp. 15-72.

Oppido, Stefania, Stefania Ragozino, Donatella Icolari, Serena Micheletti (2019) Landscape as driver to build regeneration strategies in inner areas. A critical literature review. In: Calabrò, Francesco, Lucia Della Spina, Carmelina Bevilacqua (eds.) *New Metropolitan Perspectives–Volume 1,* Cham (Switzerlan): Springer, pp. 615-624.

Owen, Harrison (2008) *Open Space Technology. A User's Guide* (third edition). San Francisco: Berret-Koehler Publishers.

Prieur, Michel (2006) Landscape and social, economic, cultural and ecological approaches. In: *Landscape and sustainable development. Challenges of the European Landscape Convention*. Strasbourg: Council of Europe Publishing, pp.11–28.

Saponari, Maria, Annalisa Giampetruzzi, Giuliana Loconsole, Donato Boscia, Pasquale Saldarelli (2019) Xylella fastidiosa in Olive in Apulia: Where we stand. *Phytopathology*, 109 (2), pp. 175–186.

Sassen, Saskia (1994) *Cities in a World Economy*. Thousand Oaks: Pine Forge Press.

Scholten, Rebecca, Laura Martinez Sanchez, Alberto Hornero, Juan A. Navas-Cortes, Pablo J. Zarco-Tejada *et al*. (2019) Monitoring the impact of Xylella on Apulia's olive orchards using Sentinel-2 satellite data and aerial photographs, Second European Conference on Xylella fastidiosa, Ajaccio, October 30, 2019. [Online] Available from: https://digital.csic.es/bitstream/10261/207915/1/monitoring_impact_Xylella.pdf [Accessed 13/05/2023].

Sen, Amartya (1999) *Commodities and capabilities*. Oxford: Oxford University Press.

Servillo, Loris, Antonio P. Russo, Filippo Barbera, Giovanni Carrosio (2016) Inner Peripheries: towards an EU place-based agenda on territorial peripherality. *Italian Journal of Planning Practice*, VI (1), pp. 42–75.

Soja, Edward W. (2010) *Seeking spatial justice*. Minneapolis, MN: University of Minnesota Press.

Stiglitz, Joseph E. (2012) *The Price of Inequality. How Today's Divided Society Endangers Our Future*. New York: W.W. Norton.

Vacik, Harald, Mikko Kurttila, Teppo Hujala, Chiranjeewee Khadka, Arto Haara, *et al*. (2014) Evaluating collaborative planning methods supporting programme-based planning in natural resource management. *Journal of Environmental Management*, 144, pp. 304–315.

Wilkinson, Richard, Kate Pickett (2010) *The Spirit Level: Why Equality is Better for Everyone*. London: Penguin.

UNVEILING THE PLACE-BASED APPROACH FOR LOCAL TERRITORIAL DEVELOPMENT: OBSERVATIONS IN ONE ITALIAN 'INNER AREA' (1135)

Valentina Romero Silva

Università IUAV di Venezia, School of Doctoral Studies, Research area: Regional planning and urban policies, Italy; e-mail: vromerosilva@iuav.it

Abstract. This paper explores the challenges and opportunities associated with implementing integrated territorial projects in Inner Areas of Italy using a place-based approach. The study focuses on the case study of the Bormida Valley, one of the pilot project areas under the National Strategy for Inner Areas (SNAI). The analysis delves into the decision-making processes, multi-level governance, and mobilization of local knowledge in formulating and implementing project actions. It reveals the complexities involved in project selection, stakeholder engagement, and adherence to regional guidelines. The findings highlight the importance of context-specific approaches, local knowledge activation, and stakeholder engagement for successful project outcomes. The research contributes to understanding the intricacies of implementing integrated territorial projects and provides insights for policymakers and practitioners seeking to promote sustainable development in Inner Areas.

Keywords: local development, left-behind places, place-based approach.

Introduction

The National Strategy for Inner Areas (SNAI for its acronym in Italian) is an experimental policy in Italy of the place-based approach (Barca, 2009). It targets Inner Areas, territories far from centres that provide essential services (mobility, health, and education). Although the SNAI has been recognised in the academic debate as an interesting novelty and a particular case of territorial sensitivity (Coppola *et al.*, 2021; Viesti, 2021), there are still some questionable aspects of the effective implementation of the Strategy in project areas. The models and approaches considered so far are only reproducible in some contexts where knowledge acquisition and capability diffusion processes have taken place with varying degrees of depth and complexity.

This paper presents the outputs of a case study. The context analysed by the research concerns the Bormida Valley, one of the three first pilot SNAI project areas in the Piedmont Region. The Valley is rich in a widespread cultural and landscape heritage. At the same time, there is an interesting project scenario recently activated by the SNAI, the recently

approved Piedmont Regional Landscape Plan and the objectives of the New Urban Agenda.

The paper attempts to illustrate the arrangements made during the operational translation of the project by answering some specific research questions: Which project objectives and principles are consistent with the place-based approach within the context of SNAI's implementation? In what manner are the central aspects of the place-based approach translated into actionable projects and their subsequent execution? The insights result from empirical research, participatory observation, interviews and first-hand experience. The field-research activities were conducted over 12 months in the local territorial authority overseeing the project.

The first part provides an overview of the development policies in Italy for marginal territories and the initiatives that laid the foundation for the place-based approach and the National Strategy for Inner Areas (SNAI). It also discusses the objectives, key areas of intervention, and multilevel governance structure of the SNAI, highlighting the integrated nature of the Strategy.

The second part presents the case study context for this research: The Bormida Valley in the Piedmont Region. It summarises the methods and activities conducted during the research period and the specifics of the formulation process of the Area Strategy.

The third part discusses the implementation of integrated territorial projects in the Bormida Valley. It focuses on the main findings related to the decision-making process for project actions, the role of multilevel governance in supporting local interventions and the activation of local knowledge during implementation.

1. Place-based Approach and Inner Areas

1.1 Overview of development policies in Italy for marginal territories

For decades, the policies for development issued by the Italian State were focused on supporting the industry through incentives and direct interventions[1]. These kinds of policies were replicated throughout the country without being articulated with the specificities of each territory. In the late '70s, the experience of *Distretti Industriali*[2]

[1] OECD. (2019). OECD Economic Surveys: Italy 2019

[2] Distretti Industriali, translated as Industrial Districts, is an Italian concept referring to geographically concentrated areas characterized by the presence of interconnected small and medium-sized enterprises (SMEs) belonging to the same or related industries. These districts are known for their strong inter-firm relationships, collaboration, and specialization, which contribute to their competitiveness and innovation. Distretti Industriali emphasize the importance of local production systems, clustering of similar industries, and the synergies that arise from close geographical proximity. Becattini, G. (1990). The Marshallian Industrial District as a Socio-economic Notion. In F. Pyke, G. Becattini, & W. Sengenberger (Eds.), Industrial

(Becattini, 2000) and *Patti territoriali*[3] (De Rita and Bonomi, 1998) represented a turning point in development policies as they proposed a comprehensive vision of the project area and a multisectoral approach (Cavazzuti, 2004; Trigilia, 2005). These initiatives provided essential contributions to what would later become the foundations of the place-based approach and the SNAI (Trigilia, 2005; Borghi, 2017). In particular, the *Patti territoriali* initiated active participation at various territorial levels, identified medium-small areas as objects of Strategy, and focused on improving essential services (De Fano and Mantino, 2015).

Although there are connections between the SNAI and the learning process already initiated by the initiatives mentioned above, there are two essential characteristics of political innovation (Calvaresi, 2015; Carrosio, 2020; Coppola *et al.*, 2021). First, the SNAI firmly commits to improving citizen services to trigger economic development. Second, it presents the role of national-level actors as an "external destabilising action" of local practices that perpetuate territories in the "underdevelopment trap." The Strategy seeks to act on education, health, and mobility services, essential to guarantee citizenship rights and activate local production chains. Additionally, the Strategy mobilises actors, spurs public debate, and activates knowledge acquisition processes and modifications in local governance networks in the project areas.

1.2 EU Cohesion Policy and the place-based approach

Since the 2007 Lisbon Treaty, achieving territorial cohesion has become a shared goal of the European Union[4]. Cohesion policies have undergone significant developments over

---

Districts and Inter-firm Cooperation in Italy (pp. 37-51). International Institute for Labour Studies.

[3] "Patti territoriali" refers to territorial agreements or contracts in Italy. These agreements represent a collaborative and participatory approach to local development, involving various stakeholders such as local authorities, businesses, community organizations, and citizens. The purpose of "patti territoriali" is to foster coordinated actions, shared vision, and strategic planning for the improvement of specific territories. Bagnasco, A. (1977). "Territorial Pacts and Local Development in Italy." Regional Studies, 11(1), 1-26.

[4] Territorial cohesion, as defined in the EU Treaty of Lisbon, refers to a concept that aims to reduce disparities and promote balanced development among different regions and territories within the European Union. It recognizes the importance of all regions, including urban, rural, and remote areas, and emphasizes the need for integrated and harmonious development across the EU.

The Treaty of Lisbon, signed in 2007, explicitly recognizes territorial cohesion as a key objective of EU policies. It highlights the importance of promoting economic, social, and territorial cohesion, with specific attention to the challenges faced by less developed regions, including those affected by geographical and demographic disadvantages.

The concept of territorial cohesion emphasizes the need for coordinated actions and policies to ensure that

the years. A particular transformation began for the European programming period 2014-2020 concerning territory and local dimensions.

In 2009, a report commissioned independently by the European Commissioner for Regional Policy, Danuta Hübner, was published for the then Head of the Department for Development and Economic Cohesion, Fabrizio Barca. In the so-called Barca Report, the author identified critical points of cohesion policy and highlighted possible transformations for future programming periods.

The proposed agenda proposed by Barca in the mentioned Report to overcome the "blindness" to the territory, which he believed was inherent in previous approaches, is the self-proclaimed innovative place-based policy. In summary, the place-based approach is a long-term strategy to reduce inefficiency and ineffectiveness in specific places, producing public goods and services by intersecting local knowledge and needs with institutional and expert political participation and triggering multilevel governance.

The reform of the Cohesion Policy based on the recognition of the potential of places will then translate into the formulation of national territorial policies for local development.[5], including the Italian National Strategy for Inner Areas.

The place-based approach has been demonstrated to be a valuable tool for integrated territorial policies. Integrated territorial policies holistically promote economic development and social cohesion, considering each place's unique characteristics (McCann and Rodríguez-Pose, 2011). Place-based policies can help to achieve these goals by providing targeted support to areas that need it most. According to the place-based approach literature, the policy interventions following this perspective focus on improving opportunities in terms of efficiency and equity, recognising the importance of local contexts and community involvement (Barca, 2009). To reduce socio-economic marginality, the integrated management of material and immaterial local resources proves to be a valuable tool in inner areas (Battaglia *et al.*, 2019).

By addressing issues of accessibility and marginality reduction, the attractiveness of inner areas can be augmented. Attractiveness, viewed as the mobilisation and endowment of territorial assets, is crucial in fostering territorial cohesion and creating opportunities for all parts of cities and regions to contribute to national development (Tomaney, 2010;

---

all regions benefit from EU initiatives and contribute to the overall development of the Union. It recognizes the diversity of regions and territories within the EU and aims to address regional disparities, enhance connectivity, and improve the quality of life for all citizens.

Treaty of Lisbon (2007). Official Journal of the European Union, C 306, 17 December 2007.

[5] Other national policies…

Servillo, Atkinson and Russo, 2012).

Collaborative efforts and community engagement are vital to realising the full potential of inner areas and creating vibrant, inclusive, and prosperous spaces. Adopting a place-based approach and involving multidisciplinary and multistakeholder territorial planning can effectively promote cultural territorial systems and tap into the economic potential of inner areas (Rotondo *et al.*, 2016; Battaglia *et al.*, 2019).

Engaging local communities through inclusive practices reveals new dynamics of transformation and innovation, contributing to the vitality of inner areas. Initiatives across the country emphasise the significance of built heritage and highlight the transformative power of "co-creative communities" and neo-rural practices in marginalised landscapes (Ferretti and Favargiotti, 2022; Ferretti *et al.*, 2022).

In general, place-based development can be an effective way to improve the economic conditions of places that are lagging by involving diverse stakeholders, valuing local resources, and focusing on improving accessibility and attractiveness.

1.3 National Strategy for Inner Areas and the Place-based project approach

Fabrizio Barca, then Italian Minister for Territorial Cohesion, presented the first proposal document for the SNAI in 2012 within the Partnership Agreement 2014-2020. It expressed the need for a national strategy to protect the territory and the safety of its inhabitants, promoting natural and cultural diversity and polycentrism.

The SNAI aims to counteract the decline of a large part of the Italian territory, the so-called "Inner Areas", which cover 60% of the country's land, 4,261 municipalities, where 23% of the population lives. The Inner Areas are characterised by a distance from major urban centres, a demographic trend towards ageing, depopulation, and poor economic trends. The first generation of pilot areas comprised 72 areas distributed over the Italian territory.

The SNAI, in its proposal, develops fundamental nodes of the place-based approach: (i) it prioritises participatory processes beyond the sole public-private partnerships that were at the centre of integrated planning; (ii) it intends to act on the provision and quality of services that guarantee citizenship rights as a precondition for development intended as growth and social inclusion.

The State establishes the policy procedures. Within the policy process, three decision-making moments (Dente, 2011) are recognised, which are fundamental to understanding how the strategy design works in each project area: (i) the "Draft Strategy", the first collective document drawn up by local administrators with a generic aspiration of the area; (ii) the "Preliminary Strategy", where the guiding idea is deepened, and actions begin to be detailed, (iii) and the "Area Strategy," where the contents of the preliminary are

translated into specific interventions and actions accompanied by project sheets with expected results and outcome indicators. Once the Area Strategy is approved, the Framework Programme Agreement (Accordo Programma Quadro – APQ) is the last document prepared. This implementing tool contains the activities and interventions to be carried out and the timing, implementation methods, and funding sources (Lucatelli and Tantillo, 2018).

Therefore, the SNAI is a comprehensive and structured approach that aims to address the challenges faced by inner areas in Italy, promote sustainable development, and use resources in inner areas through a place-based approach and multilevel governance. Its objective is to promote territorial development that caters to the diverse needs of these identified areas.

The SNAI seeks to combat depopulation, mitigate hydro-geological disasters, preserve cultural and landscape heritage, and foster intensive and extensive local development. To achieve these goals, it establishes intermediate objectives, including improving local populations' well-being and social inclusion, enhancing employment opportunities, utilising territorial assets effectively, reducing social costs associated with depopulation, and strengthening local development factors such as market and employment opportunities.

To accomplish these objectives, the Strategy focuses on two types of integrated actions: (i) improving essential services like education, healthcare, and mobility, and (ii) implementing local development projects. Access to these services is considered a fundamental right for quality citizenship and a prerequisite for local development. Without adequate services, it becomes challenging for residents to stay in inner areas and discourage potential newcomers, hindering the critical mass needed to initiate local development processes.

The SNAI identifies five areas for local development interventions: protecting the territory and local communities, enhancing natural and cultural resources and sustainable tourism, promoting agri-food systems, implementing energy efficiency measures and local renewable energy projects, and supporting craftsmanship and traditional knowledge. Although not explicitly stated, these five areas encompass various aspects of the landscape, including its natural and cultural components, economic activities, and energy resources.

The integrated nature of the Strategy encompasses not only the collaborative synergy among different types of integrated actions to achieve the ultimate objective but also the coordination of various governance levels and development perspectives. SNAI's multilevel governance proposal is structured at the central level by the State represented by the National Technical Committee for Inner Areas (CTAI for its acronym in Italian), which acts as an 'exogenous actor' or 'destabilising agent' and plays an essential role in the

participation and scouting phase, approves the Strategy and is responsible for measuring and evaluating its implementation. The Region is crucial in making available and articulating regional-managed EU funds for local rural development actions. Finally, the inner area Local Team is formed by the referent mayors and professionals. Other institutional and non-institutional actors flank them, like school principals or health authorities.

The SNAI also integrates the EU funds during the 2014-2020 period (allocated for local development types of actions allocated through the regional rural development plans) with the resources designated by the National Budget Legislation, intended explicitly for essential service types of action.

As illustrated, the SNAI allows the selected inner areas to formulate an integrated landscape and rural development project. It is, therefore, a unique occasion to reflect on what degree the institutions in the inner areas manage to leverage the territorial resources through local mobilisation, how the multilevel governance supports local communities in interpreting their potential, and in general, how the institutions in the inner area get to mobilise knowledge and capacities for implementing projects actions that are coherent with the premises of the SNAI and place-based approach.

2. Case study context: Bormida Valley

The Bormida Valley is one of the first three pilot project areas of the SNAI in the Nord-west Piedmont Region. The Bormida Valley is known for its rich cultural and landscape heritage, with various natural resources, including forests, rivers, and hills. Economic and social issues, including depopulation, youth migration, and lacking essential services,

impact the area's potential.

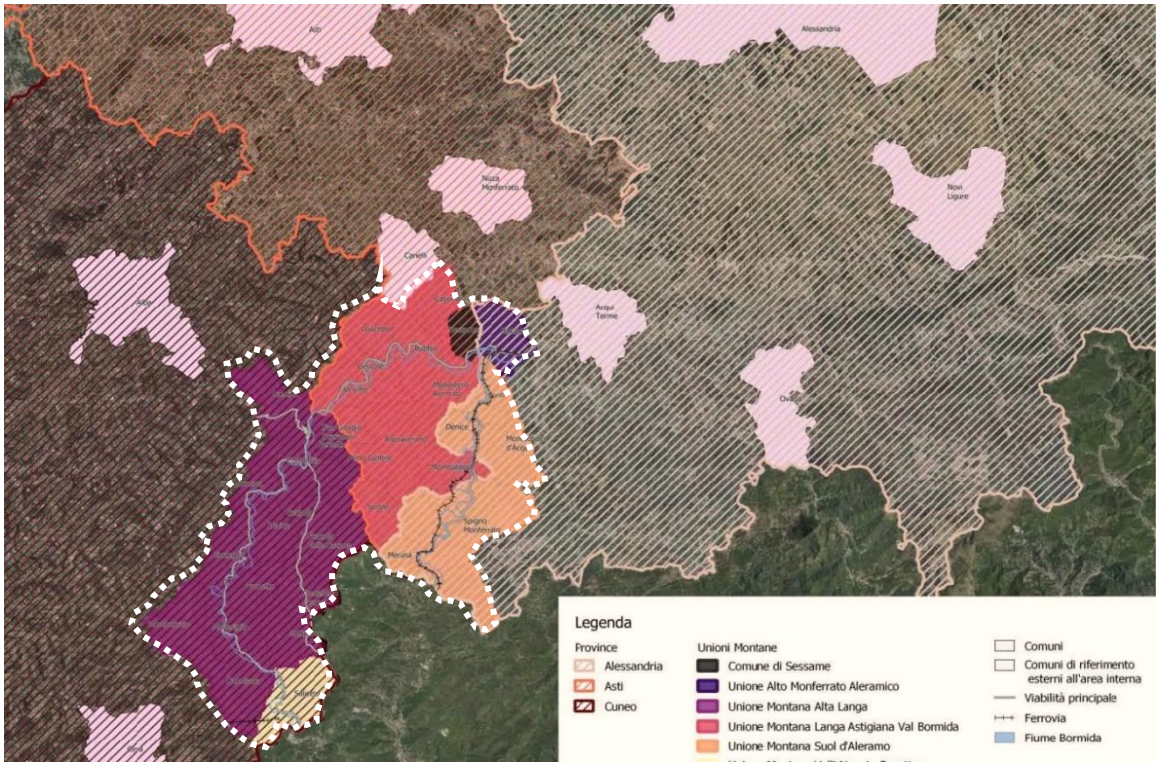


Figure 1. Delimitation of Bormida Valley Inner Area

The boundaries of the inner area of Val Bormida (figure 1) involve 33 municipalities and a resident population of approximately 16,800 inhabitants. Of the 33 municipalities, 32 belong to 5 different Mountain Unions, while one municipality does not belong to any aggregation figure (Sesame). In addition, the territory is spread across three provinces (Cuneo, Asti, and Alessandria). The management of healthcare services is the responsibility of four Local Health Authorities, while the education sector involves three Comprehensive Institutes and one Higher Institute. The Landscape Commissions approve and evaluate landscape projects in the Mountain Unions, and the recently created Archaeology, Fine Arts and Landscape Superintendence for the Provinces of Alessandria, Asti, and Cuneo supervise them.

It is necessary to consider the initial scenario to reflect on the effects on the actors' network that the SNAI process may generate. The Val Bormida is a valley historically united in the fight to restore the Bormida River against the pollution caused by ACNA (Aziende Chimiche Nazionali Associate, later becoming Azienda Coloranti Nazionali e Affini). This struggle has led them to undertake programming processes born from the bottom up, such as attempting an integrated project entrusted to some municipalities in the Valley

(Cortemilia, Torre Bormida, Levice, and Bergolo). The integrated project stayed in draft form. The Region's intentions to restore the Valley through a River Contract with all municipalities also went unimplemented.

Figure 59. Generalities of the Area Strategy: Administrative Structure, Timing and Territorial Data

Despite being a territory that shares a common past, institutional fragmentation makes it challenging to have a single territorial representation capable of making project decisions. For example, the stalemate of the River Contract can represent a missed opportunity to build a local governance "platform". On the other hand, specific programming tools promote the protection and enhancement of the landscape, such as the Local Action Groups - GAL - Borba and Langhe Roero Leader, Interreg program projects, and Alpine space, which generally involve only part of the project area but can constitute partial scenarios of encounter.

2.1 Area Strategy approbation process

The process of formulating the Area Strategy was particularly lengthy, taking almost seven years between the first meeting with the Ministry of Cohesion and Development and the approval of the APQ. The first draft of the Strategy was drawn up at the end of 2014, after which the process was suspended due to lack of funds until the 2018 budget law allowed its resumption in July, 2018. The Local Team was structured and formed by the president and the general Secretary of Alta Langa Mountain Union (lead authority), one mayor representing the Langa Astigiana side, and a professional in charge of the technical

consultation.

Between July, 2018 and March, 2019, the CTAI organised thematic working tables with key actors. The Consultant Professionals animated the meetings. The meetings aimed at collecting information on issues, needs, and proposals for constructing the preliminary Strategy.

During the meetings, the role of the CTAI as an "exogenous" agent was quite active in both the organisation of the meetings and the revision of the preliminary strategy drafts. It oversaw the inclusion of the identified needs in the meetings in defining the strategy action proposals.

The strategy design process was completed with its approval in November 2020 and the signing of the APQ in July,2021. It became one of the last area strategies approved in Italy during the 2014–2020 programming period.

The complexity of the administrative network in the Valley inspired the concept of the Area Strategy: to restore unity to a fragmented territory but homogeneous in its identity. The Bormida River itself became the element that represents a 're-appropriation' by the local population of its own identity and links the restoration and the enhancement of the territorial values. The Area Strategy is titled "*Ritroviamo il Fiume*" (Let us rediscover the river). The operational program is structured along the two types of project action established by the SNAI guidelines (table 1).

Table 1. Projects of the Area Strategy

	Project Actions			**Funding**	**Budget (€)**	**Institution in charge of the action**
Type 1: Essential Services	**Healthcare**					
	A.1	Activation of home care service		Allocated by Italian Budget Legislation 2018	350,000	Asti Local health agency - ASL AT
	A.2	Development of tele-assistance and tele-medicine systems			350,000	Cuneo Local health agency - ASL CN2
	A.3	Establishment of widespread medicine centres				
		A.3.1	Bubbio health centre		195,000	Alessandria Local health agency - ASL AT
		A.3.2	Spigno Monferrato health centre		213,000	Alessandria Local health

						agency - ASL AT
		A.3.3	Ponti health centre		50,000	Alessandria Local health agency - ASL AT
		A.3.4	Cortemilia Health centre		200,000	Cuneo Local health agency - ASL CN2
	Education					
	B.1	Enlargement of the educational offer				
		B.1.1.	Colloquiando con il mondo, il potenziamento delle lingue straniere	Allocated by Italian Budget Legislation 2018	209,926	Institute Cortemilia-Saliceto
		B.1.4.	Servizi per la prima infanzia: asili nido di valle		94,675	
		B.1.2.	Star bene insieme con la musica, il teatro e lo sport		99,690	Institute *4 Valli*
		B.1.6.	Formazione insegnanti		29,929	
		B.1.3	Il futuro siamo noi ! Conoscenze tecniche innovative		268,682	Institute Spigno
		B.1.5.	Tartufaia didattica dell'area interna. Sperimentazione di laboratori didattici		30,670	
		B.1.7.	Attività extracurricolari propedeutiche all'inserimento/qualificazione professionale		30,000	IISS Piera Cillario
	B.2	Renovation of school facilities				
		B.2.1.	Ampliamento del plesso scolastico di Bistagno per la realizzazione di ambienti didattici polifunzionali		234.000,00	Municipality of Bistagno
		B.2.2.	Adeguamento di locali scolastici esistenti ai fini dell'apertura di un Micronido a Cortemilia		57.700,00	Municipality of Cortemilia
		B.2.3.	Adeguamento locali Scuola dell'Infanzia di		52.728,00	Municipality of Monesiglio

			Monesiglio ai fini dell'apertura di un Micronido			
	B.3	Requalification of laboratory for learning activities in presence and online			416,000	Institute Cortemilia-Saliceto
	Mobility and Transport					
	C.1		Mobility study and proposal of reorganisation of mobility in the area	Allocated by Italian Budget Legislation 2018	90000,00	Alta Langa Mountain Union
	C.2		Flexible collective public transport service		310000,00	Alta Langa Mountain Union
Type 2: Local Development	**Rural development**					
	D.1		Rural Development	EAFRD - European Agricultural Fund for Rural Development	2,500,000	Funds allocated through calls for tenders managed by Alta Langa Mountain Union
	E.1		Digital tourism services	FSC - Development and Cohesion Fund	278,000	
	F.1		Incentives for development of Non-agricultural activities in agricultural domains		750,000	
	G.1		Energy efficiency in public buildings		556,000	
	H.1		Bicycle and pedestrian path along the Bormida River		1,250,000	
	H.2		Enhancement of local heritage		1,875,000	
	I.1		Improvement and support of the socio-economic context	European Social Fund (ESF)	450,000	
	L.1		Consultancy for Technical assistance	Allocated by Italian Budget Legislation 2018		

2.2 Research design

The focus of this research design is on the implementation of the SNAI strategy in the Bormida Valley inner area. Data were collected in situ. Research activities included direct

observation, dialogues and informal exchanges with local actors and officers. The researcher position provides a privileged point of view of the challenges and opportunities associated with implementing the SNAI. The analysis of collected material examinates the decision-making processes and strategies employed by local actors during the implementation phase. The investigation looks to identify timelines, actors, and criteria for project formulation and implementation.

The research activities were developed in 12 months inside the Leading institutions of the Area Strategy: Municipality of Cortemilia.[6] and Unione Montana Alta Langa[7]. The direct observation of Local Team meetings proved essential for the research. In implementing the Strategy, collaboration among the various local authorities is crucial for the project's success. Moreover, the area is characterised by great complexity and diversity of actors and implementing entities that can influence the project's success differently. Therefore, the observation of meetings was an opportunity to understand the internal dynamics of the local authorities and the measures adopted to deal with the challenges and opportunities of the project.

The research material collected is qualitatively analysed to discuss in what manner are the central aspects of the place-based approach translated into actionable projects and their subsequent execution by the local institutions?

3. The translation of place-based in Bormida Valley

As discussed in section 1.3., the SNAI place-based approach calls for local mobilisation and multilevel governance to leverage the territorial resources and strengthen institutional capacities. Therefore, the analysis of research findings in the translation of the place-based approach in the Bormida Valley considers three main aspects: i. stakeholder engagement, ii. territorial governance, iii. leverage of local resources.

Firstly, in this case, stakeholder engagement was mainly promoted by the national actors themselves and involved the active participation of key actors chosen by the same local leaders. The Bormida Valley area has implemented mainly one public consultation

[6] The mayor of Cortemilia, himself president of Alta Langa Mountain Union, acted as the area's contact person for the research and as a liaison point with other local actors.

[7] The Unione Montana is an Italian administrative unit created to address the challenges faced by mountainous regions in Italy. It is a group of municipalities collaborating on common issues and challenges, such as economic development, infrastructure, and social services. The Unione Montana allows smaller municipalities in mountainous areas to have a louder voice in regional and national decision-making. It is often responsible for managing and implementing regional development programs, coordinating services, and promoting the cultural and natural heritage of the area.

moment, organised in six thematic tables and inviting specific target groups. There have been no other moments of public participation to involve local communities and stakeholders in the design and implementation of the local development plan during the implementation phase.

The involvement of institutional actors' part of the inner area, such as mayors and officials, has been difficult. Several mayors and officials have changed since the strategy process started back in 2014. The "Local Team" realises efforts to maintain a coordinated action between the different institutions in charge of project actions. The local team decided to resume mayoral involvement during the implementation phase.

Secondly, territorial governance involves the coordination and collaboration among different levels of government, such as regional, provincial, and municipal, in the planning and implementation of territorial development policies. In the case of the Bormida Valley, the local team has been playing a crucial role in the coordination and communication among the different levels. During the implementation phase of rural development interventions, the interaction between different levels of government is limited to meetings with the Region. This interaction is only related to issues concerning the disbursement of funds and administrative authorisations.

Thirdly, as previously described in Section 2., local project actions following a place-based approach refer to the identification and prioritisation of strategic objectives and actions for the territorial development of the area. The Bormida Valley has developed an Area Strategy titled "Ritroviamo il fiume" (Let us rediscover the river) that aims to enhance the natural and cultural heritage of the area around its main geographical element, the one they identified as a common identity for such administrative fragmented territory. The plan includes several strategic actions related to landscape enhancement, such as restoring historical buildings, creating cycle and pedestrian paths, and promoting ecotourism.

The following sections detail how these aspects intersect the reality of Bormida Valley. Each section identifies the issues in formulating and implementing project actions in the Inner Area.

3.1 Decision-making in project formulation

Local institutions have played a crucial role in the decision-making process for project actions. The final decisions were primarily in the hands of the public administrators. They considered the inputs from consultation and listening activities conducted by the project team. During the writing phase of the Area Strategy, they provided indications on the specific projects to be pursued, prioritising certain initiatives while leaving others behind.

The selection of projects followed budgetary, technical, and political criteria. Some

projects were left behind due to their relative immaturity compared to others. For example, a project proposal for a coworking space was strongly advocated at the meetings. While this idea had support from consulted groups, the complexity of implementing such a project, including finding someone to manage it, led to its exclusion in favour of other more prioritised initiatives.

There were larger-scale guidelines. At the national level, sectoral offices established guidelines for the projects that could be included in the Strategy. The National guidelines regarded interventions related to public services such as mobility, education, and healthcare. Projects related to rural development objectives depend on the regional level since the funding is within their jurisdiction.

The Piedmont Region canalises the funds for the Inner Areas through the Regional Rural Development Plan (PSR)[8]. The Region also establishes the rules and criteria for eligible expenses, project lines and priorities. The local level has the mission to choose the specific projects to be financed based on their territorial specificities.

The team planned to refine and decide on the interventions in the coming months. For accomplishing that task, there were several proposals. Initially, the local team considered it necessary to reconnect with stakeholders and develop other consultation moments (there was never a program in place). By re-establishing contact, the local team aimed to ensure active participation when the calls for proposals were published. When calls for proposals are open to privates (agricultural-related) or associations, there is a need to align the guidelines in the call for proposals with the demands and priorities of the local territory to ensure the engagement of interested parties. For example, the local team engaged the consortia responsible for protecting and promoting local products, such as the consortium for Robiola di Roccaverano, Toma di Murazzano, wine, hazelnuts, and potatoes. The idea was to involve these stakeholders in defining the details of the projects related to their specific industries.

On a second moment, the local team proposed organising technical roundtables involving the project's consulting professionals. These roundtables aimed to establish the eligibility criteria for the planned interventions collaboratively. The team aimed to leverage their extensive knowledge of the local territory by focusing on internal decision-making processes to make informed judgments.

Lastly, when faced with a time constraint for funds allocation, the responsibility of

[8] The Rural Development Plan is typically implemented at the regional level and is supported by funding from the European Agricultural Fund for Rural Development (EAFRD) and national resources. It serves as a framework for allocating resources and coordinating interventions that contribute to the overall development and revitalization of rural areas.

preparing the tenders was delegated to the consultancy professionals with the local team supervision, thereby abandoning the potential for participatory meetings.

Several actors expressed concerns regarding the challenges associated with implementing participatory initiatives. The potential scope of the interventions was significantly constrained due to the stringent criteria mandated by the regional authority, primarily the requested adherence to the regional Rural Development Plan for any proposed call for tenders (section 3.2).

3.2 The Role of Multilevel Governance in supporting local interventions

As mentioned in the previous section, the Region plays an essential role in shaping the implementation of the Strategy within the local context. The research made evident that decisions regarding specific projects were influenced by both internal considerations and external obligations imposed by the Region. For instance, while buying minivans for a flexible collective public transport service (C.2.) was a shared decision, the regional authorities mandated the feasibility study (C.1.). This illustrates the interplay between local decision-making and regional directives in project selection.

The local actors also discuss the required adaptation of the project actions to the PSR as challenging. The discussion emphasised balancing the freedom to shape local development strategies and compliance with regional guidelines. An example cited was the "*bando borgate*" measure, originally designed for mountain municipalities, which posed difficulties in application for territories that were not strictly considered high-mountain regions, as in Bormida Valley. While the SNAI allows for formulating a strategic approach and action plan, aligning these initiatives with the requirements and criteria set forth by the PSR is crucial.

In addition, the Region is also in charge of ensuring the effective utilisation of funds allocated for rural development. However, local actors contended that the Area Strategy could have merely become a conduit for the PSR funds, albeit with the distinction that these funds are specifically designated for the municipalities within the inner area.

Finally, the Regions play an essential role in defining time horizons. The local team expected that the Region would initiate internal procedures to facilitate allocating and utilising the funds. Nevertheless, key actors noted that the Region faces challenges managing multiple funding priorities and ensuring timely execution.

The complex nature of EU funds and the respective timelines managed by the Region lead to delays in the project implementation at the local level. Therefore, effective coordination and prioritisation are vital to ensure that funds are allocated efficiently and used to develop projects that effectively leverage regional resources while addressing rural development's unique challenges and opportunities.

3.3 Local knowledge activation during implementation

The implementation of rural development projects, as established in the approved Val Bormida Strategy, requires the activation of specific competencies at the local level, which, although not explicitly indicated in the documents, would be closely connected to the overall objective of the SNAI to leverage territorial capital for a successful place-based project.

The execution of actions D.1. and F.1. (Table 1) required the construction of a 'cooperation group'. The group should be formed by public entities part of the Inner Area (municipalities, mountain unions) and local private stakeholders (associations, consortiums, local businesses, farmers). The partnership should work to identify the actions based on critical issues and needs. In this case, the Leading Mountain Union should play a role in facilitating territorial animation activities to develop project ideas. Qualified support is expected to assist the organisation in scouting and drafting the project proposal during the initial phase.

The actions H.1. and H.2. (Table 1) hold a significant value regarding landscape enhancement. The proposed cycle path along the Bormida River is not only valuable in terms of identity (as the river was the key element for the leading concept of the Area Strategy), but it also serves as a physical connection to the Inner Area. The execution of this action is complex and challenging. Creating a bidding process to select professionals for the design and execution phases is a singular opportunity for the Inner Area. The project will require the valuation of local landscape commissions and careful consideration of environmental regulations. Consequently, local actors have already considered creating *ad hoc* discussion scenarios with relevant commissions and environmental authorities to gather feedback and obtain approval for the project.

Local institutions are crucial in coordinating and managing the project development and implementation phases in these cases. They must navigate complex procedures, engage with stakeholders, address environmental concerns, and seek necessary approvals to ensure successful project outcomes.

Nevertheless, good intentions are currently jeopardised by the deficiency in technical proficiency within the governing bodies, alongside the pressures of adhering to stringent timelines and criteria that transcend the local jurisdiction.

4. Closing Considerations: Challenges and lessons learned

This paper aimed to explore the implementation of integrated territorial projects in the Inner Areas of Italy, specifically focusing on landscape enhancement and rural

development initiatives. By examining the case study of the Bormida Valley, one of the pilot project areas under the National Strategy for Inner Areas (SNAI), the research shed light on the challenges faced by local administrations and the activation of place-based approaches in the context of limited technical capacities.

The findings of this study highlighted several key concepts and insights. Firstly, it was evident that the SNAI, as an experimental policy rooted in the place-based approach, has the potential to address the needs and promote economic growth and development in areas that have been traditionally left behind. However, the effective implementation of the Strategy still needs to be improved, particularly in terms of adaptability to specific context needs.

The case study of the Bormida Valley revealed the significant role played by local institutions in formulating and implementing these initiatives. By employing empirical research, participatory observation, interviews, and first-hand experience, the research provided valuable insights into the operational translation of the project and discussed the specific role of local institutions and knowledge activation.

The case study highlighted the significance of the local team in facilitating communication and decision-making among regional, provincial, and municipal authorities. However, limited technical capacity and expertise within governing bodies, alongside stringent timelines and criteria imposed by regional authorities, posed challenges to effective territorial governance.

The activation of local knowledge proved crucial for identifying and prioritising strategic objectives and actions. However, concerns about technical proficiency and dissemination of participatory initiatives to local stakeholders still need to be addressed.

The findings emphasised the importance of activating local knowledge and engaging stakeholders in the decision-making process to ensure the success and sustainability of the projects. However, it is important to acknowledge the limitations of this research. The study focused on a single case study, the Bormida Valley, within the Piedmont Region of Italy. While the findings contribute to the understanding of the challenges and opportunities in this specific context, they may not be fully generalisable to other regions. Further research should aim to expand the scope and include a broader range of case studies to provide a more comprehensive understanding of the implementation of integrated territorial projects in Inner Areas.

Considering the limitations and findings of this study, there are several avenues for future research. Firstly, a comparative analysis of different Inner Areas could provide insights into the contextual factors that influence the effectiveness of the SNAI and place-based approaches. Additionally, exploring the role of stakeholders and the mechanisms for their active participation in project formulation and implementation would enhance the

inclusivity and sustainability of such initiatives. Furthermore, investigating the long-term impacts of landscape enhancement and rural development projects on Inner Areas' social, economic, and environmental aspects would provide valuable knowledge for policymakers and practitioners.

In conclusion, this paper has contributed to understanding the challenges and opportunities in implementing integrated territorial projects in Inner Areas, with a specific focus on landscape enhancement and rural development. While the strategy project has shown some promising results, some challenges still need to be addressed to ensure the effective and sustainable implementation of territorial development policies in the inner area. These include difficulties in strengthening territorial governance, limited institutional capacity and expertise, and limited dissemination of participatory initiatives to local stakeholders.

The case study of the Bormida Valley highlighted the importance of context-specific approaches, local knowledge activation, and stakeholder engagement. However, further research is needed to broaden the scope of analysis and explore the replicability, inclusivity, and long-term impacts of such projects.

References

Barca, Fabrizio (2009) 'AN AGENDA FOR A REFORMED COHESION POLICY A place-based approach to meeting European Union challenges and expectations. [Independent Report prepared at the request of Danuta Hübner, Commissioner for Regional Policy]'. Commissione Europea. Available at: https://ec.europa.eu/regional_policy/archive/policy/future/pdf/report_barca_v0306.pdf (Accessed: 6 August 2021).

Battaglia, Massimo, Annesi, Nora, Pierantoni, Ilenia and Sargolini, Massimo (2019) 'Future perspectives of sustainable development: An innovative planning approach to inner areas. Experience of an Italian alpine region', Futures, 114, p. 102468. Available at: https://doi.org/10.1016/j.futures.2019.102468.

Becattini, Giacomo (2000) Dal distretto industriale allo sviluppo locale: svolgimento e difesa di una idea. Torino: Bollati Boringhieri.

Borghi, Enrico (2017) Piccole Italie: Le Aree Interne e la Questione Territoriale. Roma: Donzelli Editore.

Calvaresi, Carlo (2015) 'Le aree interne, un problema di policy', TERRITORIO, (74), pp. 87–90. Available at: https://doi.org/10.3280/TR2015-074015.

Carrosio, Giovanni (2020) 'Teoria e pratica di un modello di policy placebased: la Strategia Nazionale per le Aree Interne', Urbanistica Informazioni, special issue.

Cavazzuti, Franceso (2004) 'Sebastiano Brusco e le politiche per lo sviluppo locale', Economia e politica industriale [Preprint], (121). Available at: https://doi.org/10.1400/64356.

Coppola, Alessandro, Fabbro, Matteo Del, Lanzani, Arturo, Pessina, Gloria and Zanfi, Federico (eds) (2021) Ricomporre i divari. Politiche e progetti territoriali contro le disuguaglianze e per la transizione ecologica. Bologna: Il Mulino.

De Fano, Giovanna and Mantino, Francesco (2015) 'Sviluppo rurale, innovazione sociale e politiche per le aree interne', TERRITORIO, (74), pp. 91–96. Available at: https://doi.org/10.3280/TR2015-074016.

De Rita, Giuseppe and Bonomi, Aldo (1998) Manifesto per lo sviluppo locale: dall'azione di comunità ai patti territoriali. Torino: Bollati Boringhieri.

Dente, Bruno (2011) Le decisioni di policy: come si prendono, come si studiano. Bologna: Il mulino.

Ferretti, Maddalena and Favargiotti, Sara (2022) 'COMMONS IN MARGINAL LANDSCAPES. Collective practices for an alternative narrative and use of common spatial resources in peripheral landscapes', Ri-Vista. Research for landscape architecture, 19(2), pp. 176–189. Available at: https://doi.org/10.36253/rv-11412.

Ferretti, Maddalena, Favargiotti, Sara, Lino, Barbara and Rolando, Diana (2022) 'Branding4Resilience: Explorative and Collaborative Approaches for Inner Territories', Sustainability, 14(18), p. 11235. Available at: https://doi.org/10.3390/su141811235.

Lucatelli, Sabrina and Tantillo, Filippo (2018) 'La Strategia Nazionale per le Aree Interne', in A. De Rossi (ed.) Riabitare l'Italia: le aree interne tra abbandoni e riconquiste. Roma: Donzelli editore.

McCann, Phillip and Rodríguez-Pose, Andres (2011) 'Why and When Development Policy Should Be Place-Based'. Available at: https://www.oecd-ilibrary.org/content/component/9789264120983-16-en.

Rotondo, Francesco, Selicato, Francesco, Marin, Vera and Lopez Galdeano, Josefina (eds) (2016) Cultural Territorial Systems. Cham: Springer International Publishing (Springer Geography). Available at: https://doi.org/10.1007/978-3-319-20753-7.

Servillo, Loris, Atkinson, Rob and Russo, Antonio Paolo (2012) 'Territorial attractiveness in EU urban and spatial policy: a critical review and future research agenda', European Urban and Regional Studies, 19(4), pp. 349–365. Available at: https://doi.org/10.1177/0969776411430289.

Tomaney, John (2010) Place-based approaches to regional development: global trends and Australian implications. Sydney: Australian Business Foundation.

Trigilia, Carlo (2005) Sviluppo locale: un progetto per l'Italia. Roma: GLF Laterza.

BEYOND THE RHETORIC: PLANNING THEORY IN THE AGE OF TECHNOLOGY (1092)

Ruggero Signoroni

Department of Architecture and Urban Studies (DAStU), Politecnico di Milano, Milano, Italy; ruggero1.signoroni@polimi.it

Abstract. Within the animated debate of contemporary Planning Theory, more and more space is (appropriately) devoted to the critical deconstruction of some forms of rhetoric that, collecting vast consent within the public opinions, have been widely used in the field of urban politics and urban planning. What are these rhetorics? How do they take shape?

In an attempt to answer these questions, the paper proposes an exploration articulated on two levels. The first consists in the analysis of rhetoric as an 'epiphenomenon', i.e. ephemeral manifestation of a structural tendency: that is, the return, in the field of social sciences and in particular of spatial planning, of scientism. By addressing the origins of the disciplinary rhetorics as well as the reappearance of scientism, the paper finally reflects on possible implications for Planning theory in the age of technology.

Keywords: Planning Theory; Rhetoric; Scientism; Technology.

1. Introduction: Planning Theory, Disciplinary Rhetorics and Scientism. Preliminary Clarifications

Within the animated debate of contemporary Planning Theory, more and more space is conveniently devoted to the critical deconstruction of some forms of rhetoric that, collecting vast consent within the public opinions, have been widely used in the field of spatial planning. Thus: what is meant by 'rhetoric' in the field of spatial planning? The term 'rhetoric' does not intend here to label, in a disparaging sense, a certain line of research rather than a specific theory of planning. Indeed, in the field of spatial planning, rhetoric should be understood as something more than «ornament, display, or 'mere rhetoric' that threatens to reduce all judgments to immediate persuasive effect rather than sound intellectual argument» (Throgmorton, 1991, p. 155). This conception of rhetoric, according to Throgmorton (*ibidem*), would have been overcome by the post-positivist turn:

> This traditional view has recently been challenged, however. Throughout the sciences one can detect a broad turn away from positivism, modernism and

> objectivity and towards a concern for the ways in which language, discourse, and rhetoric construct society […] This turn toward rhetoric (in its deeper sense) is connected to a much larger scholarly conversation about post-structuralism, post-positivism, critical pluralism, hermeneutics, and critical theory. (p. 155).

In the light of this turning point, which – within planning theories – is usually associated to the rise of the communicative-collaborative planning (Fischer and Forester, 1993; Healey, 1997), rhetoric takes on a very different meaning. Associated with the concerns for democracy and participation, rhetoric is understood as «persuasive discourse within a community or honest argument directed at an audience» (*ibidem*). If this conception appears consistent with the post-positivist framework, on the other hand it should be emphasized that today disciplinary rhetoric has taken on a very different function (and purpose). More than being a tool, or a technique, within a discursive process, today's rhetoric (in the variegated forms that we will try to describe later) has become part of a vaster and more profound change: that is, the return of scientism in the field of spatial planning. I speak of a 'return' because the idea of an 'urban science' (Batty, 2010, 2012, 2013) dates back to the 1960s, at the time of the so-called «Systems Revolution» (Hall, 2014):

> [F]or the first time, the engineering-based approach invaded the professional territory of the traditional land-use planner. Spatial interaction models […] became part of the planner's stock in trade. […] This involved more than a knowledge of computer applications – novel as that seemed to the average planner of the 1960s. It meant also a fundamentally different concept of planning. Instead of the old master-plan of blueprint approach, which assumed that the objectives were fixed from the start, the new concept was of planning as a *process* […]. (p. 395).

This paradigm shift, while facing significant criticisms – especially in relation to the efficacy of *systems analysis* (Rittel and Webber, 1973; Wildavsky, 1973) – has nevertheless produced its fruits. In certain lines of research, in fact, the idea of the discipline as a science has never been abandoned and indeed has largely consolidated. This is the case, for example, of transport planning: the first applications of system analysis, as documented by Hall (2014), were experimented by Robert Mitchell and Chester Rapkin in the prediction and management of urban traffic patterns (p. 394).

So what is it that makes today's scientism, assuming that this phenomenon can be so labeled, different from what has already been experienced? To answer this question, I think it is appropriate to distinguish the *phenomenon* from the *epiphenomenon*. That is: if it is true that «the return to scientistic, positivist and technocratic conceptions is there for all to see, as also demonstrated by the complex events surrounding the definition of the Recovery Fund» (Pasqui, 2022b, p. 38), it follows that among this, let's say 'structural', trend and the above rhetoric there is some connection. My hypothesis is that returning

scientism is the original *phenomenon*, the structural tendency irreparably linked to the affirmation of technoscience as a dominant force (Severino, 2021). Differently, disciplinary rhetoric represents the *epiphenomenon*: the spread of imaginaries – some of which are unexpectedly ancient (Cugurullo, 2018) – which simply reflect the aforementioned structural trend. Nothing more than an ephemeral emanation, so to speak, of the original phenomenon. It should be specified that the understanding of rhetoric, according to such methodological approach, implicitly accepts the complexity of the issues at hand. The comprehension of the epiphenomenon (the rhetoric) is made possible, and enriched, by the study of the structural phenomenon (the scientistic posture), as deeply related to both the civilization of technics and the rise of specialisation as «the spirit of our time» (Pitari, 2019, p. 367). Obviously, in between this two major fulcrums, disciplinary rhetorics should be associated to the complex array of economic, technological and political interests revolving around contemporary urban development processes.

One could object: given this premise, what is the advantage of studying disciplinary rhetoric? If the phenomenon on which they depend is scientism, why not directly question the reasons behind this tendency? The answer to these legitimate objections is the following: rhetoric, in itself, is of little interest if disconnected from the underlying trend. But it is equally true that rhetoric, especially those connected to the idea of *smartness*, have been able to create a new language (Palermo, 2022, p. 150). And spatial planning often relies on new languages through which it can reinvent itself: «[indeed] planning as a discipline is constantly reinventing itself and thus creates public acceptance at the expense of a clearly defined intellectual basis, what might be seen as disadvantage for a scientific justification as a discipline» (Behrend and Levin-Keitel, 2020, p. 310).

Trying to recognize and 'unmask' rhetoric is therefore a priority. Today, unlike half a century ago – when the claim to create an 'urban science' proved to be rash and perhaps premature – the conditions would make possible «[the] achievement of a true urban science, an objective that has always been missed, [but] which now would be rehabilitated by a set of technological operations and procedures, which moreover were inspired by marketing questions and logics» (Palermo, 2022, p. 151).

Accordingly, behind the advertising *patina*, behind the economic and technological interests that feed the disciplinary rhetorics, behind the vast literature supporting the scientistic drift, there is hidden a big 'unsaid'. What is behind the rhetoric? Scientism as a new disciplinary positioning. And what does this structural trend depend on? What is the consequence, in terms of efficacy, transparency, process accountability, of the pervasive use of this scientistic posture? As documented by a vast literature, the outcome (already experienced) of a scientistic and technocratic drift in spatial planning is depoliticization (Swyngedouw, 2007; Allmendinger and Haughton, 2011; Gualini, 2015; Legacy et al., 2019). But it only represents the prelude to a far more disturbing scenario: that of a (for

now only imaginary?) *Leviathan-city*, where mass surveillance and the collection of big data would make it possible to create that society of control (Deleuze, 1990; Zuboff, 2019) for years only fantasized. A dystopian future to which, on the other hand, irenic scenarios are continually juxtaposed: «The images of the future of the digital city (or society) continue to oscillate between hyper-technological representations, where technology is recognized as undoubted primacy, and vague utopias or suggestions that promise benefits for everyone in a post-political society» (Palermo, 2022, p. 151).

The implications for planning theories are, of course, manifold. An in depth exploration of the difference between the *epiphenomenon* (rhetoric) and the *phenomenon* (the scientistic posture) will provide further elements of reflection useful for pondering the implications for planning theories 'beyond the rhetoric'.

2. Exploring the Epiphenomenon: Digital Urbanism, Smart City and the Society of Control

In general terms, the first and perhaps most pervasive of the disciplinary rhetoric is 'digital urbanism'. As Vadiati (2022) argues, the diffusion of this model cannot but be compared to the (steadily increasing) presence of tech companies in urban development processes:

> The ever-increasing presence of large digital companies (LDCs) for the application of information communication technologies (ICTs) in urban development has been gaining the attention of digital geographers. In broad brushstrokes, the uniquitous appearance of large development companies in urban development has been considered disingenuous. […] large digital corporations in cities have diffused a belief about urban digitalisation, which holds that the application of information and communication technologies (ICTs) is a cure-all for today's cities' many pressing problems, and that LDCs are the only ones capable of collecting, producing and applying urban data, by which they justify the commodification of urban data and their lucrative opportunities. (Vadiati, 2022, p. 2).

The issue is undoubtedly complex. Beyond the veil of rhetoric – that is: (self)promotion, for marketing purposes, of the solutions advertised by the LDCs – what emerges is the hegemonic role played by IT companies, «who construe urban politics as a technical issue and circumvent planning with software- based data processing» (Krivy, 2018, p. 13). To what is this position of power due, with respect to the role of local administrations? According to Vadiati (2022): «the governance capabilities of local and state-based agencies are relatively limited due to privatization agendas, which has left many local governments with limited capacity to access and make use of large quantities of urban data» (p. 2). This condition would promote, more or less implicitly, the diffusion of «post-political urban policy agendas» (*ibidem*). More specifically, LDCs «[are] endorsing this

existing post-political mode of urban governance» by draining «public institutions of time and resources» (*ibidem*). The final result would be a reconfiguration of the relations between state and society, remodeled on the basis of a technological paradigm in which the very production of space is in the hands of large tech corporations. In fact, they have control «over a newly ubiquitous form of digital abstract space» over which they exercise a peculiar form of dominion: the collection of urban data. «In this capacity», as Vadiati (*ibidem*) underlines «they have now joined – and in some cases, perhaps even superseded – the ranks of urban planners, developers and landlords from Lefebvre's era in terms of their power over the city […]».

Within the framework of digital urbanism, Smart City (SC) is probably one of the most widespread (and powerful) narrative. However, this should not be misleading: the imagery that feeds the rhetoric of SC, as already underlined, has deep roots that date back to the dawn of modernity. Federico Cugurullo (2021) provides an account of this, by reconstructing the origins of the Smart City imaginary, starting from a significant observation:

> The theoretical underpinnings of smart urbanism are considerably older than what present smart-city initiatives suggest. The smart-city phenomenon is composed of images of modern, high-tech and futuristic cities which seek to leave history behind in the attempt to look novel. […] [Nevertheless] Like its historical predecessors, the smart city continues to profess and practise a universal credo of modernization […] Visions of smart cities are [in fact] visions of cities perfected by technology, sustainable societies whose endless needs are fulfilled by endless technological innovation. (pp. 60-61).

It is difficult to remain indifferent to the promises of smart urbanism: it portrays an irenic scenario, in which sustainability and the fight against climate change would be guaranteed by an unprecedented technological breakthrough. What is interesting to note, in this case, is that the unshakeable faith in technology – in an almost eschatological conception – goes back in time, even as far back as the 17th century:

> […] the origins of the smart city can be traced back to Francis Bacon's *New Atlantis*. Published in 1627, Bacon's utopian novel contains what are arguably the first images of an experimental city permeated by technology, where technological innovation is actively employed to produce information about the natural and the built environment. […] this information is, in turn, employed to rationalize and control the environment (intended as the totality of the surrounding conditions) for the development of human societies. (Cugurullo, 2021, p. 48).

The reference to Bacon's work is significant for at least two reasons. The first: it bears witness to the typically modern conception of science and technology (today one should speak of 'technoscience') as means «through which nature can be controlled and

subjected to human needs» (*ibidem*, p. 49). It is precisely this credo – the faith in technology – that makes the evolution of the Smart City imaginary possible. Herein lies the second element of interest: the relationship between technological innovation and urban development, sanctioned by the birth of the modern scientific method, has in fact influenced the future development dynamics of cities. According to Cugurullo (2021), the Second Industrial Revolution represents the first of the two key moments of this evolution:

> During the years of the Second Industrial Revolution, from the late nineteenth century throughout the early twentieth century, scientific research and technological innovation were largely supported by capital investments. The logic of profit had just married the logic of mass-production: a union meant to maximize the return on investment. […] These factors, coupled with novel devices of mass-distribution, led particularly in the United States and Europe to a pervasive diffusion of new technologies which became part of the everyday life of cities, thereby influencing their design and experience. (p. 50).

If this first peak, in terms of connection between science, technology and industry, exerted crucial consequences for urban development in the first half of the 20th century (Cugurullo provides two major examples: steel, which allowed the construction of the vertical city; the automobile, and its impact on urban growth with the emergence of suburbanisation), is the second one – closest to us – to represent an unprecedented turning point:

> In the 1970s, with the invention of computers, ICT reached a tipping point that was going to have a profound, but not immediately visible, effect on cities. This is the second burst of modernity in the conceptualization and development of the city, crucial for the understanding of smart urbanism […] [At the time] the convergence of micro-electronics, computing, telecommuniations and broadcasting was paradigmatic because of the high degree of pervasiveness of the technological changes in question. (Cugurullo, 2021, p. 55).

Nonetheless, it is only today – in the age of smart (digital) urbanism – that the effects of this ICT revolution can be observed in their full extent. Through the collection of large quantities of data (Big Data), the premises implicit in the Network Architecture theorized by Castells (2011) – and recalled by Cugurullo himself – have become reality. And the most severe consequences undoubtedly concern the (direct and indirect) organization of life in the times of 'surveillance capitalism' (Zuboff, 2019). Here what Vadiati (2022) argues:

> Regarding this thesis, large tech companies have a predatory approach to collecting data, enabling them to predict citizens' behaviour and facilitate algorithmic governance for city governments. […] Further, she [Zuboff] raises concern that computing and commodifying behaviour data is going beyond just interfering with our behaviour in our everyday lives, to determining and redirecting desirable and

undesirable ways of living. (p. 3).

These are widely shared criticisms (see, for example: Kitchin, 2014; Sadowski, 2021), especially in relation to the intrinsic risks of platform urbanism (Graham, 2020; Bauriedl and Struver, 2020; Leszczynski, 2020). The latter, far from being a phenomenon in its own right, should be understood as an emerging (re)configuration of the SC: «The platform-mediated city does not so much constitute a radical disjunction with the smart city, but rather a reconfiguration, diversification, and intensification of its constituent practices, processes, and technologies» (Leszczynski, 2020, p. 193).

The recent research work dedicated to this new evolution of 'smartmentality' (Vanolo, 2014) seems to confirm the starting assumption. That of smart urbanism, declined in the forms that have been described here, is a largely: «vacant rhetorical device able to be filled with any number of comparable or conflicting definitions; all cities wanted to be perceived as "smart", since the corollary was to appear "dumb"» (Wiig, 2016, p. 547). To oppose this 'empy rhetoric', therefore, it is necessary that academics «[…] follow smart city initiatives into the city, beyond the policy discourse. Critically engaging with the smart city necessitates considering the longer process of technologically driven, entrepreneurial economic development as well as digitally driven civic engagement, looking past a policy's script and onto the actions circulating around the policy's implementation» (*ibidem*, p. 549).

In addition to all this, it is a priority for academics and planning theorists to study the structural trend that precedes and, to a certain extent, determines the appropriation, by the disciplinary discourse, of the rhetoric of smartness and digital urbanism. Therefore, it is a question of understanding the reasons for the return to scientism.

3. Exploring the Phenomenon: Scientism and the Planning Discipline

Discussing scientism in the field of social sciences implies, as a first step, the need to clarify its meaning. Hence: what is meant by scientism? A particularly sharp and compelling understanding of the phenomenon, in reference to the meaning of the term as to its use, is provided by Friedrich von Hayek (1942). The implications of Hayek's theories for spatial planning research and practices have been widely explored in the literature (Moroni, 2005, 2007, 2014, 2018; Alexander, Mazza and Moroni, 2012). What is recalled here, instead, is the peculiar 'anti-scientistic' approach theorized by Hayek in the early 1940s (Hayek, 1942, 1943) – and then resumed in a later work (Hayek, 1952). Here, his definition of scientism's lineage and meaning:

> […] to preclude any misunderstanding on this point we shall, whenever we are concerned, not with the general spirit of disinterested inquiry but with the slavish imitation of the method and language of Science, speak of "scientism" or the

> "scientistic" prejudice. Although these terms are not completely unknown in English, they are actually borrowed from the French, where in recent years they have come to be generally used in very much the same sense in which they will be used here. […] these terms […] describe, of course, an attitude which is decidedly unscientific in the true sense of the world, since it involves a mechanical and uncritical application of habits of thought to fields different from those in which they have been formed. (Hayek, 1942, p. 269).

Being an essay dating back to the early 1940s, Hayek's words are striking for their relevance. Even then, scientism was appropriately labeled as «a very prejudiced approach which, before it has considered its subject, claims to know what is the most appropriate way of investigating it» (*ibidem*).

The quantitative approach is the dominant element of contemporary scientism, especially in the field of spatial planning: in what terms can it be defined, following Hayek's definition, as 'prejudice'? For the sake of clarity, let's firstly pause on the true purpose of the quantitative method within sciences:

> There is the widespread impression that the main importance of this quantitative nature of most natural sciences is their greater precision. This is not so. It is not merely adding precision to a procedure which would be possible also without the mathematical form of expression – it is of the essence of this process of breaking up our immediate sense data and of substituting for a description in terms of sense qualities one in terms of elements which possess no attributes but these relations to each other. It is a necessary part of the general effort of getting away from the picture of nature which man has now, of substituting for the classification of events which our senses provide another based on the relations established by systematic testing and experiment. (Hayek, 1942, p. 275).

The quantitative approach is therefore not necessary for the sciences to define themselves as such (given that it would be a question of adding a 'form of mathematical expression' to a procedure that does not require it), but it is crucial in defining the purpose of the sciences: «its aim is to produce a new organization of all our experience of the external world and in doing so it has not only to remodel our concepts but also to get away from the secondary sense qualities and to replace them by a different classification of events» (*ibidem*).

Therefore, denouncing the return to a scientistic posture in the field of spatial planning does not mean fueling a generalized distrust of quantitative techniques. The point under discussion is another, and concerns the meaning of scientism as understood by Hayek. Concisely: scientism, in the context of social studies, indicates the 'collectivist' tendency through which a certain 'whole' is considered as a 'given'. Herein lies the first misunderstanding:

> Social wholes are not given to us as what we may call “natural units” which we recognise as similar with our senses […] They are not given to us as similar things before we even begin to ask whether what looks alike to us also behaves in like manner […] What we group together as instances of the same collective or whole are [indeed] different complexes of individual events, in themselves perhaps quite dissimilar, but believed by us to be related to each other in a similar manner; they are classifications or selections of certain elements of a complex picture on the basis of a theory about their coherence […] the wholes about which we speak [therefore] exist only if, and to the extent to which, the theory is correct which we have formed about the connection of the parts which they imply and which we can explicitly state only in the form of a model built from those relationships. (Hayek, 1943, pp. 43-44).

Here scientism can therefore be described as the claim, in the field of social-spatial sciences, to describe social phenomena as a ‘given’, ‘wholes’ that can be observed and studied by gaining «a distant and comprehensive view in the hope that thus regularities will reveal themselves which remain obscure at a closer range» (*ibidem*, p. 46). According to Hayek, this conception goes back even to the founder of sociology, Auguste Comte (*ibidem*). This is the same methodology at the basis of positivist philosophy. This philosophy, belonging to Empirism (Davoudi, 2012; 2015), profoundly influenced the formation of planning as an academic discipline and as a professional practice, in the first decades of the 20th century (Pacchi, 2018; Signoroni, 2022).

What we are witnessing, with the return to the scientistic posture, is therefore the reaffirmation of a neo-positivist epistemology that treats the city as a set of ‘wholes’ (or a single ‘whole’) controllable in every dynamic. But the most alarming aspect is another: by conceiving a complex social phenomenon, such as the city, as a ‘whole’, the use of the aforementioned disciplinary rhetoric is made possible – and strengthened. If it is true, as Shannon Mattern (2021) reminds us, that «a city is not a computer», it is equally true that in the public discourse as well as in the academic debate, the predominance of references to the ‘resilient city’, rather than the ‘sustainable city’ or the ‘smart city’ is still widespread and very strong.

The reappearance of scientism, in the characteristics just described, constitutes an undoubted regression, especially if considered in relation to the phenomenon of academic hyper-specialisation (Campbell, 2014; Montedoro and Pasqui, 2020; Signoroni, 2022). How is the city conceived, studied and designed today? Each branch, each sector works, processes data and models in relation to a specific part, however considered a ‘whole’ in its own right. Once again, it is not a question of mistrusting a set of quantitative analysis techniques, which have already been subjected to more than persuasive criticisms (Palermo, 1992); rather, it is important to look at the bigger picture. The conjunction between scientism, specialisation and rhetoric configures a not much

reassuring scenario: de facto, a surrender to the post-political condition that has been denounced for years. Added to this, the alleged scientific nature of the discipline – supported, perhaps, also to remedy for the historical and chronic rivalry with engineering and architecture (Davoudi, Pendlebury, 2010) – can only appear as instrumental. Even the embarrassing «confusion between the collection of big data and the production of science», as Palermo denounces (2022, p. 152), is perhaps a symptom of an instrumental (and short-sighted) conception of technology. In conclusion: spatial planning has long since surrendered to the scientistic posture, regressing to a merely quantitative and procedural conception of the discipline. In line with the spirit of the times, in the age of technology, planners would aspire to use the technique available as a means of achieving the ideal of smartness, but in reality – by working towards this, according to an instrumental point of view – they do not other than consolidating the post-political scenario.

In the end, one can only agree with Pier Carlo Palermo's discouraging observation: «I fear that the *smart* trend could be read, in some time, as a sort of speculative bubble, which arose from reasons and projects worthy of attention, of a technological and economic nature, but that found too trivial urban and town-planning developments, out of impatience, lightness or instrumentality. The development of technology is not enough, if the idea of the city, of project and of politics is weak» (*ibidem*).

4. What Implications for Planning Theory? Some Partial Considerations

> There is nothing wrong with the attempts to improve the knowledge base of planning. What *is* problematic is that evidence is often understood as synonymous with facts, […] This view perpetuates the Geddesian dictum of 'survey before plan' and assumes a linear and unproblematic process that begins with the collection of often descriptive data and ends with a blue print. (Davoudi, 2015, p. 317).

In the history of planning as a discipline, the pernicious effects of scientism have already been widely known, studied, criticized but only partially abandoned. The new, powerful affirmation of a neo-positivist epistemology should lead planning academics to a (self)critical reflection on the value of knowledge within the planning process. More precisely, and taking up the epistemological criticisms of technocratic planning model (Pacchi, 2018), planners should question themselves about the nature of the knowledge brought into play. Solicited from this point of view, planners could then take refuge in the argument pointed out by Davoudi (2015): since, in the light of the 'evidentialist' turn of planning, «plans are considered 'sound' if they 'are founded on a robust and credible evidence base'» (*ibidem*, p. 316), what is needed – and used – is the pure technical knowledge. Given that this epistemological paradigm, in which knowledge plays a merely instrumental role, is consubstantial with scientism, it is definitely necessary to change

perspective.

A first possibility, as suggested by Davoudi (*ibidem*), would be that of «articulating knowledge and action as recursively interlinked rather than considering the former as a precondition to, or coming before, the latter in a linear, causal chain» (*ibidem*, p 317). This approach is based on the awareness that «facts and information are not in themselves evidence; they become evidence when they are used in conjunction with other information to prove or disprove a proposition» (*ibidem*, p. 318). Unlike scientism, this approach takes into account the criticisms of technocratic and rational-comprehensive planning. Overcoming the Aristotelian conception of epistemic knowledge is, in this sense, the first step towards a theory of planning capable of recognizing that «the goal of knowledge is less about explaining and predicting social events and more about understanding what the social world means for the people who live in it» (*ibidem*, p. 320).

It is, precisely, the opposite of what the scientistic posture foresees: instead of using it to merely perform forecasting – moreover, in conditions of radical uncertainty (Pasqui, 2022a) –; knowledge should guide action, on the basis of an understanding of the social world. Technology can play a key role within these processes of co-production of knowledge. Provided, of course, that the instrumental logic that so much distinguishes scientistic rationality is left aside. Within a conception of planning as a practice of knowing, technology is no longer a means to implement certain goals, or to predict certain developments; rather, it becomes a *means of knowledge*, for both experts and citizens; but also of contestation and reaffirmation of the political.

For a theory of planning that intends to go beyond rhetoric and beyond scientism, the first objective is to overcome the bifurcation between theory and practice, between knowledge and action that is implicit in the neo-positivist paradigm. Doing this means recognizing that, in the age of technology, spatial planning can be practiced as a mere 'procedure' – aligned with the profit logic of techno-capitalism, but 'emptied' of any political meaning – or as a practice of knowing, situated, collective and distributed, but also contested (Davoudi, 2015). It is the uncertain road towards the reconquest of the *polis* (Swyngedouw, 2007). Here, then, are the two models: the *New Atlantis*, the Leviathan-city that is taking shape as a society of perennial control, and the *Polis*, not to be built but to be repoliticised.

References

Alexander, Ernst R., Luigi Mazza and Stefano Moroni (2012) Planning without plans? Nomocracy and teleocracy for social-spatial ordering. *Progress in Planning*, 77(2), pp. 37-87.

Allmendinger, Philip and Graham Haughton (2011) Post-political spatial planning in England: a crisis of consensus? *Transactions of the Institute of British Geographers*, 37(1), pp. 89-

103.
Batty, Michael (2010) Towards a New Science of Cities. *Building Research and Information*, 38(1), pp. 123-126.
Batty, Michael (2012) Building a Science of Cities. *Cities*, 29(1), pp. 9-16.
Batty, Michael (2013) *The New Science of Cities*. Cambridge (MA): The MIT Press.
Bauriedl, Sybille and Anke Struver (2020) Platform Urbanism: Technocapitalist Production of Private and Public Spaces. *Urban Planning*, 5(4), pp. 267-276.
Behrend, Lukas and Meike Levin-Keitel (2020) Planning as scientific discipline? Digging deep toward the bottom line of the debate. *Planning Theory*, 19(3), pp. 306-323.
Campbell, Heather (2014) Specialist and generalists: are there too many hedgehogs and not enough foxes. *Planning Theory and Practice*, 15(3), pp. 287-290.
Castells, Manuel (2011) *The rise of the network society: The information age: Economy, society, and culture (Vol. 1)*. Oxford: John Wiley & Sons.
Cugurullo, Federico (2018) The origin of the Smart City imaginary: from the dawn of modernity to the eclipse of reason. In Lindner, Christoph and Miriam Meissner (eds) *The Routledge Companion to Urban Imaginaries*. London: Routledge, pp. 113-125.
Cugurullo, Federico (2021) *Frankenstein Urbanism. Eco, Smart and Autonomous Cities, Artificial Intelligence and the End of the City*. New York: Routledge.
Davoudi, Simin (2012) The legacy of positivism and the emergence of interpretative tradition in spatial planning. *Regional Studies*, 46(4), pp. 429-441.
Davoudi, Simin (2015) Planning as practice of knowing. *Planning Theory*, 14(3), pp. 316-331.
Davoudi, Simin and John Pendelbury (2010) Centenary Paper: The evolution of planning as an academic discipline.*The Town Planning Review*, 81(6), pp. 613-645.
Deleuze, Gilles (1990) Control and becoming. Gilles Deleuze in conversation with Antonio Negri. *Futur Anterieur, 1*. [Online] Available from: www.generation-online.org/p/fpdeleuze3.htm Accessed [16/05/2023].
Fischer, Frank and John Forester (1993) *The Argumentative Turn in Policy Analysis and Planning*. Durham: Duke University Press.
Graham, Mark (2020) Regulate, replicate, and resist – the conjunctural geographies of platform urbanism. *Urban Geography*, 41(3), pp. 453-457.
Gualini, Enrico (ed) (2015) *Planning and Conflict. Critical Perspective on Contentious Urban Developments*. New York: Routledge.
Hayek, Friedrich A. (1942) Scientism and the Study of Society. Part I. *Economica*, 9(35), pp. 267-291.
Hayek, Friedrich A. (1943) Scientism and the Study of Society. Part II. *Economica*, 10(37), pp. 34-63.
Hayek, Friedrich A. (1952) *The Counter-Revolution of Science: Studies on the Abuse of Reason*. Carmel (IN): Liberty Fund Inc.
Hall, Peter (2014) *Cities of Tomorrow. An Intellectual History of Urban Planning and Design Since 1880*. Chicester (WSX, UK): Wiley Blackwell.

Healey, Patsy (1997) *Collaborative planning: shaping places in fragmented societies*. Basingstoke (UK): Macmillan.

Kitchin, Rob (2014) The real-time city? Big data and smart urbanism. *GeoJournal*, 79(1), pp. 1-14.

Krivy, Maros (2018) Towards a critique of cybernetic urbanism: The smart city and the society of control. *Planning Theory*, 17(1), pp. 8-30.

Legacy, Crystal, Jonathan Meztger, Wendy Steele and Enrico Gualini (2019) Beyond the post-political: Exploring the relational and situated dynamics of consensus and conflict in planning. *Planning Theory*, 18(3), pp. 273-281.

Leszczynski, Agnieszka (2020) Glitchy vignettes of platform urbanism. *EPD: Society and Space*, 38(2), pp. 189-208.

Mattern, Shannon (2021) *A City Is Not a Computer: Other Urban Intelligences*. Princeton: Princeton University Press.

Montedoro, Laura and Gabriele Pasqui (2020) *Università e cultura. Una scissione inevitabile?* Milano: Maggioli Editore.

Moroni, Stefano (2005) *L'ordine sociale spontaneo. Conoscenza, mercato e libertà dopo Hayek*. Torino: UTET.

Moroni, Stefano (2007) *La città del liberalismo attivo. Diritto, piano, mercato*. Torino: De Agostini.

Moroni, Stefano (2014) Two Different Theories of Two Distinct Spontaneous Phenomena: Orders of Actions and Evolution of Institutions in Hayek. *Cosmos + Taxis*, 1(2), pp. 9-23.

Moroni, Stefano (2018) Planning, Law, Ownership: Hayek and Beyond. *Planning Theory*, 17(2), pp. 305-310.

Pacchi, Carolina (2018) Epistemological critiques to the technocratic planning model: the role of Jane Jacobs, Paul Davidoff, Reyner Banham and Giancarlo De Carlo in the 1960s. *City, Territory and Architecture*, 5(17).

Palermo, Pier Carlo (1992) *Interpretazioni dell'analisi urbanistica*. Milano: Franco Angeli.

Palermo, Pier Carlo (2022) *Il futuro dell'urbanistica post-riformista*. Roma: Carocci Editore.

Pasqui, Gabriele (2022a) *Coping with the Pandemic in Fragile Cities*. Berlin: Springer.

Pasqui, Gabriele (2022b) *Gli irregolari. Suggestioni da Ivan Illich, Albert Hirschman e Charles Lindblom per la pianificazione a venire*. Milano: Franco Angeli.

Pitari, Paolo (2019) Emanuele Severino on the meaning of scientific specialization. An introduction. *Cosmos and History: The Journal of Natural and Social Philosophy*, 15(1), pp. 366-386.

Rittel, Horst Wilhelm and Melvin M. Webber (1973) Dilemmas in a General Theory of Planning. *Policy Sciences*, 1973(4), pp. 155-169.

Sadowski, Jathan (2021) Who owns the future city? Phases of technological urbanism and shifts in sovereignty. *Urban Studies*, 58(8), pp. 1732-1744.

Severino, Emanuele (2021) On the Meaning of Technology's Domination. In Chiodo, Simona and Viola Schiaffonati (eds) *Italian Philosophy of Technology. Socio-cultural, Legal,*

Scientific and Aesthetic Perspectives on Technology. Cham: Springer, pp. 69-83.
Signoroni, Ruggero (2022) Rethinking the role of the 'fragile experts' in the age of technique. Urban planners between specialization and ontological uncertainty. *Planum Magazine*, 44, Vol. I/2022.
Swyngedouw, Erik (2007) The Post-Political City. In BAVO (ed) *Urban Politics Now. Re-Imagining Democracy in the Neoliberal City*. Rotterdam: Netherland Architecture Institute (NAI), pp. 58-78.
Throgmorton, James A. (1991) The rhetorics of policy analysis. *Policy Sciences*, 24, pp. 153-179.
Vadiati, Niloufar (2022) Alternatives to smart cities: A call for consideration of grassroots digital urbanism. *Digital Geography and Society*, 3, pp. 1-7.
Vanolo, Alberto (2014) Smartmentality: The Smart City as Disciplinary Strategy. *Urban Studies*, 51(5), pp. 883-898.
Wiig, Alan (2016) The empty rhetoric of the smart city: from digital inclusion to economic promotion in Philadelphia. *Urban Geography*, 37(4), pp. 535-553.
Wildavsky, Aaron (1973) If Planning is Everything, Maybe it's Nothing. *Policy Sciences*, 1973(4), pp. 127-153.
Zuboff, Shoshana (2019) *The age of surveillance capitalism: The fight for a human future at the new frontier of power*. London: Profile Books Ltd.

TRACK 15: ENVIRONMENTALISM: CLIMATE CRISIS AND GREEN DEAL

TOWARDS A RESILIENT DROUGHT MANAGEMENT SYSTEM (1072)

Joachim Vercruysse[1*], Greet Deruyter[1], Luuk Boelens[1], Renaat De Sutter[1]

[1] Ghent University, Belgium; [*]joachim.vercruysse@ugent.be

Abstract. Drought is considered an insidious, complex and multidisciplinary phenomenon due to many interacting influences. This paper focusses on the specific situation in Flanders, Belgium. Although in Flanders, the annual precipitation remains stable, drought impacts are becoming more and more severe. This is partly due to increased water demand, changed water use patterns in combination with outdated legislation and reactive policies, not aimed at resilient water management.

This paper identifies contributing elements, relations and interactions in the drought system of Flanders, through the actor relational approach and demonstrates how this approach might be implemented in the Flemish case. An actor relational approach would allow striving for a more resilient drought management system.

Keywords: resilience, drought, actor relational approach.

1. Introduction

Since 1950, the climate system has changed in such a way that the world has become a different place (Chapagain et al. 2021; IPCC 2014, 2022). Climate change manifests itself in more frequent and severe hazards, causing problems in sectors such as agriculture, economy, energy, water management, etc., thus showing the sensitivity of both natural and human systems to climate change (Boelens et al. 2017; Hervás-Gámez and Delgado-Ramos 2019; IPCC 2014, 2022; Kasting 1989; Kiehl 2011).

Droughts differ from most other natural hazards, as they are not the result of a singular event (Wilhite 2000) with a well delineated onset and end, while their impact increases and accumulates slowly over a considerable time span, and can linger on for many more years after water supply is back to normal. Therefore, droughts are referred to as 'creeping phenomena' (AghaKouchak et al. 2021; Crausbay et al. 2017; Mishra and Singh 2010; Vilonen et al. 2022; Wilhite 2000; Wilhite and Glantz 1985), which often have non-structural impacts over large geographical areas, unlike most natural hazards. This complicates agreeing on definitions and quantification of impacts (Wilhite 2000), since it subsequently gets influenced by human activities (AghaKouchak et al. 2021; Chapagain et

al. 2021; Crausbay et al. 2017; Mishra and Singh 2010; Van Loon et al. 2016).

The occurrence and severity of droughts as well as other climate related hazards are predominant. However, although several regions have been struggling with droughts for many decades, this threat is relatively new for the Flemish region, situated in the north of Belgium, see Figure 60. The annual water availability per capita, in Flanders, ranges from 1,100 m^3 to 1,700 m^3, which is lower than other European regions often linked to drought, such as Spain, Portugal and Greece. (Flemish Environment Agency 2021b) Moreover, in 2019, the World Resources Institute (WRI) ranked Belgium 23rd among 164 countries studied for drought risk (Gassert et al. 2013). Flanders struggles to achieve the goals from the European water framework directive, especially when droughts occur. These analyses highlight the significance of judicious and efficient utilisation of available water resources and is caused by several factors. For instance, to date, the high population density, 492 people per km^2, in combination with a total surface area pavement of 15.8%, prevents the penetration of precipitation, thus lowers the potential water supply. Furthermore, historically policies are aimed at avoiding floods, which led to infrastructure dedicated to diverting the water as fast as possible to the sea. This short-term view of dealing with water-related problems leads to a reactive drought policy. Together with the complex government structure, e.g. fragmented structures, and a history of diverting water away, ads to the problem.

As Flanders is subject to human-driven water management, the region is also prone to anthropogenic drought risks. In this paper, the Actor Relational Approach (ARA), will be used to unravel and visualise the driving forces, key actors, factors of importance and their mutual interactions as a step to prioritise water needs and minimise the impact of drought on human society and ecosystems.

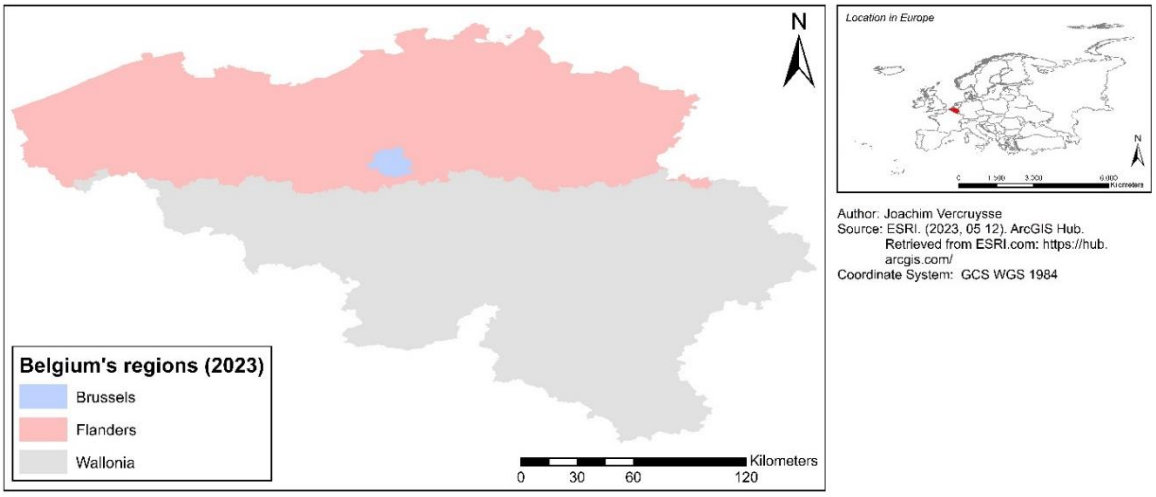


Figure 60. Location of the study area Flanders

2. Drought definition

To date, policy makers and society as a whole become more aware of drought related problems. Furthermore, research on drought development mechanisms, attributing factors, monitoring consequences, etc. progressed significantly over the years. Examples are to be found in the continuous development of drought indices (Bloomfield et al. 2013; Shukla and Wood 2008; Stagge et al. 2015), an improved understanding of the link between drought and atmospheric and ocean drivers (Fleig et al. 2010; Kingston et al. 2015), drought monitoring and forecasting (Sheffield et al. 2014; Trambauer et al. 2015), and the effects of climate change on drought (Prudhomme et al. 2014; Trenberth et al. 2014; Wanders and Wada 2015). Notwithstanding this ever-growing body of drought related research, it is still difficult to determine a precise and universally accepted definition of drought. The literature review of Slette et al. in 2019 points out that researchers use a wide variety of ways to characterise droughts (e.g. reduced precipitation, low soil moisture, reduced streamflow), while a third of the reviewed papers simply equated “dry conditions” with “drought” (Slette et al. 2019). These findings are an indicator for the complexity of “drought”.

Each research discipline uses its own lens to assess the occurrence of drought and incorporates different physical, biological, and/or socioeconomic factors in its definition. Common defined types are grouped as “meteorological” (deficit in precipitation), “agricultural” (soil moisture deficit), “hydrological” (deficit in surface water, storage, and/or groundwater) and “socioeconomic” (deficit in water-dependent economic goods and agricultural products leading to societal impacts). (Dai 2011; Dracup et al. 1980; Mishra and Singh 2010; Wilhite and Glantz 1985). More recently, this traditional classification was expanded with the terms “ecological drought” based in the impacts on ecosystems (Crausbay et al. 2017; Slette et al. 2019), and “human-induced and/or human-modified hydrologic drought” (AghaKouchak et al. 2021; Van Loon et al. 2016). Research has shown that the lack of a precise and objective definition in specific situations is an obstacle to understand drought, which has led to indecisiveness and passivity on the part of managers, policy makers, and others (Wilhite and Glantz 1985).

In this research the definition of the anthropogenic drought will be used. In this respect AghaKouchak et al. (2021), states that while the previous different classifications of droughts offer innovative perspectives about the disparate impacts of drought, the definitions generally treat drought as a product rather than a process. This product-focused approach typically quantifies deficits in water-related variables or water-dependent activities due to natural and climatic variabilities in a certain timeframe. Therefore, these definitions lack a two-way interaction of human activities with changing drought, water stress risks, and/or climate conditions. Subsequently, they do not address effects of a human-induced climate change with local water and land management, and

consequently do not conclude the impacts from the water stress on the environment beyond a specific temporal and spatial domain. (AghaKouchak et al. 2021; Crausbay et al. 2017; Dale 1997) The classic product-oriented definitions lack the complexity to fully understand the interacting elements. Drought is a multidisciplinary phenomenon characterised by processes that involve feedbacks between human activities and nature, which makes this problem a complex system. (AghaKouchak et al. 2021; Boelens 2018; Davids 2021; Van Brussel 2018)

Anthropogenic drought, is here defined as a process that ends up in water stress (societal or environmental), due to feedbacks (in)between human activities, and/or nature (AghaKouchak et al. 2021; Wahl et al. 2018; Zscheischler et al. 2018). The process will then co-evolve (negative or positive), after the drought, leading to water stress or a more resilient system. From that point on, the cycle will repeat itself, since time and drivers will never stop continuing, unless the system becomes stronger. This makes drought a multifaceted, multi-layered and complex issue, which needs an approach that can divert the definition into an operational framework.

3. Actor Relational Approach

The Actor Relational Approach (ARA) for planning is an attitude that evolves depending on specific themes and changing surroundings (Boelens 2010; Tempels 2016). As drought is a complex issue that involves multiple disciplines and sectors (AghaKouchak et al. 2021; Chapagain et al. 2021), the ARA can be used to visually illustrate and understand the problem related to anthropogenic drought as a first step in building drought resilience.

The ARA originates from three components: Actor, Relational, and Approach. The Actor component is based on planning theories such as Actor-Network-Theories (ANT) that focus on the actions of human and non-human actors within a network. The differential system theory of Luhmann posits that society is made up of distinct subsystems that are operationally closed. In planning, the challenge is to intervene in these subsystems and networks with precise tactics that address the interests and behaviours of all actors involved. By understanding the relationships between different actors and systems, planners can use their role to stimulate action and foster collaboration, even in situations where there may be competing interests and viewpoints. (Boelens 2010, 2018)

The Relational component contains post-structuralism and the idea of relational space. Post-structural theorists question the absolute valuations of features such as planning instruments and general wellbeing, meaning that nothing is vast to a subject or space and time, but always relational. This component focuses on the relations between places, their specific uses over time, and how they are organised to understand their quality or efficiency. (Boelens 2010, 2018)

The Approach component emphasises that the ARA should be flexible and open to other theories. It utilises the strategy of analysing relations in a flexible way and re-evaluating systems since contexts can change over time. (Boelens 2010, 2018) Therefore, the ARA allows systems to irritate and learn from other systems, creating a co-evolutionary perspective, which is helpful for creating a reinforcing effect. Hence, resilience building can be seen as an operational component linking the ARA and anthropogenic drought definition together.

3.1 Resilience

The concept of resilience exists for many years and is relevant across a wide range of disciplines (Grove 2018). Over the past two decades, it has become more prominent within the literature related to environment, natural sciences, social sciences, humanities, and interdisciplinarity (Folke 2016). As a result, there are many definitions of resilience, some of which are contradictory (Chapagain et al. 2021; Davoudi et al. 2013; Davoudi et al. 2012; Fünfgeld and McEvoy 2012; Klein et al. 2003; Meerow and Stults 2016; Rankin et al. 2016; Salata and Yiannakou 2020; Tempels 2016; Woodruff et al. 2022). It is not a new concept, still it is relatively new as a practice and is not yet widely reflected in existing policies or guidelines (Chapagain et al. 2021; Salata and Yiannakou 2020), however, the need for an resilient planning policy is more urgent since the problem worsens. (Salata and Yiannakou 2020)

The three main resilience approaches are Engineering resilience (the ability of a system to return to a stable state after some disturbance or shock (Chapagain et al. 2021; Holling 1996)), Ecological resilience (recognising the intrinsic dynamism of systems and the presence of multiple equilibrium states (Holling 1973; Holling 1996)), and socio-economic resilience. The socio-ecological understanding of resilience emerged from increasing interest in the interlinked dynamics of social and ecological subsystems and their behaviour. It is predicated on the complex nature of these subsystems and the co-evolution between them, which adds to the complexity of the system as a whole. (Berkes et al. 2000; Gual and Norgaard 2010; Tempels 2016) Given that the conditions are constantly changing, resilience is defined not only by the state of the system relative to thresholds, but also by the relationship between the system and its conditions. Under changing conditions, the system must adapt and co-evolve with these conditions in order to be resilient. (Tempels 2016)

The socio-economic approach of resilience is closely related to the anthropogenetic drought definition, in which it is not about a sudden occurrence, but about an ongoing process, creating a new situation that needs to be evaluated depending on each situation. So far, socio-ecological resilience is not often considered in studies, but is crucial for the transition to adaptive thinking. The major challenge in tackling the issue of drought and

resilience is the complexity involved. Overall, the ARA provides a framework for planners to deal with this complex interplay of different entities in systems, e.g. climate change, floods, energy transition, and droughts.

4. Methodological framework

4.1 Understanding drought

Numerous studies highlight the need for a shift towards a more resilient system to mitigate or reduce the impact of climate change and anthropogenic evolutions on the environment. However, a review study conducted in 2019 revealed that 54 percent of the studies on drought considered it to be static and did not account for future developments, indicating a majority on short-term rather than long-term visions (Hagenlocher et al. 2019). Moreover, most estimates of the water status are based on limited historical trends or a snapshot of current conditions, and traditional water accounting approaches lack a dynamic (Chapagain et al. 2021) and relational perspective (Boelens 2023; Boelens et al. 2017). In order to establish a resilient drought management system, it is necessary to understand the interdisciplinary context in which it operates, and to recognise drought as a process instead of an event. The literature review, explained in this paper, leads to the anthropogenic drought definition which clarifies this context.

4.2 Understanding ARA

The ARA theory makes a distinction between actors, factors, institutions, and intermediaries/mediators (Figure).

Actors are those who act, with a minimum of two actors typically involved, a sender and receiver. These actors have their own unique intentions, which can change over time or vary depending on the context. Other actors can also join a context and take over actions or add to the context. (Boelens 2010, 2018)

The context is crucial in understanding the actions of these actors. Some elements or problems urge actors to act, while others constrain them. These contextual elements are regarded as the factors. (Boelens 2010, 2018)

The result of an action, caused by different factors, can also lead to a mutual agreement to act in the future, which can be considered an institution. Institutions can be defined as the rules of the game, whether formal or informal. (Boelens 2010, 2018)

To function as a system, mediators and intermediaries are necessary to connect the actors, factors, and institutions. Intermediaries transfer information without changing it. Mediators, on the other hand, mould information in order to bring actors, factors, or

institutions together or apart. These intermediaries/mediators try to enhance the resilience of the system. (Boelens 2010, 2018)

In examining the complex issue of drought, it is important to acknowledge that the world is too complex to be fully understood. Institutions can change in response to circumstances (factors) or human influence (actors). Actors, factors and institutions (re)shape each other in their own environment over time and location. Through co-evolution, actions, within one subsystem, will have indirect effects on other subsystems. This makes a (sub)system a complex multidisciplinary entity that is always incomplete, provisional and unstable, and needs to be continuously reanalysed in a multidisciplinary way. (Boelens 2018)

In the case of drought, a scenario could arise with a water shortage (context) due to a low rainfall rate over a specific period (factor). In such a situation, various water managers (actors) may take actions to safeguard the water supply. This could be achieved through the implementation of legislation (institution), such as a consumption limit. The information on water shortage is communicated through the system via assessment models (intermediaries) or researchers (mediators).

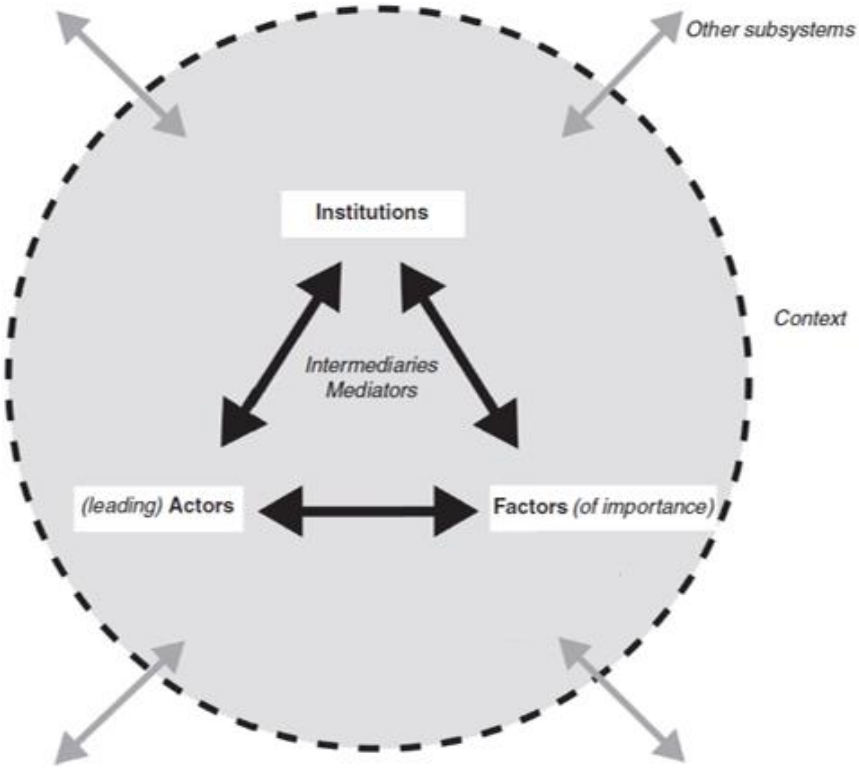


Figure 2. The Actor-Relational Approach – scheme (Boelens, 2018)

Evidently, actors, factors, institutions and intermediaries/mediators are interrelated through actions provoking reactions. It is important to fully comprehend the ARA so that

the approach can be operationalised on a study area.

4.3 Understanding the study area

The ARA determines the actors, factors, institutions, and intermediaries/mediators within a known, but evolving context. In the case of this paper, the context is the drought issue in Flanders. Determination of its constituent elements requires a thorough analyses of the specific context. For Flanders, the data acquisition was done through desktop research as a vast amount of detailed legal and other information is offered as free open-source data (e.g., databases, maps, governmental portals, official monitoring data, etc.). However, in most cases, it is recommendable to engage with specialists and stakeholders, conduct surveys, involve citizen science, etc. Throughout the data acquisition process, it is also important to ensure that the level of detail fits the context scale.

4.4 Network Analysis

Analysing and understanding the complex interactions between various actors, factors, institutions, and intermediaries/mediators involved in drought, can be done by using a network analysis tool. In this paper, the program “Gephi”, was used to visualise the relationships between the entities as a network graph. This graph can help to reveal patterns and structures in the relationships between entities, such as who is connected to whom, the strength of the connections, and how information or resources flow through the network. This provides valuable insights into the dynamics of the system and helps identifying opportunities for improving resilience to drought.

5. Results for the case of Flanders

5.1 Actors

From the obtained insights, the main drought actors have been identified as: households, energy, agriculture, trade & services, other industries, and government (within its various layers). These water managers, users and consumers have continuously major impact on the water system, therewith on drought, and provide a global overview of the involved actors. For smaller scales or subsystems, such as concerned communities, most of these actors can be subdivided. Since the actor “government” is closely linked to the ARA-pillar "institution", it is able to bring significant changes to that part. Therefore, the most important actors within “government” will be briefly explained.

5.1.1 Actor, Government

At a regional level, a vital actor within the integral water policy is the "Coordination

Commission for Integral Water Policy" (CIW). The CIW prepares the integrated water policy, on which the Flemish government relies and consequently elaborates. For this responsibility, the CIW includes representatives from the Flemish government's policy areas, local water managers, waste and drinking water companies, and a provincial governor. The lead official of the “Flemish Environment Agency” (VMM) chairs the CIW. (Coordination Committee on Integrated Water Policy 2022)

The Flemish government itself consists, on paper, of various departments and agencies with water-related powers, coordinated by the minister for environment. The departments usually support the minister by preparing and maintaining the legislation; the agencies are typically responsible for the implementation of the drought policies. As for water-related issues, the main policy areas are Environment (Flemish Environment Agency; Environment Department; Agency for Nature and Forest; Flemish Land Agency; Public Waste Agency of Flanders), Mobility and Public Works (Department of Mobility and Public Works; Flemish Waterway; Agency for Maritime Services and Coast; Agency for Roads and Traffic), and Agriculture and Fisheries. (Coordination Committee on Integrated Water Policy 2022) In reality, governmental entities receive support from semi-private and semi-public organisations, contributing to an increase in complexity.

At the basin level, a basin board represents each basin, and the Flemish government provides necessary resources and personnel for its operation. The Flemish minister for environment appoints a basin coordinator recommended by the CIW. The basin council, representing the political level of the basin, includes representatives from the Flemish Region, provinces, sub-basins, and the provincial governor. The basin secretariat manages the basin and prepares draft basin management plans and progress reports. (Coordination Committee on Integrated Water Policy 2022)

At the sub-basin level, water boards are established as a partnership between overlapping water managers. Provinces must take the initiative to establish a water board as overlapping areas are possible. (Coordination Committee on Integrated Water Policy 2022)

Besides overlapping responsibilities between provinces and municipalities, they do still have their own responsibilities within their borders. The provinces manage the second category of unnavigable watercourses (outside the area of the polders and waterways). The provinces state that they play a role in “preventing flooding and decide on environmental and nature permits”. This means that the main focus is floods instead of floods and droughts. The production, distribution, transport and sanitation of drinking water is performed by the drinking water companies. (Coordination Committee on Integrated Water Policy 2022)

Cities and municipalities are then responsible for managing third category watercourses, public canals and municipal canals. They, or a sewer manager appointed by them, take care of the collection of domestic wastewaters. Municipalities are also initiators of local

environment plans, responsible for granting environmental permits, applying the water test, etc., influencing the other major water consumers and users. (Coordination Committee on Integrated Water Policy 2022)

5.2 Factors

A significant amount of research has already been conducted on the interactions and influences of factors that contribute to drought. Various studies have focused on defining drought, developing decision-making frameworks. These studies were used to comprehend a vast variety of knowledge and determine the contributing factors. These factors are multi-faceted and can impact the occurrence and severity of drought without requiring any direct action. These factors include:

- weather conditions and the topography of an area, which affect the amount and distribution of precipitation and the flow of surface and groundwater (Abdollahi et al. 2019; Bloomfield et al. 2013; Coordination Committee on Integrated Water Policy 2021a, b; Flemish Environment Agency 2021a, b, c, d, e; Mo and Lettenmaier 2016)
- climate change, leading to more frequent and severe droughts, due to changes in precipitation patterns, higher temperatures, and increased evapotranspiration rates (AghaKouchak et al. 2021; Coordination Committee on Integrated Water Policy 2021a, b; Dai 2011; Flemish Environment Agency 2021e; IPCC 2022; Seneviratne et al. 2012)
- water quality and quantity, impacting the availability and suitability of water resources for different uses (Abdollahi et al. 2019; AghaKouchak et al. 2021; Coordination Committee on Integrated Water Policy 2021a, b; Flemish Environment Agency 2021c, d, e; IPCC 2022)
- changes in land cover, such as urbanisation or deforestation, can alter the water balance of an area (AghaKouchak et al. 2021; Coutts et al. 2007; Diffenbaugh et al. 2015; Flemish Environment Agency 2021e; IPCC 2022; Van Loon et al. 2016)
- water management infrastructure, such as dams, irrigation systems, and water allocation systems, can affect water availability and distribution (AghaKouchak et al. 2021; Coutts et al. 2007; Diffenbaugh et al. 2015; Flemish Environment Agency 2021e; IPCC 2022; Van Loon et al. 2016)
- socioeconomic factors, such as poverty, inequality, and political instability, can impact the vulnerability of communities and their ability to cope with drought impacts (AghaKouchak et al. 2021; Berkes et al. 2000; Flemish Environment Agency 2021e; Gual and Norgaard 2010; IPCC 2022; Madani et al. 2016; Madani and Shafiee-Jood 2020; Mehran et al. 2015; Van Loon et al. 2016)
- population growth, pressuring the limited water resources (AghaKouchak et al. 2021; Coutts et al. 2007; Diffenbaugh et al. 2015; Flemish Environment Agency 2021e; IPCC 2022; Van Loon et al. 2016)

These factors highlight the complex and multi-dimensional nature of drought. It is important to note that the relative importance can vary depending on the specific context and location of the drought, and understanding these contextual factors is critical for effective drought management.

5.3 Institutions

The current legislation is primarily aimed at the prevention of damage caused by floods. Currently, there is a transition towards also establishing drought policies, however actions and rules are mainly reactive and implemented ad hoc for a limited period, during drought stress. Structural and preventives rules are rare and insufficient.

Belgium itself is since the first state reform, in 1970, divided into several levels: federal (Belgium), regional (Flanders, Brussels, and Wallonia; shown in Figure 60), and provincial and municipal, shown in Figure . This division implies a certain hierarchy for both actors and institutions. In addition, in Flanders, the water system is divided in ground and surface water. The Integral Water Policy Decree of 18 July 2003 transposes the European Water Framework into Flemish legislation and classifies the water systems based on hydrological, geomorphological, ecological, and functional characteristics. The different levels of water system boundaries within Flanders are flow areas (4), basins (11), sub-basins (102), VHA-zones (264), shown in Figure; and groundwater systems (6), as shown in Figure (Flemish Environment Agency 2020).

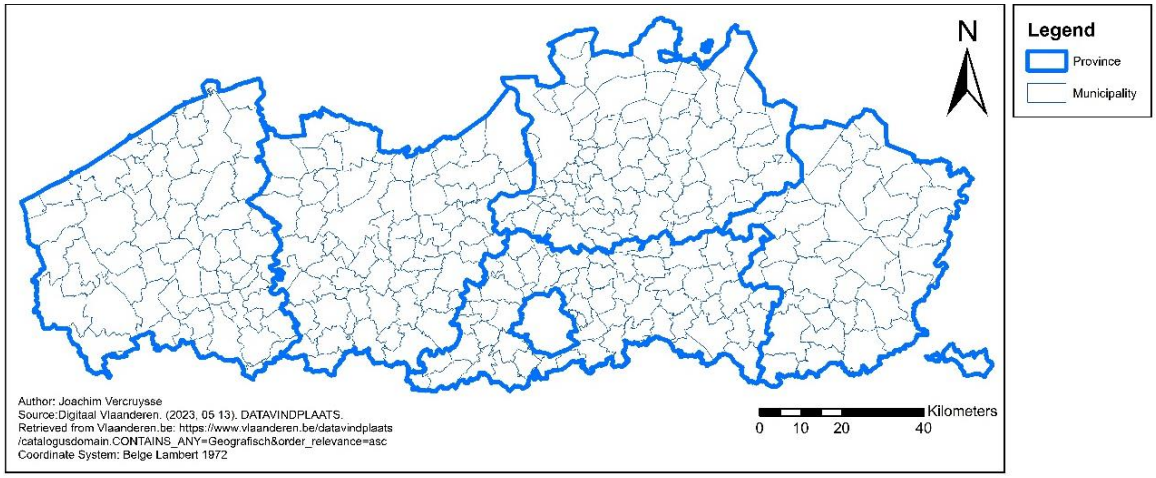


Figure 3. Flemish Provinces and Municipalities

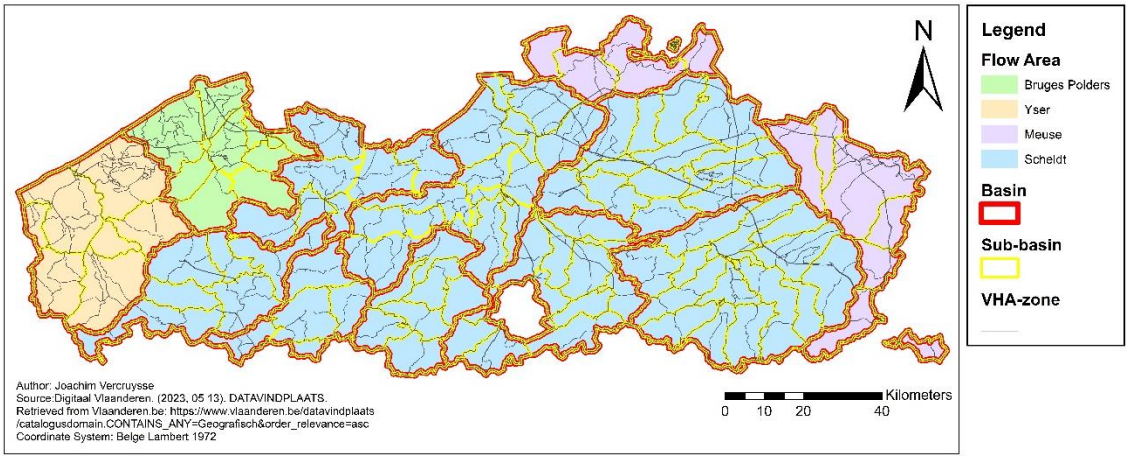


Figure 4. Flemish Flow areas, Basins, Sub-basins and VHA-zones

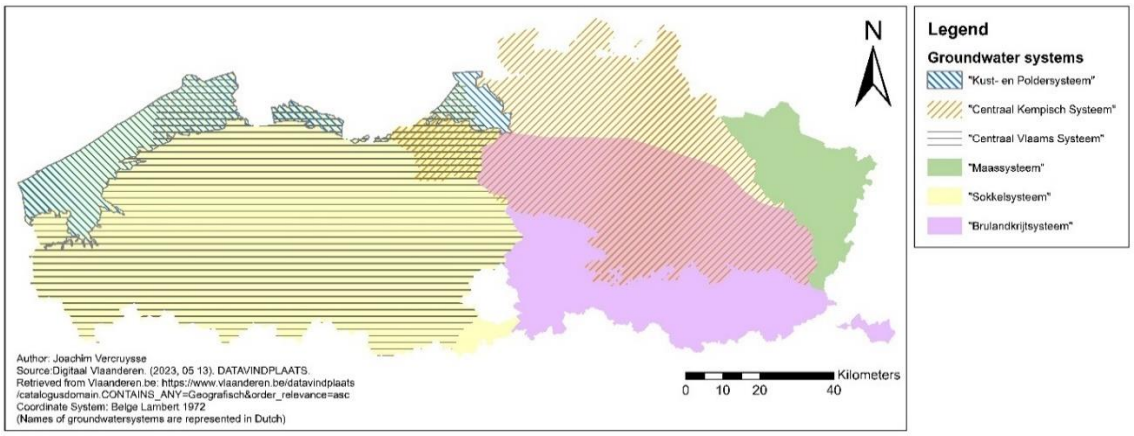


Figure 5. Flemish Groundwater systems

With regard to flooding, this division is a logical and appropriate approach, but it leads to overlapping authorities between different government levels. Therefore, the Flemish government established a general policy vision for integrated water management, in order to coordinate and organise water policy at the level of the Flemish Region. The water policy note outlines the policy framework and provides guidance for drafting flow area management plans. These plans address issues that may lead to a deterioration of the water system or that may hinder its improvement and recovery. Other degree's and legislation were drafted to regulate the amount of consumption and usage of water. (Coordination Committee on Integrated Water Policy 2021c; Flemish Environment Agency 2020) With regard to drought, there is currently no division into different areas, nor is the legislation adapted to droughts.

The following institutional regimes are currently included in the analysis: Belgian National Energy and Climate Plan 2021-2030, National Adaptation Plan, Integral water policy, Water policy note, Flow area management plans, Water Framework Directive and the Floods Directive, Flow areas, Basins, Sub-basins, VHA-zones, Groundwater system,

Flemish Climate policy plan, Flemish Adaptation plan, First Enforcement decision: water, Enforcement decision: "*Watertoets"*, Enforcement decision: Financial instruments, Subsidiary Directive Groundwater, Code of good practices, Regional urban development ordinance: rainwater, Drought measurements, Groundwater extraction legislation, Blue Deal, Extra norms for environment license and Other Decree's.

In this list, currently considered in the analysis, is it apparent that several of these legislations were made entirely in function of flood prevention and therefore outdated. The drought measures were added recently, but implemented as non-enforced and reactive measures. This adds to the drought problem, and addressing this issue will be crucial in the transition towards a resilient drought policy.

5.4 Intermediaries/mediators

The intermediaries/mediators bridge the different pillars of the ARA. These are various research institutions and universities, as well as reports produced on measurements and predictions, or internet portals providing climate predictions and scenarios, etc.

In Flanders, a significant number of intermediaries and mediators are active in monitoring and reporting on environmental factors such as rainfall, ground and surface water levels, and temperature across various locations. These environmental factors are continuously monitored at different measuring points, and the data collected is then stored and made accessible on the internet. For instance, on "Waterinfo.be", a range of time series data can be accessed, providing an overview of the various monitoring activities.

Following the dissemination of monitored data, research institutions, such as the VMM and "Hydrologic Information Centre" (HIC), provide translations of this data into various reports. These reports are made available on "Waterinfo.be*"* and are categorised into status reports, annual reports, flood-storm and drought reports, and tide tables. Furthermore, the VMM also reports on the conditions of water, air, and climate, combined with the emissions of various actors (households, energy, agriculture, trade & services, and other industries) on their own platform. This information is based on the same data from "Waterinfo.be", combined with usage and consumption figures from these actors. Additionally, the VMM has conducted research into tools that represent the impact of various natural disasters and allow users to see how the drought problem could evolve. This could encourage a change in mindset towards resilient water management practices. However, it is worth noting that the tools mainly focus on natural causes, and little attention was paid to the impact of human actors. This means that even though the tool does propose actions that actors can take to improve the situation, it does not give feedback from all causes.

Recently, in 2022, the intermediary "reactive assessment framework" was developed to

advise the provincial governor. Based on the outcome of the framework, the governor can decide which actions has to be taken to prevent water scarcity. This framework takes the water use and consumption from actors, as well as factors and institutions into account. The used data is mostly an average from the period of 2005-2019, and provides little insight into future trends. Therefore, the reactive nature of the tool does not promote long-term, resilient solutions to address water scarcity, and is limited.

Even though Flanders conducts extensive monitoring and produces many reports to reflect progress, the challenge, in this area, lies in applying this knowledge within the legislative framework.

5.5 Combining knowledge

All actors, factors, institutions, and intermediaries/mediators were brought together in a social network analysis program called "Gephi". In this program, the relationships between components were connected, thereby revealing the previously discussed aspects.

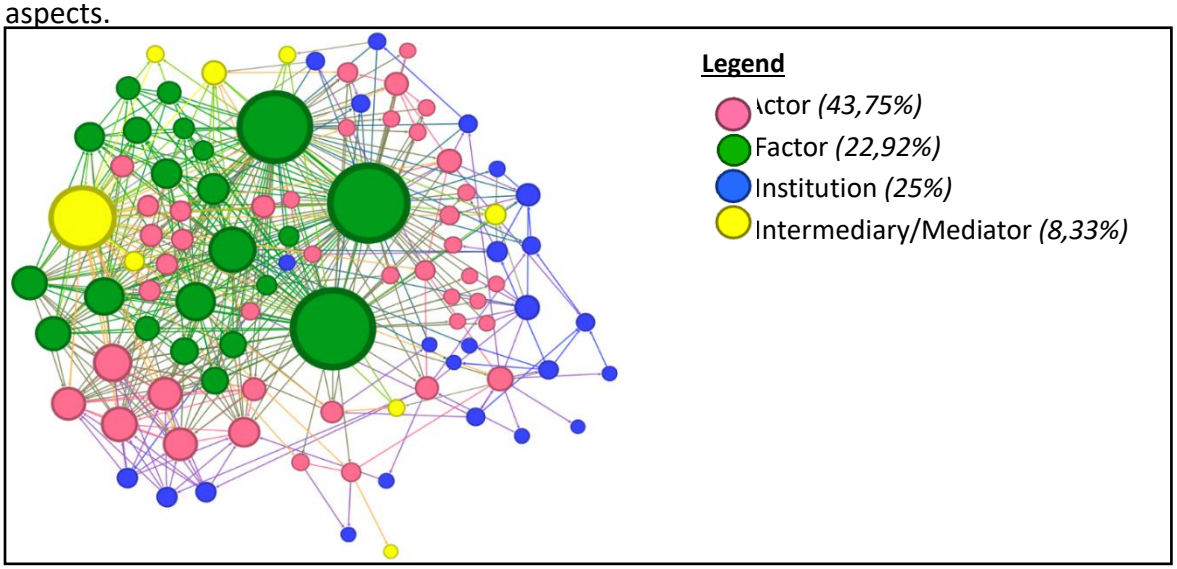


Figure 6. Case study network analysis, the proportion of the circles gives an indication of the degree of importance in the system

The system in Flanders is highly complex, as illustrated in Figure, even though only the most important components were included in the analysis. To delve into the system in more detail, it is possible to zoom in and highlight key elements. Figure shows an example, zooming in on the institution "*flow area management plans*" and where each direct link can be captured. This allows for an easier interpretation of the complex entity for the spatial planner and lights up connections that may not previously be visible.

Flanders is managed at different levels: federal, provincial, and municipal. However, these levels do not correspond to the water areas, which often results in overlaps and conflicts of interest between actors and institutions.

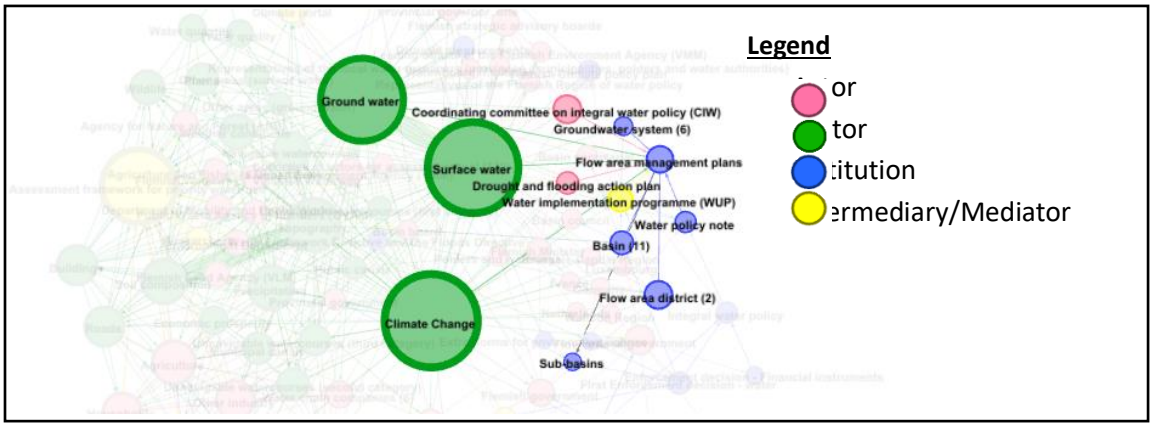


Figure 7. Detailed perspective from the network analysis

Remarkably, most relationships are found between actors, factors, and one intermediary (assessment framework). This highlights the importance of these components. Factors set everything in motion, thus influencing many components and triggering actions. The many relationships among actors can also be traced back to the various conflicts of interest, leading to additional connections. Despite their low population, intermediaries/mediators rank high in terms of importance, confirming that a wealth of data is available and that much is at stake.

An interesting finding is that legislation is mainly focused on flooding, with little attention given to other aspects of the water system. Nonetheless, 25 percent of the population in the system is constituted by institutions that can influence the drought system. When looking at the relationships, it is noted that legislation has little to no power compared to other components. Changes in factors or developments within them do not lead to changes in policy, unless there is an acute problem. Reactive measures will then be taken for a limited time, but they are not enforced, thereby weakening their impact and not evolving on a long-term basis.

6. Discussion

The research conducted in this study has focused on key aspects while acknowledging that not all possible dimensions could be thoroughly examined due to the clarity and scope of this paper. It is evident that actors and factors exhibit numerous interrelationships and interdependencies, although the influence of legislation appears to be limited. The research methodology employed in this paper provides valuable insights into the system, enabling a better understanding of the various relationships and facilitating a more

proactive approach. Previously, many studies focused within a delineated aspect of drought, not considering the implications of other remaining aspects within the issue of drought (Chapagain et al. 2021; Hagenlocher et al. 2019; Slette et al. 2019). This method will change this by dividing a complex issue into several components and combining the relationships and influences, that the components exert on each other, within one system. It allows changing elements to be adjusted over time, thus obtaining a more resilient result.

However, it is important to investigate whether different scales have an impact on the obtained results. Determining whether a global perspective, a detailed analysis at large scale or a site-specific approach, would yield more nuanced insights is an important aspect that warrants further investigation. Such exploration is essential to accurately visualise and comprehend the system, thereby empowering relevant authorities to undertake targeted and effective actions.

Furthermore, it would be beneficial to explore how a network analysis, based on the ARA, can be geographically represented, as this aspect has not been addressed in the present paper. Incorporating geographic information into the analysis can potentially offer additional contextual information and enhance the overall understanding of the system dynamics. This geographical perspective may clarify the spatial distribution of actors, their interactions and the influence of geographical factors and institutions on the system's resilience. It thus may contribute to a more comprehensive understanding of anthropogenic drought.

7. Conclusion

Numerous studies have emphasised the necessity of transitioning towards a more resilient system that can effectively mitigate the impacts of climate change and human-driven factors. To evolve towards a resilient drought management system, it is essential to establish a structured context. Drought, as a highly multidisciplinary problem, is often overlooked as a process interconnected with various underlying causes. This paper established a proper definition, through literature review, stating that the anthropogenic drought definition should be used to comprehend to problem properly.

Solely using the definition is difficult, since the system is too complex. By translating the anthropogenic drought definition into the actor relational approach, the system can be conceptualised more operational. The ARA splits the interrelated elements into actors, factors, institutions, and intermediaries/mediators, and allows to be visualised in a network analysis program, like “Gephi”. Therewith it gives new insights for possible solutions, since it analyses the intense interrelationships between human and non-human elements within a specific institutional setting, towards a resilient drought management

system.

For the case of Flanders, only the most important components were used. Nevertheless we note that the system has overlapping authorities and remains highly complex. Yet, important relationships between connections became clear in the network analysis, which were not obvious from the desktop research. The most relationships were found between the actors, factors, and one intermediary (assessment framework). Despite institutions have the second largest representation in the system, we note that the degree of importance is low. This since the reactive measures are not maintained. Subsequently, the fixed measures are outdated and fixated on floods, thereby weakening the impact of the group institutions.

In summary, employing network analysis to visualise the relationships between actors, factors, institutions, and intermediaries/mediators through a network analysis, provides a powerful method for understanding the intricate interactions within a drought system. Planners and policymakers can utilise this method to strive towards a more resilient system and formulate policy recommendations for further elaboration.

References

Abdollahi, Khodayar, Alireza Bazargan and Gordon McKay. 2019. "Water Balance Models in Environmental Modeling." Handbook of Environmental Materials Management:16.

AghaKouchak, Amir, Ali Mirchi, Kaveh Madani, Giuliano Di Baldassarre, Ali Nazemi, Aneseh Alborzi, Hassan Anjileli, Marzi Azarderakhsh, Felicia Chiang and Elmira Hassanzadeh. 2021. "Anthropogenic drought: Definition, challenges, and opportunities." Wiley Online Library.

Berkes, Fikret, Carl Folke and Johan Colding. 2000. Linking social and ecological systems: management practices and social mechanisms for building resilience: Cambridge University Press.

Bloomfield, John P., Christopher R. Jackson and Marianne E. Stuart. 2013. "Changes in groundwater levels, temperature and quality in the UK over the 20th century: an assessment of evidence of impacts from climate change."

Boelens, Luuk. 2010. "Theorizing practice and practising theory: Outlines for an actor-relational-approach in planning." Planning theory 9(1):28-62.

Boelens, Luuk. 2018. "Moving Towards a Flat Ontology of Institutional InnovationActor-Relational Lessons Learned from Early Water Management Perspectives." In The Routledge handbook of institutions and planning in action: Routledge.

Boelens, Luuk. 2023. ed. Joachim Vercruysse.

Boelens, Luuk, Georges Allaert and Chloé Walot. 2017. Adapt for life: Coöperatie In Planning UA.

Chapagain, Ashok, Colin Strong, Gregg Brill, Jason Morrison, John H. Matthews, Kari Davis and Sandra Ruckstuhl. 2021. "Water Resilience Assessment Framework." ISBN: 978-1-

940148-17-5.
Coordination Committee on Integrated Water Policy. 2021a. "Draaiboek coördinatie waterschaarste en droogte."
Coordination Committee on Integrated Water Policy. 2021b. "Evaluatierapport waterschaarste en droogte 2020."
Coordination Committee on Integrated Water Policy. 2021c. "Integrated water Policy in Flanders."
Coordination Committee on Integrated Water Policy. 2022. "Wie doet wat in het Vlaamse waterbeleid." integraalwaterbeleid.be: Coordination Committee on Integrated Water Policy,.
Coutts, Andrew M, Jason Beringer and Nigel J Tapper. 2007. "Impact of increasing urban density on local climate: Spatial and temporal variations in the surface energy balance in Melbourne, Australia." Journal of Applied Meteorology and Climatology 46(4):477-493.
Crausbay, Shelley D., Aaron R. Ramirez, Shawn L. Carter, Molly S. Cross, Kimberly R. Hall, Deborah J. Bathke, Julio L. Betancourt, Steve Colt, Amanda E. Cravens and Melinda S. Dalton. 2017. "Defining ecological drought for the twenty-first century." Bulletin of the American Meteorological Society 98(12):2543-2550.
Dai, Aiguo. 2011. "Drought under global warming: a review." Wiley Interdisciplinary Reviews: Climate Change 2(1):45-65.
Dale, Virginia H. 1997. "The relationship between land-use change and climate change." Ecological applications 7(3):753-769.
Davids, Peter. 2021. "Rethinking floodlabel: a situational approach to homeowner involvement in flood risk management." Ghent University.
Davoudi, Simin, Elizabeth Brooks and Abid Mehmood. 2013. "Evolutionary Resilience and Strategies for Climate Adaptation." Planning Practice & Research 28(3):307-322.
Davoudi, Simin, Keith Shaw, Jamila L. Haider, Allyson E. Quinlan, Garry D. Peterson, Cathy Wilkinson, Hartmut Fünfgeld, Darryn McEvoy, Libby Porter and Simin Davoudi. 2012. "Resilience: A Bridging Concept or a Dead End? “Reframing” Resilience: Challenges for Planning Theory and Practice Interacting Traps: Resilience Assessment of a Pasture Management System in Northern Afghanistan Urban Resilience: What Does it Mean in Planning Practice? Resilience as a Useful Concept for Climate Change Adaptation? The Politics of Resilience for Planning: A Cautionary Note." Planning Theory & Practice 13(2):299-333.
Diffenbaugh, Noah S., Daniel L. Swain and Danielle Touma. 2015. "Anthropogenic warming has increased drought risk in California." Proceedings of the National Academy of Sciences 112(13):3931-3936.
Dracup, John A., Kil Seong Lee and Edwin G. Paulson Jr. 1980. "On the definition of droughts." Water resources research 16(2):297-302.
Fleig, Anne K., Lena M. Tallaksen, Hege Hisdal, Kerstin Stahl and David M. Hannah. 2010. "Inter-comparison of weather and circulation type classifications for hydrological drought

development." Physics and Chemistry of the Earth, Parts A/B/C 35(9-12):507-515.
Flemish Environment Agency. 2020. "Vlaamse Hydrografische Atlas - Zones, 12 maart 2020." ed. Vlaamse Milieumaatschappij - Afdeling Operationeel Waterbeheer: Agentschap Informatie Vlaanderen.
Flemish Environment Agency. 2021a. "Drinkwaterbalans voor Vlaanderen - 2020."
Flemish Environment Agency. 2021b. "Droogte."
Flemish Environment Agency. 2021c. "Impact droogte op grondwater."
Flemish Environment Agency. 2021d. "Impact droogte op waterlopen."
Flemish Environment Agency. 2021e. "Uitwerking van een reactief afwegingskader voor prioritair watergebruik tijdens waterschaarste - Eindrapport."
Folke, Carl. 2016. "Resilience (republished)." Ecology and society 21(4).
Fünfgeld, Hartmut and Darryn McEvoy. 2012. "Resilience as a useful concept for climate change adaptation?" Planning theory and practice 13(2):324-328.
Gassert, Reig, Luo and Maddocks. 2013. "Aqueduct country and river basin rankings: a weighted aggregation of spatially distinct hydrological indicators." Washington, DC.
Grove, Kevin. 2018. Resilience: Routledge.
Gual, Miguel A and Richard B Norgaard. 2010. "Bridging ecological and social systems coevolution: A review and proposal." Ecological economics 69(4):707-717.
Hagenlocher, Michael, Isabel Meza, Carl C Anderson, Annika Min, Fabrice G Renaud, Yvonne Walz, Stefan Siebert and Zita Sebesvari. 2019. "Drought vulnerability and risk assessments: state of the art, persistent gaps, and research agenda." Environmental Research Letters 14(8):083002.
Hervás-Gámez, Carmen and Fernando Delgado-Ramos. 2019. "Drought management planning policy: From Europe to Spain." Sustainability 11(7):1862.
Holling, Crawford S. 1973. "Resilience and stability of ecological systems." Annual review of ecology and systematics:1-23.
Holling, Crawford Stanley. 1996. "Engineering resilience versus ecological resilience." Engineering within ecological constraints 31(1996):32.
IPCC. 2014. "Climate Change 2014: Synthesis Report." Geneva, Switzerland.
IPCC. 2022. "Climate Change 2022: Impacts, Adaptation and Vulnerability.". Geneva, Switzerland.
Kasting, James F. 1989. "Long-term stability of the Earth's climate." Global and planetary change 1(1-2):83-95.
Kiehl, Jeffrey. 2011. "Lessons from Earth's past." Science 331(6014):158-159.
Kingston, Daniel G., James H. Stagge, Lena M. Tallaksen and David M. Hannah. 2015. "European-scale drought: understanding connections between atmospheric circulation and meteorological drought indices." Journal of climate 28(2):505-516.
Klein, Richard J.T., Robert J. Nicholls and Frank Thomalla. 2003. "Resilience to natural hazards: How useful is this concept?" Global environmental change part B: environmental hazards 5(1):35-45.

Madani, Kaveh, Amir AghaKouchak and Ali Mirchi. 2016. "Iran's socio-economic drought: challenges of a water-bankrupt nation." Iranian studies 49(6):997-1016.

Madani, Kaveh and Majid Shafiee-Jood. 2020. "Socio-hydrology: a new understanding to unite or a new science to divide?" Water 12(7):1941.

Meerow, Sara and Melissa Stults. 2016. "Comparing Conceptualizations of Urban Climate Resilience in Theory and Practice." Sustainability 8(7):701.

Mehran, Ali, Omid Mazdiyasni and Amir AghaKouchak. 2015. "A hybrid framework for assessing socioeconomic drought: Linking climate variability, local resilience, and demand." Journal of Geophysical Research: Atmospheres 120(15):7520-7533.

Mishra, Ashok K and Vijay P Singh. 2010. "A review of drought concepts." Journal of hydrology 391(1-2):202-216.

Mo, Kingtse C. and Dennis P. Lettenmaier. 2016. "Precipitation deficit flash droughts over the United States." Journal of Hydrometeorology 17(4):1169-1184.

Prudhomme, Christel, Ignazio Giuntoli, Emma L Robinson, Douglas B Clark, Nigel W Arnell, Rutger Dankers, Balázs M Fekete, Wietse Franssen, Dieter Gerten and Simon N Gosling. 2014. "Hydrological droughts in the 21st century, hotspots and uncertainties from a global multimodel ensemble experiment." Proceedings of the National Academy of Sciences 111(9):3262-3267.

Rankin, A., M. Bång, M. Sainz, J. Radianti, J. Brage, S. Rosenqvist, L. Lebaka and J. Hernantes. 2016. "D1.1 Survey Report on World-Wide Approaches."

Salata, Konstantina-Dimitra and Athena Yiannakou. 2020. "The quest for adaptation through spatial planning and ecosystem-based tools in resilience strategies." Sustainability 12(14):5548.

Seneviratne, Nicholls, Easterling, Goodess, Kanae, Kossin, Luo, Marengo, McInnes, Rahimi, Reichstein, Sorteberg, Vera and Zhang. 2012. " Changes in climate extremes and their impacts on the natural physical environment." In Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. Cambridge University Press, Cambridge, UK, and New York, NY, USA: A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (IPCC).

Sheffield, Justin, Eric F Wood, Nathaniel Chaney, Kaiyu Guan, Sara Sadri, Xing Yuan, Luke Olang, Abou Amani, Abdou Ali and Siegfried Demuth. 2014. "A drought monitoring and forecasting system for sub-Sahara African water resources and food security." Bulletin of the American Meteorological Society 95(6):861-882.

Shukla, Shraddhanand and Andrew W Wood. 2008. "Use of a standardized runoff index for characterizing hydrologic drought." Geophysical research letters 35(2).

Slette, Ingrid J, Alison K Post, Mai Awad, Trevor Even, Arianna Punzalan, Sere Williams, Melinda D Smith and Alan K Knapp. 2019. "How ecologists define drought, and why we should do better." Global Change Biology 25(10):3193-3200.

Stagge, James H, Lena M Tallaksen, Lukas Gudmundsson, Anne F Van Loon and Kerstin Stahl. 2015. "Candidate distributions for climatological drought indices (SPI and SPEI)."

International Journal of Climatology 35(13):4027-4040.
Tempels, Barbara. 2016. "Flood resilience: a co-evolutionary approach: residents, spatial developments and flood risk management in the Dender Basin." Ghent University.
Trambauer, P, M Werner, HC Winsemius, S Maskey, E Dutra and S Uhlenbrook. 2015. "Hydrological drought forecasting and skill assessment for the Limpopo River basin, southern Africa." Hydrology and Earth System Sciences 19(4):1695-1711.
Trenberth, Kevin E, Aiguo Dai, Gerard Van Der Schrier, Philip D Jones, Jonathan Barichivich, Keith R Briffa and Justin Sheffield. 2014. "Global warming and changes in drought." Nature Climate Change 4(1):17-22.
Van Brussel, Suzanne. 2018. "The art of governing in the complex mobility transition: the value of adding an Orgware agenda." Ghent University.
Van Loon, Anne F., Kerstin Stahl, Giuliano Di Baldassarre, Julian Clark, Sally Rangecroft, Niko Wanders, Tom Gleeson, Albert I. J. M. Van Dijk, Lena M. Tallaksen, Jamie Hannaford, Remko Uijlenhoet, Adriaan J. Teuling, David M. Hannah, Justin Sheffield, Mark Svoboda, Boud Verbeiren, Thorsten Wagener and Henny A. J. Van Lanen. 2016. "Drought in a human-modified world: reframing drought definitions, understanding, and analysis approaches." Hydrol. Earth Syst. Sci. 20(9):3631-3650.
Vilonen, Leena, Maggie Ross and Melinda D Smith. 2022. "What happens after drought ends: synthesizing terms and definitions." New Phytologist.
Wahl, Thomas, Sally Brown, Ivan D Haigh and Jan Even Øie Nilsen. 2018. "Coastal sea levels, impacts, and adaptation." MDPI.
Wanders, Niko and Yoshihide Wada. 2015. "Human and climate impacts on the 21st century hydrological drought." Journal of hydrology 526:208-220.
Wilhite. 2000. "Drought as a natural hazard: concepts and definitions."
Wilhite and Glantz. 1985. "Understanding: the drought phenomenon: the role of definitions." Water international 10(3):111-120.
Woodruff, Sierra C., Sara Meerow, Missy Stults and Chandler Wilkins. 2022. "Adaptation to Resilience Planning: Alternative Pathways to Prepare for Climate Change." Journal of Planning Education and Research 42(1):64-75.
Zscheischler, Jakob, Seth Westra, Bart JJM Van Den Hurk, Sonia I Seneviratne, Philip J Ward, Andy Pitman, Amir AghaKouchak, David N Bresch, Michael Leonard and Thomas Wahl. 2018. "Future climate risk from compound events." Nature Climate Change 8(6):469-477.

EXPLORING LOCAL SPATIAL ORGANIZATION OF OFFSHORE WIND ENERGY AND COASTAL FISHERY: INSIGHTS FOR JUSTICE FROM CHANGHUA, TAIWAN (1137)

Liang-chin, Chi[1], Wei-ju, Huang[1]
[1] Department of Urban Planning, National Cheng Kung University, Tainan City, Taiwan; p28091028@gs.ncku.edu.tw

Abstract. The justice issue in energy transition concerns its distribution of benefits and burdens to society and environment. Space has been acknowledged as the underlying factor of distributive justices, by exploring the location and the relationships constituted by space. This study constructs a conceptual framework that can be used for analysing the relationship between capability of fishery livelihood, spatial organisation and justice. Through a case study of coastal fisheries and offshore wind farm development in Changhua, functionings of a coastal fisherman are defined as fishing behavior, mobility of fishing boats, accessing to fishing grounds. The capability set as their choice is constituted by fishing hours, fish catch and fishing methods for target species.

Keywords: capability, spatial organisation, coastal fishery, offshore wind energy

1. Introduction

Justice plays an important role in sustainable transition that address many environmental issues. The normative thinking of justice is to promote a more equable and inclusive participation between marginal actors and powerful actors in the development process (Köhler et al., 2019). Therefore, in terms of the justice of energy transition worldwide, it is crucial to consider the disparities related to distribution of benefits and burden among social groups in the systemic transformation process. Moreover, justice can help people to identify neglected issues from a moral aspect during the implementation of a radical transformation for purposes.

The “space” is considered as significant dimension to identify the disparities of social condition and injustice of energy transition (Bouzarovski and Simcock, 2017; Fathoni and Setyowati, 2022). Some scholars dissect broad effects of the low-carbon energy system on local territories and social spaces to clarify adverse and beneficial externalities from the practice of energy transition (Barnacle, 2020; Bosch and Schmidt, 2020). Space not only functions as a container to locate technical-industries for energy transition, delivering goods and services to people, but also as a medium to discuss the relationship between material and social, political activities. In light of this, analysing in the relations of spaces, social groups and associated changes is ready to illustrate injustice phenomenon in such

a transition process.

In recent years, Taiwan's large-scale offshore wind farm projects expand rapidly on sea and coastal area owing to the transformation policy to de-carbonization and net zero emissions. Fishermen contend that the construction of offshore wind farms not only close traditional fishing grounds, but also exclude fishing from certain sea area. At the same time, they cast doubt on potential impacts of offshore facilities on the marine ecosystem, habitats and environment as well (Chen et al., 2015; Zhang et al., 2017). Although Taiwanese fishermen were opposed to these projects, but many of them compromised after obtaining fishery compensation. It is possible that the change of spatial organisation resulted from offshore wind farms have a profound influence on fishermen's status of livelihood. However, most of the debates end up with the ocean grabbing of offshore wind farms and fisheries exclusion in the previous studies. How do fishermen in their day-to-day fishery operations and quality of livelihood are changed by the deployment of the offshore wind farms is not sufficiently manifested.

Therefore, this study attempted to construct a conceptual framework that can be used for analysing the relationship between capability of fishery livelihood, spatial organisation and justice. The following section explores the notion of capability approach with its implication of justice, and notes the role of space in the analysis. In the third and fourth section, a case study of Changhua is presented as the empirical evidence for constructing the conceptual framework. In the final section demonstrates further direction for the follow-up study.

2. Building conceptual framework: Capability approach, justice and space

2.1 Capability approach and justice

The capability approach is acknowledged to justify justice on the basis of people's capabilities to obtain well-being and quality of life (Israel and Frenkel, 2018; Przybylinski, 2022). If the relationships between human and their capability is reduced in space and time, it may be comparative injustice, in a manner of speaking (Ballet, Koffi and Pelenc, 2013). In Amartya Sen's pioneered work on capability approach, the capabilities of a person constitute one's advantage to realize various functions of living as a compound of doings and beings (Sen, 1993). Therefore, Sen argues that the evaluation of "well-being achievement" and "well-being freedom" is significantly associated with "functionings", "capability set" and "choices". As far as the freedom of choices and achieved functionings are concerned, researchers can analyse one's capability set for assessing particular well-being. "Functionings" are a combination of actions and state of existing that a person exercises on account of well-being achievement. The notion of "capability set" refers to a person's alternative functionings. The range of "choice", in other words of freedom, is how

a person values the components that he or she can choose in corresponding capability. In fact, capability approach is a framework of thought to evaluate normative issues (Robeyns, 2000). Namely, the evaluative space of capability approach must be identified clearly by the specification of value-objects and its potential scope while make the judgement of the relationship between a person's capability and justice.

2.2 Interaction of capabilities and spatiality

The capability perspective can have fertile insights into spatial intelligibility of justice. Although what is the capability approach highlight in analysis seems to focus on agency aspect, actually, the view of capability would concern itself further with social structures and environmental factors that together influence a person's or a social group' capability set to converse goods and services (Robeyns, 2005) (see Figure). In the previous studies, Israel and Frenkel (2018) draw on capital forms, habitus and their relationship of spatial substance to characterize the constitution of "capability set" and their functions in the field, in order to examine how people could mobilize different sets of goods for life-chances and well-beings. For further application of the theoretical framework, they identify the spatial dimension of the living environment as a concept to influence the capabilities-building of people through the (intermediary) social space which incorporate economic capital, cultural capital and social capital (Israel and Frenkel, 2020). Taking a better grasp of empirical spatial inquiries and practices into consideration, justice thereby implies keeping people's particular capabilities for living that depends on the creation of relational condition of capabilities and living environments where people involved (Basta, 2016).

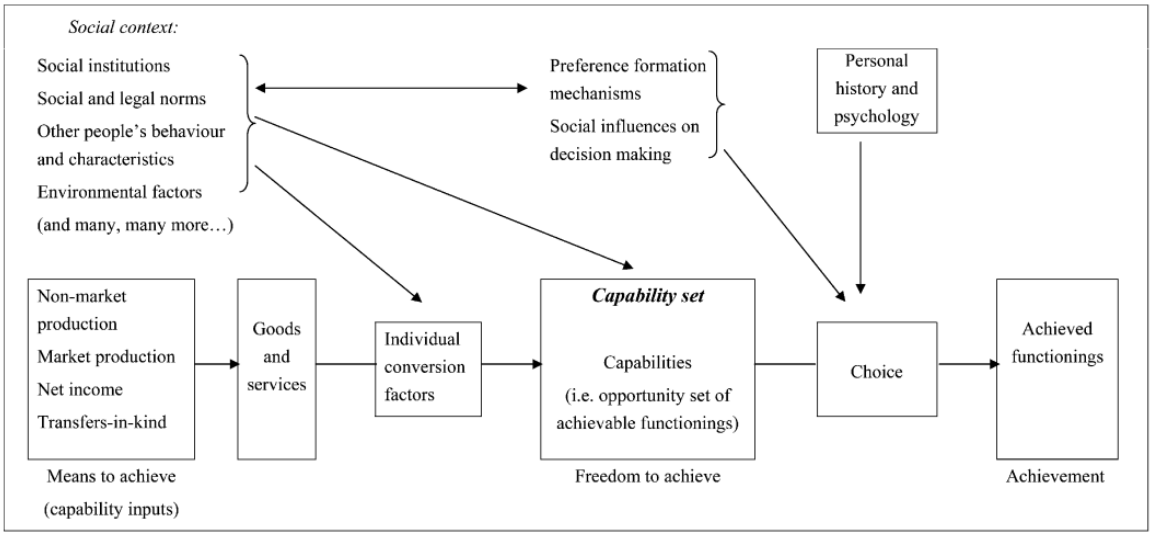


Figure 1. A schematic representation of a person's capability set and her social and personal context

Source: Robeyns, 2005, p. 98.

3. Methodology

The case study is conducted in Changhua where 11 offshore wind farms are planned up to 4.47 GW of capacity before 2026 and become the densest developing sea area, thus dominating the offshore wind farm site for Taiwan (see Table 18). At present, the offshore wind projects in Changhua area have a turbine capacity in the range of 5.2~9.5 MW. Taipower offshore wind farm - phase 1 demonstration project has been in operation since 2021. Three offshore wind farm projects are scheduled to be completed in 2023. In the face of sequential construction and maintenance activities of offshore wind farms, the spatial re-arrangement has to be performed to keep the overall marine activities operational.

Table 18. Offshore wind farms in Changhua (Developed by 2026)

Scheduled completion year	Project	Capacity (MW)	Numbers of turbines (unit capacity)	Status
2020 (completed in 2021)	Taipower offshore wind farm - phase 1 demonstration	109.2	21 (5.2 MW)	In operation
2023	Changfang offshore wind farm	541.5	57 (9.5 MW)	Under construction
2023	Greater Changhua 1-	600	75 (8 MW)	Under

Scheduled completion year	Project	Capacity (MW)	Numbers of turbines (unit capacity)	Status
	South East offshore wind farm			construction
2023	Greater Changhua 2a-South West offshore wind farm	288	36 (8 MW)	Under construction
2024	Xidao offshore wind farm	47.5	5 (9.5 MW)	Under construction
2024	ZhongNeng offshore wind farm	294.5	31 (9.5 MW)	Under construction
2025	Taipower offshore wind farm - phase 2	294.5	31 (9.5 MW)	Consent authorized
2025	Greater Changhua 2b-South West offshore wind farm	337.1	N/A	Consent authorized
2025	Greater Changhua 4-North West offshore wind farm	582.9	N/A	Consent authorized
2025	Hai Long 2A offshore wind farm	300	N/A	Consent authorized
2026	Hai Long 2B offshore wind farm	232	N/A	Consent authorized
2026	Hai Long 3 offshore wind farm	512	N/A	Consent authorized
2026	Haixia offshore wind farm	300	N/A	Early planning

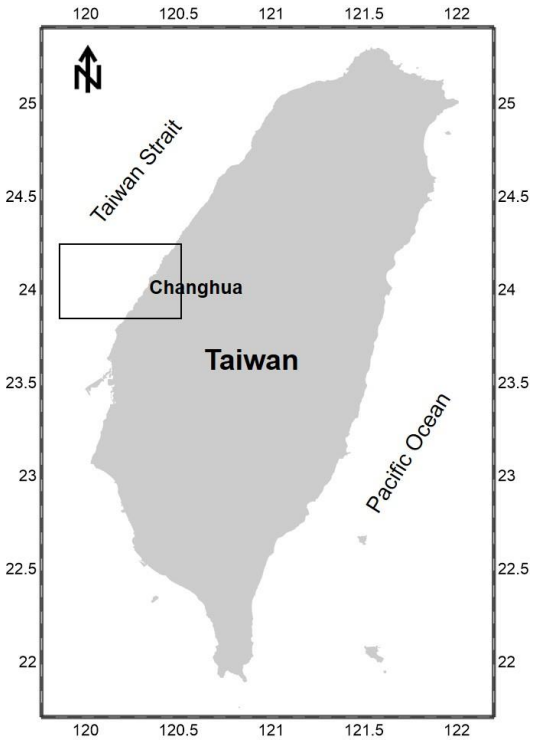


Figure 2. Map of the study area

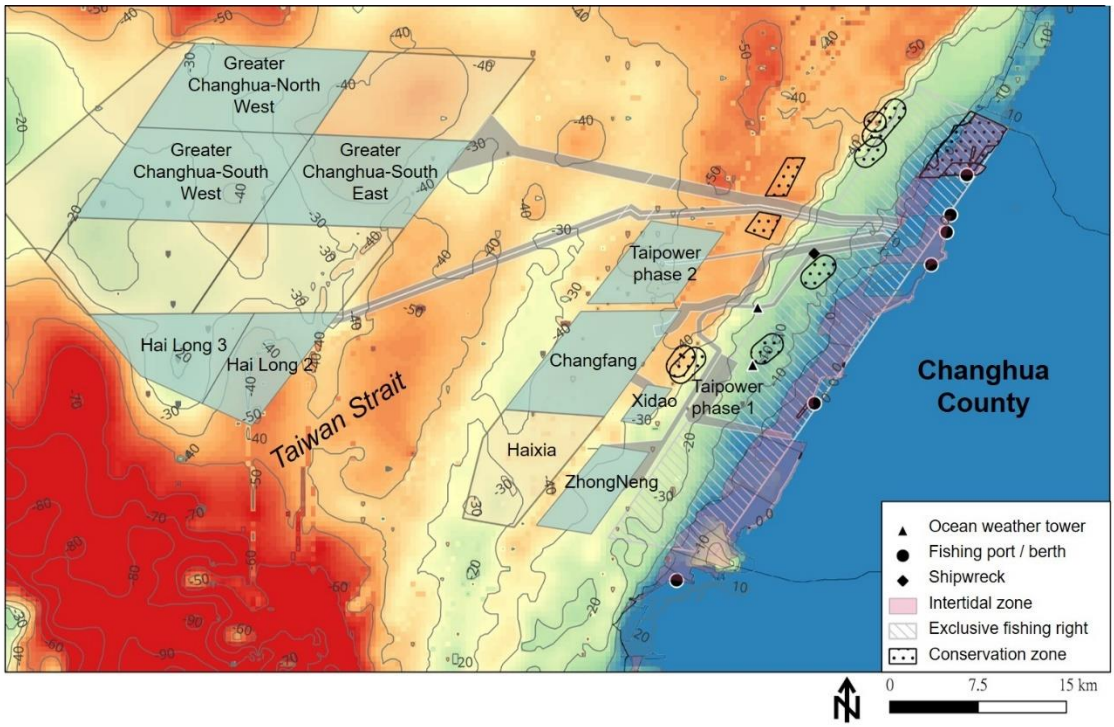


Figure 361. The spatial organisation of offshore wind farms in Changhua

Field works was carried out from 2019 to 2022 and data was collected through semi-structured interviews, observation, field notes, offshore wind project documentation, including government reports, environmental impact statements, and public news. In order to understand the diversity of coastal fisheries and their reactions about the progress of offshore wind farms in Changhua, around 82 interviews of Changhua coastal fishery community have been carried out so far, which include professional fishery operators and sideline fishery operators. The interviews are transcribed with recording-consent from the research participants. Short follow-up investigations and field notes had been made when current issues emerged in the field. The information had also been preliminarily inquired and clarified through different viewpoints from offshore wind developers (local liaisons), fishermen's association and responsible authorities.

Table 19. List of interviewees in Changhua coastal fishery community

Fishery port / berth	**Career types**	**Fishing methods / gears**	**Numbers of interviewees**
Wang-Gong fishing port	professional fishery operators	Gill nets	10
		Angling, Traps and Pots, Gill nets	1
	sideline fishery operators	Gill nets	8
		Gill nets, Angling	3
		Angling	2
Xucuogang fishing port (Yunlin)	professional fishery operators	Gill nets	1
Baxian berth	professional fishery operators	Gill nets	1
		Gill nets, Traps and Pots	5
		Gill nets, Angling	1
		Angling, Traps and Pots, Gill nets	2
		Recreational fishing boat	1
	sideline fishery operators	Gill nets	1
		Gill nets, Traps and Pots	2
Kunlun berth	professional fishery operators	Gill nets	1
		Gill nets, Angling	1
	sideline fishery operators	Gill nets, Angling	1
Lunweiwan fishing port	professional fishery operators	Gill nets	8
		Gill nets, Traps and Pots, Angling	1

Fishery port / berth	Career types	Fishing methods / gears	Numbers of interviewees
		Gill nets, Angling	1
		Gill nets, Traps and Pots	1
		Angling	1
		Recreational fishing boat	4
	sideline fishery operators	Gill nets	2
		Angling	6
Wenzai berth	professional fishery operators	Trawlers	13
		Gill nets	1
	sideline fishery operators	Trawlers	2
		Gill nets	1

4. Results

4.1 Functionings and capability set of a fisherman for coastal fisheries in Changhua

The functionings and capability set of a fisherman are possible to illustrated according to the understanding of coastal fisheries operations. To begin with, functionings are associated with what fishermen do for fishing on the sea. Elements of fishing activity comprise regular fishing behavior of casting / hauling fishing gears which require enough space and time.

For over decades, the major types of small-scale fisheries for livelihood are gillnets fishery and small-medium trawling fishery in Changhua coastal areas. Despite the catches of gillnets and trawling are relatively high, some fishermen are used to having a combination of angling or the gears of traps and pots as the supplementary fisheries to support households (see Table 20). Major fishing methods are introduced as follows. Gillnets fishery operation depends on tide and wind by fluid water in order to catch target species. In this way, fishing boats drift parallel to the coast and moves for 8 to 16 kilometres with 1 kilometre long nets. In order to waiting for the fish, adequate mobility and spatial extents are needed in the routine operation of gillnets. Small-medium trawling fishery including bottom trawls and midwater trawls, in contrast, does not depend on the current to operate. In general, they fish along the same water depth relying on the driving of engine power. Consequently, both gillnets fishery and trawling fishery temporarily occupy the three-dimensional sea space and fish resources during the act of fishing and movements.

Second, the need of fishing boats for mobility and access to a known and potential fishing grounds is also essential because of the fluid fish resources and vessel maneuver.

Migratory fish is the main target species for marine catches in Changhua coastal area. Changes of fishing grounds is accompanied by the arrival of seasonal migratory fish and seasonal mature benthic species, e.g., crabs and Areola babylons. For the experienced gillnets fishermen, they identified their seasonal fishing grounds in relation to different depth of water and water temperatures. For instance, cuttlefish is catch with water depths at 20 to 30 metres in spring and summer. Mullet is catch with water depths at 10 to 20 metres or 28 to 40 metres in winter. In addition, a bottom trawling fishermen pointed out that he was trawling from the north to the south with water depths at 20 metres, and returning from the south to the north with water depths at about 40 metres. Both of the gillnets and trawling use highly mobile fishing boats to move and fishing.

Third, capability set are associated with the conversion of fishery harvesting and sustain livelihood. The way of economic conversion can be grasped through a combination of fishing hours, fish catch and fishing methods for target species. A fisherman is able to choose one or a few fishing methods from gillnets, trawling, angling and traps and pots. Different fishing methods are corresponded to various of target species, cumulative hours and the amount of fish catch by the time. This reflects the alternatives that can be transformed into the livelihood achievement.

Table 20. A combination of fishing methods in Changhua coastal fisheries

Major fishing methods	**Supplementary fishing methods**
Gillnets	Angling, Traps and pots
Trawling (bottom trawling, midwater trawling)	Gillnets, Angling, Traps and pots

4.2 The spatial organisation of coastal fisheries in Changhua

4.2.1 Legal fishing area established by regulations

In Taiwan, some regulations are formulated to restrain people from fishing in specific areas. For examples, trawling is forbidden to fish within 3 nautical miles where is the spawning grounds of many species. It is because trawling usually fish a great deal of non-selective of undersized species by small mesh. Additionally, only angling is allowed to fish in the artificial reef and fishery resource protected zone.

4.2.2 The concept of fishing grounds: formation and the locations

A fisherman said that," *Fish is not distributed evenly across the ocean, so that fishing grounds are the places where amount of fish is*". In light of this recognition inspired, the concept of fishing grounds is likely to be distinguished into two levels which are related to the feature of marine ecosystem and the capability of individual fisherman. At the first level, fishing grounds formation is generated from the ecological relationships between the life cycle of specific species and habitat. At the second level, fishing grounds is of

individual's habitual fishing areas or traditional fishing areas where a fisherman is able to reach. In some ways, where different coastal fisheries take place in locations are thereby derive from fishermen's cognition of marine fishery environment and their own fishing practices. For example, small artisanal boats of gillnets usually fish by waves on the shore where is the feeding grounds of fish. Medium artisanal boats of gillnets usually change operational locations as fish move further from the shore.

4.2.3 Natural environment and infrastructure

Besides fishing methods, the possible spatial distribution of coastal fisheries can be illustrated observing from the environment and boat sizes. Due to a vast intertidal zone and a lack of deep-water ports in Changhua coastal areas, fishing boats have to access and leave the fishing ports or berths according to semidiurnal tide times per day. So, fishing operations are fitting for a limited time which is within 12 or 24 hours. Moreover, the weight of artisanal boats or small-scale vessels are often less than 5 tons, and no more than 50 tons. In respect of wave resistance, most of the fishing boats, except for trawls are limited to oceanic condition and wave scale that difficultly operate a far distance from shore in a terrible day.

4.3 Construction of a conceptual framework

Based on the notion of capability approach and on the spatial organisation which affects a fisherman's functionings and capability set, this study construct a conceptual framework (see Figure) to examine the spatial relationship of coastal fisheries under the construction of offshore wind farms in Changhua. As the first step, functionings of a coastal fisherman are defined as fishing behavior, mobility of fishing boats, accessing to fishing grounds. The capability set as their choice is constituted by fishing hours, fish catch and fishing methods for target species. These are important doings for fishermen to sustain a livelihood. The second step tells what kinds of spaces would make a great difference to fishermen's functionings. This identifies the spatio-temporal characteristics between fishing activities, physical environment, spatial-related regulations and fishing grounds in order to indicate the standard of normal fishing operations. In the end, this study recognizes the relationships between spatial organisation, functionings and capability set in structuring the conceptual framework for analysing possible changes of livelihood.

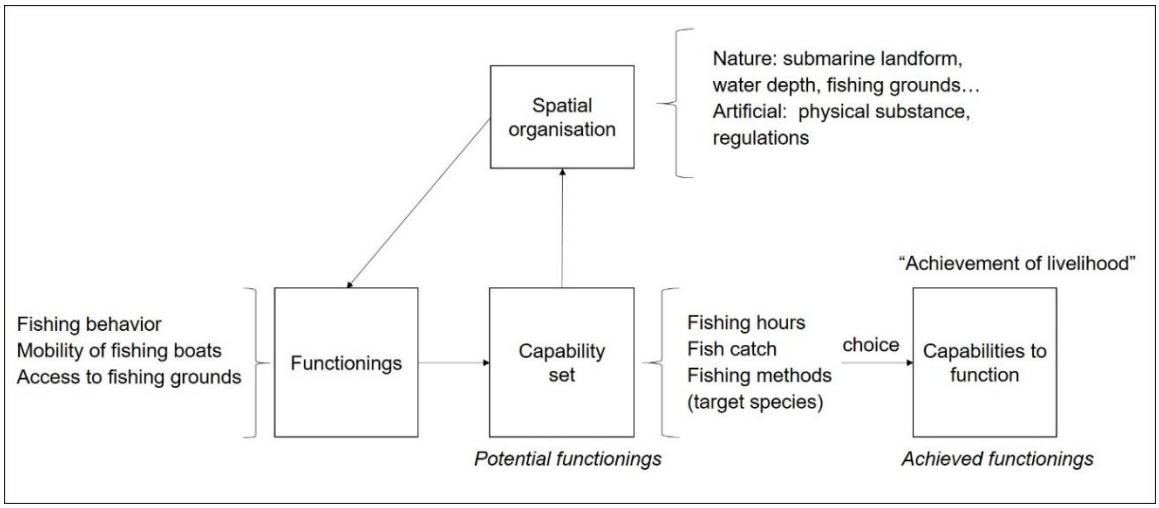


Figure 4. A conceptual framework of a fisherman's capability set in the effect of spatial context

5. Conclusion

This study demonstrates that spatial organisation plays a role to influence each element of functionings and lead to the status of capability set through a case study in Changhua. An offshore wind farm is consisting of wind turbines, subsea cables including inter array cables and export cables, a substation on land, and (or) an offshore substation. Changes in spatial organization brought by offshore wind farms have particular affect the capability of coastal fishery. The follow-up study is hoping to use the conceptual framework established in this study to analyse the specific spatial impact of offshore wind farm on fishery livelihoods.

Acknowledgments. We would like to thank the support from TPC-(608)-(3802-0604) research project: *Transformation in coastal fishery for the offshore wind farm development*.

References

Ballet, J., Koffi, J. M., and Pelenc, J. (2013) Environment, justice and the capability approach. Ecological Economics, 85, pp. 28-34.

Basta, Claudia (2016) From justice in planning toward planning for justice: A capability approach. Planning Theory, 15(2), pp. 190-212.

Becker, S., Moss, T., and Naumann, M. (2016) The importance of space: Towards a socio-material and political geography of energy transitions. In: Ludger Gailing and Timothy

Moss (eds) Conceptualizing Germany's Energy Transition: Institutions, Materiality, Power, Space. London: Palgrave Pivot, pp. 93-108.
Bosch, S., and Schmidt, M. (2020) Wonderland of technology? How energy landscapes reveal inequalities and injustices of the German Energiewende. Energy Research & Social Science, 70, 101733.
Bouzarovski, S., and Simcock, N. (2017) Spatializing energy justice, Energy Policy, 107, pp. 640-648. Available at: https://doi.org/10.1016/j.enpol.2017.03.064
Carley, S., and Konisky, D. M. (2020) The justice and equity implications of the clean energy transition. Nature Energy, 5(8), pp. 569-577.
Chen, J. L., Liu, H. H., Chuang, C. T., and Lu, H. J. (2015) The factors affecting stakeholders' acceptance of offshore wind farms along the western coast of Taiwan: Evidence from stakeholders' perceptions. Ocean & Coastal Management, 109, pp.40-50.
Fathoni, H. S., and Setyowati, A. B. (2022) Energy justice for whom? Territorial (re) production and everyday state-making in electrifying rural Indonesia. Geoforum, 135, pp. 49-60.
Lacey-Barnacle, Max (2020) Proximities of energy justice: contesting community energy and austerity in England. Energy Research & Social Science, 69, 101713.
Israel, E., and Frenkel, A. (2018) Social justice and spatial inequality: Toward a conceptual framework. Progress in Human Geography, 42(5), pp. 647-665.
Israel, E., and Frenkel, A. (2020) Justice and inequality in space—A socio-normative analysis. Geoforum, 110, pp. 1-13.
Köhler, J., Geels, F. W., Kern, F., Markard, J., Onsongo, E., Wieczorek, A., ... and Wells, P (2019). An agenda for sustainability transitions research: State of the art and future directions. Environmental innovation and societal transitions, 31, pp. 1-32.
Ministry of the Interior (2018). Minutes of the 19th meeting of the Coastal Management Committee. [Online] Available from: https://www.cpami.gov.tw/%E4%BE%BF%E6%B0%91%E6%9C%8D%E5%8B%99/%E4%B8%8B%E8%BC%89%E5%B0%88%E5%8D%80/%E4%B8%8B%E8%BC%89%E5%B0%88%E5%8D%80%E6%B8%85%E5%96%AE.html?filter_cat=7&filter_gp=28&filter_year= Accessed [22/04/2023].
Naumann, M., and Rudolph, D. (2020) Conceptualizing rural energy transitions: Energizing rural studies, ruralizing energy research. Journal of Rural Studies, 73, pp. 97-104.
Przybylinski, Stephen (2022) Where is justice in geography? A review of justice theorizing in the discipline. Geography Compass, 16(3), e12615. Available at: https://doi.org/10.1111/gec3.12615
Robeyns, Ingrid (2000) An unworkable idea or a promising alternative? Sen's capability approach re-examined.
Robeyns, Ingrid (2005) The capability approach: a theoretical survey. Journal of human development, 6(1), pp. 93-117.
Zhang, Y., Zhang, C., Chang, Y. C., Liu, W. H., and Zhang, Y. (2017) Offshore wind farm in

marine spatial planning and the stakeholders engagement: Opportunities and challenges for Taiwan. Ocean & coastal management, 149, pp. 69-80.

ARE IBA/IBTA SUCCESSFUL INSTRUMENTS FOR REGENERATING MINING REGIONS SUSTAINABLY? (1155)

Amrita Kaur Slatch

DAAD Doctoral Scholar, Institute of Landscape Architecture, RWTH Aachen University; slatch@la.rwth-aachen.de

Abstract. IBA *Internationale Bauausstellung* has been for more than a century an important instrument of structural change in the regions facing socio-economic and environmental concerns. With the onset of Information Technology being used as a successful tool for urban planning, IBA now has reinvented itself as IBTA *Internationale Bau und Technologieausstellung*. It can be said that IBA and IBTA are constantly striving to have a forward looking approach to global change in socio-economic, environmental and climatic systems.

The *IBA-Fürst-Pückler Land* was an attempt to reimagine the post industrial landscape of the open-cast lignite mining region in Lausitz or Lusatia which was completed in 2010. As part of the vision, several decommissioned and abandoned open-cast lignite mines were transformed into pit lakes, therefore becoming Europe's largest artificial lake district. Two decades later the *Rheinishce Revier* or the Rhenish Mining Area (RMA), also an important Lignite region in Germany, is undergoing a similar process of change with plans to fill up the open cast mines with underground and river water to fulfil the vision of a Lake for the community.

In the context of climate change, the observed declining ground water recharge potential and the unpredictable precipitation patterns in Germany, filling up of the open cast mines with water may not be the most optimal proposition when thinking for a sustainable future. The paper therefore seeks to highlight the limitation and challenges of the IBA/IBTA as a tool for regenerating mining regions and suggest measures and frameworks to address them.

Keywords: IBA, IBTA, Mining Regions, Lausitz and Rheinishce Revier.

1. Introduction

Germany used to be the largest lignite producer in the world since the beginning of industrial lignite mining and it has been responsible for shaping the landscape and lives of communities within the region. To date, opencast lignite mining has altered 179,490

hectares of countryside, leaving behind open pits and derelict industrial lands. Since 1924, 313 settlements have been lost to lignite mines within the country (Appunn, 2023).

Presently, due to the commitment under the Paris Agreement, Germany is aiming to reduce its dependency on coal and shift to more renewable sources of energy. One of the most contested aspects of the phase-out of brown coal is how it will affect the social and economic well-being of the people living in the mining regions. Hence the official name of the coal exit commission: "Commission on Growth, Structural Change and Employment". The idea of *Strukturwandel* or Structural Change is a key idea in the transition of German economy and executing it in coal regions involves several challenges ((BMWi), 2019).

To help facilitated the economic transition in coal regions from various formal and informal planning instruments, the *Internationale Bauaustellung* (IBA) was suggested for the regions such as Ruhr which was the largest industrial hub in Europe during the Industrial Revolution. The IBA first carried out in 1901 is an innovative strategy for urban and regional development. Among all IBA's, the IBA-Emscher Park (1988-1998) designed for the Ruhr region, was labeled as "A workshop for the Future of Industrial Regions". Headed by Prof. Karl Ganser, IBA-Emscher Park was characterised by the establishment of new planning structures and a regional approach that went far beyond mere housing and urban living. For the first time in the history of the building exhibitions, landscape design and architecture came to the fore in particular to establish a regional identity (Land, 2010).

Apart from the mining region of Ruhr, the lignite basins in east Germany were regions that had intensively been mined using open-cast method. The considerable spatial expansion of mining wastelands in the early 1990s made it necessary to conduct a rehabilitation programme involving the reforestation of large areas and the flooding of residual pits to form a lake landscape that is still under development. The Lower Lusatian lignite region is today known for its lake system, which was promoted throughout the 2000s by the *IBA-Fürst-Pückler Land*.

A similar approach has been seen within the Rhenish Mining Area (RMA) with the onset of IBTA and the expected expo by 2032. The idea of the *Internationale Bau und Technologieausstellung* (IBTA) for the Rheinische Revier represents a further development on the narrative of *IBA-Fürst-Pückler Land.* The Rhenish district seeks important tasks and future questions around the topic of technology, the *IBTA-Rheinisches Zukunftsrevier* will develop and show selected, highly ambitious next-practice projects within the dynamic structural change process in the Rhenish district. The public discussion mainly focuses on the development of new recreation areas, including a vital blue and green infrastructure, consisting, among others, of woods, meadows, and lakes (Greiving et al., 2022) .

In recent years, structural change in coal regions has been accelerated by a new driver: climate change. Although, Germany does not appear in the EU commission's report, it has always been considered a water-rich country, until now. Climate change is making summers warmer and drier (UK, 2021). As a result, landscapes are withering, wetlands are drying out, and forests are burning. Rivers too fail as important habitats for aquatic life and as transport means for ships. And as the groundwater levels drop, there is mounting concern over the future (Hein, 2022). It is therefore of utmost importance that climate mitigation policies take a strong hold in the process of Structural Change.

The nature and extent of environmental disturbance associated with mining commonly entails completely new and challenging combinations of climate, lithology and landform (Doley & Audet, 2013). Mining operations in Lausitz and RMA have been practised through open cast mining method resulting in large open pits. Before and during the mining operation the ground water table is lowered by pumps, so that the seam can be mined easily. As a result of this operation, the aquifers and the river catchments around the mining region are disturbed from their natural behaviour. This influences the water quality and quantity of the region.

In Germany, recultivation of closed mines has been practiced and investigated since the second half of the 19th century. Over the years the conversation on re-cultivation strategies has advanced with new ecological and bio-engineering thinking. Pit lakes are often the suggested post mining landform for open pit mining and life on earth is linked with the availability and presence of water, therefore it should be in the forefront of climate change discussions. The idea of converting open cast mines into pit lakes may present risks in the mining region. Poorly planned pit lakes often present risks to the environment and human health and safety (Hinwood et al., 2012), such as slope instability, drowning, entrapment, falls hazards, and poor water quality (McCullough & Lund, 2006). Conversely if well planned, pit lakes manage to have a beneficial end use. Such end uses include ecological reserves, recreation areas, water supplies for irrigation or stock water, reservoirs for cooling water and energy production, and treatment facilities for contaminated mine water (McCullough et al., 2020).

In this paper, two main Lignite producing regions of Germany are compared, through the context of its mining and recultivation history, impact on hydrology, and the planning instrument of IBA. IBA-Fürst-Pückler Land initiated 30 years ago, and IBTA-Rheinisches Zukunftsrevier which is presently being organised have their own independent memorandums. The paper intends to highlight how IBA as an instrument can help facilitate not just economic transition of these regions, but also consider new drivers of change - climate change.

2. Case of Lusatia/IBA Lausitz

2.1 Location

The Lusatian mining region is primarily a rural area in the east of Germany beside the Polish border, and stretches across the federal states of Saxony and Brandenburg. Its largest city is Cottbus with 100,000 inhabitants. The other closest urban agglomerations are Dresden in the south, Leipzig on the west and Berlin on the north. The Lusatian lignite field extends across the south-east of the State of Brandenburg and the north-east of the State of Saxony (Schulz & Schwartzkopff, 2018).

2.2 Mining and Landscape Restoration History

While open-cast lignite mining had been important in Germany since the early twentieth century, it intensified considerably in the eastern part of the country, first under the Nazi regime and then after the Second World War in the GDR (Deshaies, 2020). As a state with virtually no energy resources other than lignite, the GDR significantly ramped up the extraction of this poor quality fuel, which exceeded 300 millions tonnes per year at the end of the 1980s. Between 1970 and 1990, the areas mined for lignite in Lower Lusatia almost doubled, from 37,578 to 70,578 ha, meaning that mining activities consumed more than 2,000 ha per year throughout the 1980s.

The Slavic word Lusatia roughly translates to “swampland”. This region of swampland has been mined for lignite since 1800s. And since Lignite is the youngest form of coal, it is found closer to the surface and in the region of Lusatia it was found sometimes on the surface. When technology was not so advanced, coal was extracted with simple techniques, because of which the mines were very small in scale. By 1924, the technology for carrying out open cast lignite mining was achieved by the construction of the world’s first overburden conveyor bridge at the “Agnes” pit in Plessa, State of Brandenburg increasing the scale of the pit mines. By 1989, the whole lignite basin was characterised by mineral wastelands due to the giant excavators. The region suffered due to the incessant mining activity, which was responsible for the devastation of vast tracts of land. Although the end of mining was supposed to bring rehabilitation, recultivation or reforestation to mining wastelands, the priority given to production and the lack of financial resources as of the 1980s was to be blamed.

Following reunification in 1990, lignite mining was privatised and reorganised. This resulted in most mines closing as a result of the sharp decline in mining volumes, which today equates to around 70 millions tonnes per year in the three remaining mines. By 1994, a very important decision to separate brownfield remediation activity from mining activity was made by the federal Government. The remediation of the mines was done in collaboration with actors at three institutional levels. The federal government took charge

of the rehabilitation of mining wastelands through public companies brought together in 1994 to form LMBV (Lausitzer und Mitteldeutsche Bergbauverwaltungsgesellschaft mbH). Although dependent on the Ministry of Finance (BMF), it was able to act as a relatively independent player, integrating the complementary proposals of the Ministry of the Environment (BMU) and the Ministry of the Economy (BMWi). In 1994, however, the Ministry of the Environment wanted the remediation of operations to be done in connection with economic development and tourism, while the Ministry of the Economy saw it primarily as an objective of the country's new energy policy.

But the story recultivation measures in Lausitz starts long ago sometime in 1949. In terms of shaping of the post industrial landscape, the study "Balance Disturbances in Landscapes" (*Gleichgewichtsstörungen in der Landschaft*) by the landscape architect Reinhold Lingner at the Institute for Architecture of the German Academy of Sciences could be seen as the starting point. One year later, in 1950, this study was extended to the "Landscape investigation of the Lower Lusatia lignite mining district" (*Landschaftsuntersuchung des Niederlausitzer Braunkohlenreviers*). It was carried out on the basis of 15 plane survey sheets covering about 123,000 hectares.

The "Landscape investigation" marks a conceptual turning point in the field of recultivation as before it was understood that re cultivation is to be done in isolation. The study suggested to analyse the entire area. Based on that, complex reclamation and recultivation plans could be formulated and these plans were seen as the basis for a consistent post-mining landscape. At the same time, this study was a pilot project for the comprehensive research project "Landscape diagnosis of the GDR" (*Landschaftsdiagnose der DDR*) covering all East German states. Furthermore, the new planning methodology of surveying local farmers was applied. The results of this anaylsis are considered as follows: Due to the "capitalist predatory economy" (Reinhold Lingner), fundamental disturbances of the water balance, significant water pollution, agricultural yield losses and other negative effects had occurred. There was no complaint about the industrialized landscape itself – on the contrary, the postmining landscape was described as "often not without charm" (*häufig nicht ohne Reiz*). So due to the"generous replanning" (*grosszügige Neuplanung*), the social relevance of the post-mining landscape as a place of recovery was to be taken into account, a "special planning task" (*spezielle Planungsaufgabe*) to be carried out by landscape architects in close cooperation with city planners, geographers, water managers, spa specialists, architects and economists etc.

Later, Lingner's team deduced an "action program" (*Aktionsprogramm*) for the Lusatian mining district. However, this was not adequately supported by the Central Committee of the Socialist Unity Party of Germany (Sozialistische Einheitspartei Deutschlands). Only the demand for soil protection and the implementation of so-called "operative groups" (Operativgruppen) was included in a Central Committee decision of 1 June 1953. Already

one month later, such an “operative group” was established for the Lower Lusatian mining district.

At the Humboldt University Berlin, the research project F 3-322 “Improvement of the recultivation of dumps by researching its conditions with the help of pot and field experiments and review of previous measures in Lower Lusatia” (Verbesserung der Rekultivierung von Abraumkippen durch Erforschung der Voraussetzungen hierfür mit Hilfe von Gefäß- und Freilandversuchen und .berprüfung bisheriger Maßnahmen in der Niederlausitz) started. This was led by the well-known landscape architect Georg Pniower. The overall objective of this project was the development of scientific planning principles for the recultivation and afforestation of heaps and dumps. The research results were to be made available to the participating institutions of mining, forestry, water management and land culture. Wilhelm Knabe was another scientist incharge of this research project, whose objective was to understand the cultural value of soils and how substantial anthropogenic intervention (in this case mining activity) was needed to form life on new land.

2.3 Impact on Hydrology

In the Spree and Schwarze Elster river catchments, located in the Lower Lusatian mining district, a strong influence on water quality and quantity becomes evident. It results from more than 100 years of excessive open-cast lignite mining. In the open-cast mines of the Lower Lusatian region the mean ratio of pumped water to extracted coal is more than six tons of water to one ton of coal. This encroachment on large static ground-water supplies, in particular as effected in accordance with the energy policy of the former German Democratic Republic, resulted in the formation of a large cone of depression extending over an area of more than 2100 km2 (Grünewald, 2001). This led to a deficit of more than 9 Gm3 in the water resources of Lower Lusatia. As a result of the discharge of sump waters into the public receiving watercourses the average run-off increased by more than 30%. The rapid decline of pumped groundwater due to the abrupt closure of most mines after the German reunification in 1990 caused problems of water quantity and quality. The extent of the problem threatens the whole river system in the mining area and, additionally, other users and uses located downstream (for instance the UNESCO biosphere reserve Spreewald, the region of the German capital Berlin) (Koch et al., 2005).

The Upper Spree region (South Brandenburg) receives an annual precipitation of about 550 mm. The intensive opencast lignite mining in this region resulted in a significant groundwater depression, reaching a deficit about 13 billion m3 in 1989 (Grünewald, 2001). In the past the low surface runoff and the seepage losses of the river system were more than compensated by the amount of groundwater pumped in the course of mining. Nowadays, the problem of water availability is aggravated by a rapid decrease of released

groundwater from about 32 to 12m3/s, due to the abrupt closure of a great number of mines.

In addition, the cone of ground-water depression and the related effects of reduced surface runoff and infiltration can only be reduced during a time span of several decades. On the other hand, the water demand of traditional users, established by formerly stable and sufficient water yield due to mining, persists. Moreover, a great number of former mining pits has to be filled with surface water because the rising groundwater is characterised by pH-values down to 2.5 and low acid binding capacity (Grünewald et al., 1996, 1997, 1999, 2001). Therefore these acid mining lakes would be a threat for the connected river system and other areas located downstream. Other utilisations of these lakes, e.g., for recreation and tourism, would not be possible. A fast filling process with surface water can prevent the exfiltration of acid groundwater into the mining pits and can ensure the dilution of the acid water.

The economic consequences that accompanied the social change in Germany from the end of 1989 onwards also had significant effects on the brown coal mining industry. To an increasing degree importance is attached to questions pertaining to the effect of a decrease in output on the water resources economy. During the period up to the year 2000 the average run-off in the River Spree will decrease to about 50% of the initial water level in the period up to the year 1990. A considerable proportion of the future water supply will be provided by the 5 longterm opencast mines of LAUBAG (Lusatian Brown Coal Corporation). With the aid of the sets of ground-water models available at the LAUBAG and an extensive data base, specified targets and concepts as regards water supplies can be converted into reliable forecasts for the water resources economy, taking into account actual planning measures. In this connection interest in focussed primarily not only on ensuring a steady flow into the rivers Spree and Schwarze Elster in future, but, above all, on accelerating replenishment of the ground water and the residual lakes. It is clearly evident that a solution of the water resources problem in Lower Lusatia cannot be reached solely by means of a water resources policy for surface waters that is based on storage systems.

These changes have had a profound impact on European mining regions and towns, which had been shaped by these industries over decades if not centuries . The end of mineral exploitation often meant de-industrialisation, high unemployment and out-migration. Such regions often face a difficult environmental legacy stemming from mining and related industries in the form of persistent pollution of water, soil and air. Overall, such regions and their inhabitants face enormous challenges to their economic, social and environmental future. Owing to the lack of economic alternatives, the organisational, financial and conceptual resources of such regions are generally regarded as extremely sparse (Lintz & Wirth, 2009).

2.4 IBA instrument

The IBA-Fürst-Pückler Land is named after Hermann Ludwig Heinrich Fürst von Pückler-Muskau who was a Travel author and a Landscape Architect. He is well known for his contribution to the field of landscape architecture through projects such as his own family estate and other parks in Bad Muskau and Branitz done during the early 19th century.

Mining activity across the Lower Lusatia region for 150 years had transformed and changed the original landscape. By early 1990s 20 opencast mines were closed leaving behind wounded landscapes and abandoned industrial buildings. In 1999, the then prime minister of Brandenburg asked the IBA to give it a new face and an identity. Following the example of what had been achieved in the Ruhr basin in the 1990s with the support of the Brandenburg Land government, policy makers of the Lausitz-Spreewald region created an IBA (Internationale Bauausstellung) ; i.e. a company in charge of initiating, coordinating and promoting projects for the rehabilitation and enhancement of the heritage and landscapes developed in the region. The Government of Saxony only participated in the IBA for what concerned the area of Lausitzer Seenland.

From 2000 IBA got together the national government, the federal states of Brandenburg and Saxony, the local communities and administrative districts, employers, unions and civil society organisations to come together to implement 30 large and small scale projects for changing the structure and landscape of the region. With the support of joint subsidies of €7.3 million from the Federal Ministry for Economic Affairs and Energy, the Free State of Saxony and the federal state of Brandenburg, guiding principles were developed. In addition, there was considerable support of about 1.23 billion EUR for landscape restoration and engineering upto the year 2022 (Irimie, 2017).

Between 2000 and 2010, the IBA Fürst-Pückler-Land thus contributed to showcasing the changing landscape and a new image of the Lower Lausatian basin; the IBA logo, See (lake in German), playing on its English meaning. Thirty projects concentrated in nine areas, known as “landscape islands”, were initiated by the IBA.

The team headed by Rolf Kuhn based its work on the experiences of IBA Emscher Park, which also focused on a former industrial landscape, as well as on the Dessau-Wörlitz Gardens which were designed by the Bauhaus Dessau as an “industrial garden realm”. Together with representatives of the communities and the region, planners and students, the IBA see concept was developed in coordination with national and international experts and IBA projects were implemented throughout the entire Lower Lusatia region. Two of the projects spanned the German-Polish border (Land, 2010).

The IBA see stimulated these immense landscape and structural changes economically, ecologically and creatively: Industrial memorials were preserved and repurposed, urban renewal projects were promoted and the lunar landscapes of lignite mines were opened

for tourism. This created the Lausitzer Seenland (Lusatian Lakeland), Europe's largest artificial landscape with 20 lakes. It has 14,000 hectares of water surface with navigable canals interconnecting the lakes, kilometres of cycle tracks as well as floating houses, unique city harbours and and distinctive buildings giving the region its identity.

Radically transformed by lignite mining, the landscapes of Lower Lusatia are acquiring a new identity. When mining operations cease in 2030, the region will have become a lake and woodland region with 50,000 ha of forest and more than 140 lakes covering 26,000 ha, i.e. a quarter of the former mining areas. These landscapes, which will be reminiscent of those inherited from the ice age in Mecklenburg-Vorpommern and Finland, will also be characterised by the omnipresence of renewable energy sources, especially wind power, which is still being developed.

3. Case of Rhenish Mining Area (RMA)/IBTA Rhenish

3.1 Location

The Rhenish Mining Area (RMA) is located in North Rhine-Westphalia (NRW) in Western Germany near to the border of Netherlands and Belgium. It is surrounded by the cities of Aachen, Mönchengladbach and Köln. The area is home to around 2.1 million people with a slight downward trend, as a population decrease of 2.1% is expected by 2030. However, the population outflow is much less severe than in Eastern German lignite areas.

3.2 Mining and Landscape Restoration History:

This important lignite deposit was created by a uniform lowering of the Lower Rhine Bay during the Miocene that lasted for several million years. The main seam is located in the middle area of the Lower Rhine Bay with a thickness of up to 100 m.

Lignite was first discovered in Lucherberg (near Inden) in the year 1819, with extraction beginning in1826. With the increasing demand for primary energy sources with high energy density during the beginning of industrialization as well as technical innovations regarding the mining of lignite, the extraction of lignite in the region began to be profitable and also because before that the hard coal of the Ruhr region was a formidable competitor. In 1892, the first lignite-fired power plant was commissioned making power plants an important part of the energy industry within the region. The lignite reserves here are of around 55 billion tonnes out of which some 35 billion are commercially recoverable.Mining on a large scale started in the sparsely populated south of the lignite region, the so called "Villerücken". In this area only woodland was affected by mining activities. This situation changed in the 1960s and 1970s, when lignite-mining was shifted steadily northwards. The devastation of the landscape now affected densely populated

areas and highly productive farmland. In these parts, the soils are among the best to be found in Germany so that the land is mostly used for farming (with an index of productivity of 90 from 100). Reclamation processes became much more complex. Now, not only forests, lakes and rivers had to be relocated but also farmland and villages with several thousands of inhabitants. In the 1950s and 1960s, the creation of extended opencast mines caused an increasing number of conflicts. For the first time, mining activities provoked noteworthy resistance among people, who took the loss of fertile farmland and their homes more seriously. In contrast to the decades before, only few families were dependent on a job in the mining industry and therefore only a few accepted the traditional way of mining lignite. They attached more importance to reclamation aims, and more and more people began to reject the mining policy and even the current energy policy. Supported by local politicians and citizens 'action groups, they tried to fight against new opencast mines.

Since the beginning of lignite-mining in the Rhineland in the 19th century, there has been a considerable change in the approach to reclamation. Proper landscaping after the shut-down of the mines has always been the responsibility of the mine operator. The "Allgemeines Berggesetz für die preuischen Staaten" (general mining act for the Prussian states), published in 1865, contained only few statements on recultivation regulations. It was not until sixty years later that reclamation or "recultivation" was defifined in more detail in a mining police directive for the Rhenish lignite-mining region by the "Oberbergamt" (state mining authorities) in Bonn in 1929: "Overburden masses shall be deposited in mined-out opencast mines in such a way that as much land as possible is reclaimed so that it may then be given over to forestry and farming". This development is the result not only of technological progress, but also of the changing characteristics of the lignite deposits. Until the middle of the 20th century it was possible to gain lignite close to the surface. Only small pits were necessary and they were scarcely recultivated.

Currently, three large-scale open-cast mines – Garzweiler, Hambach and Inden – are in use by RWE AG and produce between 90 and 95 million tonnes of lignite per year, amounting to between 53% and 57% of Germany's annual lignite output. The Inden opencast mine, only minor changes in the running time and mining area are to be expected. The Hambach opencast mine, the shortening of the mining time by 15 years and the significant reduction of the mining area to preserve the Hambach forest results in a significant change in the old planning status. New plans taking into account the Coal Phase-out Act are not yet available to the LANUV.

The Rhenish coal-mining area can be roughly characterized by two different landscape types: the average mountain landscape in the southwest with high annual precipitation rates (800 mm/a), and the lowlands in the northeast with a mean precipitation of about 650 mm/a, including flat loess soil areas as well as Holocene zones adjacent to the Rhine

River and its tributaries. While the lowlands in the northeast comprise “Jülicher Börde”, “Zülpicher Börde”, and all other landscapes north from the two mentioned landscapes, the average mountain landscapes are located south from “Jülicher Börde” and “Zülpicher Börde”. Because of the high fertility of the loess soils, the Börde landscapes, at least since Roman times, have been, to a high extent, used as arable land. The soil quality in the hilly average mountain landscape is much lower, leading to a higher degree of grassland and forests, with the consequence of more diversified habitats and a rich, attractive, and partly protected landscape, which can be used for recreational purposes, as well. And due to the high quality of soil in the region, there used to be a strong focus on agriculture and still is on the food sector.

3.3 Impact on Hydrology:

As of 2020, the mining company RWE Power in the Rhineland has pumped off 512 Mill m3 for mine dewatering. Beside water supply to the power plants and some water suppliers, 132 Mill m3 were used for recharging the aquifer. Especially in areas north of the Garzweiler open cast mine (Nordraum), groundwater conditions are significantly controlled by managed aquifer recharge, particularly to support groundwater-connected wetlands, even some decades after mining has ceased. At the peak, up to 1.3 billion m3/ year of groundwater was pumped for dewatering. At the same time, controlled groundwater rise is taking place in several areas as part of the rolling mining system. Due to the long mining history, measures for controlled groundwater rise will last until the 2080s/2090s. By then, the three future mining lakes will be the largest artificial lakes in Germany. They will cover a total area of approx. 7000 ha and will hold a water volume of approx. 6.8 billion m3. The future lake Hambach will be up to 360 m deep.

Original plans for this mining lake assumed a volume of 4.6 billion m3, which exceeds the volumes of all natural lakes in Germany, with the sole exception of the Lake Constance (Bodensee). Due to the planned earlier stop of lignite production in the Rhenish district in 2030, the plans for these lakes have to be reconsidered and there final dimensions are still subject to public discussions. The future lake levels should be balanced with the groundwater level and they will also be connected to rivers (Inde, Erft, Niers).

Future giant artificial lakes with wide stretched water surfaces and very great depths will be formed after closure of the still active Hambach, Garzweiler and Inden largescale open cast mines. Also running waters have been affected by mining processes. Between 1998 and 2005, a 4-km long and straight section of the Inde River has been relocated resulting in a 13-km long new river (New Inde River) around the Inden open cast mine due to the eastward extension of the lignite mining. The new artificial river section is still geomorphologically “naïve” and characterized by temporary, highly energetic morphodynamic processes resulting in strong erosion processes in the river bed and the

surrounding area. Extreme precipitation and resulting extraordinary discharge on July 15th 2021 caused serious flooding and erosion in the Inden open cast mine. After heavy rainfall, bankfull discharge of the Inde River resulted in a spillover into the open cast mine. As the lignite mining is more than 200 m below the surface, rapid erosion of the old channel and fast backward erosion created a 540-m long gorge which was about 5 m deep. More than 500,000 m3 of material were eroded and subsequently accumulated in the open cast area. A similar event happened at the Erft River close to the settlement Erftstadt-Blessem flooding a 60 m deep gravel pit. In both areas, erosion and sediment transport occurred, showing the high risk and strong geomorphological processes in flooded open cast mining areas with large base-level changes on short distances. However, due to the spillover of water, the flood in the lower reaches of both open cast mines was reduced. In future, the open cast mine can store water and could be used as retention basins for flood protection.

3.4 IBTA instrument

The IBTA is still in its nascent stage but it primarily is based on two main operational pillars: a continuously progressing project development on site and a process-accompanying, stimulating, lively exhibition/exposé. The aim is ambitious and futuristic so that they meet international quality standards through:

(I) meet structural-spatial (B) and technological-linking systemic (T) innovations with each other as well as their high-profile exhibition (A) with a motivation of local people for active participation.

The implementation of the format IBTA in the Rhenish area requires an independent, central organizational unit as well as adequate human and financial resources. The establishment of an IBTA GmbH is recommended, as a subsidiary directly to the Future Agency Rheinisches Revier GmbH (ZRR GmbH). The task of the IBTA GmbH is to carry out the curatorial process of identification, qualification and continuous monitoring of IBTA projects. It is also responsible for the preparation and implementation of the exPOSITION, especially in the context of the three central exhibition years 2026, 2032 and 2038, as well as cooperation with third parties. The successful implementation of the IBTA is not only based on suitable management structures and innovation-promoting processes but it fundamentally requires the will of the decision-makers* inside the Rhenish Revier and the country North Rhine-Westphalia.

4. Discussion and Way-forward

The study of the re cultivation strategies in the Lausitz and Rhenish region show that the objectives and activities were simpler and have grown tremendously in terms of

technological advancement. It is also understood that the socio-economic aspects of recultivated and rehabilitated areas are important concerns to be addressed in the planning procedures of post-mine regions. But so are the eco-climatic factors. With increasing complexities of open cast mines, regional aspects need to play an important role. The paper aimed at introducing a discussion on the intention of the future of IBA. As much as it is a innovative tool for uplifting regions, IBA struggles with some past challenges of keeping up with a vision. For eg. despite the economic success story of the Lausitz region, over decades it was called as a "water emergency area" (Wassernotstandsgebiet) due to demising aquifers and heavy pollution of surface water bodies. Although it is commonly understood that it is not possible to rebuild the same landscape that existed 100 years before mining, there is a constant discussion on which post-mining landscape/landform/landuse is most beneficial for a region going through an economic transition. As IBA is a unique instrument that engages on dealing with pressing issues with region specific challenges, the more important question therein is: Are they able to address the larger sustainable development goal. Since the structural changes in both the regions are not only caused by the phase-out of mining activities, but are also related to land-use and demographic changes and, as mentioned above, and influenced by climate and mobility changes. Following are some highlights and suggestions:

1. The project oriented strategy of IBA is practical, but it takes away from the regional issues that are prevalent in such large scale mining regions.

2. The attempt to match to the international standard should be valid in technological innovations, but the design solutions should be contextual to the region.

3. IBA-Lausitz although is globally is taken as a successful case for mine reclamation but due to the ongoing climatic challenges, it is failing to meet its vision. The suggestion here is to develop future direction of pit lakes through research themes which focus on understanding the following key areas (Schultze et al., 2022):

- Interactions between pit lakes and groundwater
- Defining the role of pit lakes within the hydrology and geochemistry of watersheds
- Assessing Ecotoxicology, Biomagnification and role of micro-organisms in containment removal
- Assessing the Value of Litoral and Riparian Zones
- Influence of Pit-Lakes on post mining ecosystems
- Predicting the effects of climate change on pit lakes through advancing pit lake models

References

(BMWi), F. M. f. E. A. a. E. (2019). *Commission on Growth, Structural Change and Employment*.

Appunn, K. (2023). *Germany's three lignite mining regions*

Deshaies, M. (2020). Metamorphosis of Mining Landscapes in the Lower Lusatian Lignite Basin (Germany): New uses and new image of a mining regionMétamorphose des paysages miniers dans le bassin de lignite de Basse Lusace (Allemagne) : nouveaux usages et nouvelle image d'une région minière. *Cahiers de la recherche architecturale, urbaine et paysagère*, *7*. https://doi.org/10.4000/craup.4018

Doley, D., & Audet, P. (2013). Adopting novel ecosystems as suitable rehabilitation alternatives for former mine sites. *Ecological Processes*, *2*. https://doi.org/10.1186/2192-1709-2-22

Greiving, S., Gruehn, D., & Reicher, C. (2022). The Rhenish Coal-Mining Area—Assessing the Transformational Talents and Challenges of a Region in Fundamental Structural Change. *Land*, *11*(6).

Grünewald, U. (2001). Water Resources Management in River Catchments Influenced by Lignite Mining. *Ecological Engineering*, *17*, 143-152. https://doi.org/10.1016/S0925-8574(00)00154-3

Hein, M. v. (2022). *Water scarcity triggers fierce competition — also in Germany* https://www.dw.com/en/water-scarcity-triggers-fierce-competition-also-in-germany/a-62942563

Hinwood, A. L., Heyworth, J., Tanner, H., & McCullough, C. (2012). Recreational Use of Acidic Pit Lakes°™Human Health Considerations for Post Closure Planning. *Journal of Water Resource and Protection*, *Vol.04No.12*, 10, Article 25442. https://doi.org/10.4236/jwarp.2012.412122

Irimie, S. (2017). *Smart strategies for the transition in coal intensive regions* (Factsheet: From mining to dream vacation "Lusatian Lake District", Germany, Issue.

Koch, H., Kaltofen, M., Grünewald, U., Messner, F., Karkuschke, M., Zwirner, O., & Schramm, M. (2005). Scenarios of water resources management in the Lower Lusatian mining district, Germany. *Ecological Engineering*, *24*(1), 49-57. https://doi.org/https://doi.org/10.1016/j.ecoleng.2004.12.006

Land, I. B. I. F.-P. (2010). Neue Landschaft Lausitz. In. Berlin: Jovis.

McCullough, C. D., & Lund, M. A. (2006). Opportunities for Sustainable Mining Pit Lakes in Australia. *Mine Water and the Environment*, *25*(4), 220-226. https://doi.org/10.1007/s10230-006-0136-0

McCullough, C. D., Schultze, M., & Vandenberg, J. (2020). Realizing Beneficial End Uses from Abandoned Pit Lakes. *Minerals*, *10*(2).

Schultze, M., Vandenberg, J., McCullough, C. D., & Castendyk, D. (2022). The future direction of pit lakes: part 1, Research needs. *Mine Water and the Environment*, *41*(2), 533-543. https://doi.org/10.1007/s10230-022-00850-1

Schulz, S., & Schwartzkopff, J. (2018). *European Lignite-Mining Regions in Transition Challenges in the Czech Republic and Germany*.

UK, M. O. (2021). *Drier European summers projected under climate change*

THE ROLE OF MENTAL STRUCTURES ON IRAN DEVELOPMENT PROGRAM REALIZATION (1084)

Hassan Afrakhteh

Kharazmi University, Tehran, Iran; afrakhteh@khu.ac.ir

Abstract. Iran has one of the most extensive histories of development programs in developing nations. The sixth of the national programs is curreFntly in operation, and none of them have been a success. This article attempts to identify three mental structures that contributed to Iran's development plans failing. Elite development planners were interviewed for the research, and data were also collected from some published documents. Grounded theory was used to analyze the data. The outcomes show that the economic plans for development were not realized because the political ideas concealed in the development plans are incompatible with Iran's circumstances, development programs have epistemologicalF flaws, meritocracy , the rule-making and rewarding system have not produced motivation, even for those in charge of program implementation. As a result, voluntary public participation doesn't help the implementation of programs.

Keywords: Development Programs, political ideas,methodological perspective, motivation, Iran.

1. Introduction

With the spread of the quantitative revolution in the 1960s, natural science, technology and industry created a huge transformation in human life. Humanities were subjected to these achievements and tried to be placed in the realm of modern sciences, similar to natural sciences and physics, and like natural sciences, by predicting and managing human actions, provided the possibility of creating and maintaining social order in a controlled manner. But this approach, although it was able to bring fruits in some fields, ultimately could not play a useful role in the field of human intellectual and existential life, because the aforementioned thinking, neglected the unique characteristics of humans, reducing humans to a quantifiable category, as other natural phenomena.

The development of science in a positivist way caused science to be referred to as

something that can be transferred from any time and place to any other time and place. For these reasons, development studies in Iran were often one-dimensional and isolated from economic, social, political, physical, and management development; In Iran, often, the development theories that have worked in developed countries, including the theory of growth (modernization), has been implemented, while Western capitalism is a "package" and the implementation parts of the programs, will not lead to the desired result without connection with other defined closed components, and connection with the context of society, abstractly and without connection with historical, economic, social and cultural characteristics. These theories have been a later consequence for developed countries, and they cannot be implemented in the less developed world without paying attention to the country's history and culture. While the development planners have been loyal to the aforementioned theories and have been indifferent to the facts in Iran. According to "Amartya Sen", in the thoughts of justice, only physics is not enough, but political philosophy should also be used; the development planners in Iran, have not established a proper relationship with the context (the land and country of Iran and the development capacities in Iran) despite a lot of sincere efforts, As a result, local characteristics are neglected in the application of global theories.

Among the underdeveloped countries, Iran has the longest history of development planning. The term "vicious circle of poverty" or "breaking the vicious circle of poverty" with the help of planning was first used by Abolhassan Ebtahaj, one of the main advocates of economic planning in Iran. In his speech at the 1961 International Industrial Conference held in San Francisco, Ebtahaj said about planning, "If backward countries want to break the vicious cycle of poverty and stagnation, they are forced to start national planning" (Jannat, 2015). Official planning in Iran is more than 70 years old. Germany started planning in 1933, France and Japan in 1947, and China and India a few years after Iran (Momeni, 1995). All the mentioned countries are now in the territory of developed countries, but Iran is still in the group of developing countries.

Taleb, 2016: 181-202) says Iranians have received only the appearance and objective criteria and objective examples of modernization of Western civilization, but they have not understood the creative theoretical foundation of this civilization and even have denied it. Therefore, the thought of development in Iran has not thought about empowering people and increasing their selection power but has been influenced by the will of the politicians and the powerful. Beheshti Dehkordi and Mohammad Khani Tabasi (2015: 5) consider the beliefs of the country's senior managers as one of the first and most important reasons for the failure of the fourth and fifth development plans after the revolution. According to Ghafari (2016:1-18), the lack of theoretical and methodical discussions about the correct understanding of socio-historical conditions, the assets and liabilities of the Iranian society and tribal thinking has been very effective in the failure to realize development plans. Therefore, the benefit of the development programs from a

solid theoretical framework and thought structures and appropriate to the conditions of the natural environment and social and economic characteristics of the country is one of the requirements for the success of these programs.

Before the revolution, five programs and after the revolution until now, six periodic programs (known as five-year programs) have been implemented, and the seventh program is about to be compiled. Inequality between different developed and backward areas, poor and rich, has been and still is one of the major problems, despite the implementation of economic and social development programs. Exacerbation of class and regional gaps, widespread discrimination in terms of access to property rights, and its guarantee for different groups, economic problems, climate, water, environmental crises, missed opportunities, weak capacity to attract talented and skilled people, weak access to quality education, weak innovation and export of goods with advanced technology, severe limitation of access to opportunities and international markets, are among the development problems in the country.

A group believes that regional inequalities can be reduced by implementing different physical plans without paying attention to the prevailing social and economic system and only by following several key models and theories known as central locations. As a result, several programs have been designed and implemented.

But these programs have not resulted in the expected achievements; the country does not have a suitable relative position in terms of development level in the world; and in some cases, there has been a regression. The estimates of the Research Center of the Islamic Council indicate that only 30-35 percent of the total development plans have been realized. The author of this article has conducted research under the same title, which was published in the Quarterly Journal of Interdisciplinary Studies in Human Sciences in 2018 (Afrakhteh, 2019: 49-74). Although the single-cause analysis in the analysis of social issues is rejected and unacceptable, this article has tried to analyze the non-fulfillment of Iran's development plans from three perspective: first, epistemological perspective; Second, ideas hidden in the text of development theories; and third, the motivation of the executive staff.

2. Analysis of Iran's development plans from three perspective

2.1 Epistemological Perspective;

Humanities have characteristics. Including:

- Human daily life skills play an effective role in the formation of human actions and experiences and give shape to judgments in his mind that cannot be studied in certain situations (such as what is done in natural science laboratories);

- Human actions in these contexts are formed based on a set of individual and collective values and interests;
- The formation of judgments, experiences and skills resulting from the effective participation of human beings in the events of daily life is so subjective and unsystematic (in the sense of the legality of natural sciences) that it is impossible to formulate it under controlled laboratory conditions. (Manouchehri and others, 2021: 268).

According to Harald Bathelt and Johannes Gluckler (2011:39), human action is contextual, from a structural perspective, economic agents are situated within contexts of social and institutional relations (Granovetter, 1985, 1992a, 1992b). Since this conceptualization views the action as contextually embedded, action cannot be usefully explained through the application of universal spatial laws. Human action is Path-dependence, from a dynamic perspective, contextuality leads to path-dependent development because past economic decisions, actions, and interactions enable and constrain current actions. They also direct future intentions and actions to some extent (Nelson and Winter, 1982), and finally, human action is Contingency, economic processes are, at the same time, contingent in the sense that the agents' strategies and actions may deviate from existing development paths. Economic action in open systems is not fully determined and cannot be predicted through universal spatial laws. Despite its path-dependent development, which is shaped by a particular history, economic activity is subject to unforeseeable changes and is therefore fundamentally open-ended (Sayer, 1992).

If we allow that human action to be contextually embedded, universal laws offer limited explanatory leverage. Action in open systems is not fully predictable and, thus, cannot be adequately conceptualized through deterministic mechanisms or theories (Peck, 1999). Critical realism offers a fundamentally different epistemological perspective in that it systematically accounts for context-specificity in explanations of human action (Archer et al, 1998). This approach was originally developed by the British philosopher Bhaskar (1975) and propagated in the social sciences by Sayer (1992). It serves as a pragmatic epistemological alternative that attempts to avoid problems of both deductive-nomological determinism in logical empiricism and relativism in postmodern theory (Lovering, 1989; Thrift, 2002). Critical realism does not deny the possibility of an objective reality that is independent of the individual. While the relationship between reality and human knowledge is recognized as asymmetrical, the fact that empirical observations must be necessarily mediated through concepts does not imply that they are merely a product of such concepts. Instead, empirical observations are also dependent on the structural properties of real objects (Sayer 2000: 41). Critical realism also aims to develop causal explanations for general mechanisms. In contrast to positivist approaches, however, causality is no longer implied from their universal co-occurrence (Bathelt, Glu¨ ckler, 2011: 30).

Conventional causal analysis, as employed in regional science, is based on Hume's principle (1900) of regularity. According to this principle, an event is the cause of another subsequent event if its occurrence is always associated with the occurrence of the latter event. Constant conjunction is, in this view, used as an associative principle of causality (Sayer 2000). This explanation claims to be universal for it assumes that an event has particular consequences that occur at any time and any place in association with this event. In contrast, critical realism establishes a contextual explanation based on the principle of contingency that we apply in our approach. This approach distinguishes two types of relations between events (Sayer, 1985):

- Necessary relations. Relations are necessary if two events always occur in association with one another, independent from a specific context. Such non-contextual relations or universal laws are, however, extremely rare in social and economic processes (Fleetwood, 2002).
- Contingent relations. Relations are contingent if two events occur in conjunction with one another only under specific circumstances. Such relations are quite typical in the analysis of economic activity from a partial perspective. The principle of contingency suggests that one event does not necessarily cause another particular event. Therefore, identical preconditions for human action do not necessarily have the same consequences at any time and place. This provides an epistemological basis for a context-specific conceptualization of the intentions and consequences of human action. At the same time, it is that future actions and developments are fundamentally open-ended (Bathelt, Glu¨ ckler, 2011: 30-31).

Hence, the epistemology of social sciences is critical realism. There is an external world independent of the mind, but our understanding and experience of the external world do not fully correspond to it, and our experiences are focused on certain aspects of the world, and our experiences of the external world cannot be considered equal to that external world. (Banifatimah and others, 2008: 30-57).

From the critical realist point of view, social reality is multi-layered and multi-level. These levels are:

- The real level, includes the mechanisms, forces and trends that science seeks to discover;
- The actual and event level, includes events, observable events and objective relationships that occur objectively in the social world around us and can be observed or experienced;
- Experimental level, observed events that occur in fully controllable and laboratory conditions.

In the natural phenomenon, such as the gravity of the earth, the real layer is the phenomenon of gravity that no one can touch; smell, or hear his voice.

The event layer is the mechanism of gravity and the object falling to the ground.

The experimental layer is the use of gravity to design experiments in laboratory environments in order to better understand this force.

But in the social phenomenon, for example, the causal relationship between "social trust" and "social participation" as a social issue, is an open issue and we cannot talk about it on the level of the empirical layer; Rather, it should be reconstructed in a closed framework (such as a behavioral laboratory) in order to achieve the experimental layer by removing other social events.

According to Baskar, the nature of the world is complex. Complex means that many factors are involved in creating a phenomenon. This complexity makes it impossible to properly study, predict and finally explain all its factors in the explanation of a subject. He considers the cause of this complexity and its consequences to be the system of openness of existence (Pourkrimi et al., 2013: 171-137).

2.2 The political ideology of development theories

Political thinking means a geographical map of politics based on which it is possible to determine "where we are and how we can reach our desired destination". According to the "practical logic" of Thomas A. Spragens, every political thought is formed according to a specific time and place and responds to the needs and necessities of that time. Political thinking determines the constituent elements of a good society of the same time and place and introduces criteria and solutions to solve the problems of the same time and place. According to this approach, every "school of thought" or every "political thinker" goes through four stages in the course of its formation:

Observing the crisis;

The diagnosis of pain;

Providing an alternative situation; and

Presenting a solution.

Every political thought contains five implications, each of which can be placed in the conceptual system of one of the fields of humanities and social sciences:

- The historical-explanatory implication, political thinking first begins with the thinker's encounter with the problems and crises in his context and time, and the thinker explains the major social-historical problems of the society. It means that it responds to why and how the existing situation was created;

- The fundamental implication, "human happiness" and "state interest" are the main categories in the fundamental meaning of every political thought, which are linked with two identities, one human identity and the other common identity (government-public arena). Different schools of political thought, with different interpretations of man and individual and collective identity, have defined happiness and expediency in a certain way and consider the duty of political science to provide them;
- The normative implication, the norm means "standard", that is, a model for the actions of people who are together in the public arena and live. Justice, freedom, solidarity, rights, dialogue, friendship and agreement can be mentioned among the prominent norms in the history of political thought. Every political thought, with its normative implications, provides standards and criteria for desirable social relationships, so that with their help, a "desired situation" or those relationships that are "better" for a desirable life can be established. The normative implication is one of the principles of ethics;
- The strategic implication, i.e. the theoretical model of authority (theories of government) which is recommended in consideration of other implications and for the realization of the fundamental implication and its implications. Law has also been an element of strategic implication since the beginning of the history of political thought; and
- Applied implication, which means that throughout history, different schools of thought have been the basis of constitutions, revolutions, and social changes and socio-political reforms. Therefore, political thinking is the theoretical basis of development.

According to the semantic-paradigmatic theory, the success of the development theory is related to the effectiveness of its political thought. Examining the political intellectual foundation of development theories is necessary from two aspects. First, understanding and how to apply and evaluate the success of development theories; and other, opening new horizons in development theory. To discover the political thought foundation of development theories or the political ideology of development theory, its various implications must be revealed. Four theories have been most effective in Iran's development plans, which are examined as follows:

2.2.1 Rostov's growth model:

The implications of the political thought of Rostov's growth model:

Table No. 1 shows the implications of the political thought of Rostov's theory (1960s).

Table 1. the implications of the political thought of Walt Rostow's theory (1960s)

Explanatory historical implication	Fundamental Implication (current situation)		normative implication (Ideal situation)	Strategic implication (Providing prescriptions	defects
	Individual and society	happiness and welfare			
The cause of backwardness is a lack of income and investment	individualistic	The purpose of developme nt is to make money	National income growth and higher per capita income. Good is the benefit and right is the maximum benefit or good.	To stimulate growth, it is necessary to increase savings and investment. The government and the market complement each other.	Ignoring the issue of distributio n

- Explanatory historical Implication: backwardness is considered to mean a lack of income. Development is compatible with high income. The growth of per capita income leads to development through the mechanism of savings, investment and the emergence of a political and social framework. The focus of this theory is on utilitarianism. Utilitarianism sees the problems of society from the side of attention to utility.
- Fundamental Implication

Individual, group and community

- First, per capita income is a measure of well-being and the goal of growth in the stage of mass consumption;
- Second, social mechanisms, industrialization, and investment are carried out in order to increase per capita income.

In the stage of mass consumption, two things happen: high per capita income and the growth of the sum of incomes, so in the attitude towards society, a person has originality. Since the increase in per capita income is dependent on the increase in national income, then a kind of collective originality is established (Mozaffarinia et al., 2016: 157-157).

Happiness and welfare

Development is considered synonymous with economic growth. Income is an indicator of the ability to gain benefit and a measure of well-being, and well-being or consumption is also a measure of development.

So by establishing the originality of the individual in this model, happiness does not have a social aspect and only has an individual aspect, and happiness is when people consume durable goods more than they need because of their high income (Mozaffarinia et al., 2016: 157-157).

- Normative implication (optimal situation): good and right

The goal is high growth and national income and higher per capita income; therefore, good is directed to something for which income is earned, and that is the consumption and enjoyment of people. The right is the principle that governs the settings (regulator) or the maximum income or production.

Good is benefit and right is the maximum benefit or good (Mozaffarinia et al., 2016: 157-156).

- Strategic implications (State and market):

To stimulate growth, it is necessary to increase savings and investment. The government is responsible for creating a class of people who have the desire to save, and it must also ensure that people who save more get a greater share of the national income. Therefore, the government and the market are complementary to each other in such a way that the market is a tool for economic growth and the government is considered to remove its shortcomings and even as the main investor, and this fits into the framework of utilitarianism (Mozaffarinia et al., 2016: 157-157).

2.2.1 Basic needs theory:

Table No.2 .shows the political thought implications of the basic needs theory (1970s).

Table 2. Implications of the political thought of the theory of providing basic needs (1970s)

Explanatory historical implication	Fundamental Implication (current situation)		normative implication (Ideal situation)	Strategic implication (Providing prescriptions	defects
	Individual and society	happiness and welfare			
The cause of backwardness is the lack of goods	Individualistic	The goal of development is access to basic needs	Reducing poverty and meeting basic needs	Welfare state or a combination of a market economy and a welfare state	Ignoring the cause of poverty

- Explanatory historical implication

In the model of basic needs, backwardness is interpreted as a lack of goods.

The basic needs model is one step closer to the goal of development, i.e. the full life because it refers to the consumption of goods, which is achieved in the last stage of the Rostow development model. In fact, Rostow needs income for the consumption of goods and consumption of goods for a better life.

The pattern of basic needs emphasizes the consumption of goods, and if essential goods can be provided, it seems that we are one step closer to the goal of development. In Rawls's political thought, a functionally disordered society is a society in which the necessary goods are not provided.

- Fundamental implications

Individual and society

In three ways, the model of basic needs can be considered individualistic, and in this sense, it is compatible with Rawls's thought as an intellectual foundation:

- The way of choosing basic needs as a plan for development is based on an understanding of man and his goal, which will ultimately be the goal of the development model. The choice of people is based on their interests and the provision of basic needs, and according to Rawls, in such a situation, people seek to maximize their interests;
- The provision of basic needs is associated with Rawls's first principle of justice, which is the necessity and priority of providing people's rights and has an individualistic aspect;

Third, the distribution of charity and social benefits to the poorest people and its measurement indicators are mortality and literacy statistics, which are all individualistic;

Happiness and prosperity, are the goal of reducing poverty because poverty makes people

unable to pursue their interests. Development is ensured when people are empowered by providing basic needs. The result is that society itself does not have any good apart from the good of individuals, and social good is the good of individuals and has an individual aspect.

- Normative implication, (optimal situation) good and right: a full life is achieved from the basis of reducing poverty and poverty is also lifted through the provision of basic needs. Poverty means incapacity and endangers the scope of people's choices. Food, healthy water, housing, medicine and hygiene are necessary as inputs only for survival. It is the responsibility of people to make a life with commodity tools. So perception is a good tool.
- Strategic implication, (providing prescriptions) government and market.

Economic growth is measured through public services, growth and participation. Because it believes that growth does not necessarily benefit the weakest people and therefore the provision of basic needs requires some form of government to guide public policy making and supports some form of the welfare state or a combination of market economy and the welfare state; the market has an important role, but regulation is with the government (Mozaffarinia et al., 2017-153: 183).

2.2.3 Structural adjustment model:

Table 3 shows the implications of the political thought of structural adjustment theory (1980s).

Table 3. Implications of the political thought of structural adjustment theory (1980s)

Explanatory historical implication	Fundamental Implication (current situation)		normative implication (Ideal situation)	Strategic implication (Providing prescriptions	defects
	Individual and society	happiness and welfare			
The reason for the backwardness is the lack of production, government intervention and the lack of property rights	Individualistic	Precedence of right over good The purpose of development, production growth	Motivating people through economic liberalization and recognition of property rights	Using the role of regulating the free market and building a society based on the market mechanism and minimal government	Ignoring justice: Social injustice does not conflict with justice but causes economic motivation.

- Explanatory historical implication: the goal is economic growth, which was raised after the failure of basic needs, but it believes in the right to property and freedom of people and non-interference so that people find motivation. Therefore, underdevelopment is the result of government intervention, lack of property rights and lack of market mechanisms (Mozaffarinia et al., 2016: 93-116).
- Fundamental implications

Individual and society:

The key to growth is stimulating individual motivation through liberalization, privatization and non-interference of the government. Therefore, individual ownership is prominent and the individual has originality. The whole or society has no originality and is nothing but the sum of individual people (Momeni, 2009:5). This model believes that harm to an individual cannot be compensated or justified by any greater achievement for others or society.

Happiness and prosperity

Happiness depends on valuing personal freedom, both political and economic. Everyone unconsciously, while pursuing his own personal interest, is the cause of the happiness of others and the individual happiness of society. A prosperous society is a society in which no one's rights are violated (Mozaffarinia et al., 2016: 93-116).

- Normative Implication (optimal situation):

Stimulating people's motivation in this model by liberating and recognizing their rights indicates the priority of people's good. Any social good conflicts with the good of individuals and as a result, reduces their motivations.

Justice and freedom:The main concern of this model is to encourage individual motivation. Justice is not in equality but in protecting people's rights and it takes precedence over freedom. The excuse of securing one's interest cannot prevent the free activities of individuals.

- The strategic implication, government and market

The ideal situation is when the free market has the role of regulation and the construction of society is based on the mechanism of the market and the minimal government, and this is not because of utilitarianism, but it is a moral defense in preventing the violation of the rights of others (Mozaffarinia et al., 2016: 93-116).

In the structural adjustment program, the organization of the economic-social system is based on the philosophy of "individual originality" and maximizing "individual profit" (Taro, 2013:29). In the framework of this attitude, "whole" or "society" has no originality and should not be considered anything other than the sum of "individuals". Therefore, as far as the perspective of traditional economics is concerned, general concepts such as "total

demand" or "total supply" do not have independent objectivity and originality and will be nothing more than the horizontal sum of individual supplies and demands (Momeni, 2009). Only the individual and each "person" are completely separate and independent from each other and without any interaction with each other, and should be considered as an inherent reality, and the "nation" society, first of all, is a manifestation the meaningful will of each person who wants to live in such a structure (Momeni, 2009). It is natural that in the framework of such an approach, the collective interest or anything that corresponds to the collective identity, is nothing but an idea or validation, and it is personal interest and individualistic motives that have independent reality and objectivity, and only individual.

2.2.4 Christaller's model:

Table 4 shows the implications of the political thought of Christaller's theory

Table 4. the implications of the political thought of Christaller's theory

Explanatory historical implication	Fundamental Implication (current situation)		normative implication (Ideal situation)	Strategic implication (Providing prescriptions	defects
	Individual and society	happiness and welfare			
The cause of the backwardness is the physical disorganization of the settlements and the lack of access to proper services	Individualistic	Precedence of right over good and the purpose of development, physical (potential) access to services	Creating geometric order between settlements and providing services in accordance with Newton's law	Free market and economic man and perfect competition	Ignoring human beings and assuming conditions of complete human competition

- Explanatory historical implication

In Christaller's model, backwardness is interpreted by the irregularity of settlements.

Christaller's model emphasizes the provision of goods and services according to the hierarchy of settlements, in this case, it seems that we are one step closer to the goal of development, which is physical access to goods and services. If physical access does not mean people's actual access to goods and services, and people may not benefit from it due to the lack of purchasing power in addition to the thriving markets of goods and

services.

- Fundamental Implication (current situation)

Individual and society:The Christaller model has an individualistic and atomistic perspective because it justifies economic laws in accordance with the three laws or axiomatic principles of Newtonian physics:

Any particle or body in a straight line is in a state of rest or uniform motion unless it is forced to change that state. Where forces exert pressure on it, all states of the system are uniformly determined, unless an external force disturbs it;

The acceleration is proportional to the external force and is located in the same path. Here there is an exogenous variable, which is the external force, and an endogenous force, which is mass and acceleration. The exogenous variable can be considered as the cause (explanatory) and the endogenous variable as the effect (effect, dependent); and If body A exerts a force on body B, then body B also exerts the same force on body A, but in the opposite direction, and every force has its opposite.

This model simulates the laws of economics with Newton's law. That means:

The economic operation is repeated in a monotonous manner unless an external force disturbs it. Considering the fixed assumption of preferences, technology, etc., economic actors repeatedly perform the same market exchanges;

Exogenous variables that are historical in nature, such as preferences, technology, etc., and due to the clarity of information about their change, the entire set of operations can be carried out in a similar and coordinated manner; and

The desire to trade and trade are similar in all cases and in different markets, and there is no difference in their implementation under the right conditions.

They argue that just as energy is the force that drives movement, utility drives one's decision-making. It is assumed that:

Bodies are assumed as persons, agencies or economic operators;

Movements are considered to be an exchange of goods; and

Forces are assumed as people’s tendencies or preferences.

So that by adding these three elements, they form "supply and demand", "mechanical balance" becomes "market balance" and this is in the condition that the supply and demand difference is zero and the "physical system" is converted to "market system".

Happiness and well-being, the goal of the Christaller model is the access of people to goods and services in terms of physical distance. Development is ensured when people have access to goods and services in terms of physical distance. As a result, the whole society will have access to goods and services by itself.

- Normative Implication (optimal situation):

In the field of humanities and especially economics, human behavior can be interpreted and explained in the form of mathematical and physical models by imitating physics in order to manage the economy more precisely.

From the point of view of pure science, "perfect competition" should be considered as an assumption. The equations show that freedom yields the highest utility. Since the factors that interfere with freedom are obstacles to its maximum attainment, they should be eliminated and removed as completely as possible.

People are seen as abstract and independent individuals with complete rationality, utility functions are independent of each other, and people's behavior is not influenced by social norms and laws, and they behave passively towards market forces;

The whole system is seen mechanically. When the initial assumptions and conditions are specified, the achievements are logically arranged in advance and determined by invisible forces or invisible hands, and they harmonize people's actions in a completely competent manner, just like the law of attraction of the sun and planets.

- The strategic implication, (providing prescriptions) of the government and the market, in the crystal model, perfect competition is the basis of development. The balance of perfect competition requires the existence of perfect knowledge; the large number of buyers and sellers; and the movement without the cost of resources and this condition should be guaranteed. In this view, an economic man (a bond) in an artificial economic system is typically considered to be completely rational to be completely understandable. For this reason, the distance between the settlements, as well as the number of settlements that receive services from a central settlement, is justified and specified through universal mathematical rules.

3. Motivation in the executive staff of development programs

Motivating factors:

Several factors play a role in encouraging and mobilizing people to perform activities. Among these factors are:

3.1 Providing human security

In 1994, Mahbub Ul-Haq, related the human development report to the issue of human security and said that concern for human security is not a weapon; rather, it is life and human dignity (Tajbakhsh, Droodi, 2017: 374-367).

In this way, in countries where human security is ensured; People should not be afraid of any kind of violation; and freedom and human dignity are guaranteed, the possibility of

the appearance of conflicts increases, public participation in the society and economy is institutionalized, and the society enjoys all the capabilities of the people and the society in the direction of development, and in turn, the individuals and the society themselves are considered responsible and committed in the fate of society.

3.2 Effective property rights

According to "Harold Demsetz", the first function of property rights is that it directs the motivation to achieve more internalization of external works (Momeni, Naib, 2015: 75).

The condition for the existence of comprehensive economic institutions is to guarantee property rights and the existence of equal economic opportunities for all different strata of society (Ace moglu, Robinson, 2014: 114).

It seems that no one has a debate on the ownership of personal equipment, but the issue under discussion is the ownership of productive assets such as land, buildings and machinery, whether it should be absolutely privately owned or should be exploited by society with conditional ownership and under supervision of government (Afarakhteh, 2017: 26).

In this context, there are some things that should be considered:

First, when the business environment is not ready for the activities of the private sector, handing over government property to the private sector do not help to make the economy more productive.

Second, in the 1997 report of the World Bank, it is stated that many outstanding human achievements have been made in state-owned enterprises, a notable example of which is the Internet, which is one of NASA's initiatives. Information technology, which is one of the most important and effective global industries, was invented in collaboration with Stanford University, Harvard University, and the capital of the US Department of Defense, which is a government organization.

Third, many assets are intergenerational in nature, if the ownership of these assets is transferred to a few people, it will contradict the intergenerational nature of assets. In fact, with privatization, governments turn the assets of the present and future generations into income in the present. In this case, the right of future generations to own the means of reproduction of land, water, forest and even industries will be lost.

Fourth, in Germany, after the integration process following the fall of the Berlin Wall, East German industries were handed over to the private sector. The government did this under conditions so as not to reduce production.

3.3 Proportional reward system

The reward system encourages and motivates the individual to provide his services and time to the organization; and provides the organization with its creativity and initiative for innovation in the way of production and management of affairs and newer and better working methods. Therefore, the reward system must be efficient and effective and can make the maximum margin and productivity possible for the organization (North, 1994: 368-359).

If development is to happen in a country, productive activities should be encouraged (Momeni, 2015).

3.4 Respect for meritocracy

Competence is a point of view based on which citizens develop their talents through the educational system and with a lot of effort, and finally, regardless of social class, wealth, race, ethnicity, and gender, they are accepted in the management of the country based on their inherent competence (Afrakhteh, 2017: 54).

Ferdowsi (Shahnameh), is stated that three actions can cause the overthrow of a government: the ruler's violence; valuing an inefficient person and preferring him over people with art and knowledge; and hard work in accumulating wealth.

According to Section 558 of the civil laws (relevant executive order) of the state of Maine, USA, the person howm making the decision on hiring or promoting people should not be within family relationships (relative and causal) with them(Nicholas, 1998).According to Oghlu, the reason for the incorrect implementation of economic policies and the failure of countries to achieve development lies in one word: the politician's dilemma: maintaining efficiency or maintaining the government of a particular group. Politicians often prefer to leave the economy and politics to a few groups that protect their political interests. This path is the same as an oligarchy (Acemoglu, Robinson, 2014: 12).

3.5 Providing voluntary participation of the people

Participation can be of different types:

Traditional participation or inevitable community cooperation, this type of participation is different from the real participation that is necessary for development. No society can live without cooperation.

In participation, the interests of the individual must be secured. Civil society is not a society of self-sacrifice, but it is the presentation of the individual's most conscious

interests, which his rationality has forced him to do collectively and with respect to the rights of others (Piran, 2013: 118-124).

4. The motivation system in the period before the revolution

Foran (1387: 483) claims that before the revolution, the Ministry of Economy increased the customs fee for the import of similar goods that were produced domestically. This was done to protect domestic producers from the threat of foreign competition. The government tried to produce goods such as clothing, food, automobiles, and household appliances.Those who have a government job should not be in other jobs, but according to the statistics of the Ministry of Labor, in 2016, there were three million and seven hundred thousand government employees. But only in the government sector, 76,000 people have two or more jobs. In the private sector, this situation is much worse.

But economic development programs in Pahlavi era Iran failed despite initial positive efforts in the 1350s. In justifying this process, a group of institutionalists introduce the existence of exploitative political institutions as a factor that overshadowed the relatively comprehensive economic institutions and provided the ground for the failure of the development program in the 1980s. In such a situation, participation and using the potential power of citizens has no meaning.

Amir Asdullah Alam says in his memoirs: Every minister who was present in the parliament, the only thing he said was that it was discussed and approved in the presence of the king {that is} stop being nosy (Alam, 1992: 216).

Therefore, it can be seen that even the employees and trustees of the government lack the necessary compassion and only pay attention to short-term personal interests, and pay attention to long-term national interests very little.

Using the oral history of Iran at Harvard University, Raees Jafari has introduced the cause of the collapse of the Pahlavi regime as neglecting human development, a corrupt incentive system, structural breakdown, lack of meritocracy, and neglecting expert affairs in the country's administration(Raees Jafari,2019). In the book "Economic History of Iran" (1983: 56), Charles Issawi, says that from the perspective of Iran's legislative system, Iranians have a good relationship with brokers, as a result, productive activities cannot compete with unproductive activities.

5. The motivation system in the post-revolution period

The law in Iran does not have general acceptance, or is very weak from the point of view of bureaucracy. In a modern democracy, regular work will have speed, accuracy and efficiency, but the Research Center of the Islamic Council says that civil servants and their

productivity is less than 11 hours of useful work per week and 22 minutes per day; this figure is 30-33 hours per week in America and France.

In terms of the impersonalisation of relationships, the statistics of the 2014 perspective document show that the favoritism index, which is the personalization of relationships, is high in Iran and ranked 46th among 147 countries in 2017.

Those who have a government job should not be in other jobs, but according to the statistics of the Ministry of Labor, in 2016, there were three million and seven hundred thousand government employees. But only in the government sector, 76,000 people have two or more jobs. In the private sector, this situation is much worse.

Therefore, it can be seen that even the employees and trustees of the government lack the necessary compassion and only pay attention to short-term personal interests, and pay attention to long-term national interests very little.

Respecting and preserving human dignity and the feeling of usefulness of people and their activities can create motivation. If people understand that the street sweeper is necessary and his absence is a problem, he will also feel respected.

6. Conclusion

The findings indicate that because the programs are not based on comprehensive theoretical foundations, the economic plans for development have not been realised during past 70 years;

The political ideologies hidden in the development plans do not fit Iran's circumstances;

Effective solutions are not offered because development programs are unable to assist in fully comprehending the problems via a research epistemological perspective employing the traditional natural sciences epistemology; and

Consequently, voluntary public participation is not in favor of program implementation. The rule-making and rewarding system, meritocracy, and bureaucracy have not led to improvements in motivation, even for those in charge of program implementation.

Refrences

Acemoglu, Daron; Robinson, James (2014), Why nations fail, translated by Mohsen Mir Damadi, Mohammad Hossein Naimipour, 2nd edition, Tehran, Rozeneh Publications.

Afrakhtheh, H. (2019),The role of mental structure on Iran development program realization, Journal of interdisciplinary studies in the humanities, 11(3), 49-74.

Afrakhteh, Hassan (2017), Rural Economy of Iran, Semnan, Habale Roud Publications.

Alam, Asadaleh (1992), My conversations with the Shah, translated by the group of translators, New Design Publications, Volume 4, Tehran, New Design Publications.

Archer, M., Bhaskar, R., Collier, A., Lawson, T., and Norrie, A. (1998), Critical Realism. Essential Readings (London, New York: Routledge).

Bathelt. Harald and Glu¨ ckler Johannes (2011), The Relational Economy, Geographies of Knowing and Learning, Oxford University Press.

Bani Fatimah, Hossein; Shields, Rob; Gulabi, Fatimah; Qureshi, Fardin. Bayani, Farhad (2008), "Ontological and social epistemological foundations of critical realism with a source on Roy Baskar's opinions", Culture Strategy, 44th issue, winter 2008:30-57.

Beheshti Dehkordi, Ali; Mohammadkhani Tabasi, Mustafa (2015), "Performance of major macroeconomic indicators in the fourth and fifth plans", Journal of Society and Economy, number 29: 11-60.

Bhaskar, R. (1975), a realist Theory of Science (London, New York: Verso).

Castells, Manuel (2009), Information Age: Economy, Society and Culture, The Rise of Network Society, translated by Ahmed Aliqlian and Afshin Khakbaz, Tehran, New Design Publications, 6th edition.

Fleetwood, S. (2002), Boylan and O'Gorman's causal holism: A critical realist evaluation, Cambridge Journal of Economics, 26, 27–45.

Foran, John Jr (2008), Fragile Resistance, History of Social Developments in Iran, translated by Ahmad Tedin, Sood Printing, Tehran, Rasa Cultural Institute.

Ghafari, Gholam Reza (2016), Dynamics of Development Programs in Iran after the Islamic Revolution, Quarterly Journal of Social Studies and Research in Iran, 5(1): 1-18.

Granovetter, M. (1985), Economic action and economic structure: The problem of embeddedness, American Journal of Sociology, 91, 481–510.

Granovetter, M. (1992a), Economic institutions as social constructions: A framework for analysis, Acta Sociologica, 35, 3–11.

Granovetter, M. (1992b), LProblems of explanation in economic sociology, in N. Nohria and R. G. Eccles (eds.), Networks and Organizations: Structure, Form, and Action (Cambridge, MA: Harvard Business School), 25–56.

Hume, D. (1900), An Enquiry Concerning Human Understanding (Chicago: The Open Court Publishing Co).

Issawi, Charles (1983), Iran's economic history, translated by Yaqoub Agand, Tehran, Gostareh Publishing House.

Jannat, Mohammad Sadegh (28 Azar 2015), "Evaluation of development programs in Iran (third part)", Duniya Eqtesad newspaper, number 1156, taken from https://donya-e-eqtesad.com

Lovering, J. (1989), The restructuring debate, in R. Peet and N. Thrift (eds.), New Models in Geography (London: Hyman), 159–74.

Manouchehri, Abbas; Alavipour, Seyyed Mohsen; Nariman, Saeed (2021), Smart development, an alternative model for Iran, Tehran, Research Institute of Humanities and Cultural Studies.

Momeni, F. (1995), An autopsy of a development program, published by the Institute for

Economic Research, Tarbiat Modares University.
Momeni, F. (2009), "Individual" and "collective" interests in the process of structural adjustment, Nama Mofid Quarterly, No. 23, 27 August 1388.
Momeni, F.; Naib, S. (2015), Technological developments and the future of development in Iran, Tehran, Institutional Publications.
Momeni, F. (1999), "Perception of development in Iran's past plans", Proceedings of the Conference of Fifty Years of Development Planning in Iran, Volume 1, Iran Economic Research Center: 61-89.
Momeni,F. (2017), Social Justice, Freedom and development in Iran, Tehran, Naghsh and Negar press.
Mozaffarinia, Mehdi; Manouchehri, Abbas; Ghafari, Massoud (2016), "Political Ideology of Basic Needs Model", two scientific-research quarterly "Research on Theoretical Politics" number twenty-two, autumn and winter 2016: 153-183.
Mozaffarinia, Mehdi; Manouchehri, Abbas; Ghafari, Massoud (2015), "Political Ideology of Structural Adjustment Model", Contemporary Political Essays, Institute of Humanities and Cultural Studies, 7th Year, Number 2, summer 2015: 116-93.
Nelson, R. R. and winter, S. G. (1982), An Evolutionary Theory of Economic Change (Cambridge, MA: Harvard University Press).
Nicholas, L.Caraganis (1998), “Nepotism in state Hiring & promotional practices”, Personal Bulletin 8.7, state of Maine bureau of human resources, 5M.R.S.A 7 558.
North, Douglass .c (1994), “ Economic performance through time”, the American Economic Review, vol 184, No 3: 359-368
Peck, J. (1999), Grey Geography? , Transactions of the Institute of British Geographers, (24)1, 131–35.
Piran, Parviz (2013), "The possibility or refusal of participation in Iran", Iran Farda, new period, number 3, July 2013.
Pourkrimi, Mojtabi; Sadegh Zadeh Qomsari, Alireza; Bagheri Tavparast, Khosrow; Mehrmohammadi, Mahmoud (2013), "Explaining the ontological assumptions of Bhaskar's critical realism and its implications for interdisciplinary research", Quarterly Journal of Interdisciplinary Studies in Humanities, Volume 6, Number 3, Summer 2013, 137-171.
Raees Jafari, Rasool (2019), Narrative of a collapse, Tehran, Institutional Publications.
Sayer, A. (1985), The difference that space makes, in D. Gregory and J. Urry (eds.), Social Relations and Spatial Structures (Basingstoke: Macmillan), 49–66.
Sayer, A. (1992), Method in social science: A realist approach. Routledge, London.
Sayer, A. (2000), Realism and Social Science (London: Sage).
Tajbakhsh, Shahrabano; Droodi, Massoud (2017), "The concept of human security and its policy-making dimensions", Strategic Studies of Public Policy Quarterly, Volume 8, Number 28, fall 2017: 367-374.
Taleb, Mehdi; Anbari, Musa (2016), "Reasons of the failure of the development planning

system in Iran during the second Pahlavi era", Social Sciences Journal, 4(27): 181-202.
Taro, Lester (2013), Great Encounter, translated by: Aziz Kiavand, Didar Publishing House, first edition: 29.
Thrift N. (2002), “The future of geography”, Geoforum, vol. 33, no. 3, pp. 291-298.

TRACK 17: PLANNING FOR POST-PANDEMIC WORLD

POST-EPIDEMIC ERA COMMUNITY MICRO-REGENERATION OF ACTIVE HEALTH INTERVENTION: A CASE STUDY OF TONGDA COMMUNITY IN WUHAN, CHINA (1071)

Zeliu Huang[1*], Lei Mei[1], Nuoya Yuan[1]

[1] Wuhan City Planning & Design Co., Ltd., China; [*]329262870@qq.com

Abstract. As the world enters the post-epidemic era, how to create a community environment that meets the physical and health needs of residents has gradually become the focus of micro- regeneration of old communities in China. Based on the analysis of the promoting effect of community physical spatial environment on residents' health, this paper constructs a community active health intervention system framework that includes two levels of "path and place" and six aspects of "connectivity, safety, pleasantness, complexity, balance, and quality". Taking the micro-regeneration of Tongda Community as an example, by optimizing the design of community spatial environment, active health intervention is carried out on residents' activities and behaviors, providing experience for the future development of the community from the perspective of health.

Keywords: China; Residents' health; Community public space; Micro-regeneration; Active health intervention.

1. Introduction

Since 2020, the global outbreak of novel coronavirus pneumonia (COVID-19) has become the most severe infectious disease in the world in a century. Designated by the World Health Organization as a public health emergency of international concern, it has not only caused significant impacts on the physical health and life safety of the general population but also profoundly influenced the production and lifestyle patterns as well as the daily activities of residents in the post-epidemic era. In addition to passive defense and treatment against the disease, residents have also begun to pay attention to their physical and mental health, cultivate a sense of well-being, and gradually establish a social consensus on active control and prevention of diseases through increasing physical activity, adjusting lifestyle, improving physical and mental health, and enhancing immune function.

As the fundamental spatial unit of a city, the community plays a crucial role and has

achieved significant results in combating the epidemic as the "frontline" and "last mile" of the response. It has contributed to the provision of essential services and the organization of prevention and control measures. However, the pandemic has also exposed various shortcomings in the material spatial environment of the community when dealing with sudden public health emergencies. As the spatial carrier of residents' daily activities, the quality of the community environment greatly affects the physical health of its residents. Therefore, against the backdrop of community renewal becoming a core issue in urban development in China, the creation of a community environment that meets the physical activity and health needs of residents has gradually become a focal point in the planning of aged community revitalization.

2. Related Theoretical Studies

Urban spatial environment provides the material foundation for outdoor activities, while diverse outdoor activities serve as a fundamental guarantee for physical health. Focusing on the principle of "prevention before the onset of illness," urban planning can take effective intervention measures from the perspective of spatial environmental design, which can have a positive impact on the health of the population and play a more crucial role in promoting the construction of a healthy China.

2.1 Promotion of Physical Activity through Environmental Improvement

According to the literature research, the physical activities of residents in community public spaces can be divided into three categories: necessary activities, spontaneous activities, and social activities [1]. Daily necessary activities such as commuting, going to school, and shopping occur under various conditions, while other spontaneous and social activities such as stopping to rest, walking, playing, and chatting only occur in suitable external material environments. When the environmental conditions are suitable and the place is attractive, it will stimulate people's willingness to participate in spontaneous activities. Meanwhile, since people and their activities are the most attention-grabbing and interesting factors, people naturally engage in various social activities that depend on the participation of others in the same space (Table 1). Therefore, for individuals, necessary activities are relatively fixed, while spontaneous and social activities that depend on high-quality material environmental conditions are the effective ways to increase physical activity.

Table 1. Content and characteristics of different types of outdoor activities

	Necessary activities	Spontaneous activities	Social activities
Types of outdoor activities	Routine daily activities such as work, school, shopping, meeting people, waiting for transportation, business trips, and mail delivery.	Strolling, pausing to observe, sitting down for a rest, and so on.	Various activities that rely on the participation of others, including children's games, greeting each other, conversing and chatting, engaging in recreational activities based on common interests, and a wide range of public activities. It also includes passive forms of interaction, such as experiencing others through visual and auditory stimuli.
Requirements for the material environment	occur under various conditions.	only occur when the outdoor conditions are suitable, and when the weather and environment are attractive.	only occur when the outdoor conditions are suitable, and when the weather and the environment are appealing.
Methods to promote the occurrence of activities.	When the quality of the outdoor environment is good, although the frequency of necessary activities remains relatively stable, there is a noticeable trend towards prolonged duration.	When the quality of the outdoor environment is good, there is an increase in the frequency of spontaneous activities.	In the majority of cases, social activities are indirectly facilitated by the development and interplay of the other two types of activities. By improving the conditions for the other two types of activities in public spaces, social activities can be indirectly fostered.

2.2 Concept and Connotation of "Active Health Intervention"

In the field of urban planning, "active health intervention" refers to the use of optimized spatial environment design to intervene in human behavior, thereby promoting physical activity and achieving the goals of disease prevention and health improvement. Unlike the passive treatment approach of traditional medicine towards chronic diseases, "active health intervention" aims to improve the community environment to attract regular physical activity. By enhancing the physical fitness of residents and strengthening their immune system against diseases, it actively promotes health (Figure 1).

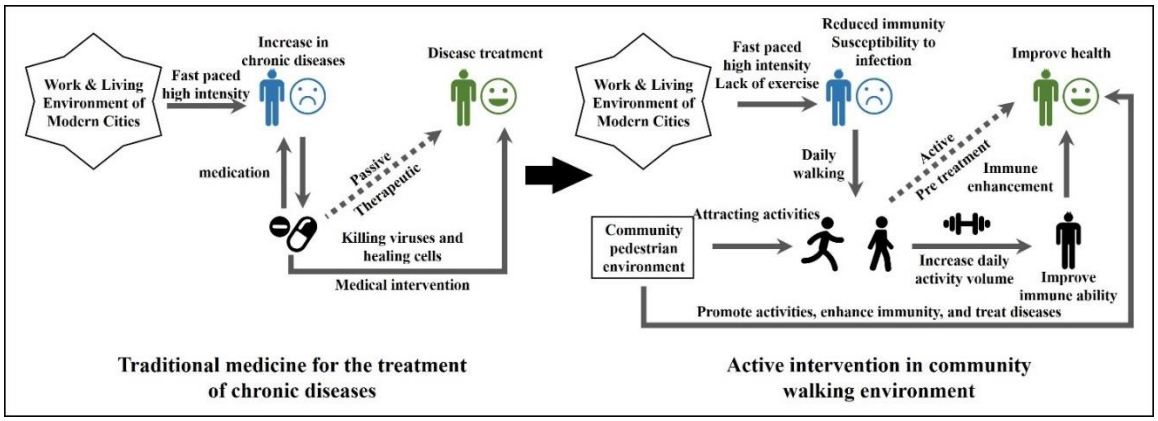


Figure 1. Active intervention mechanism of community environment on residents' physical health [2]

Community micro-renovation based on active health intervention emphasizes starting from the health needs of residents, fully exploring and utilizing local resources, and actively engaging in the construction of a healthy community. It aims to create a supportive environment for health by implementing micro-renovation of the community's material spatial environment. This approach encourages residents to engage in spontaneous and social daily physical activities, leading to active intervention in their physical fitness and health status, and preventing or mitigating the occurrence of various diseases.

3. Community Spatial Characteristics of Active Health Intervention

Improvement in outdoor environmental quality can stimulate residents' potential demand for physical activity and guide their health behaviors through two aspects: path and place. Firstly, optimizing the walking environment expands residents' activity space. Secondly, enhancing the attractiveness of resting places prolongs residents' activity duration. Consequently, active health intervention in community spaces should focus on optimizing the walking environment and enhancing the attractiveness of places.

3.1 Optimizing Walking Environment

(1) Road connectivity

Connectivity measures the degree of difficulty of point-to-point travel in the road network

system. High connectivity means that the travel distance to reach the destination is shorter, the travel time is shorter, and there are more route options available. By building a complete road system, selecting the appropriate road network density, ensuring the continuous and smooth flow of roads, and strengthening the construction of barrier-free facilities, it is possible to make travel more convenient, expand the range of areas that can be reached within a tolerable walking time, and thereby increase the willingness of residents to walk and their level of physical activity.

(2) Environmental safety

The perception of safety hazards in the community can influence the level of residents' willingness to engage in outdoor physical activities. Factors such as excessive vehicle speed, dimly lit community environments, and inadequate security management can create a subjective sense of insecurity during travel. Measures should be taken to reduce traffic hazards, such as implementing pedestrian and vehicle separation and calming traffic. Additionally, a combination of hardware infrastructure development and effective management should be employed to prevent illegal activities and create a safe and reliable outdoor travel environment in the community.

(3) Spatial amenity

Compared to cars, pedestrians have slower movement speeds and a wider range of visual perception, allowing them to observe more details. Their aesthetic demands for the travel environment are greater than the pursuit of travel efficiency. Pleasant spaces with a suitable scale, strong recognizability, and visual attractiveness can make people feel comfortable and enjoyable. They can encourage walking as a mode of transportation and encourage residents to spend more time engaged in outdoor activities.

3.2 Enhancing Place Attractiveness

(1) Functional complexity

By restructuring the community's functional format and guiding the standardized management of mobile vendors, a diverse life service circle can be formed to meet the individual basic living needs of different residents as much as possible. This can attract various people to engage in diverse activities and provide residents with more reasons to go out and be active, thereby stimulating potential activity demands.

(2) Optimal layout

An equitable and well-distributed public activity space system aims to provide every resident with equal access to outdoor activity conditions and opportunities within a

certain distance. This includes convenient access to centrally located cluster green spaces as well as enjoyment of public spaces in front of their own homes, thus offering a wide range of possibilities for various activities.

(3) Characteristic quality

By enhancing the ability of activity spaces to withstand adverse weather conditions and providing high-quality, age-friendly activity facilities, the creation of year-round, attractive gathering places will enhance the comfort and experience of participating in activities. Special attention is given to incorporating community cultural elements into the creation of distinctive landscapes and sculptures, which awaken residents' collective consciousness and promote social activities and interactions among neighbors.

4. Planning Background and Community Overview

Tongda Community is located in Yejin Street, Qingshan District, Wuhan, China. It is also known as "108 Block" and consists of two residential areas, namely "Wugang 108" and "Yiye 108" (Figure 2). It was built in the 1989-1992 period as a unit-based community to provide housing for employees of Wuhan Iron and Steel Company (Wugang) and China First Metallurgical Construction Company (Yiye), two large state-owned industrial enterprises.

Figure 2. Tongda community location

As a typical factory community in Qingshan District, Tongda Community was selected as one of the top ten pilot projects for the renovation of old communities in Wuhan City in 2018. The planned renovation covers an area of 8.2 hectares. With the aim of serving the residents' livelihoods, the community focuses on comprehensive and healthy development driven by micro-improvements in the physical spatial environment. It serves as a demonstration project for community revitalization.

The community space has a good foundation, and the spatial pattern of factory community style has a unique contemporary character. The roads are arranged in a “chessboard” pattern, and there are a total of 72 existing buildings, mainly 5 to 7-story brick and concrete residential buildings, forming a spatial form combining “row-style” and

"point-style", emphasizing group enclosure and symmetry (Figure 3). The permanent population is about 5,821 people, mostly retired employees and their families from state-owned enterprises, accounting for about 77%. As part of the 120,000 steelworkers in Qingshan at that time, they enjoyed generous welfare benefits from state-owned enterprises and experienced rich collective life. They have a strong sense of belonging and identity to the courtyard, forming a familiar social-style neighborhood relationship, and also have a strong demand for public activities such as fitness, leisure, and entertainment.

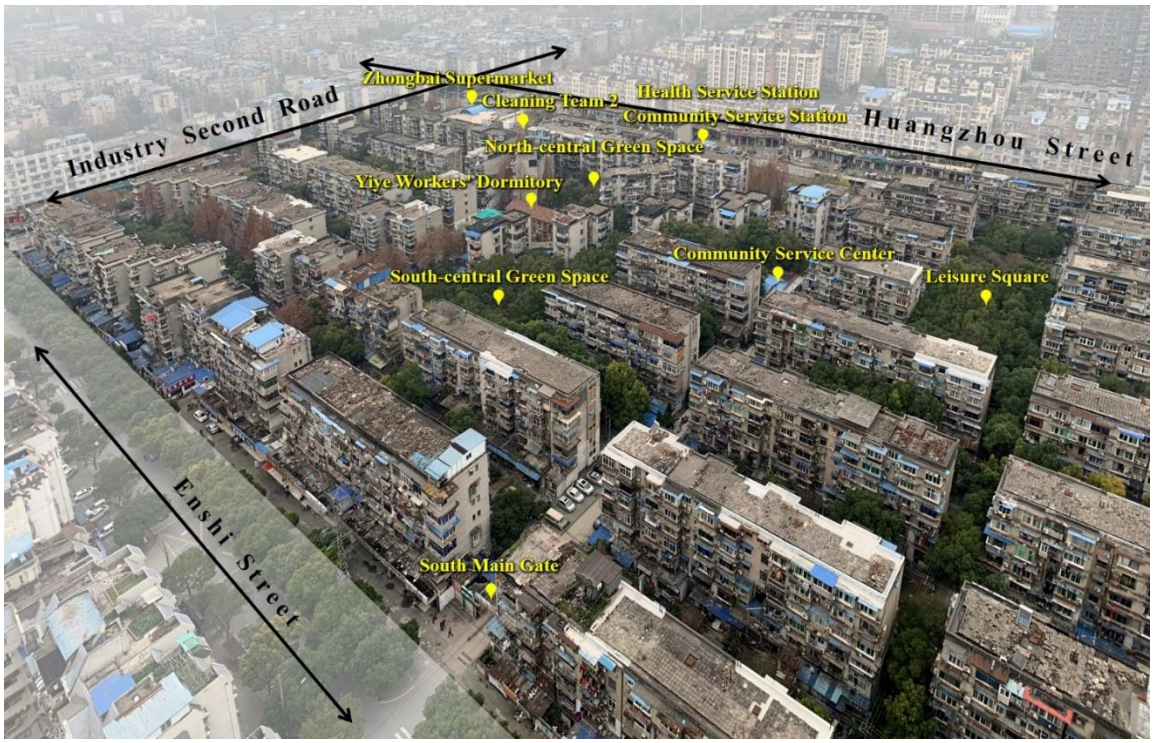


Figure 3. Community current situation aerial view

With the acceleration of state-owned enterprise transformation and aging process, the factory community has gradually become an important place for retired elderly people to settle down and an important community space for urban response to aging society. Currently, Tongda Community has entered a mild aging stage, with 1,040 people over the age of 65, accounting for about 18% of the total population. The natural aging of the population has accelerated the rise of chronic disease incidence among residents, and the residents' health needs are increasing. At the same time, due to the weakening of state-owned enterprise management and the backwardness of social management, the factory community has been in a state of disrepair for a long time, and problems such as poor road travel, low-grade commercial services, lack of activity space, and outdated public

facilities have gradually appeared in Tongda Community. It is difficult to meet the daily activity needs of residents, weakening the frequency and willingness of residents' spontaneous and social daily activities, and further accumulating the risk of chronic diseases among residents. Therefore, it is urgent to carry out health community planning and construction.

5. Analysis of Current Community Issues

To address these prominent issues, the planning team, after studying relevant cases, identified the community environment characteristics that are not conducive to residents' daily physical activities through the following three aspects. Firstly, by establishing a joint planning group with the street, community neighborhood committee, and enthusiastic resident representatives, a close relationship with the community was established. Secondly, a combination of qualitative and quantitative research methods, such as on-site surveys, behavioral observations, questionnaires, in-depth interviews, and meetings, were used to gain a deeper understanding of residents' health status, daily activities, and satisfaction with the community's public environment. Thirdly, residents were mobilized to participate in the community's micro-reconstruction, and planning demands were directly expressed through meetings, phone calls, WeChat, and other means. Finally, the planning team summarized the current issues in the Tongda community environment that are not conducive to promoting physical activities.

5.1 Poor Walking Environment

(1) The road accessibility is poor, parking occupies the road seriously, the continuity of the walking environment is low, and it is inconvenient to travel

According to the survey, among the community residents' modes of transportation, 39% bus and 27% walk. Most of them believe that the walking environment and parking facilities in the community need to be improved (Figure 4). Although the name "Tongda" of the Tongda community implies the development of four connections, the community's roads are blocked and inconvenient to travel.

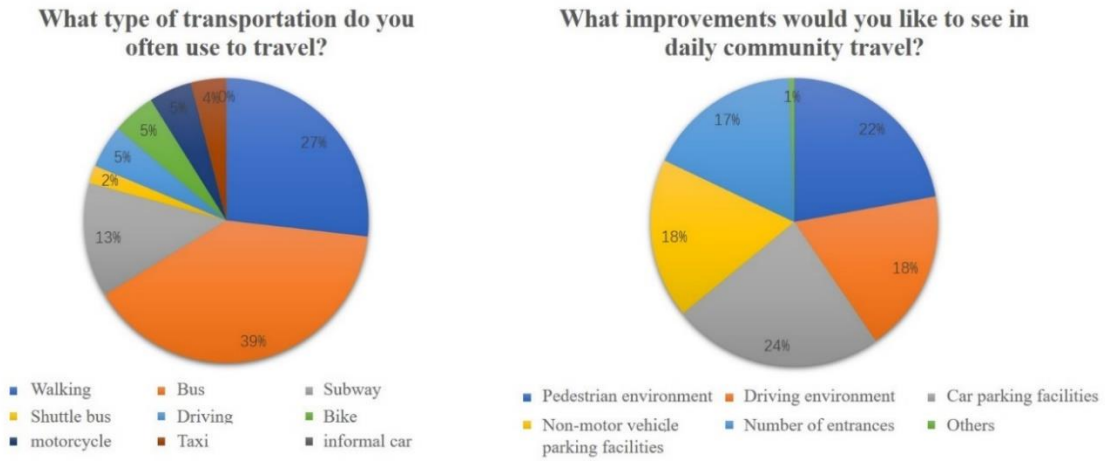


Figure 4. Travel modes and transformation needs of community residents

Firstly, the road accessibility is poor. The walls surrounding the community are a concentrated reflection of the closed space of the factory community, which distinguishes the unit space from the urban space through courtyard walls and gates. Due to different construction subjects and construction years, in addition to the periphery of the community, the interior of the community is also separated into three relatively independent areas by a “Y-shaped” wall that is more than 400 meters long and multiple roadblocks (Figure 5), each with its own vehicle entrance and exit, and the road system is independent, resulting in many dead-end roads and extremely inconvenient connections between groups (Figure 6). Residents are forced to detour, greatly reducing the maximum range of walking accessibility within the tolerance time for walking. With the entry of social property and the overall management of the community, these walls and roadblocks no longer have any meaning, obstructing the smooth flow of roads and reducing the convenience of walking. Currently, three walls have been artificially destroyed, which reflects the urgent need of residents for convenient passage.

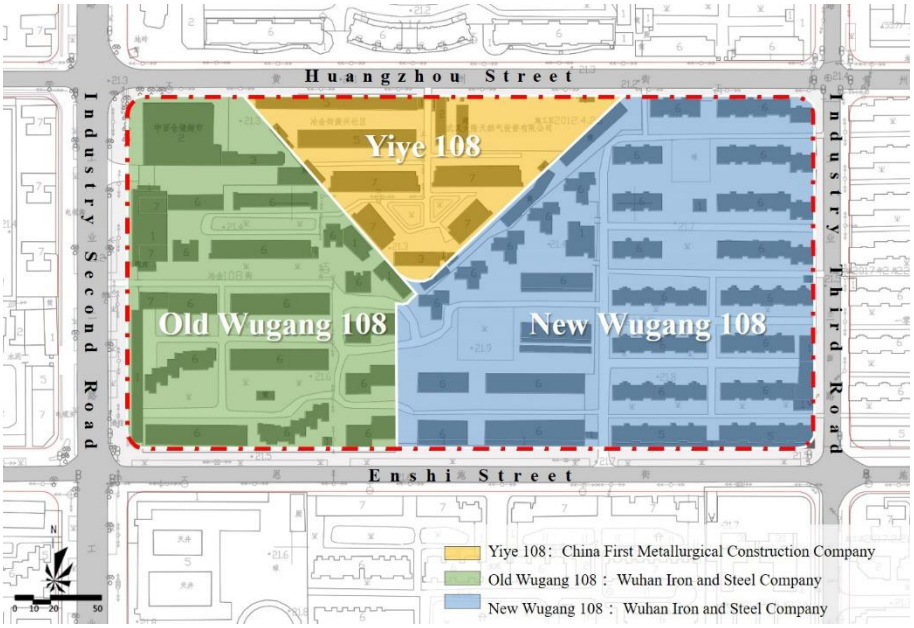


Figure 5. Current community divided into 3 relatively independent areas

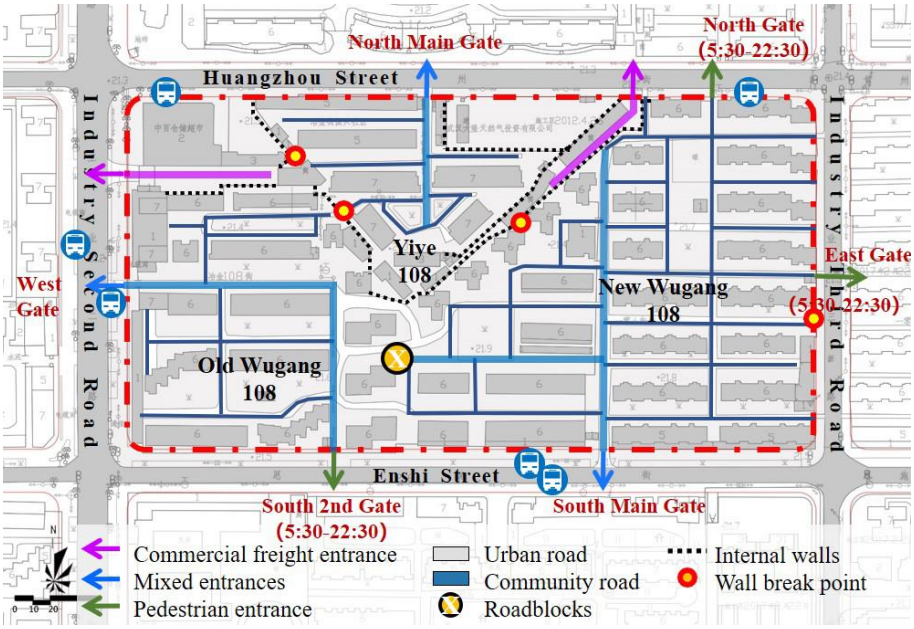


Figure 6. Current road blocked by walls and roadblocks

Secondly, there is serious illegal parking on the road. When the community was built, cars were not yet popular, and there were not enough parking spaces reserved in the community. Nowadays, parking spaces are increasingly in short supply. Due to the lack of

standardized motor vehicle parking spaces, about 210 vehicles are illegally parked in the community on a daily basis (Figure 7), seriously occupying internal roads and affecting pedestrian normal passage. Although there are three non-motorized vehicle sheds in the community, which can accommodate about 300 vehicles, they are concentrated in the middle of the community, and various non-motorized vehicles, including shared bicycles, are often parked randomly.

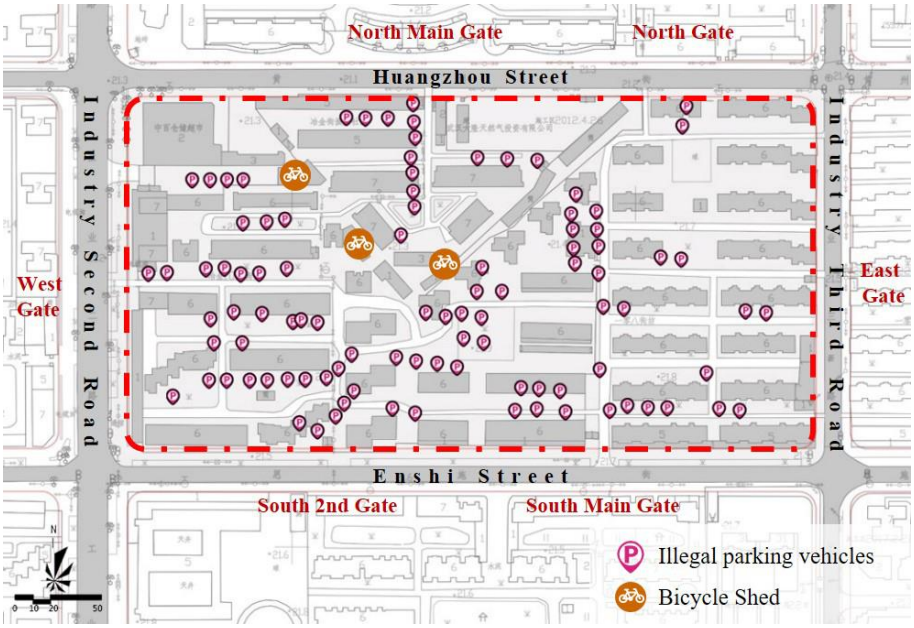


Figure 7. Serious illegal parking and vehicle occupation of roads

Thirdly, the continuity of the walking environment is low. Due to long-term disrepair, some sections of the road surface are uneven, damaged, and cracked, and the ground is prone to water accumulation. At the same time, due to the insufficient aging-friendly road facilities, only some areas have installed barrier-free facilities, making it difficult for baby carriages, wheelchairs, and other equipment to travel.

(2) Mixed traffic of people and vehicles, insufficient lighting, and inadequate security facilities, which leads to a lack of sense of security

Although the internal roads of the current community have been classified, the pedestrian and vehicle spaces overlap, without division or separation, and the right of way for slow traffic is not guaranteed, often resulting in conflicts between pedestrians and vehicles, making it difficult for pedestrians to pass safely. At the same time, the number of streetlights is insufficient, and the aging lighting equipment does not provide enough illumination, increasing the insecurity of the night walking environment. On the “voice

wall" in the center of the community, residents generally complain that "the lights are too dark," indicating a high demand for lighting facilities for night walking in the community (Figure 8). In addition, with the community moving from closed to open and the trend of population hybridization, the lack of security equipment such as monitoring has made residents feel insecure when traveling, reducing their willingness for nonessential travel.

Figure 8. Insufficient lighting in the current walking environment

(3) Poor recognizability and human friendliness

On the one hand, the spatial form of community construction in the era of factory community has inherently low recognizability. On the other hand, the community lacks easily recognizable signs and labels, resulting in even more complex travel routes without guidance, making it difficult to facilitate convenient travel. In addition to the community disaster reduction and evacuation map located at the bulletin board of the north gate, residents can only judge their location by the blue doorplates at the entrance of each unit, which are not only small in size but also faded and difficult to identify in some cases (Figure 9).

Figure 9. Unrecognizable current unit doorplate

5.2 Inadequate Attractiveness of Places

(1) The functional format of commercial service facilities is single, and the complexity is not strong

Within a five-minute walking distance of the community, there are public service facilities such as a health service station, community service center, elderly service center, and sports park, as well as a primary school and several kindergartens nearby (Figure 10). However, according to relevant standards and combined with residents' demands, the scale of the community service station and elderly care center is still insufficient, and there is a lack of cultural activity station and public toilets. In terms of commercial service facilities, there is a Zhongbai Warehouse Supermarket at the northwest corner of the community, but the commercial format along the street is single, with about 42% of the ground-floor shops being restaurants, and the rest being low-end businesses such as private contractors for waste recycling and hardware, with a lower level than the surrounding neighborhoods (Figure 11). The range within walking distance cannot provide diverse and high-quality services, which cannot fully meet the basic needs of residents' daily life and leisure, thereby reducing their willingness to walk.

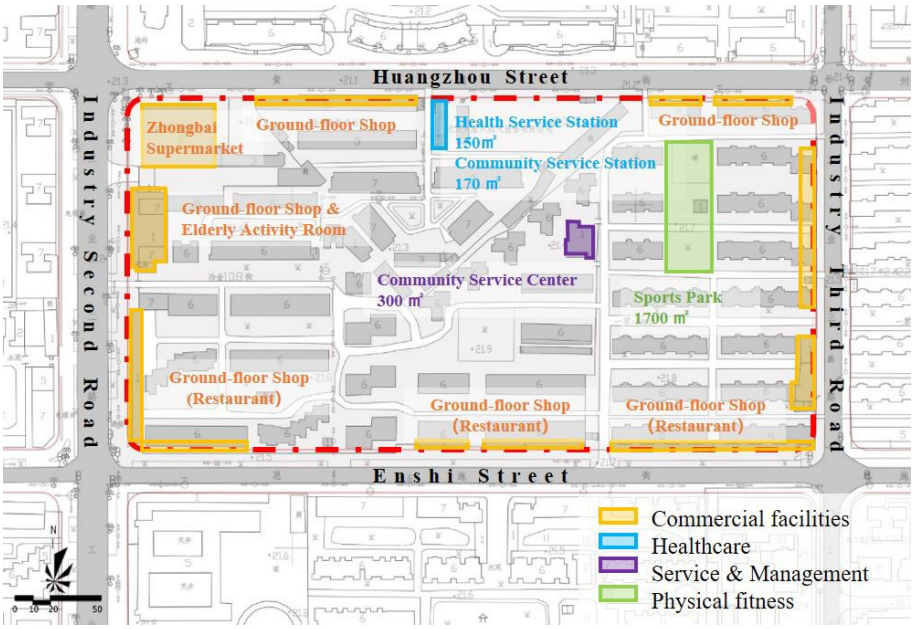


Figure 10. Distribution of current public service facilities

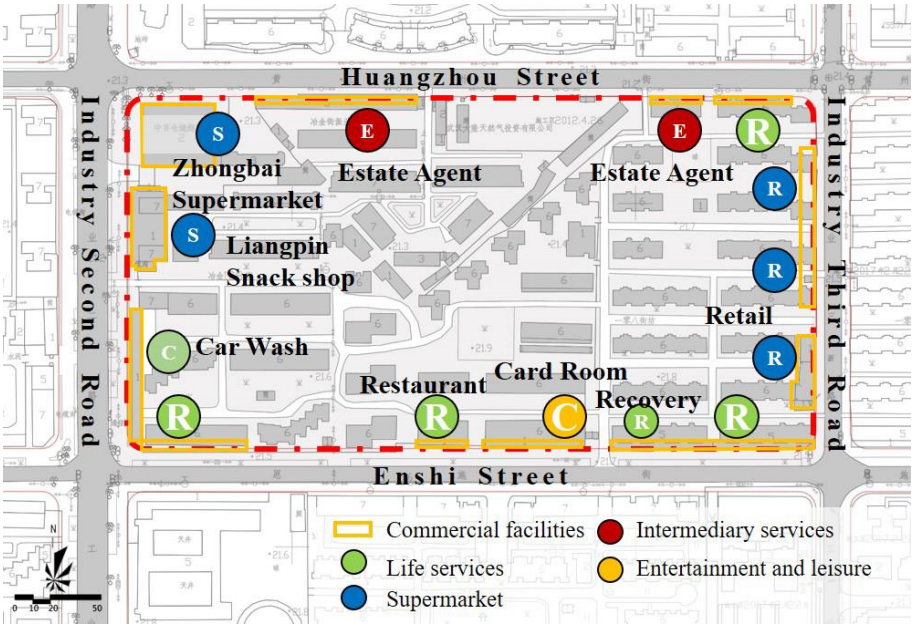


Figure 11. Distribution of current commercial facilities

(2) The layout of centralized activity venues is unreasonable, and the distribution is not balanced

The community includes three centralized public activity spaces, namely a leisure square of about 1700 square meters in the New Wugang 108 area, a south-central green space of about 1000 square meters, and a north-central green space of about 300 square meters in the One Metallurgical 108 area, which are relatively sufficient in scale. Among them, the leisure square consists of an activity square, fitness equipment, and table tennis tables, which is the core area for the community to carry out large-scale public activities and sports exercises. However, the three venues are all distributed in the central and eastern parts of the community, and residents in this area can easily engage in physical activities, while the old Wugang 108 area in the western part of the community lacks centralized activity venues, and residents need to walk a longer distance to reach public activity spaces. The uneven distribution of activity venues in space means that residents cannot enjoy equal rights to access activities.

(3) The spatial quality of the activity venues is not high, and their attractiveness is limited

Through on-site observation and big data analysis, there is a mismatch between community vitality and public space. Firstly, public spaces with more active crowds lack necessary public facilities and venues. During the survey, a scene at the entrance of the community service center was impressive. Five or six residents were sitting together,

playing poker enthusiastically, and even attracted passers-by to stop and watch. Upon closer inspection, besides a public bench, the tables and chairs they used were all brought by themselves, with various styles and not the same. It can be said that “even without conditions, they will create conditions.” This reflects that in the old residential area, due to close social connections, residents have a strong demand for leisure activities outside their homes. At the same time, the large leisure square is empty, except for the benches set under the trees along the edge, there are almost no people participating in activities or staying there, reflecting that the centralized activity venues set up in the community lack attractive features and leisure facilities such as seats and pavilions, resulting in insufficient vitality (Figure 12).

Figure 12. Misalignment distribution of community vitality and activity venue

6. Community Active Health Intervention Planning Concepts and Strategies

Based on the current problems of the two levels and six aspects that are not conducive to promoting physical activity in the Tongda community, the corresponding planning is proposed from the two dimensions of “optimized travel paths” and "improved stopping places", and six design concepts of “connectivity, safety, pleasantness, complexity, balance, and quality” are proposed (Figure 13). Firstly, connectivity is emphasized to reshape the barrier-free “accessible” road system. Secondly, safety is emphasized to build a safe and reliable pedestrian environment. Thirdly, pleasantness is emphasized to form an easy-to-recognize and comfortable and beautiful travel space. Fourthly, complexity is emphasized to improve the multi-functional life service circle. Fifthly, balance is emphasized to construct a balanced layout of public space system. Sixthly, quality is emphasized to create characteristic and vibrant places that can provide rich participation experience and tell the story of the Tongda community.

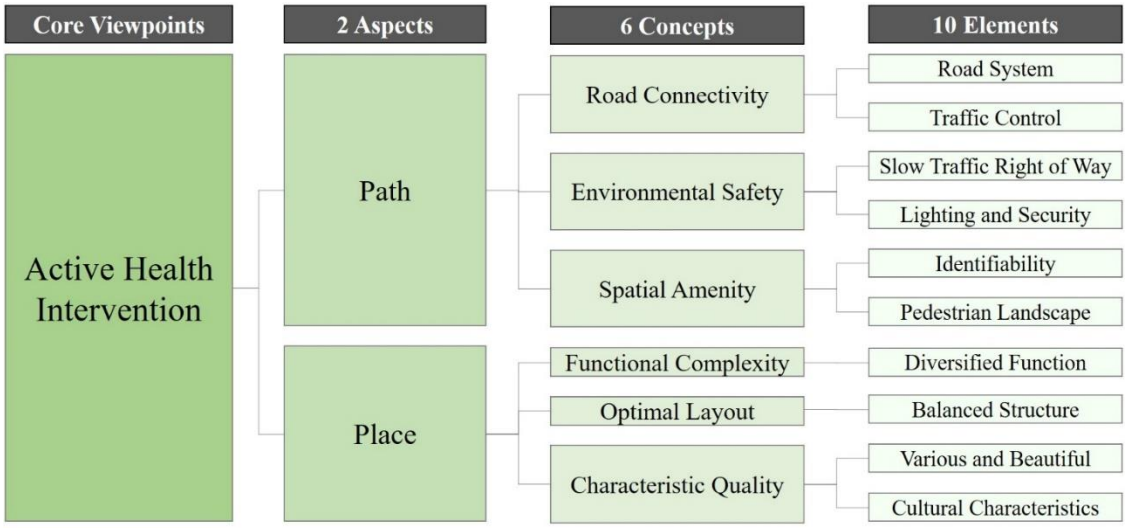


Figure 13. Framework of community active health intervention system

Starting from the health needs of residents, through the “small-scale, progressive” renovation of the material space environment, a healthy community that promotes residents’ national fitness, revitalizes diverse neighborhood communication, and combines the characteristics of the factory era is created. Active intervention is carried out on residents’ behavior to promote physical activity, thereby achieving the effect of preventing diseases and improving health, and ultimately guiding residents and the community to develop health together (Figure 14).

Figure 14. Planning general layout

6.1 Optimization of Travel Paths.

(1) Reshaping the connected and accessible road system

Firstly, the road connectivity needs to be improved. In order to connect the community road network, shorten travel distances, and provide more diverse travel route options, the most important task is to remove obstacles and demolish the walls and barriers that separate the three areas within the community. This not only maximizes the accessibility of transportation, but more importantly, by transforming the originally negative space along the walls into pleasant green spaces, it breaks down the invisible walls in residents' minds, integrates the three independent areas into a prosperous community as a whole, and stimulates the willingness of neighbors to walk and visit each other (Figure 15). Based on this, the three-level road system of community roads, group roads, and residential roads is planned and reconstructed. According to relevant specifications and combined with the actual situation of land shortage, the road widths are set as follows: 6 meters for community roads, 4 meters for group roads, and 2.5 meters for residential roads. Through local widening and new road construction, a connected and accessible road system is formed (Figure 16).

Figure 15. Comparison of the current wall and the effect of demolition and renovation

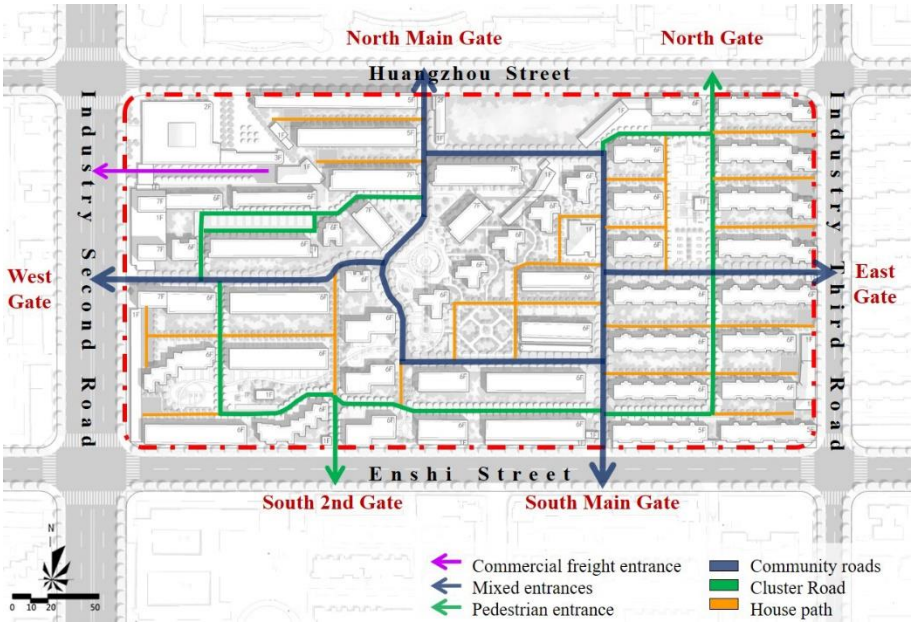


Figure 16. Road transportation planning

Secondly, it is necessary to strengthen vehicle traffic and parking management. The problem of difficult and disorderly parking in old communities not only affects residents' normal travel, but also reduces their willingness to engage in daily physical activity. The planning attempts to improve the pedestrian environment from two aspects of motor vehicle and non-motor vehicle parking management. In terms of vehicle traffic management, the community entrance is renovated, and non-resident registered vehicles are restricted from entering the community by setting up barriers and monitoring license plate recognition. At the same time, in cooperation with multiple departments such as traffic management and public security, abandoned "zombie cars" that have not been used for a long time are cleared to avoid the occupation of parking spaces. In terms of parking management, for motor vehicle parking, in order to ensure the orderly and safe parking of community residents' vehicles, the planning excavates the potential within the community, combs the parking spaces, and plans and marks 273 parking spaces. Due to land shortage, it is recommended that the district government coordinate with the traffic management bureau to add timed parking spaces on the surrounding city roads as a supplement. For non-motor vehicle parking, the planning renovates one existing non-motor vehicle parking shed in the community; adds five sheds, evenly distributed throughout the community, providing about 350 non-motor vehicle parking spaces. Outdoor bicycle racks are set up around the main public service facilities and activity spaces in the community for temporary parking (Figure 17). By managing dynamic and static vehicle traffic in an orderly manner, the community can create a safe and smooth

pedestrian environment.

Thirdly, it is necessary to renovate the road surface and barrier-free facilities to create a smooth and coherent pedestrian space. The road quality is improved by renovating the current damaged and cracked cement concrete road surface, laying permeable asphalt, and using different renovation methods to blacken the road surface, creating a sponge street that is slip-resistant, durable, and conducive to road drainage, avoiding pedestrians from slipping on wet roads. Where there are height differences in the current site, accessible facilities such as ramps are added to eliminate travel “barriers” and improve the level of aging. Continuous tactile paving is formed in the main pedestrian spaces to ensure the safe travel of visually impaired and disabled people.

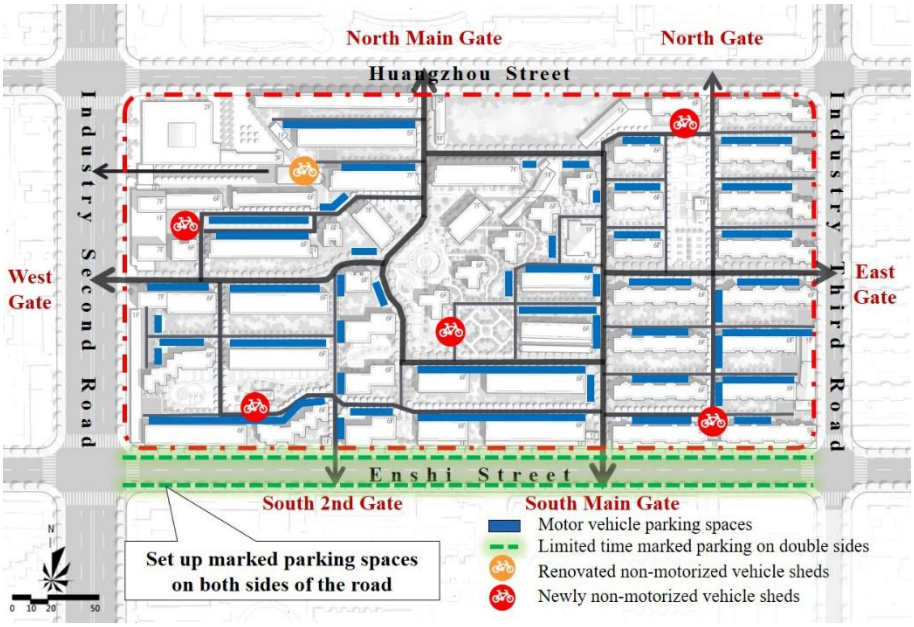


Figure 17. Parking facility planning

(2) Building a safe and reliable pedestrian environment

Firstly, it is necessary to ensure the right of way for pedestrians. People and vehicles should be separated as much as possible. Slow walking spaces of 2.5 meters wide are designated on both sides of the community roads, separated by roadside green belts and distinguished by pavement. For group roads and residential roads with low motor vehicle traffic, a mixed lane form of motor and non-motor vehicles is adopted to intensively use space, while traffic stabilization measures are taken to reduce vehicle speed and limit the speed of community vehicles to within 5 kilometers per hour. Motor vehicle deceleration belts are set up at the entrances and exits of the community to prevent vehicles from

entering the community at high speeds. Combined with building and landscape spaces, local road design measures with horizontal line offset are adopted to manage road speed, eliminate traffic safety hazards, and provide a safe and comfortable slow walking environment.

Secondly, it is necessary to upgrade lighting and security facilities. Firstly, the pedestrian environment should be illuminated at night. The planning proposes to increase the number of street lamps that meet the lighting needs of sidewalks along the internal roads of small paths within a service range of 30 meters. Solar energy-saving street lamps can be used in areas with sufficient sunlight, with a total of 14 additional lamps planned. Daily maintenance should be strengthened, and old and damaged light bulbs should be replaced in a timely manner to provide sufficient night lighting and promote activities in public spaces during the day and night. At the same time, high-quality landscape lighting of different forms should be selected in combination with landscape greening to enrich visual artistic experience. In terms of security, intelligent security facilities such as video surveillance should be added at the main entrances and exits of the community, places where people gather, and individual locations with hidden dangers. At least one high-definition close-up of each person entering the community should be captured, and patrols should be strengthened in key areas such as community roads and unit entrances and exits to improve the level of community security services, provide a reliable pedestrian environment, and ensure the perceived safety of pedestrians.

(3) Forming a pleasant and comfortable, recognizable travel space

Firstly, it is necessary to establish a community identification system. Firstly, a sign reflecting the community image and cultural connotation should be set up at the west entrance of the community, supplemented by landscape shrubs and flowers to enhance the visibility of the community gateway. At the same time, a community identification and guidance system should be established, with map signs added at major entrances and exits, and guide signs set up at major intersections. Based on the planned road system, the community is re-divided into five groups, each with a different theme color, and a signboard corresponding to the group color is uniformly set on the wall of each building to clearly identify the unit building number contained in the building. This provides people with timely and continuous prompts, guiding residents to accurately identify directions and facilitate travel.

Secondly, it is necessary to beautify the walking green belt. The planning proposes to create a slow walking greenway of about 940 meters, forming a leisurely walking green belt that organically connects major public service facilities and activity venues into a big stage that promotes neighborhood interaction and stories, achieving shared and inclusive community. In terms of landscape design, the unique soda ticket pattern of Wugang is integrated into the design of characteristic pavement patterns to enhance the interest of

the place, allowing residents to revisit the landscape of the era during their walks and enhance their willingness to engage in spontaneous activities. Recycled industrial scrap materials and mechanical components, old objects from Wugang and YiYe, and doors, windows, bricks, tiles, furniture, and other items left over from the future demolition of the “red house” are reused to create landscape sculptures that evoke a sense of the era, continuing the life atmosphere of the neighborhood, awakening collective memories and emotions, and promoting social activities among neighbors (Figure 18).

Figure 18. Vintage venues, identification, activities featuring the life of workers in the 1980s and 1990s

6.2 Improving the Quality of Stopping Places.

(1) Enriching the commercial service functions and formats

By providing diversified and high-quality commercial services, necessary activities such as shopping can be more convenient and of higher quality, while attracting residents to participate in spontaneous and social activities through characteristic service experiences.

Firstly, it is necessary to renovate existing idle buildings and supplement the missing community service functions. The poor-quality one-story brick buildings in the north of the community will be reinforced and renovated, adding elderly service center, cultural activity station, public toilets, etc., to meet the basic needs of residents for life services. In addition, create two major characteristic functions, namely the community canteen with the theme of the factory community and the worker story hall that tells the cultural memories of the times, to attract residents to participate in the experience by reminiscing about the old times (Figure 19).

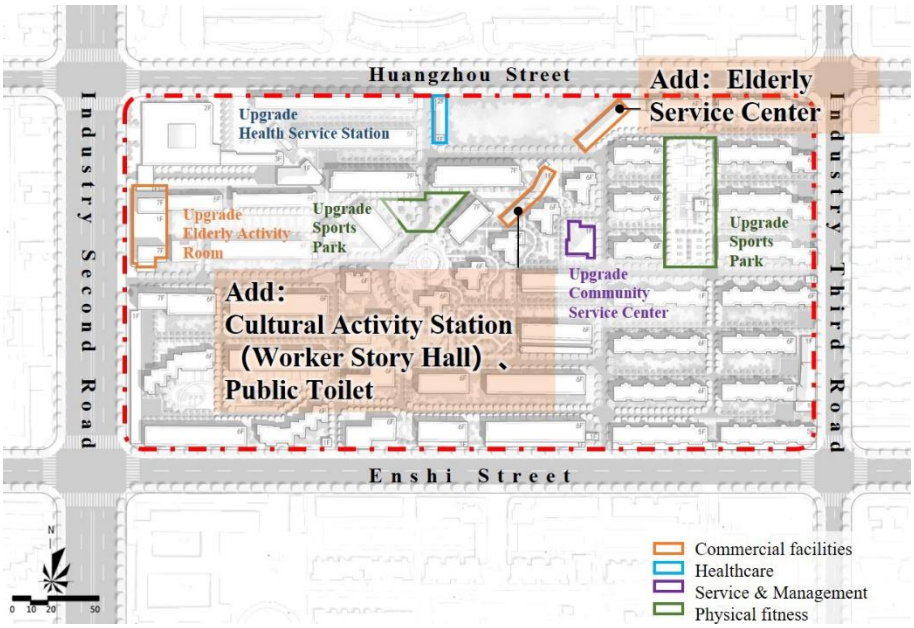


Figure 19. Public service facilities planning

Secondly, it is necessary to upgrade the commercial facilities along the street to form a rich and active street interface. It is recommended to vacate low-end businesses such as waste recycling and hardware building materials, and replace them with high-quality and diversified service facilities, and upgrade the existing poor-quality businesses. Enrich the overall business format, encourage the mix of small and medium-sized commercial retail, leisure catering, cultural entertainment, community services and other formats, providing residents with more reasons to travel (Figure 20).

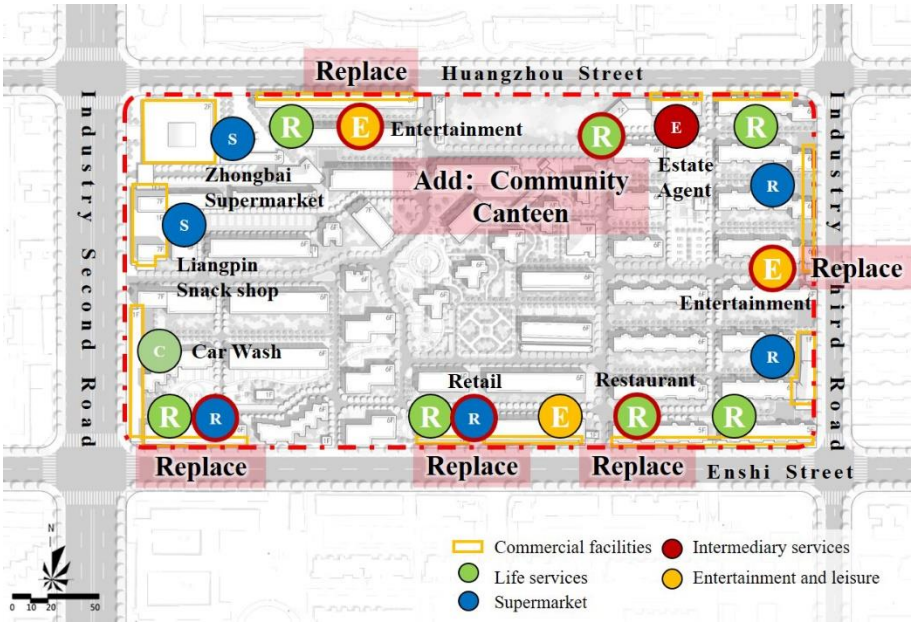


Figure 20. Commercial facility planning

Thirdly, it is necessary to guide the development of the street vendor economy and stimulate community vitality. For residents, street vendors are not just commercial places, but also spaces for leisure and social interaction with a human touch. By providing removable tents, weekend markets can be organized in the leisure square as a place for residents to exchange idle items, DIY handicrafts, and other social activities. At the same time, it is necessary to strengthen the management of mobile vendors selling snacks, fruits and vegetables, shoe repair and lock matching within the community, and guide each vendor to participate in the formulation of community street vendor conventions. The street vendor behavior will be standardized in terms of location, opening and closing times, hygiene, honest operation, and quality, providing non-formal commercial services that retain the atmosphere of the market while being clean, orderly, and standardized, continuing the warm and human experience within the community.

(2) Building a balanced and high-quality public activity space system

Advocating for equal and high-quality sharing, and ensuring that every household has a view, we will construct a public space system consisting of four levels: “shared playgrounds, walking green belts, green spaces next to homes, and rooftop farms,” starting from the needs of residents to enable them to equally enjoy various public activity spaces. We will make full use of existing sites and create one outdoor activity site in the middle, north, east, and west of the community as a themed shared playground, which will serve as the main venue for community activities, promote daily and high-frequency activities for residents, and help them develop healthy exercise habits. We will use personalized

customization to transform the green spaces next to homes, providing residents with a variety of public space modules to choose from, allowing them to freely choose the courtyard landscape below their own building, and providing residents with open spaces that are fresh and beneficial to their physical and mental health. We will create small rooftop gardens that also serve as community farms, providing each building with a participatory neighborhood interactive social space (Figure 21).

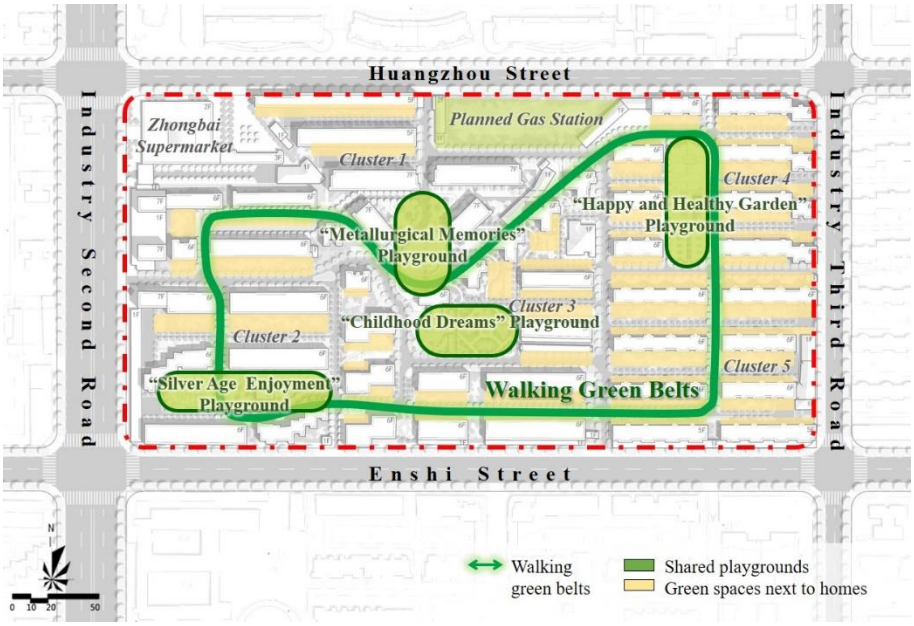


Figure 21. Public space planning structure

(3) Creating high-quality activity venues infused with local culture

Combining cultural themes to activate shared parks. Like other factory communities, Tongda Community is like a living fossil. After several changes, one can still see the traces of the past from the remaining "red house" (the former dormitory of the First Metallurgical Construction Company) and the faded and blurred shop signs on the street. However, the lively neighborhood activities in the courtyard have disappeared due to the lack of space and facilities. We will plan around the cultural characteristics of the local unit courtyard in the community, combining the current green landscape conditions and future available open spaces, and create four major activity venues around cultural, sports, elderly, and children's themes, namely "Metallurgical Memories, Happy and Healthy Garden, Silver Age Enjoyment, and Childhood Dreams." We will reshape the courtyard life scenes full of the flavor of the 1980s and 1990s, in order to revitalize the living atmosphere of the workers in the courtyard and promote community residents' activities and

interactions.

“Metallurgical Memories” Playground - The only remaining “red house” in the community is located in the central area of the community. The plan is to transform the site after demolition and create a community public activity and spiritual cultural center through a landscape design with a sense of the times, reproducing the glorious metallurgical years of the workers in the First Metallurgical Construction Company and Wuhan Iron and Steel Company, enhancing community identity and residents’ sense of belonging (Figure 22). The plan fully inherits and extracts the cultural genes of workers and the unique elements of the unit courtyard, such as weathering steel as a representative of industrial style, alloy as an embodiment of steelmaking history, and red bricks as a reproduction of Soviet style red houses, creating cultural stone relief walls, cultural sculptures, steel and wood leisure seats, etc. (Figure 23).

Figure 22. Current situation and renovation effect of the “Metallurgical Memories” playground

Figure 23. Application of characteristic elements injected into local culture

“Happy and Healthy Garden” Playground - In order to recreate the lively neighborhood activities in the factory community, such as leisure 3-step dance, outdoor movies, and

relaxing on bamboo bed, the plan is to upgrade the current leisure square in the northeast of the community (Figure 24). Firstly, we will use the existing open square to create a versatile activity space, improve the utilization rate of the square, and attract residents with different activity needs, such as improving sports fields and adding sports facilities. Secondly, we will improve public facilities and extend the time residents spend here. By adding removable sunshades to adapt to the hot climate in Wuhan, illuminating the night scene to improve the utilization rate of the square at night, and setting up Wugang soda vending points to increase the vitality of the site. Thirdly, we will improve the landscape environment by using a plant configuration of “evergreen trees + local flowers,” enriching the green layers, providing shade, and creating a vibrant and colorful spatial atmosphere.

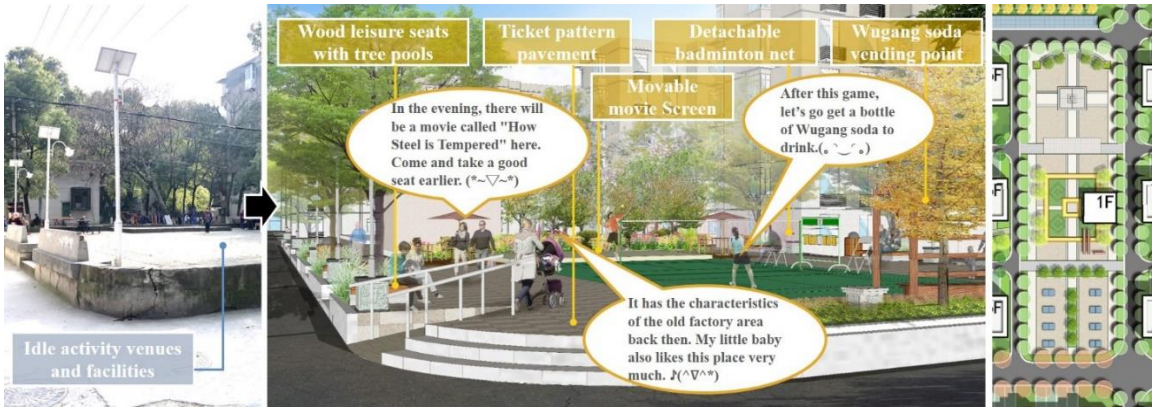


Figure 24. Current situation and renovation effect of “Happy and Healthy Garden” playground

“Silver Age Enjoyment” Playground - Based on the community’s mild aging characteristics, the plan is to transform a current site in the southwest of the community and create a space for elderly activities (Figure 25a). We will transform the newspaper kiosk and sunshade seats to provide residents with a place to read and communicate while keeping cool; beautify the existing leisure pavilion, add chess tables, and ground chess grids to create an interest corner for music, chess, calligraphy, and painting, providing outdoor space for the community’s chess fans to practice their skills.

“Childhood Dreams” Playground - In order to change the current situation of the community lacking children’s playgrounds, the plan is to transform a landscape garden in the middle of the community and create a child-friendly public space, fully stimulating children’s interest in playing from various sensory experiences such as sight, hearing, smell, and touch (Figure 25b). We will use the existing four grassy areas to create a sports area, a pastoral area, an art area, and a rest area: the sports area will have small children’s play equipment such as sand pits and climbing nets; the pastoral area will have a vegetable

garden for fun and education, providing experiences in recognizing vegetables and fruits, learning about nature, and exploring parent-child planting; the art area will have interactive art walls to stimulate children's imagination and creativity; the rest area will have tables and chairs suitable for all ages, convenient for parents to take care of their children and for leisure and socializing.

Figure 25. Current situation and renovation effect of the "Silver Age Enjoyment" playground (a) and "Childhood Dreams" playground (b)

7. Summary and Outlook

Against the backdrop of the post-epidemic era, the micro-transformation of Tongda Community in Wuhan aims to promote residents' spontaneous and social activities. Oriented by problems, the plan proposes two dimensions of planning strategies: improving the accessibility and comfort of road traffic and enhancing the attractiveness and cultural characteristics of activity venues. The goal is to expand the breadth and intensity of activities, enhance the willingness to engage in outdoor activities and social interactions, cultivate healthy lifestyles in daily activities, improve residents' health literacy, and ultimately promote the healthy development of community residents. By creating a community environment for active health intervention, this micro-transformation of an old community provides experience from a health perspective.

References

Jan Gehl, Renke He. Communication and Space [M]. China Construction Industry Press, 2002

Shaohua Tan, Yinbao Gao, Lifeng Li, Yang Zhang. Active health interventions in community walking environments - from the perspective of physical activity

Urban Planning, 2020, v.44; No.409(12):40-51+61.

THE RELATIONSHIP BETWEEN NATURAL RESOURCES AND CHILDREN'S INTERACTION WITH NATURE IN EXPERIMENTAL PRIMARY SCHOOLS: A STUDY ON ENVIRONMENTAL SETTINGS AND CURRICULUM IN TAIWAN'S EXPERIMENTAL PRIMARY SCHOOLS (1093)

Yi Chien Chan[1*], Pingli Chen[1]

[1]Department of Urban Planning, Nation Cheng Kung University, Tainan, Taiwan (R.O.C.); [*]yichien317@gmail.com

Abstract. The intellectual development of children has always been a crucial part of education. However, traditional education in Taiwan often leads to a limited understanding of the local community and a lack of interaction with nature and the community, thus impacting their developmental rights. In recent years, the Ministry of Education has promoted the "Outdoor Education Program" to encourage schools to lead students out of the campus and engage with nature.

Unfortunately, COVID-19 has hindered the implementation of this program. Experimental schools, on the other hand, have integrated natural resources into their spaces early on. Therefore, through researching how these schools utilize natural resources to support the curriculum, we hope to evaluate the assistance and limitations provided by different natural environmental experiences while considering the rights of children's development. This study aims to provide a framework for adjusting campus and surrounding environmental planning within the context of traditional education in Taiwan.

Keywords: children, natural resources, interaction with nature, experimental primary school, COVID-19 epidemic.

1. Introduction

1.1 Research Background and Motivation

The expansion of urban areas has resulted in the majority of children growing up in urban environments with fewer opportunities for contact with nature. Richard Louv (2008) mentions that the diminishing presence of natural environments and the convenience of technology have led to a decrease in outdoor attractiveness, giving rise to the concept of "nature deficit disorder." The United Nations' Convention on the Rights of the Child, established in 1990, unanimously recognizes that the goal of children's education is to "enable the child's personality, talents, and mental and physical abilities to develop to their fullest potential." The phenomenon of "nature deficit disorder" in the modern environment appears to contradict the educational goals outlined in the Convention on

the Rights of the Child.

The impact of natural environments on child development is receiving increasing attention, and numerous studies have explored the relationship between various natural scales and different aspects of children's development (Arola et al., 2023; Hong et al., 2021; Zare Sakhvidi et al., 2022). Louv (2008) points out that in addition to its influence on physical and psychological aspects, interacting with nature not only enhances creativity but also has therapeutic effects on ADHD. However, traditional education in Taiwan itself limits children's opportunities to engage with nature and lacks interaction with the local community, thereby affecting their rights to development. The Ministry of Education's National Education Direction announced in 2022 encourages educational innovation and experimentation, implements diverse outdoor education, and promotes mountain and marine education, aiming to shift students' learning from the classroom to the real world. However, compared to the educational focus of traditional schools, experimental schools integrate natural resources into their spaces earlier and utilize the natural environment to support their curriculum. The outbreak of Covid-19 in 2019 had various impacts globally, and Taiwan faced significant restrictions on school activities from May 2021 to July 2022, hindering the implementation of diverse outdoor education programs and making it even more challenging for children to have opportunities to engage with nature.

1.2 Research Objectives

This study focuses on elementary schools, which represent the longest period of compulsory education in the national education system, and selects school campuses where social status backgrounds are relatively equal and fair. By examining how experimental schools utilize natural resources to support their curriculum, the study aims to analyze and summarize the relationship between different categories of natural places and the level of interaction in children's environmental cognitive development. Through this analysis, the study aims to evaluate the assistance and limitations provided by different nature-based experiences in curriculum design and planning, which can serve as a framework for future discussions on adjusting campus and surrounding environmental planning in traditional education. In summary, the research objectives of this study include the following three points:

a) Analyzing the environmental composition of experimental schools that highly incorporate natural resources into their curriculum.

b) Understanding the differences in how schools incorporate natural resources into their curriculum and adapt during the pandemic.

c) Verifying the extent to which children interact with nature in the curriculum.

1.3 Research Process

Based on the context of the research background and motivation, the research process and objectives are illustrated in the following diagram.

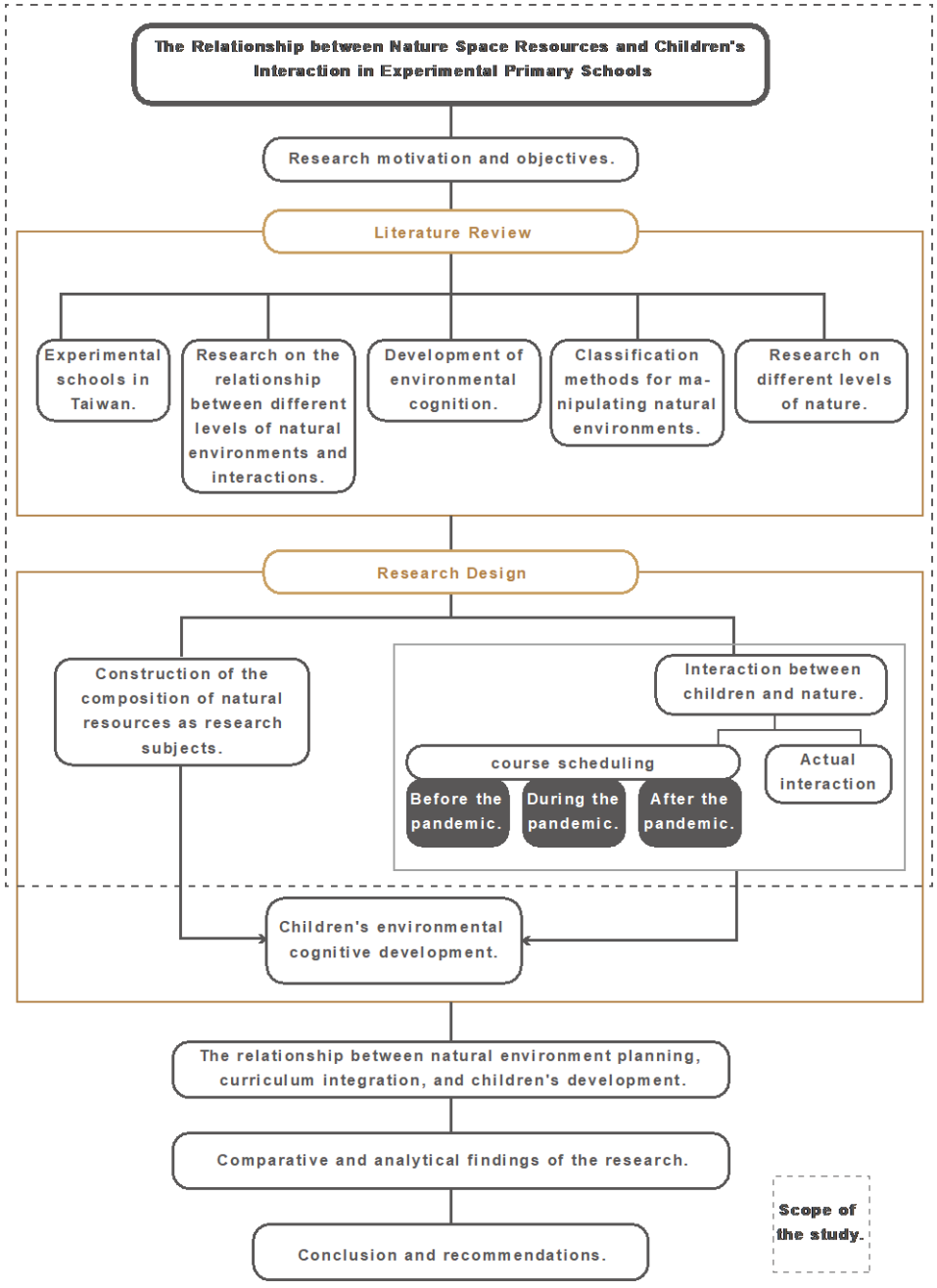


Figure 62 Research Flowchart

1.4 Research Scope

This section provides explanations and definitions for various research scopes in this study:

1.4.1 Natural resources

The term "natural resources" in this study is based on the Land Cover Classification System (LCCS) developed by the Food and Agriculture Organization of the United Nations (FAO). This system categorizes natural areas into primarily vegetated and primarily non-vegetated areas.

1.4.2 Environmental cognition

The definition of "environmental cognition" in this study is based on Gifford et al.'s (2011) definition, which refers to the process of seeking clues and identifying important elements and features of a scene in a real environment. It involves the perception and exploration of the environment, leading to an understanding of the environment.

1.4.3 Nature experiences

Based on Kellert's (2002) categorization, nature experiences can be classified as direct, indirect, or symbolic. In this study, "nature experiences" are defined as direct experiences, while experiences during the pandemic include symbolic experiences.

1.4.4 Interaction with nature

The term " interaction with nature " in this study is based on the concept of nature experiences proposed by Cornell, a naturalist educator. It refers to the interaction between individuals and nature using the five senses.

1.4.5 School curriculum

The "school curriculum" defined in this study refers to the curriculum that takes place in a natural environment, with the natural environment serving as an important teaching resource. The curriculum design focuses on engaging students in activities within the natural environment.

1.4.6 Experimental schools

Based on the classification of experimental schools by Common Wealth Magazine (2022), the definition of "experimental schools" in this study includes schools that embrace ecological concepts and extensively incorporate natural resources into their curriculum.

2. Literature Review

2.1 Research on the Impact of Different Levels of Nature on Children's Development

Louv (2008) mentioned the problem of human lack of contact with nature and referred to various studies that demonstrate the benefits of nature exposure. Playing in natural outdoor environments has been shown to enhance physical fitness, particularly balance and agility, and contribute to a greater sense of self-worth. It has also been associated with lower rates of behavioral problems, anxiety, and depressive symptoms, as well as increased resilience to stress or adversity (Wells & Evans, 2003). Children in nature-based kindergartens exhibit greater flexibility and a preference for creating their own games compared to those in traditional kindergartens. These findings suggest the importance of nature exposure for child development.

The United Nations Children's Fund (UNICEF) mentions that investing in green and blue spaces promotes positive living and health, benefiting children's psychological, physical, and social development. Several studies (Almeida et al., 2022; Arola et al., 2023; Dadvand et al., 2015; Reuben et al., 2019; Zare Sakhvidi et al., 2022; Zare Sakhvidi et al., 2023) have summarized different aspects of child development based on the dimensions of "physiological development," "psychological development," and "cognitive development" across the lifespan. The natural environments children are exposed to can be categorized into three scales. The following sections review the influence of natural environments on the three domains of child development within each scale:

2.1.1Neighborhood

Research on the natural environment in neighborhoods often focuses on green spaces, with greenness indices used to measure the extent of vegetation. Regarding studies related to physiological development, higher greenness exposure (NDVI) has been associated with a lower risk of allergies, but there is less significant correlation with proximity to water bodies (Paciência et al., 2021). The soil-adjusted vegetation index (MSAVI) of green spaces shows a slightly stronger correlation with externalizing behavior compared to internalizing behavior (Lee et al., 2019). Higher physical accessibility to green spaces is also related to better adaptation to physical stress (Ribeiro et al., 2019), although there is no significant association between green exposure and asthma risk, but rather a stronger relationship with traffic congestion levels (Putra et al., 2022).

There is relatively limited research on the impact on psychological development, and the findings show no significant correlations. For example, the quantity of green spaces does not show a significant relationship with self-regulation, independence, and emotional aspects (Mueller & Flouri, 2020), and the level of greening in open green spaces and parks does not appear to have a promoting or protective effect on stress and externalizing behavior, sometimes even the opposite (Weeland et al., 2019).

Studies on cognitive aspects also utilize greenness exposure (NDVI, MSAVI) as a measure to predict children's cognitive development during childhood and adolescence, including executive function, memory, and attention. Although there are significant relationships (Dadvand et al., 2015; Lee et al., 2019), once family or neighborhood socioeconomic status is taken into account, the association between greenness and cognitive development becomes non-significant and is likely influenced by family and neighborhood socioeconomic factors (Reuben et al., 2019).

2.1.2 School

There is relatively less research exploring the physiological aspects of school environments, with the main focus being on cognitive development, followed by psychological aspects.

Some studies suggest that outdoor activities in green spaces play an important role in children's mental health (Louv, 2008). Chiumento et al. (2018) conducted a six-month gardening activity in schools in England and found that it was indeed related to improvements in mental health, particularly in emotional well-being and self-help, and also had therapeutic benefits for children with autism (Chang, 2010). It is not limited to gardening activities alone, as shown in the study by Largo-Wight et al. (2018), which indicates that conducting classes in green spaces can also promote children's sense of happiness.

Based on the findings of this literature review, more research at the school level focuses on the relationship with cognitive development. It has been found that exposure to greener environments (measured by NDVI) and long-term classroom experiences in green spaces have positive effects on attention and memory (Dadvand et al., 2015; Largo-Wight et al., 2018). However, some studies suggest that there is no significant difference in attention restoration between classes conducted in green spaces compared to those in gray spaces (Anabitarte et al., 2021). The preliminary judgment of this study is that it may be due to the short duration of exposure to green spaces in the research methods, leading to inconclusive results. The accessibility of urban green spaces around schools and residences is positively correlated with intelligence quotient (IQ), but there is no clear association with the accessibility of water bodies (Almeida et al., 2022). According to Liu and Chen's (2021) research on Chinese schools, they found a positive correlation between the area of green spaces and children's environmental attitudes and behaviors.

2.1.3 Forest

Some studies indicate that forest-dwelling families living within 3 kilometers of a forest and with at least 30% of the community's land covered by forests have a very positive impact on dietary diversity compared to non-forest-dwelling families located more than 8 kilometers away from a forest (Rasolofoson et al., 2018). Attending forest schools and

engaging in play and interactions in the forest for a period of eight months also has a positive impact on motor skills (O'Brien & Murray, 2007).

The literature review on the psychological aspects also shows a positive correlation. Hong et al. (2021) conducted 72 forest therapy projects in a national forest and found that they contribute to the participants' interpersonal relationship health. Additionally, children attending forest schools for eight months also experience positive effects on self-esteem and self-confidence (O'Brien & Murray, 2007).

The study conducted by O'Brien and Murray (2007) found that students attending forest schools for eight months significantly improved their cooperative abilities, language development, knowledge, and environmental cognition.

Based on the literature review mentioned above, it can be observed that neighborhood-scale studies mostly measure the extent of exposure to green spaces (Arola et al., 2023; Dadvand et al., 2015; Reuben et al., 2019), while some also examine both green and blue spaces (Paciência et al., 2021). Natural resources such as nature museums have received relatively less discussion (Dopko et al., 2019). In contrast, forest-scale studies often use the level of engagement in activities within the environment as a criterion, which better reflects children's opportunities for connection with nature compared to measuring the degree of greenness. Moreover, the natural resource composition of forest environments is more diverse, which may contribute to a more significant association between forest-scale research findings and child development.

Psychologist Kurt Lewin believed that human behavior is the result of the interaction between individuals and their environment. In mainstream education in our country, students spend approximately 6-8 hours per day in the school environment from elementary to high school, making it one of the significant living environments. The school environment also has a certain influence on students (Ho & Chang, 2011). Therefore, this study chose the school as the research scale, and the campus setting ensures relative equality and fairness regardless of social background.

2.2 Classification of Natural Environment Manipulation

The definition of the natural environment includes two aspects: (1) intact ecological units without significant human interference, and (2) natural resources and physical phenomena unaffected by human activities. The degree of naturality exhibits a continuum, and there are no absolute values of 0% or 100% naturality.[1] In this study, the scope of

[1] Source of information: Copyright © 2023 Environment and Ecology. http://environment-ecology.com/what-is-environment.html

naturality falls within the category of intact ecological units, and therefore, the literature review will primarily focus on the commonly used measurement of naturality, the Normalized Difference Vegetation Index (NDVI).

2.2.1Normalized Difference Vegetation Index (NDVI)

Usually (but not necessarily) observed from space, the Normalized Difference Vegetation Index (NDVI) utilizes the principles of light reflection and absorption to assess the color and evaluate the state of green vegetation growth. It is calculated using satellite remote sensing. The formula is as follows:

$$NDVI = \frac{(NIR - RED)}{(NIR + RED)}$$

NIR: Near-Infrared reflectance; RED: Red reflectance; NDVI: Ranges between -1 and 1. In general, NDVI values are positive for green vegetation (including crops, shrubs, grass, and forests); surfaces such as sand or concrete tend to approach zero, and water bodies display negative values (Huang et al., 2021).

However, in the selected school-scale environment for this study, the possibility of artificial elements needs to be considered. After taking this into account, alternative and more comprehensive classification methods will be explored.

2.2.2 Plant Ecological Assessment Technical Specifications

This classification method corresponds to the "Plant Ecological Assessment Technical Specifications" announced by the domestic Environmental Protection Administration. It usually involves interpretation in conjunction with aerial photographs and classifies the environment into the following levels from 0 to 5 based on land use and vegetation composition distribution:

Naturality Level 5: Natural forest areas, undisturbed forests in their natural state, with minimal expected changes in composition and structure in the future. Naturality Level 4: Original grassland areas, which could develop into forests but are restricted to a grassland form due to limiting factors.

Naturality Level 3: Afforested areas, where the vegetation is artificially planted but exhibits long harvesting periods and higher stability.

Naturality Level 2: Agricultural land, areas with artificially planted crops or temporarily abandoned grasslands.

Naturality Level 1: Bare land, areas devoid of vegetation due to natural factors.

Naturality Level 0: Areas devoid of vegetation caused by human activities.

Although this classification distinguishes between artificial and natural environments, the classification of natural compositions beyond green spaces is less clear. Therefore, this classification method will not be used in this study.

2.2.3 Land Cover Classification System (LCCS)

The Land Cover Classification System (LCCS) aims to provide a consistent framework for classifying and mapping land cover. Its primary goal is to overcome the rigidity of land cover classification, as in many cases, it is challenging to easily assign a specific predefined category using other classification systems. In contrast, LCCS offers easier classification and mapping capabilities and can be applied to maps at various scales. From a practical standpoint, the advantages provided by LCCS include: (1) ease of integration; (2) allowing flexible application with available information in specific regions, project budgets, and time constraints; (3) separating data collection from the interpretation process (Di Gregorio, 2005)

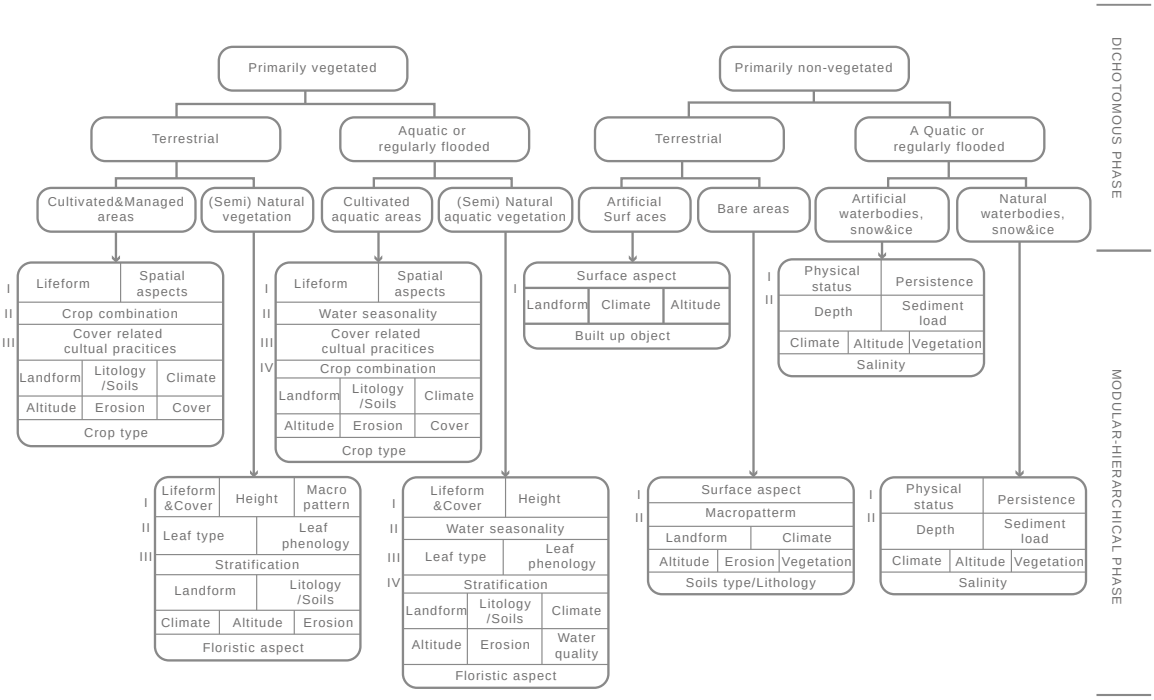


Figure 2. Overview of the Land Cover Classification System
Data Source: Cited from Di Gregorio, 2005

Saleh and Aboelghar (2013) utilized the LCCS classification system to map land cover in North Sinai, Egypt, as their case study. The mapping process can be summarized into four steps: (1) defining the study area, (2) determining the land cover categories, (3)

referencing satellite imagery (Figure 3), and (4) creating the land cover map. The researchers evaluated the accuracy of the final map results (Figure 4), achieving an overall accuracy percentage of 96.14%.

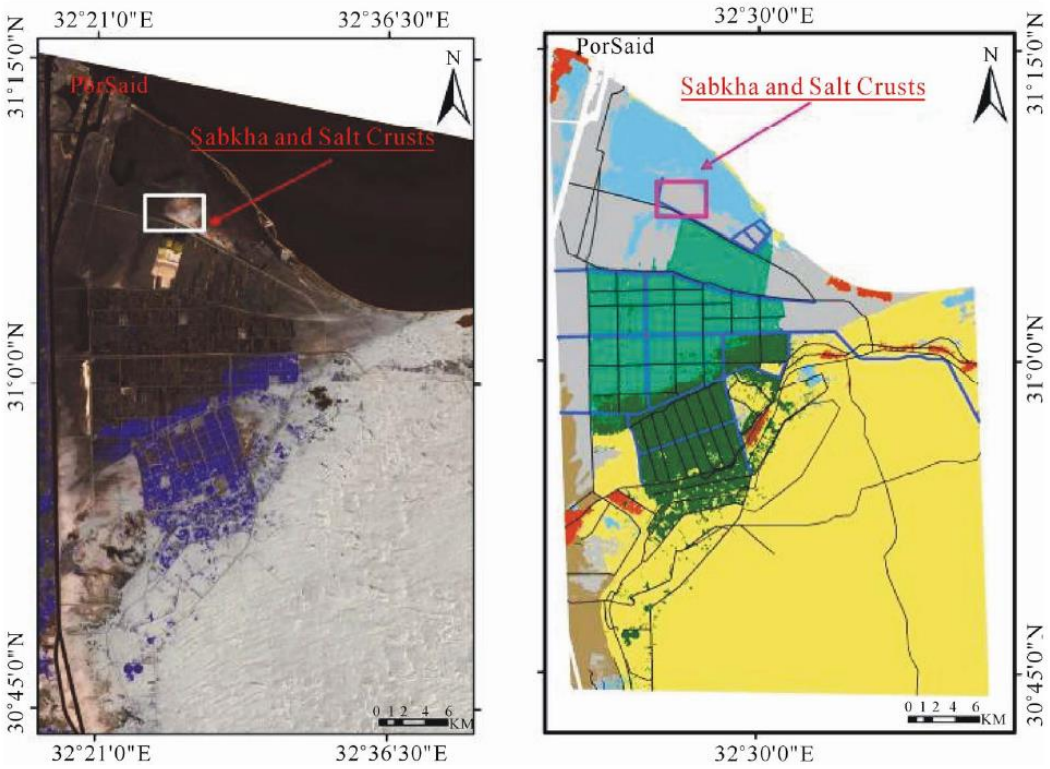


Figure 3. Satellite Comparison Chart for the Study by Saleh and Aboelghar (2013)

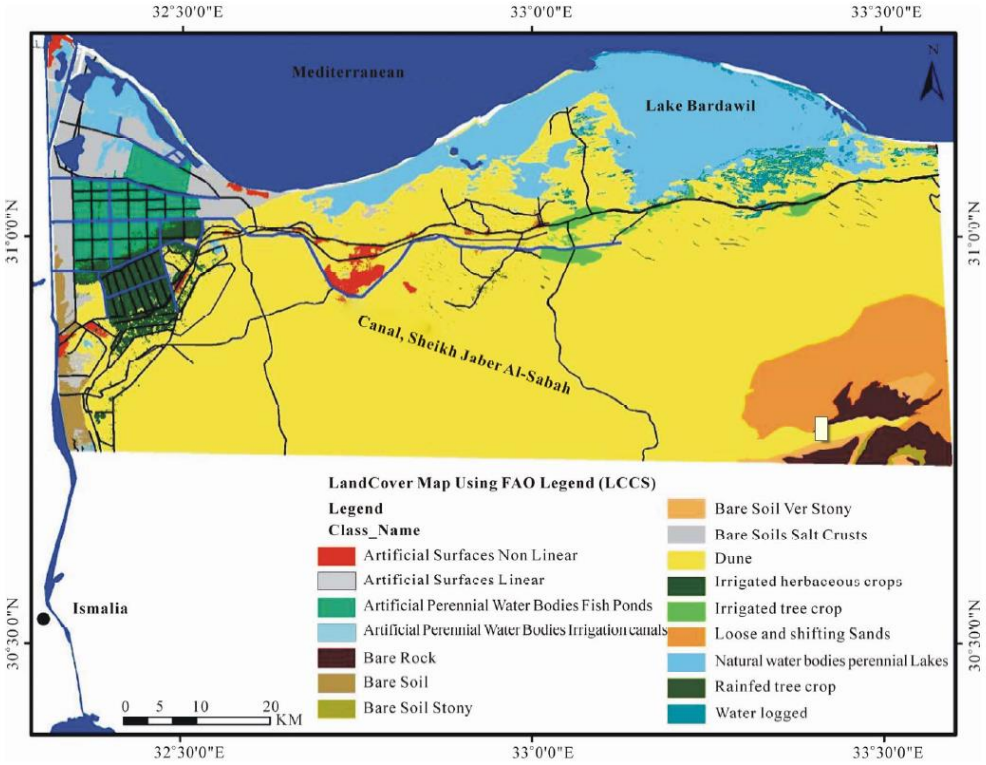


Figure 4. Land Cover Map of the Study Area by Saleh and Aboelghar (2013)

2.3 Development of Environmental Cognition

The overall process of human development is often categorized by researchers into three domains: "physiological development," "psychosocial development," and "cognitive development." The development across these three domains is typically interconnected (Adolescent Psychology)[2], where changes in one aspect can impact the development of others, known as a "holistic perspective" (Shaffer & Kipp, 2013). In the context of cognitive development in children, two prominent psychological theories, Jean Piaget's theory of cognitive development and Lev Vygotsky's cognitive development theory, are frequently applied. Piaget is considered a pioneer in this field during the 20th century. He proposed that cognitive development is not simply the accumulation of knowledge in the mind but rather a process aimed at survival and understanding the world. According to Piaget, learning occurs through the interaction of assimilation and accommodation with new environmental experiences, leading to long-term changes. Piaget's theory divides

[2] Source of information: Created with support from SUNY OER Services and Hudson Valley Community College. https://courses.lumenlearning.com/adolescent/

cognitive development into four stages based on age: the sensorimotor stage (0-2 years old), the preoperational stage (2-7 years old), the concrete operational stage (7-11 years old), and the formal operational stage (11 years old and above) (Huitt & Hummel, 2003). Some studies have incorporated this theory into educational planning, using cognitive development theory to design suitable dance curriculum and movements for different age groups in children's dance instruction (Liao, 2012). Additionally, researchers have applied these theories as a basis for comparing the appropriateness of Orff music pedagogy and Kodály music pedagogy in relation to the physical and mental development of children at various stages (Lin, 2020).

According to the aforementioned theory of cognitive development, understanding the world includes the recognition and understanding of the environment. Gifford et al. (2011) define environmental cognition as the process in which individuals attend to complex environments in order to identify important elements and patterns within them. Through perceptual exploration of the environment, individuals develop their understanding of it. Actual environmental perception can vary among individuals due to differences in culture and age, and different perceptual modes can result in diverse interpretations of the same scene.

2.4 Different Levels of Natural Settings and Related Interactions Research

2.4.1 Natural Settings

Based on Kellert's (2002) classification of nature experience, this study will review relevant literature on three types of natural interaction experiences:

1. Direct experiences involve relatively natural environments such as forests, riversides, and community parks that are closer to the wilderness.
2. Indirect experiences involve human-controlled and intervened natural environments, such as zoos, vegetable gardens, and farms, which heavily rely on human control. (Chiumento et al., 2018)
3. Vicarious/symbolic experiences involve understanding nature knowledge through multimedia without actually entering natural environments.

The impacts of these three types of experiences on children's cognitive, affective, and evaluative aspects will be examined.

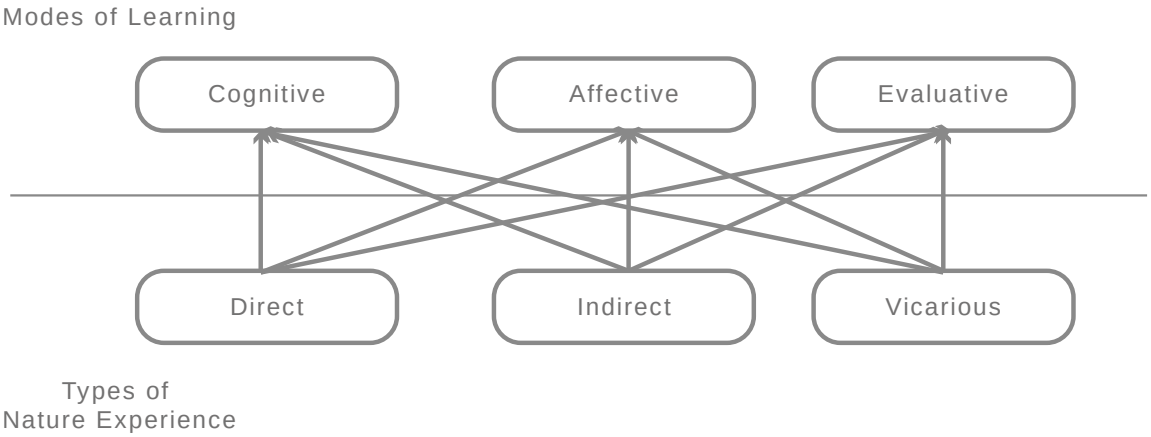


Figure 5. Classification Chart of Natural Activities Experience
Data Source: Cited from Kellert (2002)

This study categorizes the literature review based on the types of experiences mentioned in the first paragraph. From the literature review mind map, it can be observed that the majority of previous studies focused on direct natural interaction experiences. Therefore, this study relies on literature related to direct natural experiences as the foundation and defines it as the normative scope of natural experiences for children.

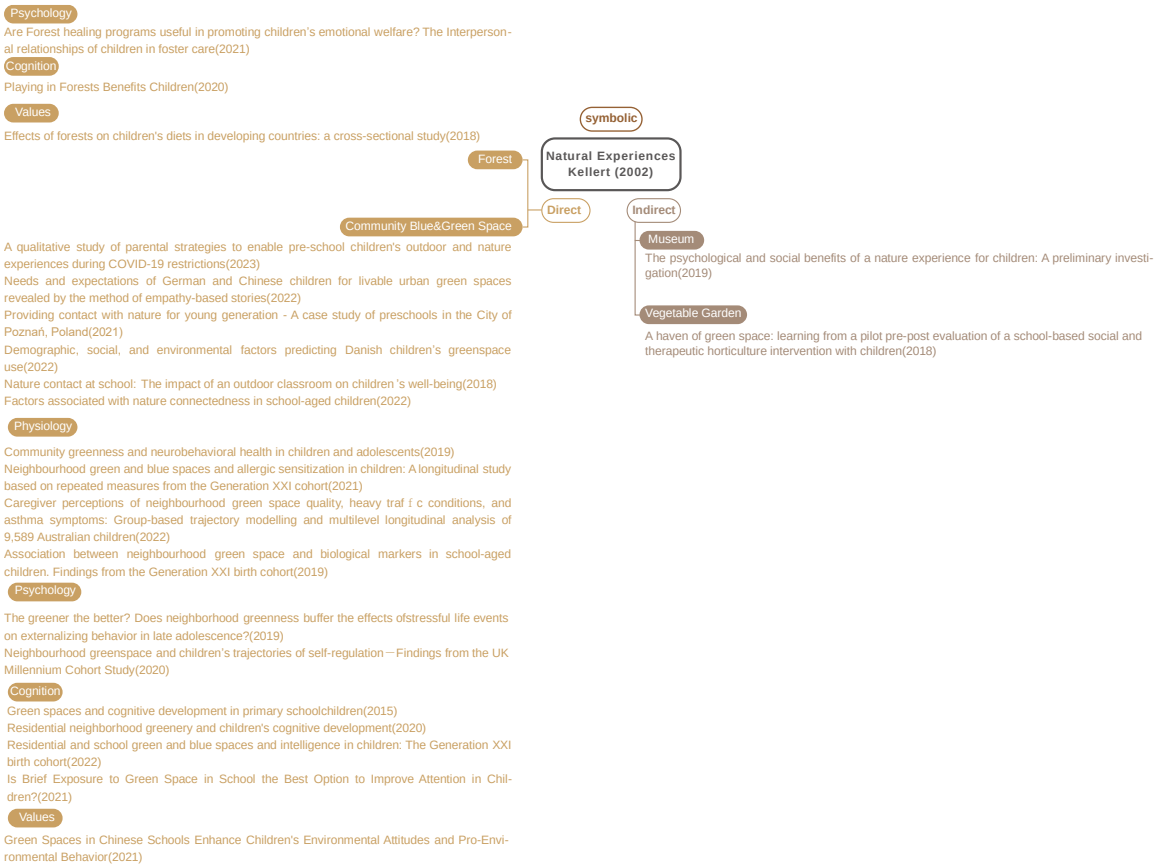


Figure 6. Classification of Literature on Nature Experiences

2.4.2 Interaction with Nature

Environmental educator Cornell (1979) summarized five principles for outdoor teaching experiences in nature:

1. Teach less, share more: Instead of emphasizing cognitive aspects, focus more on emotional and sensory experiences to elicit diverse responses from children. Spend more time sharing their feelings about nature.
2. Be receptive: Listen and be aware of children's feelings. Respect them and provide opportunities for expressing their true thoughts and emotions.
3. Focus students' attention without delay: Capture children's attention before starting an activity, stimulating their keen observation skills and fostering their interest in new discoveries.
4. Look and experience first, talk later: Direct experiences have a deeper impact on children than indirect ones. Encourage them to observe and experience more, without rushing to provide cognitive answers.

5. Foster a joyful learning experience: Create an atmosphere of laughter and happiness throughout the process, as children are naturally attracted to enjoyable experiences and are more willing to learn.

The definition of nature experiences should be to stimulate children's sensory abilities, guide their perception and insight, and evoke joy. The importance of sensory education is also a core educational concept in Montessori's approach to promoting children's development (Chen, Biyun et al., 2018).

2.5 Taiwan Experimental Schools

Education environments can be categorized into five types: political, family, school, social, and ecological. Among them, the school environment in Taiwan's education system can be divided into mainstream and non-mainstream systems. The latter is also known as "alternative education" or "ideological education" because it is mostly based on specific educational core principles and exhibits diverse educational forms. In terms of classification, it can be further categorized into school-based experimental education and non-school-based experimental education. The former differs from the mainstream education system in its advocacy and conducts integrated experiments within the scope of schools, while the latter is not limited to schools and can be conducted by individuals, groups (consisting of three or more people), or institutions (Peng, Qianyun, 2010). According to Parenting Magazine (2022), Taiwan's current experimental education system can be further divided into seven categories:

1. Waldorf Education: Based on "anthroposophy," it advocates that each individual possesses inherent qualities and talents. The curriculum emphasizes broad knowledge to promote the holistic development of students' mind, body, and spirit.
2. Montessori Education: Emphasizes interdisciplinary knowledge rather than subject divisions, guiding children to learn from everyday life. It emphasizes active exploration and provides classrooms with practical, concrete, and manipulative materials to help children transition from the concrete to the abstract learning phase.
3. Democratic Schools: Founded on trust in children and the belief that "all children are born curious," it criticizes traditional education for suppressing children's curiosity and learning motivation. Teachers and students collaborate to design the curriculum, and student autonomy is emphasized, with students taking responsibility for managing the school, including participating in school meetings and establishing school rules.
4. Ecological Education: With mountains and forests often located near the schools, the abundant natural environment becomes the students' classroom, providing a different learning experience compared to sitting in a classroom taking notes and listening to lectures.

5. Expeditionary Learning Education: Students engage in challenging physical activities and participate in high-demand outdoor activities. It not only strengthens physical fitness but also cultivates various non-cognitive skills in children, such as confidence and taking initiative. This learning approach is based on Expeditionary Learning Schools (ELS).
6. Indigenous Experimental Education: Faced with the rapid erosion of indigenous cultures in modern times, this category encourages the establishment of education models that meet the needs of indigenous peoples.
7. Others: In recent years, there has been a rise in institutions focusing on international education, providing an all-English environment while emphasizing students' involvement in sports and the arts, and offering personalized course choices.

Although experimental schools can generally be classified based on the aforementioned educational systems, in practical educational planning, they may involve a combination of curriculum practices. Therefore, this study selects ecological experimental schools in Taiwan and experimental schools that highly incorporate nature into their curriculum as the research subjects, in line with the research objectives.

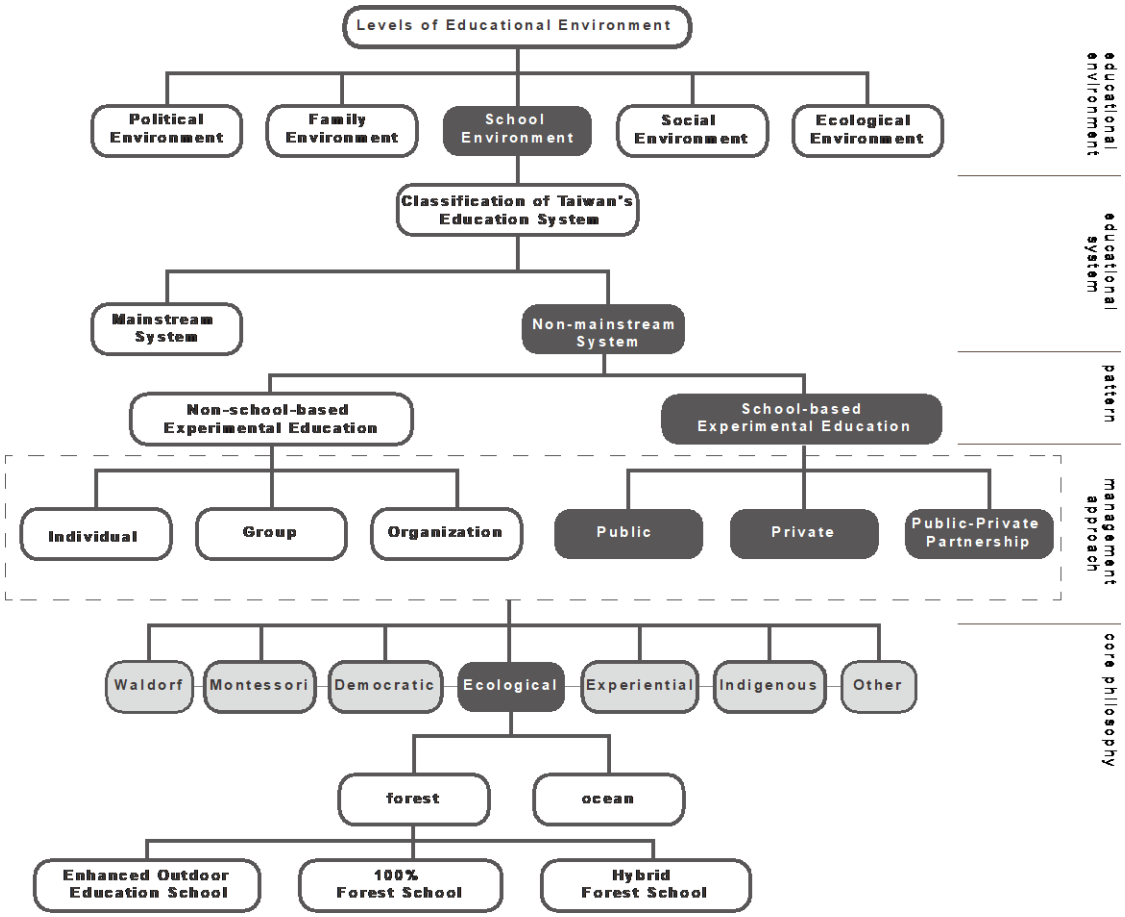


Figure 7. Hierarchy Diagram of Experimental Education

Data source: Self-drawn in this study

3. Research Design

3.1 Research Framework

This study takes into consideration the guidance and intervention in education and utilizes interviews with teachers as the primary tool to explore how natural resources can support curriculum and their impact on children's environmental cognitive development. The research is divided into three main steps: "Classification of Natural Environmental Resources," "Integration of Nature into Curriculum Planning," and "Data Compilation." Through these steps, the study aims to derive insights into children's nature experiences and their interactive relationships.

The first step involves considering the diversity of natural resources in the research environment. The Land Cover Classification System (LCCS), developed by the Food and Agriculture Organization of the United Nations (FAO), is employed to create visual

representations of the composition of the school's internal and surrounding environments. Subsequently, interviews with teachers are conducted to verify the approaches used in incorporating nature into the curriculum, including resource composition, activity scope, and level of interaction. The interview content is then transcribed verbatim and coded to address the research questions, leading to the analysis and conclusion. Following this, data collection results are analyzed and discussed. Detailed descriptions of each step are provided below, and the research framework flowchart can be found below.

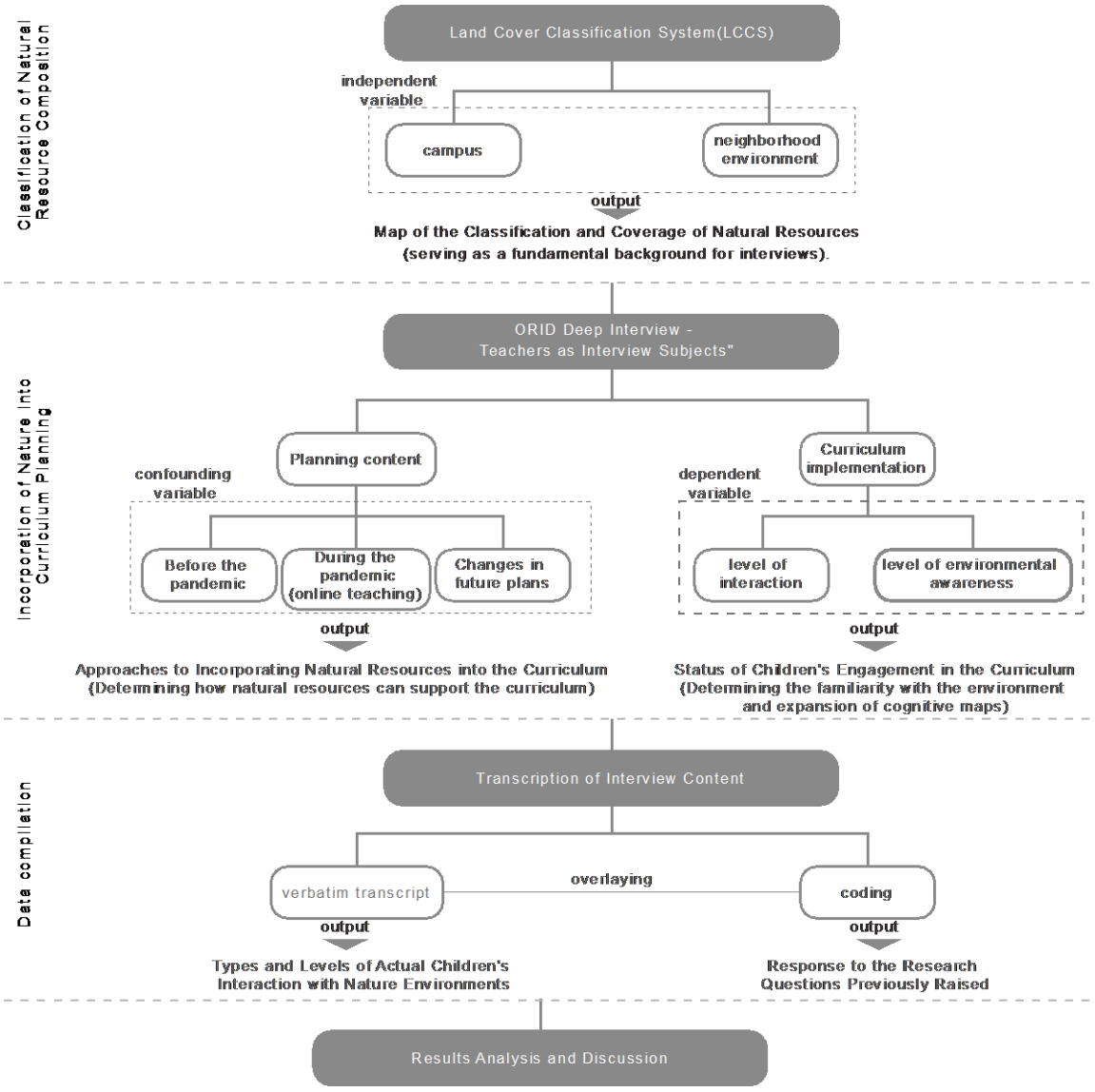


Figure 8. Research Framework Flowchart

3.2 Selection of Research Subjects

For this study, a total of 100 experimental primary schools under the category of school-type experimental education were selected from the list provided by the Ministry of Education for the 110th academic year. These schools were then categorized based on their educational philosophies, and those that emphasized ecological education and extensively incorporated natural resources into their curriculum planning were identified as experimental primary schools of interest.

Considering the differences between direct nature experiences in curriculum planning and the online teaching experiences during the COVID-19 pandemic, Taipei City and New Taipei City, which had experienced longer periods of online teaching compared to other cities and counties, were chosen. Among the three selected schools, Xishan Experimental Elementary School and Hutian Experimental Elementary School, located in Taipei City, are both situated within the Yangmingshan National Park. The third school, Zhongzi Parent-Child Experimental Elementary School (Zhongzi Elementary School), is located in the Wulai Bao'an Protection Zone in New Taipei City. After contacting and negotiating with the schools, Zhongzi Elementary School, which showed a higher willingness to cooperate, was ultimately selected as the research subject. The selection process flowchart is presented below.

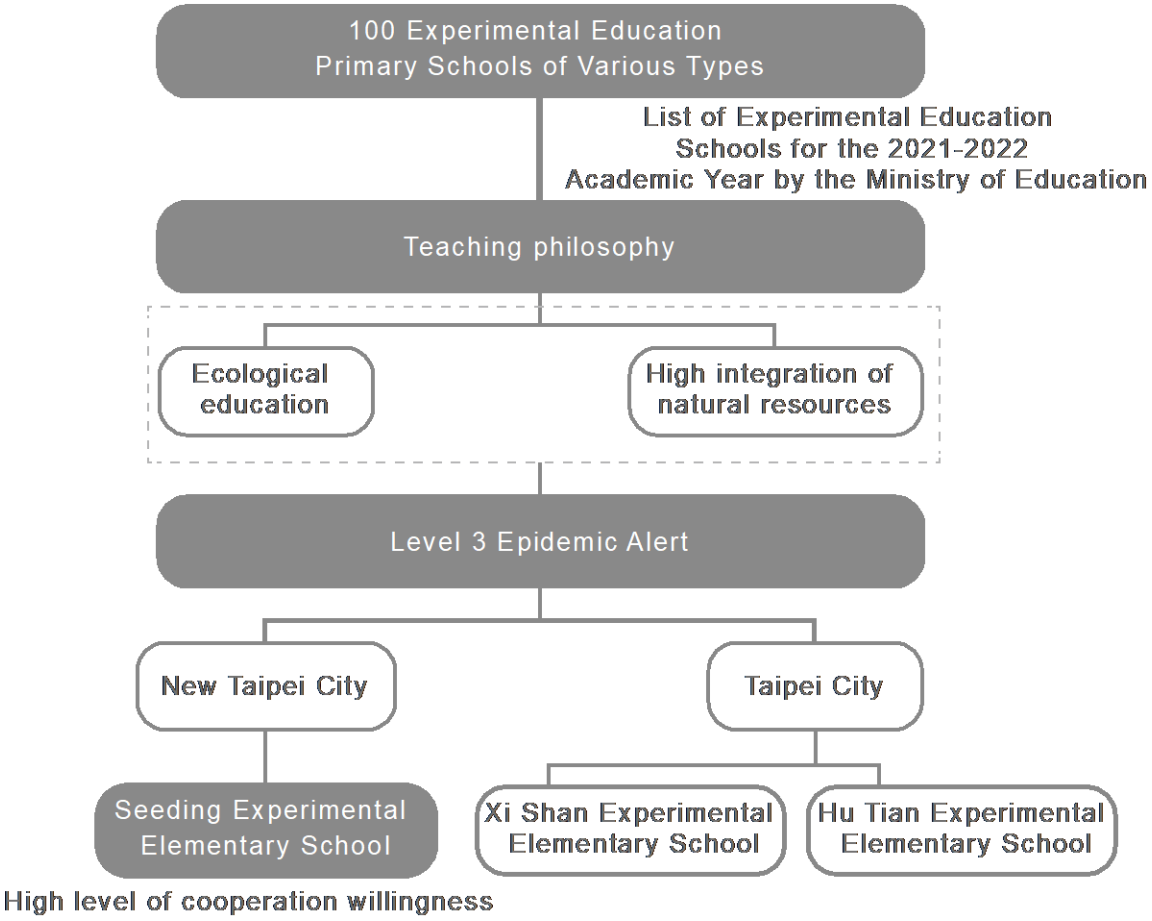


Figure 9. Flowchart of Research Subject Selection Process

3.3 Composition and Construction of Natural Environmental Resources for the Research Subjects

Given that previous studies have mainly explored the relationship between the degree of green space and child development, it is important to consider the differences in environmental factors between domestic and international contexts. Additionally, some studies have shown a significant correlation between water body exposure and well-being (Vitale et al., 2022). Taking all of these factors into account, this study incorporates the diverse composition of natural elements. Therefore, the "natural resources" in this study are based on the Land Cover Classification System (LCCS) developed by the Food and Agriculture Organization (FAO) of the United Nations. Rather than limiting the natural resources to green spaces alone, the study considers the physical coverage observed on the earth's surface, including descriptions of vegetation characteristics and whether the features are natural or artificial. This approach helps identify the composition of the

surface in the study area and provides a clearer understanding of the environmental resources in the selected experimental schools for subsequent curriculum integration.

Considering that children may be taken to different locations based on the arrangement of the curriculum, interviews will be conducted to determine the range of physical contact with natural environments. Subsequently, the LCCS classification system will be utilized at the third level of the level-two subzone to create maps.

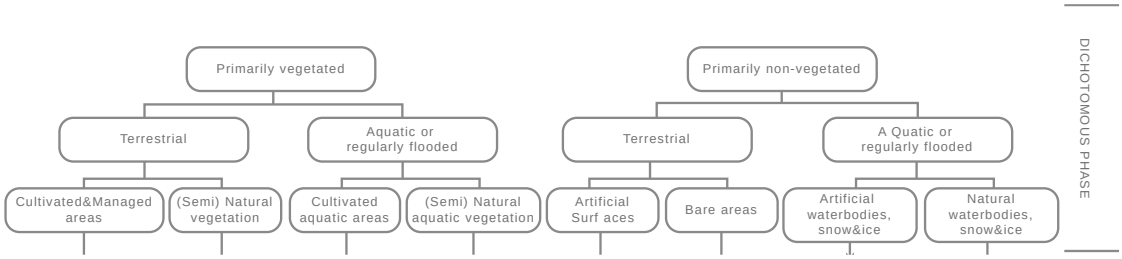


Figure 630. Dichotomous Phase
Data Source: Cited from Di Gregorio, 2005

3.4 Experiencing Interaction with Nature at Different Levels

3.4.1 ORID Interviews

Focused conversation is a conversational approach that centers around a specific topic or goal, aiming to facilitate deep thinking, communication, creativity, and collective wisdom. ORID is one of the specific application models within focused conversation, used to promote meaningful discussions and decision-making. It consists of four stages: Objective, Reflective, Interpretive, and Decisional (Stanfield, 2000).

3.4.2 Interview Content

This study will employ the ORID focused interview method and develop an interview outline. The interview will focus on the following aspects:

(1) Integration of natural resources in the curriculum by teachers: This part of the interview aims to confirm the scope of activities and the inclusion of natural resources in curriculum planning. It also explores the differences, potentials, limitations, and possibilities for improvement in incorporating natural resources based on the incidental circumstances of the COVID-19 pandemic (online teaching).

(2) Facilitating children's interaction with nature during classroom implementation: Building on the understanding of curriculum planning mentioned above, this aspect further identifies the level of interaction between children and nature. The primary research subjects of this study are elementary school students, aged between 6 and 12

years, spanning the last three stages of Jean Piaget's cognitive development theory. Their curiosity drives sensory stimulation and cognitive development from concrete object recognition to logical reasoning and abstract concept thinking. Therefore, the study measures and operates on the stimuli, frequency, and duration of sensory experiences to promote environmental cognition development.

(3) Children's level of environmental cognition after participating in the classroom activities[3]: Finally, through the observations made by the teachers during the classes, the level of environmental cognition among participating children will be assessed. This assessment may involve evaluating the children's familiarity with the environment, the expansion of their cognitive maps, or other judgment criteria proposed by the interviewees.

3.4.3 Pilot Interview and Confirmation of Interview Outline

Prior to conducting formal interviews, a pilot interview will be conducted with teachers from the research schools to ensure the readability and effectiveness of the interview questions. Based on the feedback received, the interview outline will be revised and finalized. For the pilot interview, Teacher Wenning, who has been teaching at the Seed School for 18 years, will be invited as the interviewee. Teacher Wenning primarily teaches subjects related to holistic development, including physical and sensory development, language, and social sciences. The interview outline will be adjusted accordingly, as shown in the table below:

[3] This item is not within the scope of this discussion.

Table 1. Interview outline

Interview Activity Planning Sheet - Final		
Seeding Experimental Elementary School Teacher Team	Theme: Interaction between Natural Spatial Resources and Children in Experimental Elementary Schools	
Preparation before the interview	**Steps**	
1.Voice recorder 2.Sticky note 3.Campus and Surrounding Area Map **Time/Location** Time:2023/05/04-05 Location:Seeding Experimental Elementary School **Actual Execution Results** To approach the curriculum from the perspective of teachers, and to understand the integration of nature into curriculum planning, actual interaction with nature, and the level of environmental awareness. **Opening remarks** ◦ A brief introduction: Graduated from National Cheng Kung University, a member of the 18th batch of Seed Experimental Elementary School alumni. The focus of the interview content. ◦ Introduce the definition of nature integration into the curriculum and guide to fill in basic information. **Closing remarks** ◦Thank you for your participation. I would like to inquire about your willingness to assist in future research. ◦Casual chat: What are your thoughts and feelings about this interview experience? **Duration** Expected duration for one teacher: 60-90 minutes.	O	1. Please briefly describe the course planning you are responsible fo r. 2. Which parts of the curriculum utilize the natural resources in the surrounding environment? 3. Which specific natural resources are used to support the curriculum and how are they utilized? 4. What are the activities and locations where natural resources are used to support the curriculum? 5. During the pandemic (when online teaching was implemented), which parts of the curricu - lum were adjusted? 6. After the pandemic, are there any di fferences in the curriculum planning compared to before the pandemic?
	R	1. What are your beliefs as an educator? How do you perceive the relationship between the curriculum and the natural environment? 2. What kind of interactions do you hope children will have with nature in such a curriculum arrangement? 3. How do children actually interact with nature during the course? Building upon O5 and O6, what are the di fferences in the level of interaction between children and nature in the curriculum before, during, and after the pandemic? 4. What sensory perceptions do children excel in utilizing to engage with nature? What developmental impacts do you expect the curriculum arrangement to have on 5. children? Based on your observations as a teacher in the classroom, what influence do you think the 6. curriculum has on children's environmental awareness? To what extent does it impact them?
	I	1. Building upon O4, why did you choose these particular natural resources to be included in the curriculum? 2. Building upon R5, how do you observe and assess the level of cognitive understanding? 3. Building upon D1, what are the reasons for not currently incorporating certain natural resources?
	D	1. Based on the previous course arrangements and observation experiences, are there any approaches to integrating nature into the curriculum that you haven't tried yet but would like to explore further? 2. Is there anything important that I haven't asked about but you think should be addressed?

4. Empirical Analysis

Table 2. Basic information of the interviewed teacher

character	Interviewee	Teaching period	Subject/Grade level
Testing interview	A Teacher	18 years	1. Sexual and perceptual development (Lower Grades)
			2. Language and Social Studies
Actual Interview	B Teacher	4 years	1. Nature (Lower Grades)
			2. Mountain Activities (Middle/High Grades)
			3. Reading and Writing (Grade 3)
	C Teacher	1 years	1. Mountain Activities (Lower Grades)
			2. Atayal (Middle Grades)
	D Teacher	12 years	1. Mathematics (Grade 1,4)
			2. Bicycle (Lower/ Middle/High Grades)
			3. Game(Lower Grades)

4.1 Curriculum Planning/Interactivity

From Table 4, it can be observed that during the period of online teaching due to the pandemic, most of the curriculum implementation was suspended. Only symbolic approaches were used to incorporate nature into the curriculum. However, physical interaction with nature is also crucial for children's development. Therefore, an analysis is conducted to summarize the curriculum planning involving nature before and after the pandemic, as well as the level of interactivity for children.

Table 3. Curriculum planning and level of interaction

Curriculum	Incorporation of Nature Level				Teacher's observation of the level of interaction (through the five senses)
	Before the pandemic.	During the pandemic (online teaching).	After the pandemic.	Inclusion approach	
A-1	-	-	-	-	-
A-2	Direct	Symbolic	Direct	On a good weather day, take students to the riverside for writing; during the pandemic, incorporate nature through the use of memories.	-
B-1	Direct (2/5) Indirect (2/5) Symbolic (1/5)	Symbolic	Direct (2/5) Indirect (2/5) Symbolic (1/5)	Theme-based understanding of natural species with interweaving outdoor and indoor teaching. During the pandemic, share homemade animal and insect specimens.	Tactile, visual, olfactory, auditory
B-2	Direct (2/3) Indirect (1/3)	-	Direct (2/3) Indirect (1/3)	Arrange the curriculum according to seasons: planting plants in spring, playing by the stream in summer,	Tactile, visual, auditory

				collecting plants in autumn, and making fires in winter.	
B-3	Direct (1/5) Indirect (1/5) Symbolic (3/5)	-	Direct (1/5) Indirect (1/5) Symbolic (3/5)	Guide students to observe outdoors and provide writing assistance based on nature-related writing themes.	Tactile, visual
C-1	-	-	Direct (1/3) Indirect (1/3) Symbolic (1/3)	Explore nature through the understanding of Atayal indigenous culture and engage with nature through the Atayal language.	Tactile, visual, auditory
C-2	-	-	Direct (1/3) Indirect (1/3) Symbolic (1/3)	-	-
D-1	Symbolic (8/10)	Symbolic (6/10)	Symbolic (8/10)	Integrate mathematics application and imagination through stories about the forest.	-
D-2	Direct (8/10)	-	Direct (8/10)	Engage in nature through cycling to specific destinations, inspired by the concept of travel.	Tactile, visual
D-3	Direct (8/10)	NO	Direct (8/10)	Allow students to play in a semi-natural environment through games.	Tactile, visual

Regardless of whether the curriculum is highly related to nature or not, students are exposed to nature in a direct way through suitable topics. Through interviews, it was found that the sense of touch is the most important among the five senses for children's experiences. Allowing them to touch objects enhances their curiosity. Visual stimuli also play a guiding role in encouraging children to use their sense of touch. Additionally, taste experiences can increase children's attention, and teachers often incorporate nature experiences with food, even encouraging students to observe and find edible plants along walking routes. Most teachers have observed that among the five senses, hearing is the least conscious sense for children. Sounds are not a prominent aspect of their nature

experiences.

4.2 Natural Environment Layering

Based on the aforementioned curriculum planning and the level of children‘s interaction with nature, it can be mapped onto the composition of the natural environment. Through teacher observations, it was found that in addition to designated environments with high interaction in the curriculum, walking areas are particularly familiar to children and provide opportunities for close sensory interaction. Along these routes, plants, animals, and artificial water channels serve as objects of interaction for children, offering a linear space where visual, tactile, and gustatory senses are highly engaged.

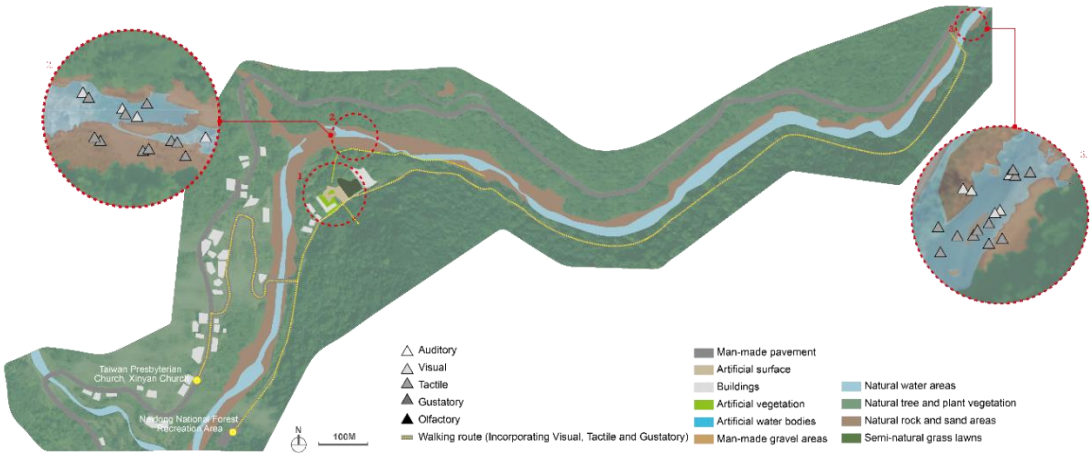


Figure 641. Composition of natural elements within walking range and level of children’s interaction with nature

Data source: Reference to aerial photographs from the National Geographic Information System. The diagrams in this study were created by the researchers.

The frequently designated outdoor spaces outside the school encompass natural water areas and sandy regions, providing opportunities for children to engage in water-related activities such as wading, water-floating, diving, catching fish and tadpoles, and stream tracing. These activities promote sensory interactions involving touch and vision. Within the school premises, the use of natural tree vegetation and artificial plants is common in curriculum integration. In addition to visual and tactile interactions, the aroma of fruit trees is often used to guide olfactory interactions among children. Additionally, semi-natural grassy areas, artificial gravel regions, and man-made water features serve as curriculum spaces. In these areas, children primarily engage in visual and tactile interactions, including observing animals and plants, collecting firewood, and digging soil

as part of the curriculum activities.

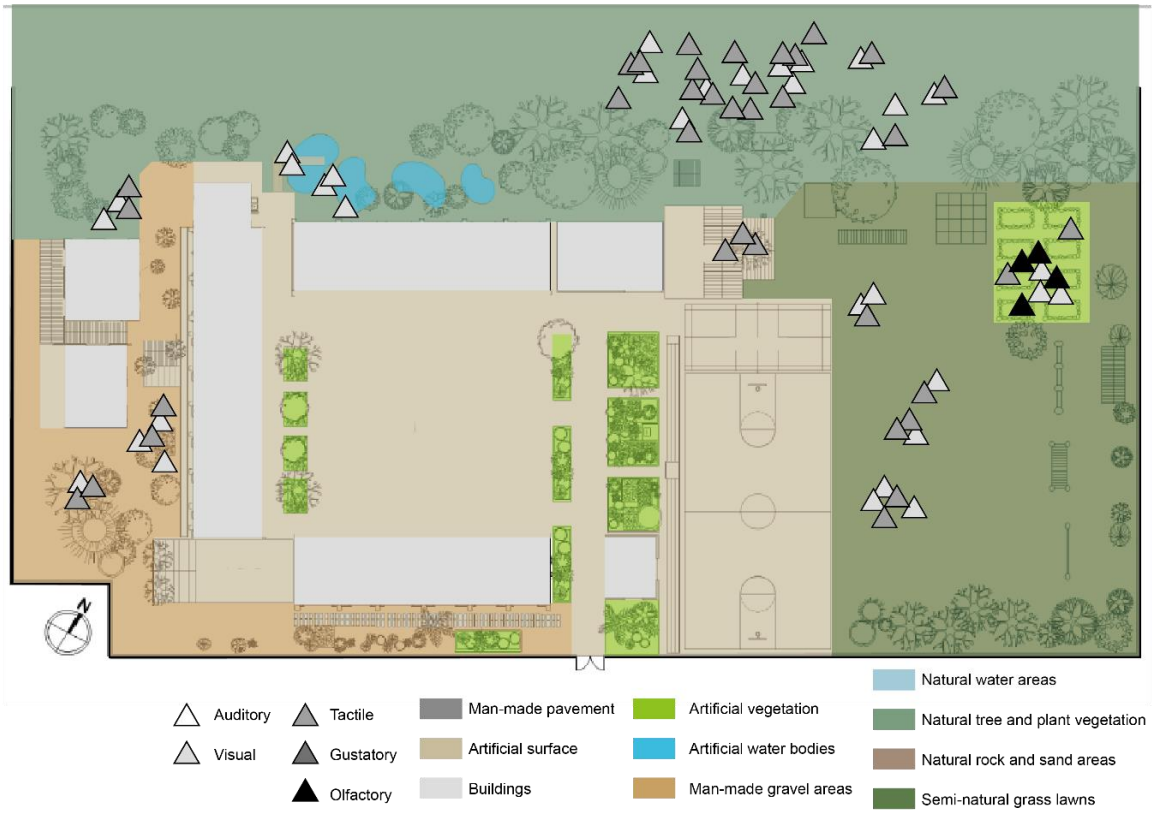


Figure 12. Level of Interaction of Children with Nature within the School Campus

Data Source: Base map adapted from Tsai, J. R. (2013), created by the researchers in this study.

4.3 Synthesis Analysis

From the perspective of natural components, both direct and indirect natural environments play a supportive role in the curriculum. However, in direct environments, the diversity of organisms allows for more observations and interactions. By creating an atmosphere that strongly supports tactile experiences, coupled with initial emphasis on visual and gustatory stimuli to stimulate children's interest in interacting with nature, the goal is to enhance tactile sensory stimulation and promote natural interactions. For children, tactile experiences are considered the primary mode of interaction.

Walking is the most suitable way to connect with the natural surroundings in the neighborhood. Although the scope of perception within the school environment is limited, compared to cycling or taking a car to specific natural sites, walking allows for a higher level of engagement with nature. Through the tactile, visual, and gustatory senses,

children can have a linear interaction with the natural environment, which serves as the fundamental basis for their engagement.

5. Research Findings

5.1 Incorporation of Natural Environmental Components in the Study Setting

The research findings reveal that the school included a significant amount of natural elements in its curriculum, making use of the existing resources in the surrounding area. These include abundant natural vegetation, natural water areas, and some artificial natural resources such as artificial vegetation, artificial water bodies, and certain areas with artificial gravel within the school campus. These components provide opportunities for children to continue their classroom experiences and maintain continuous engagement with nature. Considering safety requirements, opportunities for outdoor nature experiences were implemented within the classroom, utilizing nearby natural trails, streams, sandy and rocky areas along the creek, roadside ditches, as well as chicken coops in the neighboring community. Both natural and artificial environments were major and minor components integrated into the curriculum.

5.2 Impact of the COVID-19 Pandemic on Nature Engagement Opportunities in the Curriculum

Regarding curriculum adjustments during the pre-pandemic, pandemic, and post-pandemic periods, the research indicates that these unexpected events indeed affected both direct and indirect opportunities for children to engage with nature. During the online teaching period, many nature-based activities that involved direct contact were suspended, and the remaining activities were replaced with symbolic experiences. Apart from utilizing videos, photos, and teachers sharing their own animal specimens and plants as input-based experiences, children were also guided to engage with nature through output-based activities such as writing and recalling. After the online courses concluded, the school returned to the pre-pandemic approach of incorporating nature, relying heavily on direct and indirect nature experiences to support the curriculum.

5.3 Tactile Sensation as the Primary Sense for Children's Interaction with Nature

Through interviews conducted in this study, it was observed that the sense of touch played a crucial role in children's interaction with nature, as reported by most teachers. Even in natural environments, if tactile sensation and its interaction were not available, it would weaken children's interest in engaging with nature. Therefore, when selecting environments, it is important to consider not only the composition of the natural environment but also whether it supports tactile experiences. Visual and gustatory senses

can be used as initial inducements.

5.4 Results and Recommendations

The school's curriculum arrangement and environmental provisions serve as mediums for children to interact with nature. Direct and indirect physical experiences with nature provide greater sensory interaction for children, with particular emphasis on supporting tactile, visual, and gustatory experiences. Therefore, it is recommended that schools focus on incorporating direct and indirect nature experiences in their curriculum and create an encouraging environment for children to use their sense of touch to engage with nature, thereby increasing opportunities for interaction between children and the natural world.

Further research can be conducted using the data collected in this study to delve deeper into children's cognitive development in relation to their environment. Additionally, adopting the perspective of the researcher and employing classroom observation as a means of assessing children's state can serve as the basis for designing questionnaires on children's environmental cognition. By adopting a three-fold perspective, a more comprehensive description of natural interaction can be achieved, and the relationship between environmental cognition and development can be validated. This deeper understanding can provide valuable insights for future curriculum arrangements that incorporate nature and offer recommendations for environmental adjustments.

References

ALMEIDA, D. Q., BARROS, H. & RIBEIRO, A. I. 2022. Residential and school green and blue spaces and intelligence in children: The Generation XXI birth cohort. *Science of The Total Environment,* 813**,** 151859.

ANABITARTE, A., GARCýA-BAQUERO, G., ANDIARENA, A., LERTXUNDI, N., URBIETA, N., BABARRO, I., IBARLUZEA, J. & LERTXUNDI, A. 2021. Is Brief Exposure to Green Space in School the Best Option to Improve Attention in Children? *Int J Environ Res Public Health,* 18.

AROLA, T., AULAKE, M., OTT, A., LINDHOLM, M., KOUVONEN, P., VIRTANEN, P. & PALONIEMI, R. 2023. The impacts of nature connectedness on children's well-being: Systematic literature review. *Journal of Environmental Psychology,* 85**,** 101913.

CHIUMENTO, A., MUKHERJEE, I., CHANDNA, J., DUTTON, C., RAHMAN, A. & BRISTOW, K. 2018. A haven of green space: Learning from a pilot pre-post evaluation of a school-based social and therapeutic horticulture intervention with children. *BMC Public Health,* 18**,** 1-12.

CORNELL, J. 1979. *Sharing Nature with Children. The Classic Parents' and Teachers' Nature Awareness Guidebook*, ERIC.

DADVAND, P., NIEUWENHUIJSEN, M. J., ESNAOLA, M., FORNS, J., BASAGA*Proceedings of the National Academy of Sciences,* 112**,** 7937-7942.
DI GREGORIO, A. 2005. *Land cover classification system: classification concepts and user manual: LCCS*, Food & Agriculture Org.
DOPKO, R. L., CAPALDI, C. A. & ZELENSKI, J. M. 2019. The psychological and social benefits of a nature experience for children: A preliminary investigation. *Journal of Environmental Psychology,* 63**,** 134-138.
GIFFORD, R., STEG, L. & RESER, J. P. 2011. *Environmental psychology*, Wiley Blackwell.
HONG, J., PARK, S. & AN, M. 2021. Are Forest healing programs useful in promoting children's emotional welfare? The Interpersonal relationships of children in foster care. *Urban Forestry & Urban Greening,* 59**,** 127034.
HUANG, S., TANG, L., HUPY, J. P., WANG, Y. & SHAO, G. 2021. A commentary review on the use of normalized difference vegetation index (NDVI) in the era of popular remote sensing. *Journal of Forestry Research,* 32**,** 1-6.
HUITT, W. & HUMMEL, J. 2003. Piaget's theory of cognitive development. *Educational psychology interactive,* 3**,** 1-5.
KELLERT, S. R. 2002. Experiencing nature: Affective, cognitive, and evaluative development in children. *Children and nature: Psychological, sociocultural, and evolutionary investigations,* 117151.
LARGO-WIGHT, E., GUARDINO, C., WLUDYKA, P. S., HALL, K. W., WIGHT, J. T. & MERTEN, J. W. 2018. Nature contact at school: The impact of an outdoor classroom on children's well-being. *Int J Environ Health Res,* 28**,** 653-666.
LEE, M., KIM, S. & HA, M. 2019. Community greenness and neurobehavioral health in children and adolescents. *Science of The Total Environment,* 672**,** 381-388.
LIAO, S.-Y. 2012. The application of piaget and bruner's cognitive-developmental theory in children's dance teaching. *The International Journal of Arts Education,* 10**,** 164-197.
LIU, W. & CHEN, J. 2021. Green spaces in Chinese schools enhance children's environmental attitudes and pro-environmental behavior. *Children, Youth and Environments,* 31**,** 55-87.
LOUV, R. 2008. *Last child in the woods: Saving our children from nature-deficit disorder*, Algonquin books.
MUELLER, M. A. E. & FLOURI, E. 2020. Neighbourhood greenspace and children's trajectories of self-regulation: Findings from the UK Millennium Cohort Study. *Journal of Environmental Psychology,* 71**,** 101472.
Ministry of Education https://reurl.cc/Ov7aW3 Accessed [22/05/2023]
O'BRIEN, L. & MURRAY, R. 2007. Forest School and its impacts on young children: Case studies in Britain. *Urban Forestry & Urban Greening,* 6**,** 249-265.
Outdoor Education Resource Platform https://outdoor.moe.edu.tw/ Accessed [22/05/2023]
PACI~NCIA, I., MOREIRA, A., MOREIRA, C., CAVALEIRO RUFO, J., SOKHATSKA, O., RAMA, T.,

HOFFIMANN, E., SANTOS, A. C., BARROS, H. & RIBEIRO, A. I. 2021. Neighbourhood green and blue spaces and allergic sensitization in children: A longitudinal study based on repeated measures from the Generation XXI cohort. *Science of The Total Environment,* 772**,** 145394.

PUTRA, I. G. N. E., ASTELL-BURT, T. & FENG, X. 2022. Caregiver perceptions of neighbourhood green space quality, heavy traffic conditions, and asthma symptoms: Group-based trajectory modelling and multilevel longitudinal analysis of 9,589 Australian children. *Environmental Research,* 212**,** 113187.

Parenting World https://www.parenting.com.tw/article/5092101 Accessed [22/05/2023]

RASOLOFOSON, R., HANAUER, M., PAPPINEN, A., FISHER, B. & RICKETTS, T. 2018. Effects of forests on children's diets in developing countries: a cross-sectional study. *The Lancet Planetary Health,* 2**,** S15.

REUBEN, A., ARSENEAULT, L., BELSKY, D. W., CASPI, A., FISHER, H. L., HOUTS, R. M., MOFFITT, T. E. & ODGERS, C. 2019. Residential neighborhood greenery and children's cognitive development. *Social Science & Medicine,* 230**,** 271-279.

RIBEIRO, A. I., TAVARES, C., GUTTENTAG, A. & BARROS, H. 2019. Association between neighbourhood green space and biological markers in school-aged children. Findings from the Generation XXI birth cohort. *Environ Int,* 132**,** 105070.

SALEH, N. H. & ABOELGHAR, M. A. 2013. Land cover map delineation, for agriculture development, case study in North Sinai, Egypt using SPOT4 data and geographic information system.

SHAFFER, D. R. & KIPP, K. 2013. *Developmental psychology: Childhood and adolescence*, Cengage Learning.

STANFIELD, R. B. 2000. *The art of focused conversation: 100 ways to access group wisdom in the workplace*, New Society Publishers.

UNICFF https://reurl.cc/mD69EV/Accessed [22/05/2023]

VITALE, V., MARTIN, L., WHITE, M. P., ELLIOTT, L. R., WYLES, K. J., BROWNING, M. H. E. M., PAHL, S., STEHL, P., BELL, S., BRATMAN, G. N., GASCON, M., GRELLIER, J., LIMA, M. L., L*Journal of Environmental Psychology,* 84**,** 101876.

WEELAND, J., LACEULLE, O. M., NEDERHOF, E., OVERBEEK, G. & REIJNEVELD, S. A. 2019. The greener the better? Does neighborhood greenness buffer the effects of stressful life events on externalizing behavior in late adolescence? *Health & Place,* 58**,** 102163.

WELLS, N. M. & EVANS, G. W. 2003. Nearby nature: A buffer of life stress among rural children. *Environment and behavior,* 35**,** 311-330.

Wang Yi-Wen (2020) 2020 Group Overview, Organizations, Experimental Schools. Parenting World

ZARE SAKHVIDI, M. J., KNOBEL, P., BAUWELINCK, M., DE KEIJZER, C., BOLL, L. M., SPANO, G., UBALDE-LOPEZ, M., SANESI, G., MEHRPARVAR, A. H., JACQUEMIN, B. & DADVAND, P. 2022. Greenspace exposure and children behavior: A systematic review. *Science of The Total Environment,* 824**,** 153608.

ZARE SAKHVIDI, M. J., MEHRPARVAR, A. H., ZARE SAKHVIDI, F. & DADVAND, P. 2023. Greenspace and health, wellbeing, physical activity, and development in children and adolescents: An overview of the systematic reviews. *Current Opinion in Environmental Science & Health,* 32**,** 100445.

何昕家 & 張子超 2011. 初探「環境中的心理、行為與教育相關理論」－－以校園建成環境為基礎. *國立臺中技術學院通識教育學報*, 85-103.

林孟潔 2020. 以皮亞傑認知發展理論為基礎比較奧福與柯大宜音樂教學法.

張小南 2010. 園藝治療活動對自閉症幼兒效益之個案研究.

陳碧雲, 施宜煌 & 葉彥宏 2018. 幼兒生命教育理念的開展-蒙特梭利教育觀的啟示. *人類發展與家庭學報*, 101-121.

龚健雅, 许越, 胡翔云, 姜良存 & 张觅 2021. 遥感影像智能解译样本库现状与研究.

彭千芸. 2010. *另類教育與即興美學-一位華德福學校學生的生命故事.* 國立政治大學.

蔡佳容 2013. 實驗小學校園空間規劃研究-以種籽實小為例.

PLANNING THE 15 MIN CITY-THE CASE OF CHANIA (1125)

Despina Dimelli

Urban and Regional Planning Laboratory, School of Architecture, Technical University of Crete; ddimelli@tuc.gr

Abstract. According to C40 Cities Climate Leadership Group & C40 Knowledge hub, adopting a 15-minute city strategy means striving for an urban model that allows everyone, in every neighborhood, to meet most of their daily needs within a short walk or bike ride of their home.

The current paper will examine the possibilities of a typical Greek city, Chania, to be developed as a 15minute city. The city is chosen as it combines dense development in its historic center, and sprawled development in its borders, so these contradictions are decisive for its sustainable mobility development. Its inhabitants and visitors mostly use cars for their daily needs fact that is caused by the lack of pedestrians and cyclist networks and the fragmental way public uses and areas have been diachronically developed in the city. Research will examine the positions of public uses and areas, their connections with mobility networks and it will evaluate their accessibility. Finally, it will propose strategies for the adjustment of the city in the principles of the 15-minute city.

Keywords: 15-minute city, post pandemic cities, Chania, urban planning.

1. Introduction

During the 1960's decade Jane Jacobs in her work, argued that the creation of living cities directly depends on the proximity of their inhabitants (Jacobs, 1961). Through the next decades, urban theorists highlighted the consequences of capitalism in alleviating social and economic inequalities in the urban space (Lefebre, 2007) but also the need to shift the view of the city from the global to the local (Massey, 2005). Additionally, new technologies became new key parameters for the development of urban space, as their applications became basic elements for modern cities function.

Today, the new conditions shaped during the COVID19 pandemic, have led to the mitigation of social inequalities, and to the increase of unemployment on a global level. In this context, it is important to develop safer, more resilient, sustainable, and inclusive cities (Pozoukidou & Chatziyiannaki, 2021). The restrictions that emerged during the COVID19 pandemic made proximity a necessary feature, for urban space's function. According to data presented in the Moreno, Allam, Chabaud, Gall, and Pratlong

publication, during the period of the pandemic, cities developed different interventions. Many cities expanded their pedestrian and cyclists' networks while in other cities the role of public spaces was emphasized with the design and planning of new mostly small-scale parks and public squares. In some cases, cities proceeded to the development of small-scale and local service shops and the utilization of their external spaces, small-scale housing for the homeless and in some cases in the development of floating hospitals for the coverage of the extended healthcare needs (Moreno, et al., 2021).

2. The 15-minute city model

These new conditions that arised from the COVID19 pandemic, set the base for a dialogue for new cities forms which will provide the solutions for the emerging needs of modern societies. What was obvious was the need to redesign urban neighborhoods, cities basic urban cells in a way that will make them accessible by sustainable mobility means of transportation and ensure a mix of urban functions. These urban cells- neighborhoods can form cities in which in 15 minutes their inhabitants can approach the functions for the coverage of their needs without the need of their car. The 15-minute city is an urban planning concept in which most daily necessities and services, such as work, shopping, education, healthcare, and leisure can be easily reached by a 15-minute walk or bike ride from any point in the city (Weng, et al., 2019). This approach aims to reduce car dependency, promote healthy and sustainable living, and improve wellbeing and quality of life for city dwellers (Khavarian-Garmsir, et al., 2023). It creates a 'human-scale' city composed of vibrant, people-friendly, 'complete' neighborhoods, connected by quality public transport, and cycling infrastructure for the longer trips that residents want or need to make.

The concept of the 15-minute city assumes that the quality of life of city dwellers depends on the time they spend commuting by vehicle. Its originator Carlos Moreno argued that the more time a city dweller spends commuting to the various activities of his daily life by car, the lower the level of his quality of life (Moreno, 2021). The proposal of the 15-minute city development was strongly supported by the mayor of Paris, Anne Haldago (Fig.1), as the main axis of her election campaign (Willser, 2020) .

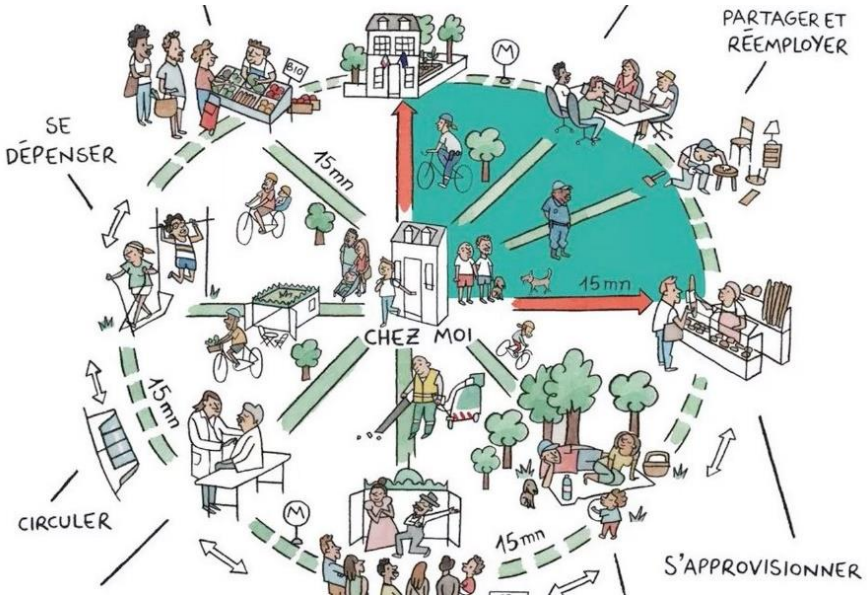


Figure 1. Anne Hidalgo's vision of a 15-Minute City according to her campaign Paris
Source: Paris en commun, Micael.

According to Andres Duany and Robert Steuteville, the 15-minute city is structured into three levels based on distances, and subsequently the times required for its inhabitants to travel these distances (Duany & Steuteville, 2021):

- The first level is the areas that can be reached on foot in 5 minutes and have a radius of 400 meters (1/4 mile). Local scale uses, neighborhood level and corresponding public spaces are developed in these areas. A key parameter is the development of many different types of residential buildings so that the area can be inhabited by all social and income strata. It is estimated that based on optimal density, this area can house 2,600 people.
- The second level is the areas that can be reached on foot in 15 minutes and have a radius of 1200 meters (3/4 mile).
- In these areas, commercial and educational uses of a larger scale and scope are developed. Green spaces and other public spaces of a larger scale are developed, while a basic condition for the development of this area is the development of public transport hubs which are the starting points or destinations of the pedestrian and bicycle networks. At this level the estimated population capacity amounts to 23,000 people.

- The third level is the areas that are covered in 15 minutes by bike and have a radius of 4,500 meters (3 miles)

In these areas, supra-local scale activities are developed (hospitals, city parks, etc.) and high-capacity networks are developed. At this level the served population is estimated at 350,000 inhabitants.

The above framework demonstrates the flexibility of the 15-minute city model as it can maintain its essential properties at all scales of urban space.

The short distances and short access times achieved with the 15-minute urban areas contribute to saving time in the daily life of the residents, (Liu, 2019) , reducing the use of the vehicle, therefore fuel consumption and pollutant emissions, in saving money and in the use of the space that until now was used for the vehicle in areas as pedestrian paths or green spaces.

The experience of the COVID19 pandemic led to the recognition of an additional key parameter that contributed to the continuous function of the city during the period of restrictive measures, the parameter of new technologies (Moreno, et al., 2021). The capabilities provided by smart solutions during the pandemic, convinced advocates the role of smart city technologies to supplement other principles (Allam, et al., 2022). Smart technologies, as big data and the internet of things, contribute to citizens and planners in planning and decision-making processes, and enable residents to use resources more efficiently. According to the above the main parameters that shape the 15-minute city are density, proximity, diversity, and the development of new technologies (Moreno, et al., 2021).

2.1. Density in the 15-minute city model.

Density is a key parameter for urban development. Salingaros states that the optimal density is that which ensures sufficient public space for the inhabitants of an area and creates the conditions so that they can be served in their daily life without the use of the vehicle (Salingaros, 2006).

In the 15-minute city model, the public spaces can have multiple roles. Thus, school yards can have a more public character and function as parks to ensure their continuous use by all residents of the neighborhood (Moreno, Allam, Chabaud, Gall, & Pratlong, 2021).

An additional parameter that should be highlighted is the equality that the public spaces can promote as they are used by everyone regardless their economic and social status, but also by people with disabilities through the promoted alternative transportation networks which provide easy and quick, due to the short distances, access to the public space (Sisson, 2020).

2.2. Proximity in the 15-minute city model

Proximity in the 15-minute neighborhoods has a spatial and temporal dimension, as the short distances ensure quick access for residents to all the city's activities. This proximity can contribute to the development of social interaction (Alexander, 2002). Neighborhood residents can easily walk or cycle through the networks of sidewalks and bike paths to any activities that interest them, thereby utilize all available spaces (Duany, et al., 2000)). Planning shifts from the prioritization of private vehicle to the pedestrian, cyclist and Means of Mass Transport utilization. (Fig 2).

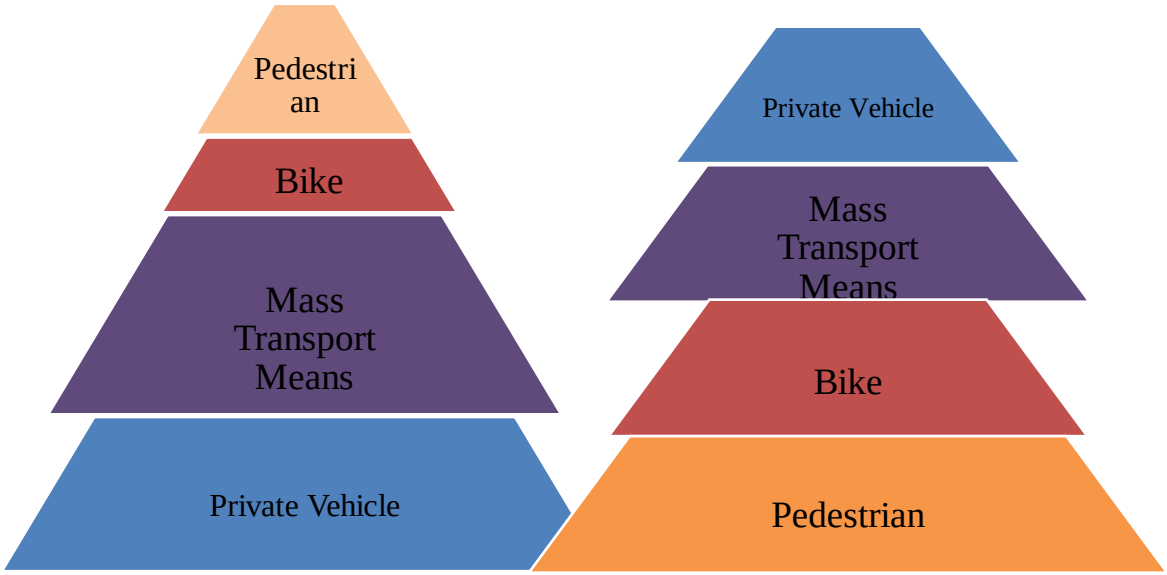


Figure 2. The old mobility planning priorities (left) and the new priorities(right) for achieving proximity in the 15-minute city

Source: Author.

2.3. Diversity in the 15-minute city model

A key feature of the 15-minute neighborhoods is the balanced development of activities with an emphasis on the human-centered neighborhood scale. As for land uses, achieving cross-functional development can be accomplished with different tools.

More specifically in suburban areas there are several concerns about the implementation of the "15- Minute City." Peripheral parts of cities have been relegated to suburban or residential status, as various studies have demonstrated (Guagliardo, 2004), and have less convenient access to services (less than 15 minutes by walking or cycling) (Vitale Brovarone, 2022). Due to the severe zoning restrictions regarding residential uses, these locations are the most difficult to handle. A shift in the narrative that has been directing

contemporary city planning worldwide is necessary to realize the aspirations of the "15-Minute City" in suburban regions as it promotes the-mix of typical uses as well as a decrease in automobile dependence, which has long been the norm in suburban areas.

In the USA the tools for defining uses have been enriched by promoting participatory processes at the neighborhood level (Form Based Codes Institute, 2021). In Buenos Aires, permitted uses are interconnected with building forms. Thus, at the neighborhood level, the uses promoted should be compatible with the building forms, thus giving the opportunity in residential areas to develop a variety of local uses. The Municipality has also, envisioned each neighborhood to have an administration building adjacent to educational functions to encourage city-wide decentralization and enhance neighborhood center development. In Vancouver, land use regulations changed in 2018 and made it mandatory to develop urban gardening for food production in neighborhoods. In the same vein, in New York, Lagos, Paris and London, school courtyards are used as community gardens.

Diversity of the 15-minute city is achieved through the development of many and different functions to cover all the needs of its residents (Moreno, et al., 2021). Functional self-sufficiency does not mean that the residents of the 15-minute city do not develop functional relationships with other areas of the city, as there is always a need to "use" other areas with different activities and characteristics. The base of the model is that daily essential activities are covered by walking or cycling while having the possibility to access and use other areas with other means as well.

2.4. New technologies in the 15-minute city model.

The use of new technologies is the tool to achieve density, proximity, and diversity in the 15-minute city. Smart applications supplement sustainable urban mobility (eg bike sharing), remote working, the participation of residents in planning processes and other aspects of the organization and operation of the 15-minute city. After all, recent experience has shown that the applications of digital technologies during the pandemic greatly facilitated in the cities function.

3. The case of Chania - A brief introduction

The study area of the research project is the Municipality of Chania (Fig 3) in Crete, an urban area of Southern Greece that occupies an area of 10.862 acres and has a population of approximately 90.000 inhabitants.

The city is chosen as it presents the typical characteristics of a Greek city. It has a dense coastal historic center, and it is surrounded by new areas constructed in different time periods according to social, economic, and political parameters. Its borders are constantly

expanding in a sprawled way and due to the lack of construction restrictions and controlling mechanisms; it has a lot of arbitrary constructions (Dimelli, 2021). With a coastline-built area, a historic district, many random structures, and expansive new growth zones, Chania is a typical Greek metropolis.

 Fig

Figure 3. The urban area of Chania
Source: Google Earth.

Chania city expanded over the past decades based on an urban plan that was enacted in 1988. The goal of this plan was to promote recreation and tourism in the city's historic district and its coastal zones, as well as residence and other public amenities that support residence, in the "inner" zones of the city.

3.1. Density of the 15-minute neighborhoods in Chania

Over the years, Chania has seen the development of several structures. Some of them were constructed under urgent conditions, as the necessity for post-war rehabilitation and shelter for refugees. Buildings on streams, remnants of the Venetian moats, and other sites resulted from the growth of these demands mixed with the scarcity of available land and zoning limitations. A second wave of structures that take advantage of the current legal system and are developed in places as streams and coastal zones have also emerged because of the Greek state's legalization of arbitrary constructions.

The density of the city presents many fluctuations. The existing built environment presents a median plot ratio that varies from 1,40 in the city’s central zones and 0,60 in

its suburbs, that are developed in the city's boundaries. During the last decades the city's population increased with fast rates, as according to the 2021 census it was estimated in 88.865 residents (Hellenic Statistical Authority, 2021), presentencing an increase as it was 84.527 according to the 2011 census (Hellenic Statistical Authority, 2011) .

This increase is reflected in new constructions that are developing in a sprawled form in the city's suburbs. The lower land prices, the lack of restrictions and the advantages of the natural environment in the city's borders act as attractors that have so far favored sprawled low-density development. On the other hand, the center of the city, where most urban activities are allocated is a less attractive area for residence for many reasons. The open and green spaces are few, the roads are congested, the conditions for cyclists and pedestrians are difficult due to the lack of the corresponding infrastructures and the land prices are high compared with the suburbs. An additional factor that does not further promote living in the central parts of the city is tourism. Many buildings are used for short term leasing as they are inscribed in platforms as Airbnb, while the intense noise, traffic and the development of recreation and other tourism activities have led to the reduction of the permanent residents in the city's central core. The high density of the city in the central areas can be a factor that will promote the development of the 15-minute city model, while on the contrary, the low-density residential areas that are developing do not have the basic characteristics to be developed according to this model's principles.

3.2. Proximity of Chania's neighborhoods

Proximity in the 15-minute neighborhoods is an important factor, as the short distances ensure quick access with the use of sustainable mobility ways for residents to all the city's activities. Proximity promotes cyclists and pedestrians mostly for local distances, while it facilitates the role of means of Mass Transport.

In the city of Chania, according to the recent Sustainable Urban Mobility plan the basic choice of the city's residents for their journeys is the private car as the use of sustainable means of transportation (public transport, pedestrians, bicycles) is limited. It is recorded that almost 97% of the city's residents use their car of their motorcycles, while people who use bicycles or the existing network of buses is limited.

The existing mass transport means are only serving 4,7% of the residents needs for many reasons. A basic parameter is the low frequency of routes that is estimated in approximately every 30 minutes, and the low average speed of the bus vehicles in morning peak. As for the existing pedestrians' network this is downgraded. The absence of a satisfactory Mass Transport means network leads to the high dependence of the use of motorized vehicles (Municipality of Chania, 2018)

Many sidewalks are extremely narrow, or in bad condition so it is not easy for residents

and visitors to walk in the city. It is characteristic that although the minimum standard width for pavements is two meters according to the Greek legislation, the medium width is 1,7 meters. The historic center is in its most parts developed for pedestrians, but the rest "new" city is presenting difficult conditions for walking. The cyclists' network is still weak, and it does not serve central, educational, cultural and other public functions.

As for parking conditions, although a satisfactory amount of offered parking spaces is offered, however, the problem of illegal parking is still intense

The increased mobility demands during the summer season caused by tourism and the low capacity of the existing infrastructures lead to traffic congestion. Finally urban planning and mobility planning are not connected fact that leads to fragmental interventions.

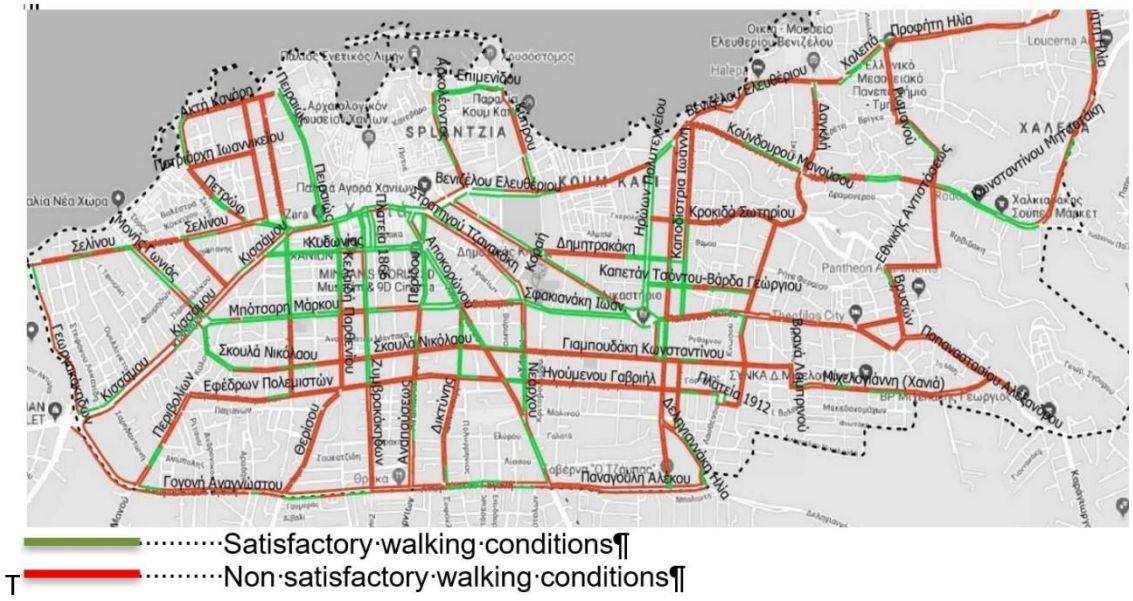


Figure 4. Pedestrian walking conditions
Source: (Municipality of Chania, 2018).

3.3. Diversity in Chania's neighborhoods

In the 15-mitute city residents can find a variety of land uses that fulfil all their daily needs and urban functions close to their homes. A basic parameter for the development of the 15-minute neighborhoods is the balanced development of activities with an emphasis on the human-centered areas. The development of urban cells that concentrate the necessary needs for neighborhoods function is an important characteristic of 15-minute cities as they it.

In Chania city where the historic dense zones, co-exists with the sprawled suburbs the

achievement of mixed uses is a huge challenge. In the historic center the existing density favors the implementation of the 15-minute model as they provide greater densities, short ways, and a mix of different land uses (Birbi , et al., 2020). However, the intense tourism development has led to the relocation of activities for the area's residents due to tourism activities. So, the mono-functional development of hotels, tourism trade, restaurants and other tourism supplementary activities is a common characteristic in the historic city which is gradually facing the reduction of its permanent residents. As for the areas in the city's borders these are strongly depending on the city's central core (Fig5.) as they have not developed local- central activities.

Another characteristic feature is the development of retail "corridors" in the main rods, mostly the supra-local roads that connect the center of the city with the rest urban zones of the city. This kind of development, caused by the "freedom" that is provided by the existing land uses legislative framework allows the allocation functions as trade in the majority of the city's zones. So, although since the 1980's decade the existing plan attempted the creation of nucleus urban neighborhoods centers, still the provided freedom led to a different allocation, as the activities "preferred" to be allocated at both sides of central roads which served in a best way their function, in a city where private car is the main transport mean.

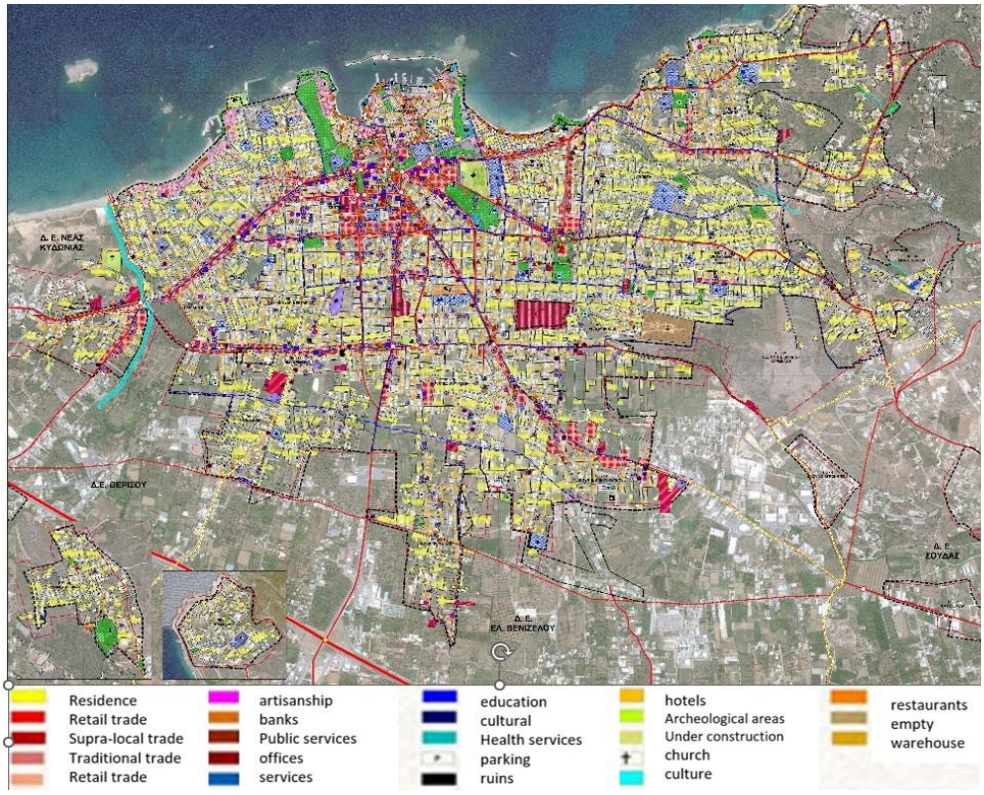


Figure 5. Land uses in Chania City
Source: (Doxiadis Associates, et al., 2017).

3.4. New technologies in Chania.

The Municipality of Chania during the last decade emphasizes its digital transformation and interaction with citizens, while creating an attractive environment for businesses, visitors, and operators. To make this transition the most appropriate, a Smart City Action Plan and a Strategic Marketing Plan for City Identification are developed. In the framework of the Act the role of. visitors, businesses, and operators is crucial for adapting data to the characteristics of the Municipality (Smart Cities-Greece Cyprus Interreg Project, 2023).

Until now the city has developed smart applications in the sectors of environmental protection, mobility, healthcare education, governance, and cyber security.

More specifically, Chania have developed smart applications in the following sectors:

- Geographic Information System for waste management using sensors in the fleet of garbage trucks of the Municipality.
- Integrated management platform of Beneficial Social Structures and Provision of Electronic Services.
- Integrated platform for the management of kindergartens.
- Smart Medical data collection and transmission devices
- Intelligent early fire detection system
- Environmental data Stations
- Energy consumption monitoring in municipal buildings
- Integrated Intelligent traffic light system
- Intelligent parking management system.
- Municipal Digital Training Center – Digital Academy
- Platform for consultation and participatory planning
- Cybersecurity Actions

In 2023, the city of Chania, received awards for its innovative smart development among other Greek cities.

The COVID19 period was a challenge for the city's residents that had the chance to use many of the above applications and integrate them in their lives. Still today, the main weaknesses are the degree that these applications are used by all ages and educational level citizens as still many of the city's residents are not familiar with many of public smart applications or even ignore their existence. Additionally, another problem that needs to be considered by the authorities is the lack of coordination of these applications under a strategic framework. So, although many smart applications are functioning , they are developed in a fragmental way fact that reduces their effectiveness.

4. Conclusions

The current paper is a part of a research that will proceed to further investigation with indicators that will specify the possibilities of the 15-mute city development in the city of Chania. Until today the macro-analysis of the examined city presents some interesting conclusions about the urban characteristics of the area in an urban context as the four main parameters that shape the 15-minute city, density, proximity, diversity, and the development of new technologies present a lot of weaknesses.

Density is a basic factor for the 15-minute city model as it promotes the required short distances for pedestrians and cyclists. In Greek cities, the lack of plans, the availability of land for sprawled constructions are key factors that create low density residential urban zones in the urban boundaries. As a typical Greek city, the city of Chania, presents a variety of densities. In its central historic core, a dense center is developed while in more distant urban zones, the densities are reducing, fact that intensifies the use of private vehicles.

Proximity is a parameter that further promotes the sustainable mobility means. In the examined city the existence of cyclists, pedestrians and means of mass transport networks is limited in the central zones of the city, where it also presents weakness in its infrastructures. So, except from the attractive for tourists' pedestrians' networks in the historic center, in the rest urban zones the conditions for walking and cycling are not satisfactory. It is important for the authorities to promote strategies and infrastructures for sustainable mobility that will be based on modal split and combine all the sustainable mobility means and then proceed to the development of networks in a local level which will make Chania's neighborhoods friendly for walking and cycling.

Diversity of land uses is a characteristic phenomenon mostly in the city's central areas and in linear zones, following main roads. The historic central zone concentrates the majority of supralocal and tourism functions. On the contrary on the distant from the center zones, the mono-functional development of residence is the common way of uses development.

Finally, the integration of smart technologies is an important factor for the organization and operation of the 15-minute city model. In the city of Chania, smart applications are developed in many urban activities as mobility, governance, education etc. Still, they can be organized in a better way so that they can supplement each other and produce a more effective smart city system.

References

Alexander, C., 2002. *The Nature of Order: The Process of Creating Life.* Berkeley, CA: The Centre for Environmental Structure.

Allam, Z. et al., 2022. Unpacking the ‘15-Minute City’ via 6G, IoT, and Digital Twins: Towards a New Narrative for Increasing UrbanEfficiency, Resilience, and Sustainability.. *Sensors*.

Birbi , S., Krogstie, J. & Karrholm, M., 2020. Compact city planning and development: Emerging practices and strategiesfor achieving the goals of sustainability. *Developments in the Built Environment*, pp. 1-20.

Bureau of Planning and Sustainability & Portland Housing Bureau, 2021. *Residential Infill Project and New Development Projects,* Portland: s.n.

C40 Cities Climate Leadership Group & C40 Knowledge hub, 2021. *15-minute cities: How to create ‘complete’ neighbourhoods,* s.l.: s.n.

Dimelli, D., 2021. Planning resilient cities: The case of Chania. *UPLanD - Journal of Urban Planning, Landscape & Environmental Design, 5(2)*, pp. 65-76.

Doxiadis Associates, Roikos, Lionis & Pavlaki, 2017. *Revison and expansion of Chania's Urban Plan, Phase B,* Chania: s.n.

Duany, A., Plater-Zyberk, E. & Speck, J., 2000. *Suburban Nation: The Rise of Sprawl and the Decline of the American.* New York: Dream North Point.

Duany, A. & Steuteville, R., 2021. *Defining the 15-minute city.* [Online] Available at: https://www.cnu.org/publicsquare/2021/02/08/defining-15-minute-city

Form Based Codes Institute, 2021. *Economic benefits & shared prosperity with form-based codes.* [Online] Available at: https://smartgrowthamerica.org/wp-content/uploads/2021/09/Economic-Benefits-of-FBCs-sRGB.pdf

Guagliardo, F., 2004. Spatial accessibility of primary care: concepts, methods and challenges.. *International journal of health geographics*, pp. 1-13.

Hellenic Statistical Authority, 2011. *Population Census,* Athens: Hellenic Statistical Authority.

Hellenic Statistical Authority, 2021. *Population Census,* Athens: Hellenic Statistical Authority.

Jacobs, J., 1961. *The Death and Life of American cities.* New York: Random House.

Khavarian-Garmsir, A., Sharifi, A. & Sadegh, A., 2023. "The 15-minute city: Urban planning and design efforts toward creating sustainable neighborhoods. *Cities*.

Lefebre, H. T. Π. (., 2007. *Δικαίωμα στην πόλη, Χώρος και Πολιτική.* Αθήνα: Πολιτεία.

Liu, J., 2019. *Commuters in this city spend 119 hours a year stuck in traffic.* [Online] Available at: https://www.cnbc.com/2019/09/04/commuters-in-this-city-spend-119-hours-a-year-stuck-in-traffic.html

Massey, D., 2005. *For space.* London: SAGE.

Moreno , C., 2021. *https://www.ted.com/talks/carlos_moreno_the_15_minute_city.* [Online] Available at: www.ted.com

Moreno, C. et al., 2021. Introducing the “15-Minute City”: Sustainability, Resilience and Place Identity in Future Post-Pandemic Cities. *Smart cities*, pp. 1-19.

Municipality of Chania, 2018. *Sustaiable Urban Mobility Plan (Phase A- Evaluation ofthe existing mobility) (in Greek),* Chania: Municipality of Chania.

Pozoukidou, G. & Chatziyiannaki, Z., 2021. 15-Minute City: Decomposing the New Urban Planning Eutopia. *Sustainability*, pp. 1-25.

Salingaros, N., 2006. Compact city replaces sprawl. *Architecture, Urbanism, Technology*, pp. 110-115.

Sisson, P., 2020. *What is a 15-Minute City?.* [Online] Available at: https://citymonitor.ai/environment/what-is-a-15-minute-city

Smart Cities-Greece Cyprus Interreg Project, 2023. *Smart Cities-Greece Cyprus Interreg Project;.* [Online] Available at: https://smartcities-project.eu/research-develop-smart-city-business-action-plan-and-strategic-marketing-plan-identify-municipality

Stanley, J., Stanley, J. & Davis, S., 2015. *Moving People: Connecting Neighbourhoods: The 20 minute city,* s.l.: Bus and Coach Industry Policy paper 4.

Vitale Brovarone, E., 2022. Accessibility and mobility in peripheral areas:a national place-based policy.. *European Planning Studies*, pp. 1444-1463.

Weng, M. et al., 2019. "The 15-minute walkable neighborhoods: Measurement, social inequalities and implications for building healthy communities in urban China. *Journal of Transport & Health*, pp. 259-273.

Willser, K., 2020. "Paris mayor unveils '15-minute city' plan in re-election campaign". . 2020-02-07. Retrieved 2021-03-14.. *The Guardian.*

ATTEMPTING THE REGENERATION OF THE ISOLATED AND BORDERLINE SETTLEMENTS OF EPIRUS: THE CASE STUDY OF THE BROADER COMMUNITY OF POGONIANI (1129)

Niovi Tomou[1], Konstantinos Serraos[2]

[1] National Technical University of Athens, University of Patras, Greece; *niovi.tom@gmail.com

[2] School of Architecture, National Technical University of Athens, Greece

Abstract. The fear of space confinement during Covid-19 pandemic, led many citizens to flee to rural areas, opening again the dialogue regarding rural development. Through the case study of a borderline rural community in Epirus (Greece), the possibility of reviving rural settlements that face severe problems of abandonment and isolation, is investigated. By evaluating the current national and international regulation on rural areas and a SWOT analysing the case study area, this research sets out to examine the character of a modern management of rural areas and contribute to the revival of these isolated communities. The subject of this paper is considered critical and needs immediate attention, as rural areas gather most of the planet's natural capital, which is currently being depleted and degraded.

Keywords: regeneration, decentralisation, desertification of rural areas, post-pandemic rural planning

1. Introduction

Right before the first lockdowns were implemented, the flight of citizens from cities to rural and coastal second homes, as Nick Gallent (2020) points out, became a defining image of the 2020 coronavirus crisis. The threat of self-isolation in dense city centres, drove many people in the countryside worldwide. Later, this phenomenon got named “urban exodus”.

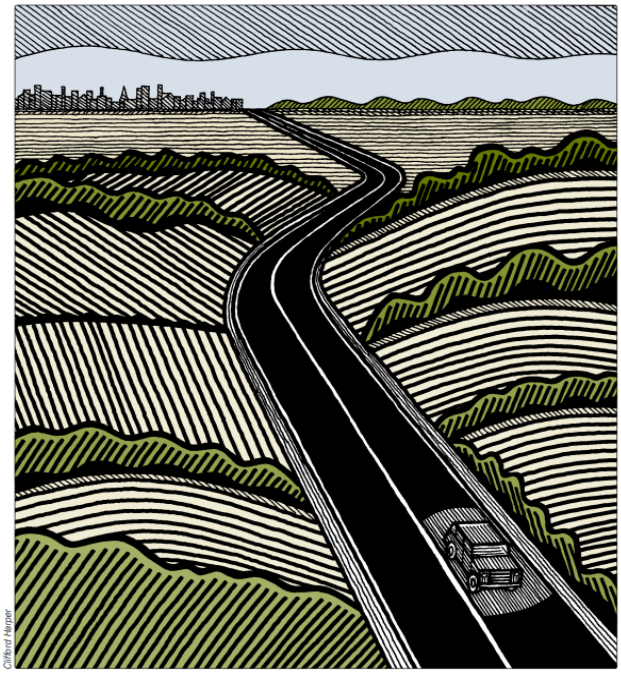


Figure 1. Escaping to rural areas
Source: Drawing by Clifford Harper (2003).

Such a reaction brought back to light an interesting discussion on the consequences of urbanisation and the desertification of rural areas. As noted by Pikner *et al* (2023), rural areas, although they are presented as dependent on cities, are places directly associated with stability, old virtues and idyllic myths. The temporary exodus from cities to rural areas proved the need of people to connect with nature, but also the suffocating environment of urban centres, despite the fact that with the return to “normality” they returned back.

The pandemic crisis caused a significant impact on people's lives and brought up immediate changes regarding spaces of living, working, leisure and travelling. It seems that the COVID-19 pandemic created a window of opportunity for regional authorities to create new and efficient strategies and policies regarding rural settlements by starting from new ideas of organising those areas for a better life quality.

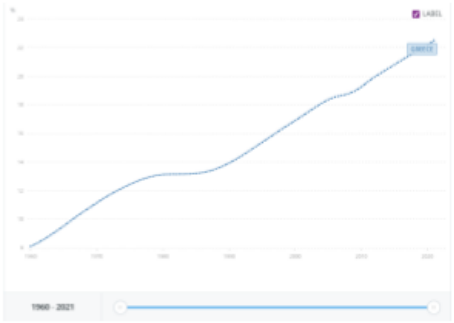
Currently, the population percentage in Greek rural areas is 19.96% of the total country’s population (Figure 2-A), demonstrating a -2.1% decline in population growth (Figure 2-B). One more critical obstacle they face is the constant population ageing. It is well known that the world demography is shifting to an era of population ageing, which is recognized by UNDP (2018) as an emerging social challenge that needs to be faced in order to achieve truly transformative, inclusive and sustainable development outcomes. These demographic changes are mainly caused by the decline in fertility rates, as well as the

increase in life expectancy. Figure 2-C shows some clear evidence of this phenomenon in Greece, where the life expectancy rate has been increased to approximately 82 years. By 2050, it is estimated that the elderly will be 40.8% of the population.

(A) Rural population (% of total population in Greece) for the period 1960-2021.

(B) Rural Population Growth (Greece) for the period 1960 - 2021.

(C) Trends of life expectancy rates for the period 1960 - 2021.



(D) Population ages 65 and above (% of total population in Greece) for the period 1960-2021.

Figure 2. Population percentages in Greece regarding rural areas
Source: The World Bank.

In Greece rural settlements can be found in both mountain or plain areas, in the heartland or the islands of the country. However, mountainous areas, although they are famous for their natural, biological and cultural wealth, in their majority face numerous environmental and socioeconomic problems, such as abandonment and isolation (Michailidou and Rokos, 2011). Today in Greece, despite there being more than 2.000 villages, the complicated, multidimensional and interrelated problems of environment and development in mountainous areas, have not been confronted, but instead have gotten worse. An important number of Greek rural areas have been degraded, isolated and abandoned. Furthermore, they have not yet been the subject of specialised spatial planning and analysis, as priority is given mainly to urban centres. Apart from this, the main directions for such a development focus on agriculture and tourism, depending solely on competitiveness, entrepreneurship, innovation and flexible forms of

employment, as well as on segmental citizens' initiatives.

For this reason, this research sets out to investigate the character of a modern management of the rural areas and contribute to the revival of mountain isolated communities, following the values of urban and regional planning. At first an investigation regarding the term "greek settlement", as well as the evolution of the residential network in Greece, was conducted. Afterwards, the national and international approach on the protection and development of rural areas was examined. Through an *in situ* observation of the case study of the Municipal Unity of Pogoniani, a SWOT analysis was undergone in order to examine whether the pandemic has created a window of opportunity for regional authorities to compose new and efficient strategies and policies regarding rural settlements.

An important obstacle while conducting the specific research, was the lack of statistical information regarding the "Urban exodus" in Greece right before the national lockdown. Thus, it was difficult to highlight the intensity of the internal migration in rural areas. According to ELSTAT there is no clear image on how many people manage to escape to rural areas in order to avoid the severe restrictions that were enforced in the urban centres. Additionally, the same obstacle was also faced concerning the precise number of mountain settlements in Greece, as it would have been very helpful to have a database for future management.

This research was conducted in the framework of the master thesis during the MSc studies in "Urban and Regional Planning" (NKUA) and was presented on 23 March, 2023.

2. Background and Literature Review

In Greece, among the compilation of rural areas, mountainous settlements account for 77.9% of the total country surface (NORDREGIO 2004, Michailidou & Rokos 2011). Up to date, these settlements are considered to be important natural, environmental and cultural residential centres, where traditional architecture, customs, professions and know-how have survived and been passed down to the new generations. Undoubtedly, they constitute "*great examples of successful coexistence between human beings and their environment, as mountainous people have managed to adapt, interrelate and interact with it in harmony and with respect*" (Michailidou & Rokos 2011, pp. 2).

Although rural areas are often associated with stillness and stability, they are in fact a complex network of needs and services (Pikner *et al*, 2023, p. 2), since they evolve over time and continuously transform based on the needs and desires of the societies that reside in them. Greek mountainous settlements are divided into distinct categories based on their demographics, the geographic location, the topography and the local architecture, dating back from the Middle Ages up to the liberation from Turkish rule (Desyllas, N.,

2007). Among them, a very distinctive category is that of the traditional settlements. As stated by the Council of State (2003) traditional settlements are defined as homogeneous residential complexes that have maintained their traditional architectural elements in their fabric.

Aiming for a better management of the residential network in Greece, two basic definitions of the concept “mountainous settlements/mountainous areas” have prevailed, separating settlements based on criteria other than architecture and cultural heritage. The residential network of Greece underwent various transformations in direct connection with the post-war efforts to transition to a new form of international economic and spatial organisation.

Based on the Greek National Statistical Service (1995), mountainous municipalities or mountainous municipal districts are defined as those that are located at an altitude of more than 800m or have an intensely sloped terrain, separated by ravines or mountains volumes with multiple soil folds with higher elevation differences from 400 metres. However, since the adoption of the Directive 75/268/EEC by the Greek Ministry of Agriculture, mountain areas are nowadays distinguished the following way (Michailidou, 2008):

- The Mountain Areas (Article 3, Par. 3) include Municipalities, Communities and Settlements following the conditions: (a) their real estate is located at an altitude of more than 800 metres, (b) their land area is between 600-800 metres and its slopes soil is at least 16%, and/or (c) their land area is at an altitude below 600 metres with slopes soil at least 20%. In case a Municipality, Community or Settlement has one of the above cases of at least 80% of land area or the sum of cases (a), (b), (c) is at least 80% of their total land area, then it is included in the mountainous areas category.
- The Less-favoured areas in danger of depopulation (Article 3, Par. 4) include many Municipalities, Communities or Settlements that are homogeneous zones and are characterised by low population density, barren land and low income. In particular: (a) the population density is up to 45 inhabitants per square kilometre; (b) the agricultural income is less than 80% of the national average, and/or (c) the yields of the main crops are up to 80% of its average country.
- Areas with Special Problems (Article 3, Par. 5) are included in zones, Municipalities and Communities of island and border areas, which have, due to their position, special problems, their agricultural income reaches up to 80% of it average of the country and the fertility of their soils is low (yields of main crops less than 80% of the national average).

Furthermore, an important factor that reinforced the disorganisation of the Greek province was the change from the Kapodistrias administrative system to “Kallikratis”. This

new system made Municipalities the main administrative instrument, making all central decisions. The problem is that many Municipalities include a large number of settlements such as the Municipality of Pogoni that rules more than 60. Additionally, although at first the Administrative “Kapodistria'' system showed that mountainous - semi-mountainous municipalities made up 61.6% of the country, the “Kallikratis” decreased them to 9.5%. Therefore, one of the most important features of the country, its mountainous terrain, is being altered. Only 31, out of 325, Kallikratic Municipalities are mountainous, now occupying only 10.28% of its surface of the country. Consequently, nowadays Municipalities are invited to plan the development planning their territorial area through study, management and execution residential and urban development programs (article 94 par.7 of Law 3852/2010) and (Article 203 of Law 3463/2006) with a direct impact on social and economic life in them, in the quality of life of their inhabitants and in the possibility of its participation of Local Government and of the citizens in the issues that concern them and shape their future.

3. Policies

3.1. European policies and strategies

In Europe mountainous regions and settlements vary, presenting different characteristics in terms of climate conditions, terrain morphology, economic organisation and population. As Michailidou & Rokos (2011) state, in 1975, the first mountain oriented “development” measure was announced by the European Community, introducing direct income support for farmers in mountainous areas (European Commission 2002). Following, in 1988 it was requested that mountainous areas are not to be treated solely as rural areas, but as separate spatial units that need different development policies (Michailidou & Rokkos, 2011). Since the 1990s, a substantial number of policies have been implemented trying to ensure a "sustainable development" of mountain areas. Important examples of European policies and strategies are the Cohesion Policy, the Integrated Mediterranean Programs (IMP) or the common agricultural policy (CAP), which provides programs such as the LEADER initiative.

All the above measures focus on ensuring a sustainable development, based on three values, the protection of the environment, the strengthening of economic competitiveness and the strengthening of social cohesion. So far, there is no specific single statutory framework that exclusively concerns these regions, except for the Alpine Convention (1995), which only concerns the Alpine countries. The policies and strategies that have been drawn up, concern mainly sectors, such as tourism, infrastructure and the environment, indirectly supporting the policies for mountainous areas. Nevertheless, for the European Union, mountainous areas are considered to be important "local communities" due to their environmental, cultural, social and economic reserves. One

cannot argue that for several years now efforts have been made, promoting good intervention practices, in order to face the continuous demographic change along with the loss of new residents, the need for better connected residential networks, as well as the tourism development based on the great environmental and naturalistic value.

3.2. Greek policies and strategies

In Greece, the concept of "integrated development" began to be spread and understood with the introduction of the Integrated Mediterranean Programs (IMP) by the European Community during 1986-1993. From the end of the 90s, measures began to be taken that focused on the protection and development of the mountainous regions of our country.

To date, the policies of the Greek State focusing on the development of mountainous settlements are simply an interpretation and implementation of the relevant European policies, without any effort to adapt them to the country's needs and characteristics. We could argue that the only framework that can possibly set a direction for a future development of the mountainous areas, or generally rural areas, is the General Framework for Spatial Planning and Sustainable Development (GPHSAA), which recently became a National Spatial Strategy. Its main objectives concern the formulation of a spatial development model that seeks to strengthen the national social and economic cohesion, strengthen the country's role internationally, competitiveness, protection and highlighting the natural and cultural environment and addressing climate change.

Another step for the management of rural areas was the introduction of the Regional Spatial Frameworks (2018) that in fact substituted the Regional Framework for Spatial Planning and Sustainable Development. The new RSF provides direction of spatial development and organisation for every Greek region separately. For example, in this research the RSF of Epirus was investigated due to the geographical location of the case study area. Specifically, it aims to formulate an integrated strategic program of spatial policies for the Region, which will form the basic framework for spatial planning, urban planning, environmental and development options for the time horizon of its validity.

1. Analysis of Case Study Area

3.3. The Municipality of Pogoni

The Municipal Unity of Pogoniani is located in the northwestern greek-albanian borders of the Municipality of Pogoni in the regional unit of Ioannina, Epirus. First inhabitants in the area of Pogoni are considered to be the Epirotian clans of the Molossians and the Chaonians, starting from the 5th century BC until the first Christian centuries (Fakatselis and Arbyros, 2006, pp. 41). Throughout history the area has met different invaders, such

as the Venetians, Normans, Lombards and Serbs, but managed to save their culture, language and religion.

From 1449 AD and until 1913 AD the area was occupied by the Ottoman empire. During those times the inhabitants of Pogoni suffered many hardships, unbearable taxes, pressures of Islamization and robberies. For this reason, several residents were forced to emigrate to Romania, Istanbul, Russia, Egypt and later to America. Important examples of the Ottoman influence can be found in many cultural and architectural elements. Until 1913, the North-continental villages of Polytsani, Chlomo, Schoriades, Tsatista, Mavrogero, Seltsi and Sopiki, also belonged to Pogoni, but today are part of the Albanian territory.

In the most recent history, the area presented a dynamic resistance against the German occupation, with a number of burned down settlements. Later, many inhabitants of the region fled to the countries of the Soviet Union, while the intensifying economic crisis and the abandonment of the region by the central authority, led to new waves of migration abroad (Germany, Australia, America) and to large urban centers (Athens, Ioannina).

3.4. The Municipal Unit community of Pogoniani

In recent years, especially in the end of the pandemic, Epirus has become an important destination of alternative tourism. However, a fairly significant percentage of its villages remain hidden, especially if they do not carry any special recognition. In this case also belongs the Municipal Unit of Pogoniani, a critical group of four mountain settlements in the homonymous Municipality of Pogoni of the Regional Unit of Ioannina. The area is located at the north-western end of the current Municipality bordering Albania and at a distance of 70-80 km from the city of Ioannina, on average.

Since 2010 (*Official Government Gazette of the Hellenic Republic,* B1292/11-08-2010) the community is consisted of four border mountain settlements of the area· Pogoniani, Stavroskiadi, Drimades and Dolo. The first three settlements are located in the northwestern borderline of the Municipality of Pogoni with Albania. The village of Dolo forms the border of its community with the broader community of Delvinaki. All four settlements are in the category of pre-existing settlements of 1923, demarcated with building conditions and restrictions (Government Gazette 1034/D/1987 & 216/AAP/2015). However, the only distinctive difference between them is the fact that Dolo has been characterised as a traditional settlement and a historical place, as issued by O.G.G 594/D/1978 and O.G.G 352/B/1967. It is important to acknowledge that the community, as well as the whole Municipality of Pogoni, have been characterised as *less-favoured areas,* which is covered in “Council Directive (EU) 75/268/EEC”.

Geophysically the community is defined by the mountains, Makrykampos (Bozovo) (1,672m), Meropi (Nemertsika) (2,209m) and Koutsokrano at (1,208m). At the same time

the Kouvaras gorge, located between the settlements of Pogoniani and Dolo, is another important local landmark. The homonymous stream of the gorge is an initial part of the Drinos river, which crosses the Greek-Albanian border in the direction of the plain of Deropolis. The main characteristic of the area is its pristine landscape, the mild climate and the variety of local flora and fauna. In the area there are rich forest complexes with a variety of species of centuries-old oaks.

In the past, these four villages of Pogoniani were important cultural and educational centres of the region. However, the increase of urbanisation, the economic crisis and the absence of initiatives for maintaining an active population in the area, led to the population's reduction, as well as the cultural degradation. Therefore, this work aims to highlight the importance of a thorough study of the course of the desertification and isolation of the Greek countryside. Today, the economy of the area is mainly based on livestock and agriculture. Additional occupations of the residents are beekeeping and the production of local traditional products.

Bearing in mind that spatial development constitutes a significantly complex process, as it demands a continuous dialectical relationship with social, economic, political, cultural factors, it is important to understand the current situation of the broader community of Pogoniani. Over time, most traditional village structures have changed and been abandoned, as new forms of life, needs and activities take shape. With the unification of the communities based on the "Kallicratis" program under the name "Municipal Unity of Pogoniani" and the integration into the Municipality of Pogoni, the community element that united the residents and created strong ties with the place has disappeared.

Today, the percentage of permanent residents in these four villages has been greatly reduced. In Drymades and Dolos the permanent residents number 4, in Stavroskiadi 5, while in Pogoniani there are around 80, including the students of the two social structures who live in the village. It is worth noting that the specific numbers of permanent residents refer to the winter months, as from March to October they return to the villages of NE. urban dwellers, but without the percentage of the population changing significantly. Many residents migrated to urban centres with increasing urbanisation. Main reasons for this change were economic factors (finding employment, higher salary), age (many young people who grew up in the village left in search of new prospects) as well as education. More specifically, several families chose to leave when their children reached elementary or high school in order to find another school for the children.

Undoubtedly, this decline in its demographic sector and the change in the age range as well as the percentage of the population in these areas has significant consequences for society. The limitation of the number of gatherings of young people implies the reduction of educational benefits, the difficulty of adopting new work methods and the utilisation of technological advances and the modernization of local societies.

Year	Dolo	Drimades	Stavroskiadi	Pogoniani	M.U. Pogoniani
2001	62	139	93	478	772
2011	60	48	34	425	567
2021	-	-	-	-	629

Figure 3. Population census of Municipality Union of Pogoniani for the years 2001, 2011, 2021.

The majority of basic public and non-public services are concentrated in the capital of the Municipality of Pogoni, Kalpaki, which with the application of the Kallikratis Law acquired the position of "director" for the local residential network ". In addition, there is a lack of a specific strategic framework for the management of all 60 villages of the Municipality. Priority is given to the settlements that gather a large percentage of the population, with the result that no weight is given to the problems faced by the smaller settlements.

Therefore, on the one hand we see traditional settlements being developed for tourism (e.g. Zagorochoria), while on the other hand there are non-traditional settlements with rich cultural heritage that are in decline (e.g. Pogoni district). This has as result in several settlements (e.g. Zagori, Metsovo, Pelion) to increase salty the number of tourists and therefore the number of tourist of accommodation (small or large hotels, rooms for rent, etc.) and at finally, the natural characteristics of the settlement are lost and the purity is altered their original image, now creating a staged environment. Details of her daily life of the villagers of the past are now ways of attracting tourists to the areas.

2. SWOT Analysis

Through the use of the SWOT analysis, the strengths and weaknesses of the broader community of Pogoniani were examined. The analysis was focused on all four settlements of the unity, Pogoniani, Stavroskiadi, Drymades and Dolo.

Figure 4. SWOT Analysis Table

As Figure 4. shows, among the main strengths of M.U. of Pogoniani is the special character of its natural environment and its geographical position. The M.U. manages to be both isolated and connected to important residential centres at the same time. The rich cultural heritage of its settlements, the pristine natural environment and the lack of tourist exploitation so far, are additional strong points of the area, as these can compose the character of their development and a notable difference from other areas of the Municipality. Simultaneously, the presence of social and cultural infrastructures, the well preserved natural environment, the richness of old trails to be explored, the social NGO structures that host young students, are more examples of the area's strengths.

In contrast to the above strong points, there are many unresolved weaknesses. The main problem is the continuous population shrinkage, especially the lack of younger people. This phenomenon is directly linked to the continuous ageing of the population in Greece, the lack of new businesses, absence of agricultural and livestock activity, as well as renewal of opinions and approaches to local socio-political developments. As noted in the SWOT table, in the four settlements there is also a great number of unexploited traditional buildings that are abandoned. Consequently, we are led to a gradual and continuous degradation of public space. At the same time, a low level of education of the local population is observed, which in turn results in the incomplete local political, economic and social organisation. The secondary and tertiary sectors are underdeveloped, as so far no weight has been given to these categories. Instead, for a period the Greek government took care to close down the country's main manufacturing schools, which largely saved important local arts. It is important to take into account also that the

promotion of less tedious work and the lifestyle shown on media platforms have reinforced the laziness of the local population. This has the result that there is no intense activity in the production of local products. Another weak point of the area is the seasonal habitation. Finally and equally important is also the non-exploitation of cultural and historical points of interest, as knowledge about the place is lost.

At the same time, significant pressures from the external environment of the settlement are identified, which in the analysis are recognized as threats. The main threat to the study area is the risk of foreign investors in the area, which can lead to the uncontrolled development of the place. In this case, the residents and the local government may lose their opportunity to shape the conditions for development, recovery and promotion of the area themselves. In addition, the uncontrolled tourist development of the area can bring about its possible "hotelization" and alteration of its character, if it is not done under the appropriate conditions.In addition, the situation is made more difficult due to the significant limitation of funding at the regional and municipal level, which combined with a laxity in the application of statutory rules for the protection of traditional settlements, can potentially lead to the alteration of the settlement and further degradation of public space. There is a lack of measures and initiatives regarding the resettlement and activation of young people in the province. A significant threat is also the lack of economic independence of the D.E., as was once the case with the "Kapodistrias" program. Finally, a low level of knowledge is observed in the Local Government, as a result of which the strategic movements for the recovery of the place are limited.

Main opportunity for D.E. Pogonianis from the external environment is the extension of the Ionian Road from Ioannina to Kakavia, which is expected to be auctioned in the near future. The development of such a road network will bring a greater wave of visitors to the area. In addition, opportunities for more exchanges with foreign countries will be given. The utilisation of state and European programs will be important tools for the Municipality regarding the implementation of specific projects or studies. Also, the traditions of the area that are directly intertwined with the public space, are potential elements that can work in a direction of upgrading and further appropriation of the public space.

3. Guidelines for reviving the broader community of Pogoniani

Through the aforementioned SWOT analysis, we can conclude that the M.U. of Pogonianis can be revived, as all four settlements of the unit have rich cultural, historical and environmental wealth, which remains unexploited.

According to the *Regional Spatial Framework of Epirus*, the wider area of the Municipality of Pogoni belongs to the *Areas of Special Spatial Interventions* requiring immediate action. Therefore, the same applies to the M.U. of Pogoniani, focusing on the utilisation of local

agricultural-forestry products and of gentle agro-tourism development.

At the same time, the RSF of Epirus stresses as critical the utilisation and protection of natural and cultural wealth, which will enhance the visibility of this unique bordering mountainous area. Furthermore, the formation and promotion of networks is promoted, the nodes of which consist of distinct and interesting destinations. Undoubtedly, the Kouvaras gorge, the traditional stone bridges of the area and the preserved buildings are important examples of monuments and sites that synthesise the special character of the area, which has not yet emerged. However, to achieve something like this, it would be useful for the Municipality of Pogoni to first understand its strengths and weaknesses. So far, there has been no recording on the important characteristics of the area and no interest in attempting to promote them. The area lacks any specific vision for development and her revival. Consequently, some directions are suggested that could be followed by the Municipality of Pogoni for the recovery of the area and for protection of future geopolitical changes.

Initially, it is important to make an in-depth recording and evaluation of services, infrastructure and points of interest in the area. This way you will identify the main character of the Municipality and the settlements that make it up. In addition, a database about residents needs to be created for residents of the area. It is not known to date how many residents are engaged in the primary, secondary or tertiary sector in the wider area of the Municipality. Equally important, at least in the case of D.E. Pogonianis, is the tradition of hosting minor children from social structures. While managing young students can be a challenge for the educational system, it can contribute to the development of small communities by their interaction and their inclusion in them. Contact with nature and the Greek highlands settlements can develop a strong link and desire establishment and future activity in the area. An equally important feature of the area is its isolation and virginity, as this can be her trademark in future. The natural environment, the mountainous landscape but the smooth slopes of the terrain could develop a form of alternative tourism, however for the older ages. THIS way a species could develop recovery tourism, disconnection from the city, which they could also take advantage of sports clubs. The existence of a wider network of paths which connects the villages to each other in an alternating mountain and plain landscape, makes the area accessible to everyone, which differentiates it from the rest Municipalities of the region.

Therefore, the cooperation of the Municipality of Pogoni with the Region or with university groups, in order to compile a scientifically thorough site development and management strategy. The external capabilities that will be given to the area with the extension of the Ionian Road up to Kakavia or even the possible integration of Albania into the EU, further intensify the importance of one of such strategic spatial planning for the region.

4. Conclusion

The experience of the pandemic gave the opportunity for reflection regarding rural development, a fundamental factor in achieving the SDGs, as UN calls for a review of rural development aiming to end the gap between rural areas and urban centres, as well as better protecting the health of the planet. In this study, the development and regeneration of Greek mountainous settlements was examined based on the existing policies regarding. The research workflow and the analysis of the study area provided an all-encompassing view of the contemporary situation in Pogoni, future possibilities and obstacles that need to be faced.

Consequently, the presented guidelines can be applied on different scales, revitalising the local communities. It is important to realise that in order to preserve the cultural, environmental and human reserves while establishing favourable living conditions for the residents of the mountainous settlements, a balance should be ensured between the desired economic growth with sustainable heritage management. The mountainous settlements can be regenerated if we realise their potential and as long as a specific national strategy is introduced in order to ensure a common vision as a country.

As documented so far, to date, the policies of the Greek State focusing on the development of mountainous settlements are simply an interpretation and implementation of the relevant European policies, without any effort to adapt them to the country's needs and characteristics. Evidently, there is no specific strategy for the development of Greek mountainous areas but the policies implemented follow the general European model for rural and regional "sustainable" development. This study pinpoints that regional development should not be the same for every region following general directions and frameworks. The local administration units should collaborate with the citizens' initiatives, in order to participate actively in the design and implementation of local action plans, since they are the only ones who really know the actual potential, peculiarities, problems, limitations, priorities and expectations of their territory and its inhabitants.

References

Angelidis, M (2000) Regional Planning and Sustainable Development. Athens: Symmetria.

'Council Directive 75/268/EEC of 28 April 1975 on mountain and hill farming and farming in certain less- favoured areas' (1975) *Official Journal* L 128, 1-7. Available at: http://data.europa.eu/eli/dir/1975/268/oj

Council of State (2003) *Council of State Decision 2526/03 (CoS 2526/2003)*. Available at: http://www.nomoskopio.gr/ste_2526_03.php?toc=0&printWindow&.

Council Directive (EU) 75/268/EEC on on mountain and hill farming and farming in certain

less-favored areas (1975) *Official Journal of the European Communities No L 128/1,* Available at: https://op.europa.eu/en/publication-detail/-/publication/86e63262-05ec-4633-94bd-9226dc1b094a/language-el/format-PDFA1B.

Fakatselis, K.Z. and Arbyros G.K. (2006) Epirus Ancient Greece: Pogoni in the routes of foreign land. Athens: Dodoni Publications.

Gallent, N (2020) COVID-19 and the flight to second homes. Journal of Town and Country Planning, 89 (4/5), pp. 141-144. Available at: https://iris.ucl.ac.uk/iris/publication/1781308/1.

Michailidou, E. (2008) Mountainous Regions of Greece: Characteristics and Development Strategies, E.M.P. - Metsovio Center for Interdisciplinary Research.

Michailidou, E. and Rokos, D. (2011) "Greek Mountainous Areas: The Need for a Worth Living Integrated Development", *Regional Studies Association Annual International Conference 2011 Regional development and policy – challenges, choices and recipients.* University of Newcastle upon Tyne, UK, 17-20 April. Available at: https://www.academia.edu/33712389/Greek_Mountainous_Areas_The_need_for_a_Worthliving_Integrated_Development.

Minister Of Interior, Decentralization and Electronic Governance (Greece). 2010. Primary and Secondary Local Organizations of the Local Government with Law 3852/2010 and proportional population distribution in primary schools communities of article 2, par. 4 of Law 3852/2010, of which cannot be distributed, due to installation location details. *Official Government Gazette of the Hellenic Republic,* B1292/11-08-2010.

Minister of the Presidency of the Government. 1967. Regarding the designation of historical monuments, etc. *Official Government Gazette of the Hellenic Republic*, 352/B/31-5-1967.

Minister of Environment and Energy. 2018. Approval of the Revision of the Regional Spatial Framework of the Region of Epirus and Environmental Approval thereof. *Official Government Gazette of the Hellenic Republic*, 286/AAP/28-11-2018.

President of the Hellenic Republic (Greece). 1978. Regarding the designation of the State as Traditional Settlements and the determination of the terms and limitations of the construction of these plots.*Official Government Gazette of the Hellenic Republic,* 594/Δ/13-11-1978.

President of the Hellenic Republic (Greece). 2010. New Architecture of Self-Government and Decentralised Administration - "Kallikratis" Program. *Government Gazette* A' 87/7.6.2010, Law 3852/2010.

Pikner, T., Pitkänen, K., & Nugin, R. (2023) Emergent rural–urban relations in Covid-19 disturbances: Multi-locality affecting sustainability of rural change. Sociologia Ruralis, 00, pp. 1- 24. Available at: https://doi.org/10.1111/soru.12421.

Sarigiannis, G. (1978) "The concept, genesis and evolution of the settlement through the etymological evolution and interpretation of the relevant words", *The Greek Review of*

Social Research, 33, pp. 371–382. doi: 10.12681/grsr.320.
United Nations, Department of Economic and Social Affairs (2021) World Social Report 2021: Reconsidering Rural Development. Available at: https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2021/05/World-Social-Report-2021_web_FINAL.pdf.
NORDREGIO (2004) Mountain Areas in Europe: Analysis of mountain areas in EU member states, acceding and other European countries. (European Commission contract No 2002, CE.16.0.AT.136).