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**Space for Species:
Redefining Spatial Justice**

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AN *ECOSYSTEM SERVICES BASED* MODEL FOR THE RECLASSIFICATION
OF URBAN USES IN PLANS.
A DECISION SUPPORT FOR THE MINIMISATION
OF SOIL CONSUMPTION

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1 | INTRODUCTION

Soil that is not artificially covered is capable of providing services with both direct and indirect benefits for humans. It is, therefore, essential to assess the impacts of different land-use and urban planning choices by estimating costs and benefits associated with different land-use scenarios and/or protection policies.

The dimensioning of municipal urban plans (Puc) sets the urban load, in accordance with the regulations, with the provisions contained in the *Provincial Territorial Coordination Plans* (PTCP) and on the basis of a careful analysis of the community's actual and irrepressible needs.

The possible transformations envisaged in the Pucs lead to two types of consequences: on the one hand, they constitute a potential income for the municipal coffers in terms of taxation on building land and buildings constructed and in terms of urbanisation charges; on the other hand, the transformation of the land entails the definitive loss of the numerous and very valuable *Ecosystem Services* (ES) that it is able to provide.

These are defined by the *Millennium Ecosystem Assessment* (MA, 2005) as the multiple benefits provided by ecosystems to humankind and are divided into four categories: life support, provisioning, regulation and cultural values. A variety of approaches to assessing the ES provided by different land covers can be found in the literature. Some of them are based on matrices that, based on the opinion of experts (such as physical geographers, forest scientists and environmental engineers), associate each land cover class with a score related to the level of performance offered by each ES (Costanza et al., 1997; De Groot, 2010; Burkhard et al., 2012; Rodriguez, Armenteras & Retana, 2015; Santolini et al., 2015).

The change in land cover from its natural state to artificial cover is technically termed *land consumption*. Forms of consumption range from total loss of the soil resource to partial loss of ES functionality. *urban densification* is also a form of land consumption insofar as it involves the introduction of new artificial cover in urban areas (Munafò, 2021).

Zeroing net soil consumption means, therefore, avoiding the sealing of agricultural and open areas and, for the residual component that cannot be avoided, compensating it by renaturalising an area of equal or greater extent in order to restore its capacity to provide ES (EC, 2016).

When considering soil as a *resource*, it is necessary to distinguish between land cover and land use.

The term *land cover* refers to the biophysical cover of the earth's surface, while land use refers to the actual biophysical state of the soil, related to its use in human activities. The latter is, therefore, defined according to the present and planned functional dimension and urban use (Directive 2007/2/CE).

A change of land use (and even less a change of land use provided for by a town planning instrument) may not alter the functions of the land and its capacity to provide SE and, therefore, not represent real land consumption.

«The relationship between land consumption and population dynamics confirms that the link between demography and urbanisation and infrastructural processes is not direct and there is a growth of artificial surfaces even in the presence of stabilisation, in many cases decrease, of residents» (Munafò, 2021: 45).

From this, the importance of correctly sizing Pucs, carefully balancing the need for new areas for human activities with the preservation of ES, aiming to achieve *settlement efficiency* (Fasolino, Coppola & Grimaldi, 2020).

2 | Urban land use, taxation and reclassification of land

Taxation is playing an increasingly decisive role in urban planning. Municipalities, in the absence of state resource transfers, are increasingly using Pucs as a tool to increase the tax base and keep their budgets afloat, encouraging urban expansion.

The zoning of a piece of land influences its tax regime. In particular, there is a clear difference in the taxation attributable to agricultural or building land. For both of them, there is the *own municipal tax* (IMU)¹ to which the tax for indivisible services is added for *building land* (TASI)². In addition, while for agricultural land the IMU is calculated taking into account the cadastral value, for building land this tax takes into account the market value which, unlike the former, is not a static value. It is, in fact, estimated on the basis of the territorial area in which it is located, the buildability index, the permitted use, the charges for any work to adapt the land necessary for construction, and the average prices found on the market from the sale of similar areas (DLgs n. 504/1992, art. 5). As a result, the tax burden is heaviest on owners of building land.

¹ IMU came into force with Article 13 of DL 201/2011 - Decreto Salva Italia.

² TASI is governed by Law 147/2013, paragraph 669 et seq.

The need to reclassify land, i.e. to transform it from building land to agricultural land, is growing, both because of the fiscal effects just outlined and because of the increased sensitivity to environmental issues, closely intertwined with climate change issues, and the need to curb (stop) land consumption.

Attention to the issue translates, in some cases, into the introduction of specific procedures through which municipalities are empowered to restore to agricultural or natural use soils intended for urban uses, through their urban reclassification, at the proposal of the citizens concerned. An example of such practices can be found in the Veneto Region where, with Regional Law no. 4/2015, art. 7, green variants were introduced for the *reclassification of building areas*.

3 | MODEL FOR THE RECLASSIFICATION OF LAND USES

The model outlined is configured as a decision-support tool to be used in the choice of land for transformation, downstream of the Puc sizing or in a periodic revision of the same, to ensure a more rational use of the land and the safeguarding of the ESs it is able to provide. The methodology for reclassifying urban land uses is divided into 4 macro-phases.

The first of these is oriented towards the formal assessment of transformable areas and is conducted through the analysis and superimposition of graphical documents (such as base maps, geognostic maps, etc.), satellite images and comparison with field surveys.

Macrophase 2 is oriented towards the classification of soils according to the ES they provide. For this purpose, starting from the matrix of Burkhard et al. (2012), a new evaluation matrix is constructed, called *Matrix ES*, to be applied to the transformable areas identified in the previous macro-phase. The scores contained therein are applied to the different land covers of each area of interest as follows:

$$PP_{ES,Aj} = \frac{\sum_{i=1}^n (St_i * ES)}{\sum_{i=1}^n St_i} \quad (1)$$

in cui:

- $PP_{ES,Aj}$ = score given to all ES of the j-th transformation area, with $j=1, \dots, z$;
- St_i : land area of the i-th land cover indicated in the Agricultural Land Use Map (CUAS) and present in the transformation area under consideration;
- $ES = \frac{\sum_{k=1}^m ES_{CLC}}{m_{SE_{CLC}}}$ = score attributed to the ES associated with 1 hectare of each land cover in the transformation area under consideration.

The results obtained are spatialised and classified into five classes (C) of ES quality: very low (C1), low (C2), medium (C3), high (C4), very high (C5), inversely proportional to the ES values (VSE), which are respectively 5, 4, 3, 2, 1.

The third macro-phase introduces the *function of controlling efficient land use* (F_{CUES}):

$$F_{CUES} = V_{ES} * w_1 + II_i * w_2 + II_E * w_3 + A_U * w_4 + P_{NA} * w_5 + P_{SF} * w_6 \quad (2)$$

in cui:

- V_{ES} = value of ES, varying from 1 to 5;
- II_i = internal settlement integration, with values of: 0 (none); 0,5 (partial); 1 (complete);
- II_E = external settlement integration, with values of: 0 (none); 0,5 (partial); 1 (complete);
- A_U = adjacency to primary urbanisation, with values of: 0 (none); 0,5 (partial); 1 (complete);

- P_{NA} = proximity to motorway junctions (in km), with a value of: 0 (distance (d) > 2); 0,5 (1 < d < 2); 1 (d < 1);
- P_{SF} = proximity to railway stations (in km), with a value of: 0 (d > 1); 0,5 (0,5 < d < 1); 1 (d < 0,5);
- w_i = weight of the i-th parameter, with values: $w_1 = 0,5$ and $w_2 = w_3 = w_4 = w_5 = w_6 = 0,1$.

The FCUES thus defined can take values from 1 to 10. The function is inversely proportional to the usefulness of reclassifying land. The lower its value, the higher the convenience of reclassifying the land use of the compartment under consideration in order to achieve a more rational land use.

The fourth macro-phase is oriented towards the selection of areas to be reclassified according to urban load, FCUES values and PPSE. If FCUES values are equal, the choice falls on the areas that have a lower PPSE

4 | MODEL APPLICATION³

4.1 | Case study selection

The model was applied to the municipality of Mercato San Severino, in the province of Salerno, selected as a good example of the use of urban planning forecasts as a tool to balance budgets, often at a loss.

For the case study, this expedient, which was used extensively in the Puc⁴, has generated discontent among citizens, leading to the emergence of specific committees formed by land owners demanding a declassification of their land from building to agricultural land. In the *Intervention Planning Acts* (API), implementation tool of the Puc, 44 urban planning subdivisions are planned, of which: 17 *Areas of Rehabilitation and Completion* (ARC), 12 *Integrated Transformation Areas* (ATI), 6 *Areas of Productive Transformation* (ATP) e 9 *Strategic Transformation Areas* (ATS) (Fig. 1).

In the Puc, the residential requirement is calculated according to the possible increase in the number of households and, over a ten-year period, considering an average number of members per household of 3, amounts to 1,664 dwellings. In addition, by simulating the implementation of the residential subdivisions, for which a number of rooms (N_v) of 5,664 (coinciding with 5,664 inhabitants (ab)) is planned, it can be seen that the number of dwellings actually planned by the Puc is higher than required and amounts to 1,888 dwellings.

The PTCP of the Province of Salerno suggests estimating this need using possible population growth as a benchmark⁵ (and not the increase in the number of households) and envisages for the metropolitan area of Salerno, Valle dell'Irno and Picentini the settlement of a maximum of 18,000 households/accommodations in the period 2009-2019.

³ The data collection contained in this section and the numerical and graphical elaborations are by Rocco Salvati.

⁴ Puc approved by the City Council in 2010 and by Decree of the President of the Province of Salerno in 2012.

⁵ See Articles 123, 124 and 125 of the Technical Implementation Rules of the PTCP.

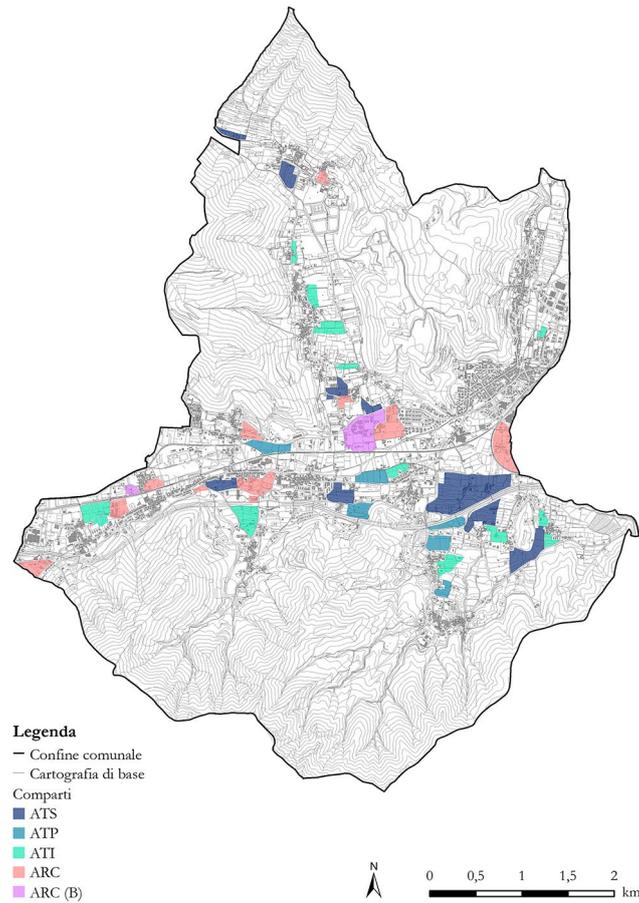


Fig. 1 | Compartments on base maps.

The particular method of calculating residential requirements adopted for the case study results in an overestimation of the same, which is more than 10% of the maximum load provided by the PTCP for its area.

With regard to the productive and tertiary sectors, although compartments are planned (ATP and ATS respectively), no dimensioning is found. The Puc only reports an analysis of the change in local units and employees over the period 1991-2001. The data show a decrease in both for the manufacturing sector and a decrease in local units against a slight increase in employees for the tertiary sector.

4.2 | Compartment selection and settlement load verification

The application covered all the subdivisions defined in the API except for those for which no reclassification was found to be necessary because they were associated with soil coverings whose ESs were respectively: very low or already impaired (ATS-8 Costa Cava, ARC 5 Capoluogo 1, ATI-10 Pandola); already affected by a project or undergoing transformation (ARC-6 Capoluogo 2, ARC-9(B) Curteri 2); already transformed (ARC-8(B) Curteri 1); those in respect of which any intervention is deemed not to be compatible (ARC-16 Capoluogo 3, non-compatibility established in relation to the variant to the Sarno Basin Authority's Stralcio Plan).

The focus in this contribution is only on residential areas (ARC and ATI) although the application of the model has also covered the production and tertiary sectors.

The evident oversizing of the Puc led to the introduction of a preliminary step to recalculate the urban load by considering, in the assessment of residential needs, the possible demographic increase, as established by the PTCP.

This operation returned an expected resident population value (P_{pr}) as of 2018 amounted to 23,599 inhabitants, with a demographic change since 2008 of 2,214 inhabitants and a residential need value of 914 dwellings.

4.3 | Classification of soils and selection of compartments to be reclassified

The next step involved the classification of the soils included in the compartments under attention, according to the ES they provide. The scores $PP_{ES,Aj}$ were evaluated using the relationship (1). The values thus obtained were then spatialised and classified into five quality classes: C1, C2, C3, C4, C5 (Tab. 1, Fig. 2).

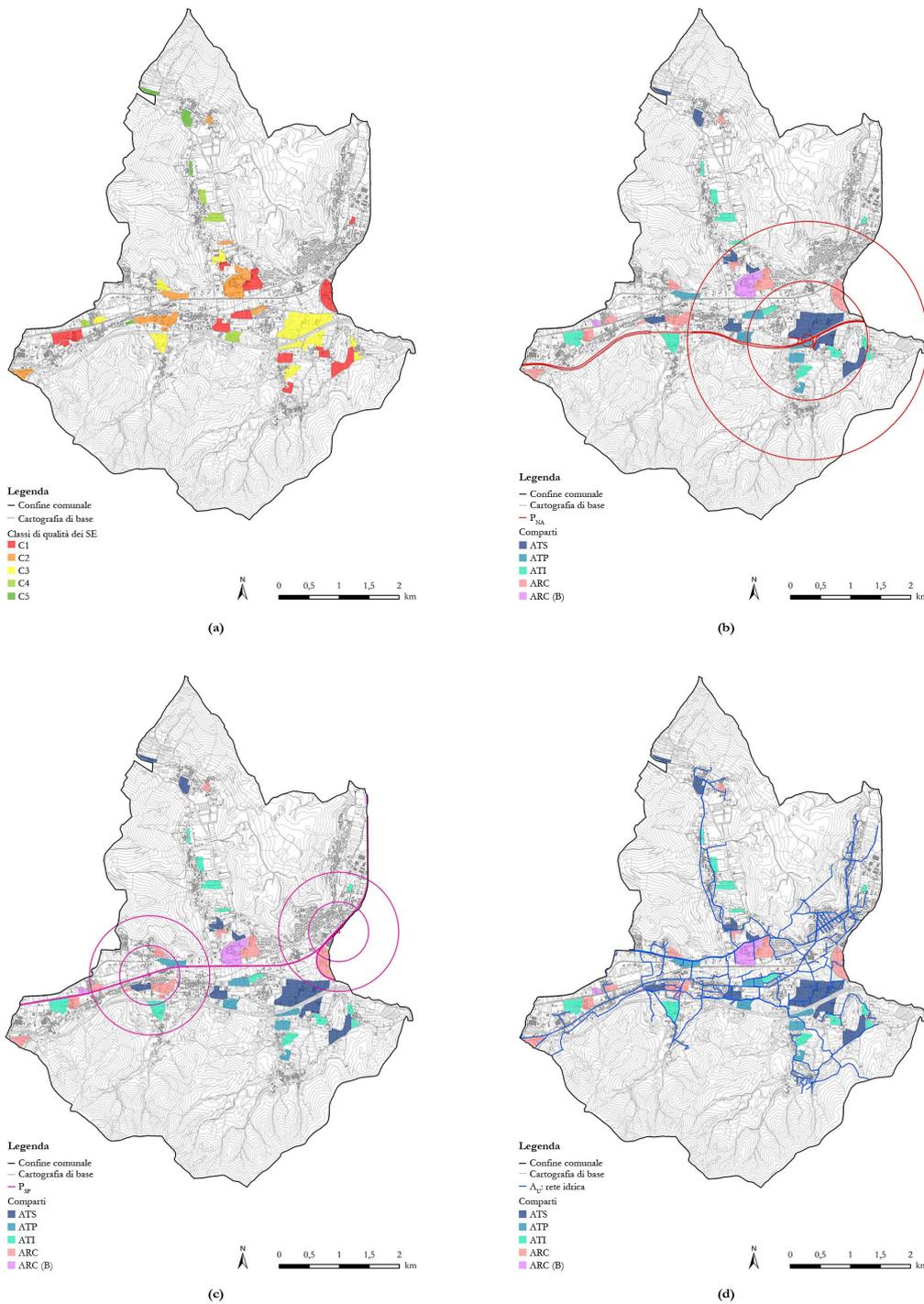


Fig. 2 | a) Quality classes of ES; b) P_{NA} ; c) P_{SF} ; d) A_U : water network.

Next, it was calculated the F_{CUES} , according to the report (2) (Tab. 1, Fig. 2). As established during the outlining of the model, the number of residential subdivisions to be reclassified or reduced was assessed taking into account the urban load envisaged by the Puc and the need to correct its values oversized in function of the real needs of the population and the area under consideration, appropriately selecting areas according to the values of F_{CUES} e P_{PSE} .

The urban load check carried out above makes it possible to state that only 2,742 of the 5,664 rooms planned in the Puc are actually needed. Therefore, 2,922 rooms were reduced from the planned ones, selecting 8 of the 21 examined subdivisions as to be reclassified: ATI 1, ARC 17, ATI 2, ATI 3, ATI 4, ATI 8, ATI 11, ATI 7 (Tab. 2, Fig. 3).

ATI 7 and ATI 15 recorded the same FCUES value, but different PPSE and C values. Specifically: 49.00 and class C3 for the former; 49.40 and class C2 for the latter. Therefore, between the two, ATI 7 was chosen as the one to be reclassified, as it is characterised by a lower PPSE, that is an higher quality of SE and to be preserved.

Tab. I | Classification of compartments according to V_{SE} e F_{CUES} .

N	API	PP _{ES}	C	V _{ES}	II _I	II _E	A _U	P _{NA}	P _{SF}	F _{CUES}
1	ARC 1-Piemonte	49,00	C2	4	0,5	0,5	1,0	0,0	0,0	6,0
2	ARC 2-Lombardi	47,40	C1	5	0,5	0,5	1,0	0,5	0,0	7,5
3	ARC 4-S. Vincenzo	47,00	C1	5	1,0	1,0	1,0	0,5	0,0	8,5
4	ARC 7-Ferrovia	48,10	C1	5	1,0	0,0	1,0	1,0	0,5	8,5
5	ARC 10-S. Angelo	49,00	C2	4	1,0	0,5	1,0	0,0	1,0	7,5
6	ARC 11-Costa	49,60	C3	3	1,0	1,0	0,5	0,0	1,0	6,5
7	ARC 12-Piro 1	49,30	C2	4	0,0	0,5	1,0	0,0	0,5	6,0
8	ARC 14-P. Del Galdo	47,20	C1	5	0,5	1,0	1,0	0,0	0,0	7,5
9	ARC 15-Rosto	49,00	C2	4	0,5	0,0	1,0	0,0	0,0	5,5
10	ARC 17-Ospizio	51,70	C5	1	0,0	0,0	1,0	0,0	1,0	3,0
11	ATI 1-Galdo dei Carifi	52,81	C5	1	0,0	0,5	1,0	0,0	0,0	2,5
12	ATI 2-Carifi-Torello 1	51,30	C4	2	0,0	0,5	1,0	0,0	0,0	3,5
13	ATI 3-Carifi Torello 2	50,60	C4	2	0,0	0,5	1,0	0,0	0,0	3,5
14	ATI 4-S. Martino	48,70	C2	4	0,0	0,0	0,5	0,5	0,0	5,0
15	ATI 5-Curteri	48,80	C2	4	0,0	0,5	1,0	1,0	0,0	6,5
16	ATI 6-Monticelli	47,20	C1	5	0,0	0,5	1,0	1,0	0,0	7,5
17	ATI 7-Oscato	49,40	C3	3	0,0	0,5	1,0	1,0	0,0	5,5
18	ATI 8-Corticelle	50,40	C3	3	0,0	0,5	1,0	0,5	0,0	5,0
19	ATI 9-Campo sportivo	47,00	C1	5	0,0	1,0	0,0	0,0	0,5	6,5
20	ATI 11-Acquarola	49,90	C3	3	0,5	0,0	1,0	0,0	0,5	5,0
21	ATI 12 - S. Eustachio	47,20	C1	5	0,0	0,5	1,0	0,0	0,0	6,5

Tab. II | Selection of compartments to be reclassified.

N	API	PP _{ES}	C	V _{ES}	F _{CUES}	N _v	N _{vr} *
1	ATI 1-Galdo dei Carifi	52,81	C5	1	2,5	173	173

2	ARC 17-Ospizio	51,70	C5	1	3,0	40	213
3	ATI 2-Carifi-Torello 1	51,30	C4	2	3,5	529	742
4	ATI 3-Carifi Torello 2	50,60	C4	2	3,5	842	1584
5	ATI 4-S. Martino	48,70	C2	4	5,0	194	1778
6	ATI 8-Corticelle	50,40	C3	3	5,0	378	2156
7	ATI 11-Acquarola	49,90	C3	3	5,0	312	2468
8	ATI 7-Oscato	49,00	C3	3	5,5	33	2921
9	ARC 15-Rosto	49,40	C2	4	5,5	453	-
10	ARC 1-Piemonte	49,00	C2	4	6,0	102	-
11	ARC 12-Piro 1	49,30	C2	4	6,0	41	-
12	ARC 11-Costa	49,60	C3	3	6,5	89	-
13	ATI 5-Curteri	48,80	C2	4	6,5	458	-
14	ATI 9-Campo sportivo	47,00	C1	5	6,5	126	-
15	ATI 12-S. Eustachio	47,20	C1	5	6,5	592	-
16	ARC 2-Lombardi	47,40	C1	5	7,5	73	-
17	ARC 10-S. Angelo	49,00	C2	4	7,5	111	-
18	ARC 14-P. Del Galdo	47,20	C1	5	7,5	45	-
19	ATI 6-Monticelli	47,20	C1	5	7,5	351	-
20	ARC 4-S. Vincenzo	47,00	C1	5	8,5	108	-
21	ARC 7-Ferrovia	48,10	C1	5	8,5	392	-
*Nota: N _{vr} = Number of rooms to be reduced							

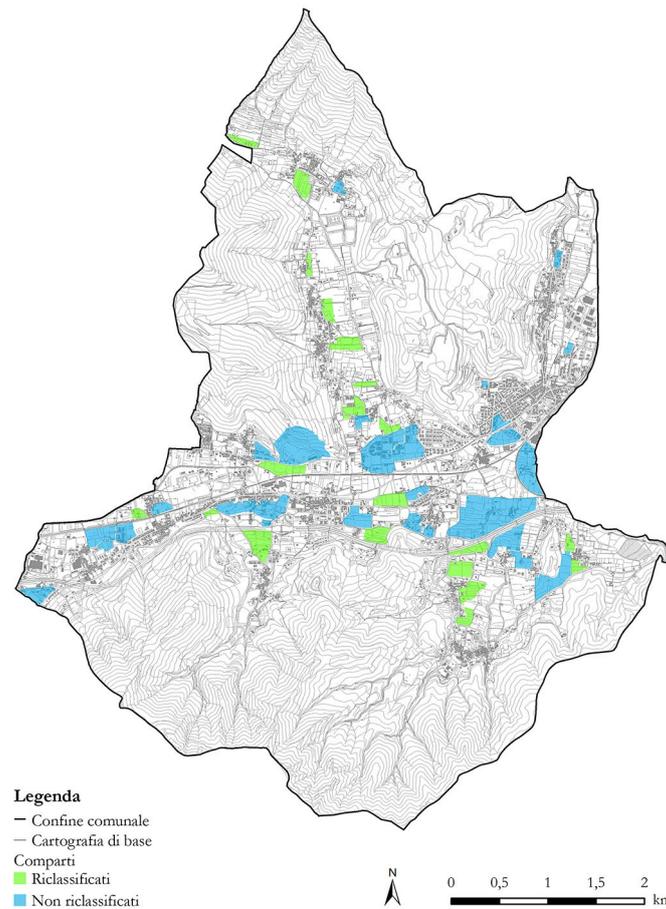


Fig. 3 | Identification of segments to be reclassified.

5 | Summary assessments and perspectives

For some time now, municipalities have been using urban planning forecasts as a tool to balance their budgets and cope with the lack of state funding and the current economic crisis. This approach, however, conflicts with the need to reduce land consumption and safeguard ESs.

This contribution proposes a soil reclassification model that can be used as a decision support tool for administrations in the identification, in municipal urban plans, of transformation areas that meet the needs of the community without excessive soil consumption.

The model outlined, due to its structure and purpose, can be replicated in any territorial context and could also be exploited within the Strategic Environmental Assessment (SEA) process, finding its specific place within the contents of the Environmental Report (EA).

The need to reduce soil consumption can no longer be ignored. An indispensable regulatory framework should support a new approach to planning, rewarding virtuous municipalities in protecting soil resources and ensuring an effective subsidiary relationship between municipalities.

Municipal budgets could be supported by appropriate forms of territorial and fiscal equalisation. This presupposes a virtuous model in which municipal taxation is no longer exclusively managed by individual authorities, but by means of a tax-distributive system to cover the budgets of municipalities that have greater difficulties than others without resorting to the consumption of free land.

It is also essential to introduce a SEA process, with assessment mechanisms that make the economic costs of the various scenarios explicit, also with reference to ecological and social aspects, in order to make public decision-makers accountable and to make the community aware of the economic and environmental costs associated with the various actions so that it can make conscious choices in safeguarding the common interest.

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TRANSLATING THE SOCIAL EXCLUSION OF VULNERABLE GROUPS INTO SPACE: AN ALTERNATIVE REVIEW THROUGH PRINT AND SOCIAL MEDIA

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URBAN DEMOCRACY AND ITS SUBJECTS AND MEDIUMS

Democracy, whose precise meaning depends on whether an observer focuses on the individual or the collective, is a form of political control in its simplest expression. In representative democracies, the most prevalent form of government today, the equality between citizens before the law and the sovereignty of the people are essential. In democratic forms of government, political control and direction is either in the hands of the people or provided by representatives elected by them. The idea of the sovereignty of the people brings together concepts such as equality, justice, freedom, independence, which together define and complement democracy in ways that transcend mere representation.

Individuals in modern democracies, in addition to their normal civic responsibilities, are also candidates for leadership. Aristotle (1999), who in his *Politics* developed his definition of democracy from the perspective of the individual citizen, associated the conditions of being a good citizen in society with both being governed and having the political ability to govern. Another discourse that prioritizes the responsibilities of the individual in democracy comes from Popper (1947), who emphasized that individuals, i.e. citizens of the democratic state, should be blamed rather than democracy for political inadequacies in the state. Democracy not only shapes individuals and therefore society with the responsibilities it imposes, but also takes its shape from the society in which it functions. The knowledge, abilities, and good citizenship of the members of a given community shape a society and thus its democracy. Although many philosophers have emphasized the uniqueness of the social aspects of human existence, whether in terms of individuality or collectivity, Aristotle and Plato did not consider the inability to live outside of a community a human-specific behavior; on the contrary, they argued that human life shares this collective nature with animal life, and that our social nature is thus far from peculiar (Arendt, 1998). Whether unique to our species or not, however, communal existence requires existence in a concrete place. The relationship that democracy establishes with space, which is the focus of this study, emerges at this point.

The spatial counterpart to the search for social and collective rights that accompanies democracy has inspired the debates around the right to the city in contemporary societies. Lefebvre (1991), who defined space as a product of history, described the right to the city as a requirement of democracy and directly associated it with humanism. Harvey (1993) highlighted the dynamic relationship of space

with society in his exploration of the subject, touching upon the dynamics of societal and spatial relationships and claiming that spatial form is at society's discretion. He thus emphasized different human behaviors and experiences and suggested that instead of asking what space is, we should instead investigate how it is that different human practices create and make use of distinctive conceptualizations of space. (Harvey, 1993). Harvey additionally associated the right to the city with living in it, arguing that those living in the city directly or indirectly contribute to the production of urban space and that this contribution is associated with the claim of a right to the city one inhabits (Harvey, 1993). In this case, in addition to human practices, the practices of non-humans who are residents of and shape the city should share in the claim to the it. The comprehensiveness of the definition of the right to the city should be examined from this perspective, and the subjects of the practices that constitute that right should be taken into consideration. Democracy and its participants, which restructure and reproduce space public space in modern societies, redefine urbanization processes with the collective and organized power it requires.

Harvey (2003) points out that the organized collective power necessary to claim the city through its alteration is quite beyond the capacity of individuals or individual rights: the realization of the right to the city demands claiming such a shaping power in an essential and radical way. Likewise, Lefebvre claims that the right to the city should involve a continual and active process of appropriation (in the sense of use rather than ownership) of city spaces (McCann, 2002). He also argues that “the right to the city [involves] the right to claim presence in the city, to wrest the use of the city from privileged new masters and democratize its spaces” (Lefebvre, 1996 in McCann, 2002). This definition specifically supports the fight against the privatization of public space and the maintenance of heterogeneity within metropolitan areas (Fainstein, 2006). The specific focus of this paper concerns this final point and attempts to engage in a discussion of the ways in which society can or cannot claim its collective rights and satisfy its needs in urban space while at the same time maintaining democracy within itself by allowing diversity and the inclusion of members with various needs and vulnerabilities.

Vulnerabilities in public space

The state of vulnerability was defined as “a matter of being under threat of harm” by Goodin (1985). This definition argues for the protection of those under threat with the assumption that harm can be prevented. From Arendt's (1998) point of view, vulnerability stems from human nature and permeates every aspect of human life. There are two important points to add to these. On the one hand, as mentioned above, those who are under threat of harm and have been deemed vulnerable by condition of inhabiting the city include not only the people but also the non-human members of society existing in public space. On the other hand, it is important to recognize the states of vulnerability that are not the result of human nature, but shaped by the environmental factors in which humans and non-humans live. In this complex web of realities, the existence of individuals and society in urban space requires them to be able to benefit from the rights offered by that space. Circumstances in which the right to the city is violated create socio-spatial conditions that put them in vulnerable situations. This is one of the states of vulnerability that does not originate from human nature, contrary to Arendt's arguments, but later emerges in the public sphere due to external factors.

Ali Madanipour opens his book, *Whose Public Space*, with the following sentence: “Public spaces mirror the complexities of urban societies” (Madanipour, 2010, p. 1). The public sphere is, in a way, made up of the existence, relations, and reflections of the things and people that constitute it. However, not all members and relationships within this sphere are equally reflected and represented socio-spatially. Arendt (1998) defined the public realm as the common world, but there are also

emotions, expressions, and even individuals and social groups that cannot find a place. Consequently, the diversity in question includes vulnerable groups and individuals that sometimes cannot find a place in the public sphere. On the inclusivity of the public realm, Arendt (1998) speaks of the great danger arising from the existence of people who are forced to live outside the common world, and the exclusion of the imperfect from the public realm, as such imperfection automatically becomes a private matter. This study brings together the concepts of *communal* and *irrelevant*, as coined by Arendt distinctively, as a pair of binary concepts, examining them through their exposure in media in which the public space is discussed. Here, vulnerability is associated with being deemed *irrelevant* in society, or the state of being unaccepted by society, while *communal* refers to the majority which is accepted by within society and has power over its counterpart.

SEEKING VULNERABILITIES IN PUBLIC SPACE: AN INVESTIGATION OF PRINT AND SOCIAL MEDIA IN TURKEY

This study explores the relationship between democracy and space and the *communal-irrelevant* binary as it pertains to vulnerability in society through the content analysis of print and social media in Turkey. Various states of vulnerability within the public sphere across Turkey were compiled based on the main vulnerability groups typology in social sciences literature (Turner, 2021), each group well represented in the literature and in the Turkish context. Accordingly, 12 vulnerable groups were examined in this study: women, LGBTQI+, children (aged below 18), elderly (aged 65 and over), the disabled, ethnic minorities, religious minorities, immigrants, refugees, the poor, the homeless, and non-humans.

In order to reveal the communal-irrelevant binaries in Turkish society, the investigation involved in-depth interviews conducted with vulnerable individuals published online, and critical humorous perspectives, mainly satirical, published online and in print form. The interviews were retrieved from YouTube, which is a major social media organ that serves as a widespread reflection of contemporary critical thinking, while the satire particularly focused on caricature magazines, which have been an important print tool of a centuries-old tradition of satire in Turkish society. While YouTube broadcasts discuss the experience and perception of vulnerability at the individual level through interviews and documentaries, the caricatures analyzed address the socio-political aspects of the vulnerability phenomenon through vulnerable groups. The research consisted of 30 YouTube channels and 35 print and online caricature magazines published between 2012-2022. Out of these, the focus lay on the cases in which various challenges for the *irrelevant* vulnerable groups mentioned above arise in relation to the rest of the society, or in other words, the *communal* public sphere in urban settings.

Women

On one YouTube channel comprising a series of interviews held in Istanbul's Kadıköy district, when asked about their conditions in Turkey, women generally complained that they do not have equal rights with men in their families, social environment, and work life, or in the public sphere (DW Türkçe, 2019). In the words of one interviewee examining the vulnerability of women in Turkish society, "it is difficult to work and live in this country, where even laughing is difficult." In the work titled "I'm afraid of Istanbul – Woman," a young woman describes the anxieties, threats, and fears she experiences in the public spaces of Istanbul and poses the question, "Have you ever calculated every step of your daily life just to feel more secure?", referring to the bothersome experiences she has undergone simply because of her gender (140 Journal, 2017; also see Figure 1).



Figure 1. Cover of Uykusuz Magazine, dated 25 May 2017
In Malatya, a special pink bus for women was established.

Man 1: If she gets on this bus instead of the pink one, she's definitely a slut.

Man 2: Why would she get on the mixed bus otherwise? She knows what she's doing...

LGBTQI+

The documentary titled "Don't look at me that way" discusses LGBTQI+ individuals' inability to be and act like themselves and live fearlessly, as well as the human rights violations they have been exposed to (Karataş, 2013). In this work, LGBTQI+ individuals state that the main problems they experience in public spaces are their exclusion and lack of fundamental rights that result from being seen as abnormal. They also complain that these issues prevent them from even voicing their concerns effectively. LGBTQI+ individuals interviewed also state that they want to be able to be open about their love wherever they are and whenever they feel like it, experience their feelings freely, and not be seen as different or inappropriate. One transgender woman describes the involuntary life she leads because of the treatment she receives in the public sphere as being "alive but walking around dead" (Figure 2).



Figure 2. A screenshot from the documentary "Don't Look at Me That Way" (Karataş, 2013)

In another documentary titled “Beyoğlu's stepson: Tarlabası,” which was filmed in the Istanbul's Tarlabası quarter, deals with the vulnerability of LGBTQI+ individuals by examining their lives alongside the spatial transformation that Tarlabası has undergone (Tatlıcan, 2012). According to this work, while LGBTQI+ individuals were excluded from most public spaces in the 90s, it was possible for them to live and survive in Tarlabası. When evaluated in terms of the inclusiveness, Tarlabası has become a more inclusive place than most for LGBTQI+ individuals, where diversity is more easily accepted. The social and physical change that this urban space underwent in the following years has also deeply touched the lives of these individuals.

Children

According to the media review, the main issues associated with children in the public sphere mentioned are the fears that children feel and their perceived and actual lack of security, including risks of kidnapping, sexual abuse, and peer bullying. One of the examples examined in this context is a set of interviews with children living on the streets waiting at traffic lights in Kağıthane, Istanbul (CNN Türk, 2018; also see Figure 3). Berfin, who is only 6 years old and lives a life with little feeling of safety as a result of the vulnerability of being a child in urban public space, earns her life on streets by selling napkins and sundries. When asked about her life on streets, she mentions her fears of theft and kidnapping. She argues that the money she earns can be taken by force, and that she is therefore ready to run away at any moment. Another remarkable media sample examined is a documentary about street children addicted to drugs, piling on the additional vulnerability of addiction to that of being a child (Öztürk, 2020). One child who began to live on the streets after the disintegration of his family says that he can use drugs in hidden areas and therefore lives away from the public. He does not establish relations with the larger society and leads a completely isolated life.



Figure 3. A caricature by Sefer Selvi in Evrensel Newspaper, dated 20 November 2020
 Woman: If you were reincarnated, what would you like to be?
 Boy: A child...

Elderly

It has been observed that the vulnerability of the elderly in relation to society and public space is very similar to that of children, as they are viewed as emotional and naïve, in addition to their relative physical frailty and sluggishness. One news report related the story of a couple between the ages of 65-70 living in Antalya that was defrauded of their money by a swindler through the exploitation of their guilt and religious beliefs (Sözcü Gazetesi, 2020; Figure 4). The unconscious attitudes and vulnerabilities of these elderly individuals were perceived and used as an opportunity for deception.



Figure 4. A screenshot from the Sözcü Newspaper, dated 13 July 2020

In another example, a 65-year-old woman living in Istanbul was swindled when a woman approached her while she was out shopping, asserted that she knew her, and offered help and money. Instead of giving aid, the fraudster stole money from the elderly woman's home. Such reports are just one of countless examples of elderly individuals whose money was stolen through the exploitation of their religious feelings and the abuse of their goodwill (Show Ana Haber, 2020).

The disabled

In the documentary “The connected” filmed in Yalova, interviews examined the social and physical difficulties disabled individuals experienced in public spaces (Özyurt, 2020). One interviewee, 70-year-old Şerife Şahin, is orthopedically disabled. Despite her age and disability, she works a job that requires physical ability and meets all her needs by herself. She speaks of her love for the nature and people of the place she lives in but still feels marginalized due to her vulnerability. Her statement, “People should not look at the disabled with pity,” reflects on the state of inconvenience she feels. Another interviewee, Yasin Sabri Şenyüz, a 27-year-old mentally disabled man, has never had a job due to his condition, so he helps his mother at home. He states that he is uncomfortable with the pitying glances he receives in public space and defines his condition not as being a disabled but a “special” individual. Seben Ayşe Dayı, a 30-year-old woman featured in a different documentary, was born with cerebral palsy (+90, 2019a). She is a trained journalist and an educational anthropologist. She expresses her vulnerability and exclusion in the following terms: “Actually, we want common sense and respect, for everything to become ordinary and be accepted as it is.” Instead of escaping public space, she wants to be there and be seen by society. She wants to feel that she lives in the public space as well. To this end, she emphasizes the importance of public spaces in maintaining communication between the disabled and the larger society. However, concerning the inconvenience of the physical conditions of public spaces, “Roads are like a minefield!” are her words (also see Figure 5). Consequently, public spaces are not their preferred place to socialize, and they usually have to spend more time at home or in shopping malls.



Figure 5. A caricature exhibited in “Accessible Caricatures” in 2013 in cooperation with the Manisa Municipality in Turkey and the Caricaturists Association of Turkey

Ethnic and religious minorities

In a documentary on the Roma people's neighborhood and social life in Beyoğlu, Istanbul (Municipality of Beyoğlu, 2013), Bülent Altınbaş, a 40-year-old clarinet player, exemplifies social exclusion in his not having been admitted to a musical conservatory solely because he was a member of the Roma community: "Am I not a human? [There should be] no discrimination, as everyone is an equal servant of Allah." In an interview on Jewish youth living in Istanbul, lawyer Betsi Penso expressed her thoughts on the attacks on their synagogues: "We have experienced bombings here. Maybe White Turks have the same feeling right now, but we have been living this for a very long time, so it is not something new" (+90, 2020a). She sees Istanbul as her home but now considers leaving like other peers in her generation due to her experiences with antagonism and polarization (also see Figure 6).



Figure 6. Cover of Penguen Magazine, dated 21 July 2016
Turkey said "NO TO THE COUP."

Man 1: Let's stop this polarization, shall we?

Man 2: Okay, you stop it first.

Man 1: You first!

Man 2: No you!

Man 1: You!

Man 2: Hell, you stop!

Immigrants and refugees

In a series of interviews about African immigrants trying to survive in Turkey (DW Türkçe, 2020), Muhammed Sierra Lioneli describes the exclusion he experiences in public spaces and argues that he is publicly called "black" by some people, seen as vulnerable by others, and has even been exposed to threats and violence. A Nigerian man named Pascal, who wants to earn his living playing football, states that although he was very successful in the trial games of several different football clubs, he was not accepted only because he was "different" as an immigrant marginalized by and segregated from other segments of society (also see Figure 7).

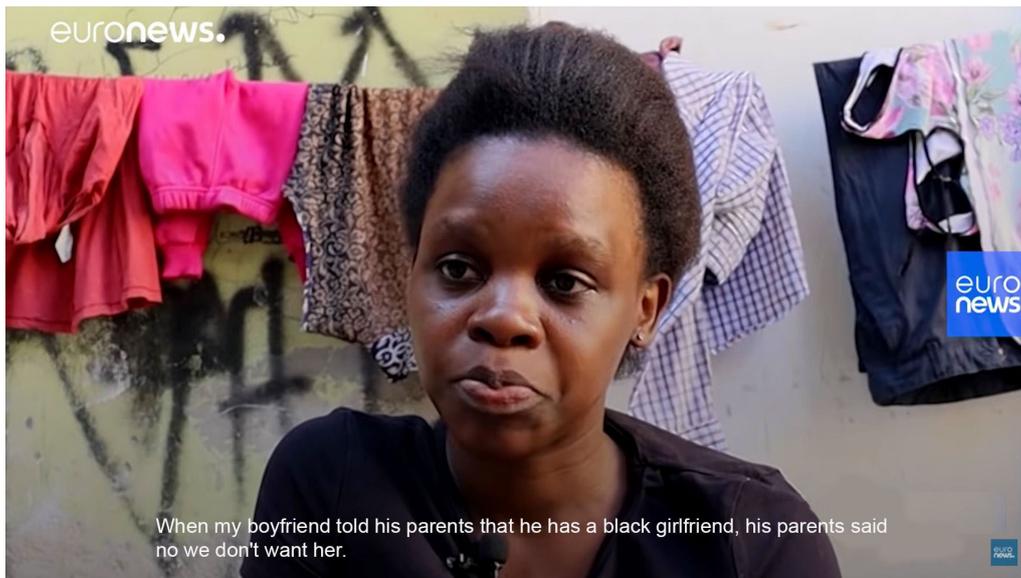


Figure 7. A screenshot from the interview “African Immigrants trying to hold on to life in Istanbul” (DW Türkçe, 2020)

In a post that discusses controversial opinions about Syrians in Hatay, a city in southern Turkey with a high concentration of Syrian refugees (DW Türkçe, 2022), Syrian Mustafa Ekreme responds to the negative image of his community by local people: “Not all the fingers of a hand are the same size. Let's not assume that all Syrians are bad. Everyone is different.”

The poor

In one documentary, Mehmet Suat Doğan, a sanitation worker in his 40s, describes it in an interview as a miracle that he can survive in Istanbul, adding: “Many of my friends around me are families that are broken or in distress, just like me. I can't sit down and chat with someone, because I see myself as inadequate due to my financial hardships” (BBC News Türkçe, 2019; also see Figure 8). Another YouTube video contains an interview about being a hammal (porter) in the wholesale marketplace in Istanbul's Bayrampaşa neighborhood (+90, 2020b). A 40-year-old man explains that being a porter is equivalent to being nothing and complains that he is not able to make any connections in public due to his outlook. He responds to the contempt of members of society with the words “We are human beings, we have rights, but no one extends to us these rights, they oppress us.”



Figure 8. Cover of Uykusuz Magazine, dated 12 March 2015
Man 1: In the last year, we have become twenty percent poorer.
Man 2: Brother, I am okay... I can't get poorer than this.

The homeless

An interview with 62-year-old Alaaddin Arslan, who lives in the streets of Tophane, Istanbul, states that he has been homeless for 35 years (+90, 2019b; Figure 9). In Arslan's words, "society is disgusted by people lying on the street, and this is one of the biggest things that hurt us in our hearts." He also emphasizes the dangers the homeless experiences in public spaces, stating that when confronted by drug addicts, they are even more vulnerable and at times even in mortal danger. He adds that the homeless cannot benefit from public health services, to which every member of society should have access. The documentary "Being Homeless: Life on the Street" about the life of a 51-year-old dweller of the streets of Alanya named Sinan reminds the greater society: "Do not despise people living outside, there are good people among them, try to support them" (Beta Video, 2020).

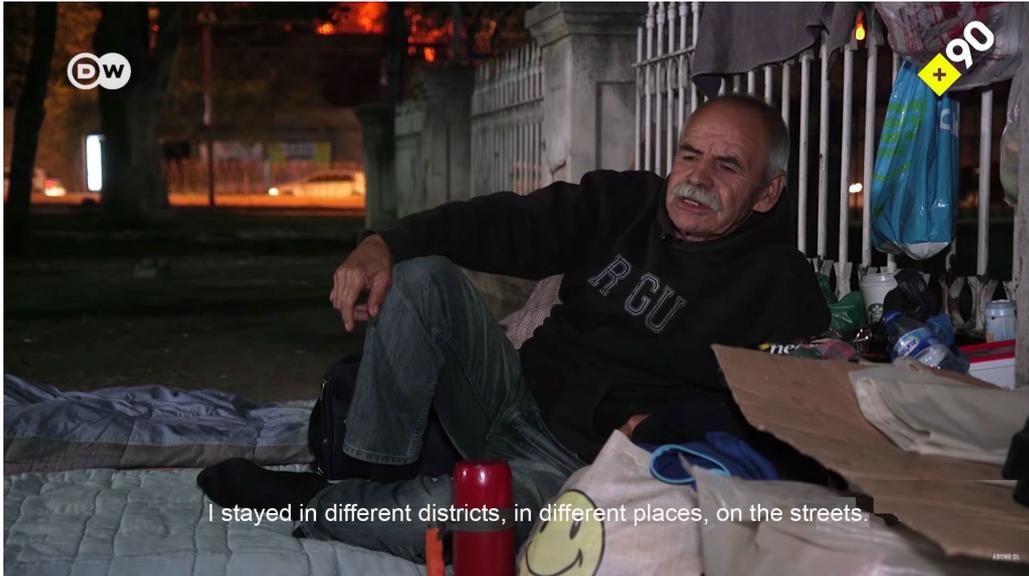


Figure 9. A screenshot from the interview “Being homeless: Living on the street. Don't look at me, come to me” (+90, 2019b)

Non-humans

Reflecting on stray dogs and cats, the most prominent animal species within the vulnerable non-humans category in Turkey, Banu Aydın, an animal rights activist and owner of a dog shelter in Istanbul, warns about stray dogs in Turkish cities: “These [animals] also deserve good families, animals that have already suffered a lot, stray dogs, abandoned animals, most of them traumatized. This one was either beaten or tortured (pointing at a dog). For example, there is a dog in the middle that I will show you. She was raped many times, it's proven. But the man paid 300 lira, got out of jail, and left” (BBC News Türkçe, 2020; Figure 10).



Figure 10. A screenshot from the interview “A day with animal rights activists” (BBC News Türkçe, 2020)

In this study, significant elements of the built and natural environments facing extinction are also analyzed as non-human. In a post concerning interviews with activists defending the Validebağ Grove in Istanbul, which is subject to a plan amendment in favor of mixed-use development (DW Türkçe,

2021), Arif Belgin, one of the volunteer advocates, calls for the grove's preservation: "A wide variety of animals, from turtles to hedgehogs, from lizards to grasshoppers, from squirrels to snakes, lives here. It has a natural ecosystem. This is a rare blessing for Istanbul. It is very important to preserve it in this way. It is extremely wrong to build facilities here." Another activist, photographer Ahmet Dayioğlu, expresses his sadness over the now lost oak trees of the grove resulting from current developments in the area: "There used to be a squirrel family in every oak tree living here, now there is only one family left."

CONCLUDING NOTES

The evidence from relevant media review shows that in Turkish society, vulnerable groups are not only viewed but also treated as *irrelevant* by the *communal* in the public sphere. As such, vulnerable individuals and groups perceive themselves as *irrelevant* through society's lens. Although their locations and types of vulnerability differ, their experiences and relationships with and in the public sphere show significant indications of social and spatial exclusion. Whether they bear an innate vulnerability or environmental factors and rights violations have made them vulnerable over time, for the members of the vulnerable groups, coming into contact with the larger society in public spaces can be strongly associated with marginalization, fear, uneasiness, insecurity, and even invisibility, in relation to exclusion. In contrast, the un-labeled remainder of society acts as a monolith that claims power over the public sphere and spaces through collectivity. Indeed, as Arendt (1998) mentioned, what makes vulnerable individuals so is not merely their smaller number, but the attitudes and behaviors of other individuals with whom they share the public space towards them. The communal-irrelevant pair is a binary of opposite and conflicting elements in this sense.

The generally assumed ways democracy manifests itself in space are that space provides the opportunity and convenience for each individual to realize themselves, both as an individual and as a member of any group co-inhabiting society, and that space has the capacity to include each without any spatial or social discrimination. However, space is only democratic to the extent that different social groups can use it equally and fairly without feeling or being assumed to be *communal* or *irrelevant*, and that these groups can relate to the space in different, free, and unique but consented ways. Vulnerable individuals wish to continually exist and realize themselves in public space because as Arendt rightfully put it, "the presence of others who see what we see and hear what we hear assures us of the reality of the world and ourselves" (Arendt, 1998, p. 53). This study demonstrates that vulnerable groups are associated with the production and reproduction of urban life from both perspectives; thus, in Harvey's (1993) words and Lefebvre's (1991) descriptions, they are 'legitimate owners' of the right to the city. Because ensuring social and spatial justice to all legitimate owners of this right—human and non-human—is a requisite for urban democracy to exist, in order for the society to claim its collective rights and needs while maintaining democracy, it must realize the socio-spatial inclusion of its vulnerable members that are deemed *irrelevant*.

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HOW DO WE PAVE A RIGHT? – THINKING RIGHT TO MOBILITY FROM WOMEN’S DISPLACEMENTS IN RIO DE JANEIRO

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Cecília wakes up at five every morning. Some minutes later, she wakes her daughter, Rosa, up so they can catch the six-five train. Then, they ride a bus to Rosa's school. Cecília follows her way towards another neighborhood where she works and studies. After school, Rosa attends her mom's college classes and they both go home at night at a quarter to nine. If they manage to catch the last direct train, they get home at half past ten. However, if they ride the multiple-stop train, they only get home after eleven pm. Conceição wakes up at half past five, gets dressed, and then wakes her children up. After her teenage children leave, she tends to her house, feeds the cats, and at eight in the morning she is at the bus stop to catch the first bus on her journey. Conceição rides two buses to and fro work every day. She gets back home around nine pm. By then, her children are bound to go to bed. Cecília and Conceição live in cities belonging to the Rio de Janeiro Metropolitan Area, which is the second largest metropolitan region in terms of population density in Brazil. They both spend three to four hours a day commuting. These hours make up their routine, and options for work, study, management of family life.

Cecília and Conceição are two of the participants of an ethnographic research conducted between March and August 2018. The research is targeted at reflecting upon what the right to mobility would be based on women's mobility. Considering mobility in large cities as an unavoidable component of the relationship with the city, the right to mobility becomes a fundamental right to fully exercise the right to the city. But neither city nor mobility are neutral elements. To the contrary, they are organized (or limited) by markers of gender, race, class, sexuality, disability, among other markers. To question the spatial project itself, which, under the aegis of an alleged neutrality, reiterates the excluding urban planning. Therefore, highlighting these markers is essential.

This analysis is linked to an intersectional feminist perspective, which seeks to construe the right to mobility by means of women's daily commute.². To do so, I am briefly introducing the current methodology for empirical research. Then, I am setting forth the concept of mobility as regards changes in the concept of transport. Finally, I am highlighting critical issues related to women's mobility and listing the parameters to define the right to mobility.

Although the research has been conducted before the onset of the Covid-19 pandemic, the labor and transport reorganization stemming from imposed covid-related sanitary measures has duly confirmed the current conclusion, at least within the geographic scope of analysis. During periods of restricted transport and lockdowns, people who had financial security have managed to better protect themselves. Those people belong to a certain group with similar markers of class, gender, and race.

1) Research Methodology

Due to their inherent complexity and recurrent invisibility within urban dynamics, studies on mobility usually lack methodological deficiency. According to Jíron and Imilan, when considering mobility as a path, only considering the starting point and the destination in a journey, traditional methods conceal issues, such as the reason routes are chosen, the effects (as regards cultural, economic, and social elements) and what kind of spatiality arises from transport practices. They believe a study that allows for addressing these concerns, constituting a broad and critical concept of mobility, is only possible by applying an ethnographic approach. (JÍRON and IMILIAN, 2016)

Thus, approaching mobility as a complex phenomenon, which concerns not only moving but a full range of projects and possibilities in life, the understanding of women's right to mobility can be construed by means of identifying the ethnography of their commute within the scope of field work about how a group of women uses transport. When proposing a methodological strategy to shape information in ethnographies of mobility, Jíron and Imilan introduce four research stages: 1) semi-structured interview; 2) shading technique; 3) transcription and data analysis; 4) return of data to study participants. This research, inspired by this methodology, sought to cross empirical data with theoretical and statistical readings pursuing a more complex understanding of mobility.

This research's *locus* of analysis is women's mobility in the Rio de Janeiro Metropolitan Region. We have conducted interviews and analyzed the ethnography of daily commute performed by eight

² As Kimberlé Crenshaw explains when introducing what is currently construed as intersectional analysis, and using, in fact, an urban metaphor, the intersection of axes of power, such as gender, race, class, sexuality, such intersection creates a place. Crenshaw regards expressions of oppression as if they were streets. So, women often find themselves at the crossroads of distinct types of oppression. In contrast, other groups of women who do not bear the burden of similar structures of domination are effectively in a different place. Therefore, it is no simple superposition but an intersection. Such intersection must be analyzed in its complexity to be, if not understood, not made invisible. Several Black feminists have approached this debate. However, the pioneering concept used herein, at least in the academic field, was coined by (CRENSHAW, 1989)

women who live in different areas of the city. The interviews have been conducted from March to August 2018. We were seeking to highlight their entire experience. of commute, even data usually not recorded in statistics. Overall, women's ages in the group range between 25 and 68 years. There were 6 Black women and two white women, two women with school-age children, all of them are public transport users on a daily basis. The outcomes presented herein highlight two of these participants, Conceição and Cecília (fake names). Both Cecília and Conceição are Black women, mothers, who live in the outskirts of the Rio de Janeiro Metropolitan Region, and work in Gávea, one of the neighborhoods with the highest concentration of income in the city of Rio de Janeiro. It is important to underpin that this type of research does not have any quantitative or statistical goals, but it might add some perspective to the process of interpreting numerical data.

I outline research perceptions together with the theoretical debate to try and shape the rationale intertwined with ethnographic results. I do so as if it were a road that can only be taken altogether.

2) From transport to mobility: A changing concept

Cecília and Conceição use public transport daily. Cecília rides the train and municipal bus and Conceição rides a municipal bus and another intercity bus. Cecília would like to be able to take a direct bus but there are none available covering her whole route. On the other hand, she is afraid of missing her daughter's school entrance time due to traffic unpredictability. Conceição resents the lack of a more accessible subway structure. She says that she can only ride the subway when she does extra work close to subway stations. Both reported the price of transport is an issue. Cecília struggles to make ends meet as she spends a lot of money on transport fares for both her and Rosa, her daughter. Conceição only goes out for fun once a month as the return ticket is expensive.

The 20th century has seen a sharp rise in urbanization and technological possibilities of transport within and between cities. In fact, much of city's growth towards becoming a metropolis is also based on the technological possibilities of transporting large amounts of people daily between housing areas and areas of economic concentration. Therefore, there is a relationship of interdependence between the development of transport systems and the uneven expansion of cities, one enabling and feeding back the other.

However, having transport as a starting point means focusing on vehicle movement, flow management, vehicle speed and capacity. The development of transport technology is based on the mechanical possibilities of vehicles, allowing physical access to jobs, not necessarily the demands and experiences of people. (AMAR, 2016)

Thus, managing transport would be based on making sure flows *from* somewhere *to* someplace else, that is, a management that organizes commutes to provide an answer to basic questions, such as where, how, and where we commute. In terms of transport, commuting is construed only as a means devoided of meaning and connection. Places as a starting point or a destination are a given. Even, the need to commute is a given. However, what happens along the way is overlooked.

On the other hand, acknowledging the lived experience of mobility delivers meaning to countless everyday acts as integral factors in forging and exercising the right to mobility. The notion of transport, as the French urbanist Georges Amar points out, reiterates a dual logic of transporter, and transported where the transported is clearly passive in the face of a system greater than individuals. Mobility, to the contrary, is an activity, it is a way of life whose multiple dimensions affect and determine the entire daily life of this *homo mobilis* for whom commuting is not an option but a mandatory way of being in society. For this *homo mobilis*, even time and space bear different meanings. Mobility time is no “wasted” time. It is time considered in the dimensions of lived experiences. Similarly, the notion of space is transformed since mobility itself is a space. (AMAR, 2016)

This perspective gains special importance in the diffuse shape of current metropolises, especially South American metropolises, and their deficient transport networks. Those regions have alternating centers of interest connected by poor transport structures, overlapping people who *can't* commute and people who *cannot* commute. Still, arriving at a place and having access to a place are completely different experiences. Being able to commute to a certain place does not mean one is actually going to get to that place. Also, exercising the right to accessing a certain place depends on other criteria.

The concept of the right to mobility was academically coined by François Ascher, in dialogue and based on Henry Lefebvre's right to the city. Ascher, also a French sociologist, creates theories based on new relationships established with time and movement. Movement, in fact, would not be a new marker but it has been transformed by the effects of the division of labor in the globalized economy (ASHER, 2005). But if, as the author points out, the division of labor in the globalized economy transformed movement within cities, the gendered and racialized division of urban flows highlights the unseen barriers of the city one has access or not. The place of mobility, a place not all people can profit from, is a place that changes city borders.

3) Women's mobility within city flows

Cecília and Conceição are always on the move, but transport structure flows do not usually cater to their needs. They cross and reinvent the city's borders to work but also to perform home managing

tasks, parent their children, and access leisure equipment. When crossing these borders, they highlight them, especially the borders that constitute gender and race within the city.

Caren Levy, upon criticizing the travel choice paradigm, demonstrates how such rationale has been forged within the logic of the “rational man” of classical economics. The kind of person who would take individual decisions in a kind of *social vacuum* (LEVY, 2013). Not only is transportation planning built upon gender standards but such standards, as Levy again points out, are obviously those of a Western middle-class family. I would dare say they cater to the standards of a white, heteronormative, Western middle-class family. If, on the one hand, the gendered transport planning reiterates power relations that guide the (im)possibility of choices, highlighting trips that go beyond this restricted classist and racist conception of the city show an exercise and demand for mobility much broader than rational man's routes to and fro work.

Therefore, construing urban mobility from a gender-based point of view means assigning a different meaning to time. Trips are spatial-temporal routines forming a set of behaviors along time. In addition to trips outside transport standards, they affect time management, behaviors shaped by fear of harassment or strategies to fight it, changes and restrictions to the relationship with the city.

Shaping the male subject in urban development, as Christine Bauhardt points out, has an intimate relationship with technization of actions in the city. Cities are regarded as machines for rationalizing everyday life. They strongly combined with male bodily autonomy, taking over urban areas as if they were institutions with their own predictable and determined flows. However, such rationalization does not consider care-providing tasks, which are socio-normative attributions of women (BAUHARDT, 2005).

The routes of our research subjects have precisely demonstrated a range of multiple commutes or stops in the route initially planned to meet care and safety needs. Although the financial cost is essential for commute accounting, it is weighted against physical safety, fatigue, multiple tasks, care-providing tasks, the city in a state of alert. Travel time is managed not only as it regards to speed but also to related care-providing tasks, especially for women who are mothers. How many means of transport one must take and where are also decided in those terms. Therefore, the geography of health and education facilities imply changing the direction of routes and how fragmented they will be. Choices, if we could dare call them that, consider financial costs, attention to safety, care-providing tasks, and the ultimate limits of the body.

4) Parameters for a gender-based right to mobility

To shape the right to mobility based on women's mobility, I set forth four parameters to define the right to mobility:

Mobility as a place

Conceição normally takes the first bus with a friend. So, for a quarter of the trip, they talk about work, make plans for the weekend. Later, he gets off the bus and she eats something she has brought in her bag, gets updates on how her children are at home over her cell phone. She would always like to read. Riding the bus is her best place to read with no distractions. Cecília also tries to read. She prefers to study when she is riding the bus or the train. But she is so tired that she ends up falling asleep. She tries not to get too relaxed, so she does not miss the station she is supposed to get off and keep an eye on her daughter. When they are going to school, they go over school material and discuss interactions with teachers and classmates.

Therefore, the bus and the train are not mere spaces of transit. They are spaces where the dimension of lived experiences create everyday life. The logic of a transport engineering managed by hourly quantification and patterns of origin and destination makes no room for the full range of lived experiences *at the* commute whether inside a vehicle or not. This issue also includes all the dynamics of bodily acts performed to commute, both to have access to the transport system and go through it, as well as sociability because it manages the organization of timetables and transport.

It is not possible, therefore, to consider hours of transport only as a total number – even if they are a worrying total number to be curbed in South American metropolises – but one must bear in mind that these hours are lived by people who allocate them to everyday tasks, by bodies that perform complex bodily acts to protect others, protect themselves, and endure all the way. Thinking about mobility as a place reveals dimension occurred in the experience of mobility itself. Such dimension is unreachable when one can only see where they started from and how they arrived. The right to mobility cannot neglect the diverse range of mobility-space experiences because such range allows for a livable and feasible space for tasks and bodies *living* within it.

Time management

Cecília every now and then thinks about getting some more sleep but she knows that if she does not take the train at that exact time, the next one will be so crowded, and the trip will be unbearable for Rosa. Conceição is always on time. If she is ever late, she knows traffic jams are going to get much worse. Sometimes, she negotiates with her boss to get to work later and leave later to escape the rush hour.

Mobility time is not just the time actually spent commuting but the entire transit-related time management. When commuting at certain times is mandatory, it creates specific burdens for this management, such as walking along unlit streets at times of greater exposure to urban violence or facing horrible traffic jams at rush hour on one's way to work. In addition, domestic-related tasks, overlooked in the entire dynamics of transport systems, require specific time management, such as allocating time to take children to school, buy groceries, and provide food for the family.

Considering time management when shaping the right to mobility and not just the time actually spent commuting allows for including several perspectives of analysis. The right to mobility, therefore, must engage in the possibility of time management by people who commute, turning mandatory schedules flexible, and creating better commuting conditions for people whose schedule remain mandatory. Similarly, by making commuting for care-providing/reproducing tasks visible, it would allow for better time management of people commuting. In other words, better circular bus lines and nicely kept public roads for commutes, and other measures.

Choosing transportation modes

Conceição would like to take the subway in Gávea to do other kinds of work. But the station that was supposed to be built for the Rio Olympics (2016) has never been constructed. Among the bus line options to her place, there is one bus line she avoids riding because she was once mugged there. Cecília too would like to ride a single bus home so Rosa could sleep on the way. Or at least manage to sit with the girl on her lap on the train.

One can only talk about choosing the type of transport or modal transport if there is a feasible option available. Fulfilling the right to mobility means more than having transport available for people to move around, it also means having access to viable options in the same route. Viable options do not only mean existing ones, but they must be equally accessible and do not pose a different kind of threat. Therefore, we need a real transport offer. We need an offer that does not only considers commutes to areas of massive demand of formal work, in other words, we must consider various flows of people within the city. Also, we should ride non-motor vehicles on the streets, as well as take better care of sidewalks, lighting, and traffic planning so people could favor walking. Choosing how to commute is a non-negotiable component of the right to mobility.

Non-compulsory mobility / mobility levels

Conceição and Cecília have already worked in places closer to their homes, but both agree they cannot find good wages there. And Cecília has no doubt Rosa's quality of education is much better at her current school, hours away from home. Cecília and Conceição are forced to commute to have

access to better work, as well as access to leisure. However, timetables and the price of transport are barriers for them. Thus, commuting in the city is both an obligation and a challenge, except for people who can choose not to commute. During the Covid-19 pandemic, the difference between people who had to commute and people who could choose not to commute grew stark.

The option of not commuting, which, in fact, is related to the possibility of managing timetables and choosing modes of travel, is an important differentiating mark of exercising the right to mobility. Therefore, we could argue that fulfilling the right to mobility is a privilege restricted to few people. Nonetheless, reflecting upon mobility in a complex way requires understanding the levels of mobility created for and by the city, identifying the people who can move and what they are allowed to do while moving, and the people who need not move and when they do commute. This relates both to allocation of well-paid jobs in the urban fabric and investments in municipal and state-level urban apparatus.

Thus, the right to mobility must encompass the organization not only of transport but the entire urban organization so investment centers are available in several areas of the city. That is why it could be interesting to tell what levels of mobility are, instead of investing in an absolute dichotomy but to make such organizations more visible:

Impossibility to move: The impossibility of movement today means the impossibility of crossing physical and social borders in the scenario of exacerbated levels of exclusion. The impossibility of movement is related to the economic impossibility of affording the unreasonable prices of public transport, the lack of fitness of urban roads for people with reduced mobility, exposure to increased risk of police violence, risk of constant sexual harassment, risk of violence/murder due to sexual orientation, among other factors that make it impossible for people to move around the city.

Mandatory movement: There is a thin line separating the impossibility of movement from mandatory movement. Mandatory movement is related to production and reproduction tasks and the distances for both are an outcome of differentiated allocation of resources in the city. Thus, the more vulnerable the working conditions are, the more likely people are forced to move through the urban fabric. Similarly, those who are responsible for household chores, usually women to this day, are more likely to face mandatory movement for managing survival tasks, such as purchasing food – and longer commutes to seek cheaper food – commutes to care for the children, health, and performing care-related tasks for other family members. There is a thin line separating mandatory movement from the impossibility of movement precisely because people who are forced to move are often unable to do so, rendering the most basic tasks impossible. Similarly, turning the very possibility of movement, even if utterly vulnerable, a better option than not being able to perform the basic tasks to sustain life.

Movement as an option: In fact, movement as an option is listed here to contrast with impossibility of movement/mandatory movement. Also, it could represent the core of an effective *right to mobility*. Choosing to move means being able to move, that is, not having economic obstacles in urban commute, having access to public roads and transport that allow and enable one's commute, not being under constant threat of physical and psychological violence. And movement as an option also means being able to choose not to move or not to cross long distances. In other words, having access to well-paid jobs throughout the urban fabric, as well as quality hospitals, legal services, education structures.

Currently, non-mandatory movement/movement as an option is increasingly a social, racial, and gender privilege marker, not a right. People who can work from home, who have managed to do it throughout the Covid-19 pandemic X people who needed to go to work despite facing risks, people who do not need to go to the supermarket X people who deliver supermarket orders. Observing the city and mobility from that spectrum allows us to rethink its design to grant the right to both groups of people.

Conclusions still (or always) in motion

The right to mobility, from these four spectrums of analysis, could thus be regarded as the right to be in the space of mobility, manage one's mobility time, choose one's way of moving, and choose when and how to move. So Cecília could choose how she is going to take Rosa to school but also choose between schools that are not so far away from her home and provide equal education quality. It also means both a chance for Conceição to work closer to her home and, when she is not working, being able to leave her home at a time that allows for her to go to the supermarket, if needed. It is Conceição and Cecília's right to enjoy the space of mobility by rebuilding the city.

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HEAP DEVELOPMENT IN THE RUHR METROPOLIS
THE 'MOUNTAINS OF THE RUHR' AS PLACES OF IDENTITY

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1. Introduction

For decades, the Ruhr region in Germany was shaped by the coal mining industry. In the late 19th and early to mid-20th century, industrialization and accompanying urbanization processes turned small villages into large cities. In consequence, the Ruhr region became the largest industrial agglomeration in Europe with coal mines being both the main employer and an essential identity-forming feature.

As of today, the Ruhr region has undergone another set of decades of structural change. Former industrial sites were re-cultivated and renaturated and by now, the region no longer understands itself as the 'Ruhr region' but as the 'Ruhr Metropolis'. Within all the change, however, there is one constant – a special kind of *place* that remains: the heaps. As former collection points for coal mining overburden and the collieries' slag, they are now the 'Mountains of the Ruhr', a vital element of Green Infrastructure (GI) of the Ruhr Metropolis and still an anchor of identity for 5.1 million people.

The regional planning authority of the Ruhr region, the Ruhr Regional Association (German: 'Regionalverband Ruhr' short RVR), is responsible for the preservation and development of open space and GI. Currently, the RVR develops 46 slag heaps and will take over several more in the near future (cf. Website RVR, 2022). The exciting challenge for the RVR is now to make the 'Mountains of the Ruhr' usable for the region's inhabitants, to foster the ecological value of this special GI in the overall open space system and to bring together cultural preservation and strategic development.

This paper offers insights into the transformation processes of the Ruhr region (see section 2), the change in identity of its slag heaps and the planning and development of heaps as an anchor of urban GI (see section 3). Recent findings on the narrative and *place*-making of heaps are presented, highlighting both the storyline for the 'Mountains of the Ruhr' and the individual character of the heaps (see section 3.3). Thus, this paper offers an empirical example of the shift in meaning of *place*, which creates identity, drives ecological restoration, and is one milestone of the green transformation of the Ruhr Metropolis (cf. RVR, 2021).

2. Transformation processes

Similar to the rust belt in the US, the Ruhr region has undergone a tremendous structural change over the last 300 years, which is why the Ruhr Metropolis has extensive transformation experience. Change is the region's 'normal state' and so nowadays, after decades of industrial and post-industrial transformation, the region is currently shaping its 'green transformation'.

2.1 Post-industrial Transformation of the Ruhr region

After decades of industrialization, in the late 1950s, the importance of coal and steel began to decline. Due to a growing competition on the world market for coal as well as the availability of cheaper energy sources like gas and oil, prices for coal began to drop. For the Ruhr region, this trend resulted in a halving of the number of coal mines in just one decade, known as the so-called 'death of the coal mines'. Shortly after, in the 1970s, the worldwide steel crisis led to an unemployment of ¼ of the workers in steel manufacturing industries within another mere decade. (RVR 2018, p. 4)

So by the end of the 1980s, the two former core industries and main employers of the Ruhr region, were strongly diminished. Luckily, the Ruhr region initialized the process of structural change towards the knowledge-based and service sector rather early. In the 1960s, the first Universities were founded, bringing research and innovation into the region. (RVR 2018, p. 4)

Other catalysts of post-industrial transformation were the International Building Exhibition (IBA) Emscherpark, which took place from 1989 to 1999, and the accompanying 'Ecology Programme Emscher Lippe' (German: 'Ökologieprogramm Emscher Lippe', short: ÖPEL). The aim was to support the renewal of the Ruhr region, especially regarding its ecosystems. 5 billion Deutsche Mark (former German currency, about 2.5 billion Euros) were granted to the region in order to reshape and re-naturalize the whole Ruhr Metropolis. (Internationale Bauausstellung Emscher 1996, p.7)

A core focus of the IBA Emscherpark was on the greenways of the region.¹ The greenways are a very characteristic GI for the Ruhr Metropolis, as they run vertically in between the densely populated cities of the region and are one reason for the founding of the RVR in 1920 by Robert Schmidt. The initiative of the IBA was to qualify these greenways into lively *places* of both work (in the park) and recreation, of biodiversity and arts. In this context, special attention was payed to the development of the heaps (RVR 2018: 5 and Internationale Bausausstellung Emscherpark 1996, 10 pp.), as shown in section 3.

The post-industrial structural change was the start of a shift in meaning of GI in the Ruhr Metropolis and especially its heaps. Although the inhabitants of the region understood the transformation processes quite early as they experienced them in their everyday lives, it took the IBA Emscherpark to also change the perception of the Ruhr areas for people from outside the region. While the Ruhr region

¹ Another core project of that time was the revitalization of the highly polluted river Emscher, which is in fact to be finalized by the end of this year (2022).

was perceived to be a 'gray' region with smoking chimneys, environmental pollution and little green spaces for many decades (RVR 2018, p. 4), the image changed over the years to a 'green' metropolitan region with universities, colleges and technology centers.

Nowadays, as many of the 5.1 million people living in the Ruhr Metropolis are second- or third-generation immigrants, the region is diverse and rich in culture. Diversity also shows in flora and fauna, as former *places* of mining and steel industry today are habitats for many species, resulting in a unique ecology also known as 'industrial nature'.

2.2 Green Transformation in the Ruhr Metropolis

As described above, the green transformation of the Ruhr Metropolis roots in the post-industrial structural change and especially the IBA Emscherpark. However, in 2020, the region decided to foster the green transformation also on a strategic level by agreeing on a common vision: the Ruhr Metropolis wants to become the greenest industrial region of the world.

Certainly, this vision entails more than the color 'green': it stands for sustainability and resilience, for facing today's and future challenges and about guaranteeing a good, 'livable' life for the people of the Ruhr region. (Website RVR 2022) Although this vision is ambitious, the region has good preconditions: 74 percent of the Ruhr area are vegetated and even in densely populated areas, green spaces make up more than 50 percent. (RVR 2021, p. 10) Moreover, within the past 30 years, the share of public green spaces has doubled, a trend, which is to be continued (RVR 2021, p. 22).

2.2.1 Green Infrastructure Strategy as an instrument for the green transformation

In order to bundle and extend activities for the green transformation, the RVR decided to formulate a GI Strategy. The GI Strategy serves as an informal instrument of regional governance and thus complements formal regional and land-use plans through agreements on qualities for existing and future GI in the region and its 53 municipalities. It contains regionally-shared visions for the core topics of GI and sets qualitative and quantitative goals for their achievement. It also acts as a strategic framework for the bundling of existing and the promotion of new 'green' projects. (Website RVR, 2022)

The GI Strategy aims at a target-oriented and participatory planning and implementation of GI. Through networking events, thematic working groups and online white-boards, the region's stakeholders collaborate on the Strategy's formulating and thereby shape their own future in the Ruhr Metropolis. (Website RVR, 2022)

The GI Strategy consists of four parts: First, an analysis part, which gives insight into the specific prerequisites of the Ruhr Metropolis regarding its spatial characteristics, its distinctive GI potentials and the several stakeholders shaping the GI in the region. Second, a so-called "Green Charter", comprising the mission statement and visions for the future development of GI in the Ruhr Metropolis, set by its stakeholders. Third, qualitative and quantitative goals for each vision and last, a concept on

the implementation and monitoring of these goals. (Website RVR, 2022) The GI Strategy is to be passed as a resolution by the Ruhr parliament in 2023.

Vision for green spaces and heap development in the Ruhr Metropolis

As the heaps of the Ruhr Metropolis are one anchor of GI, their future development is one important topic of the GI Strategy. Under the vision of a strategically developed network of Green Infrastructure that guarantees quality of life for all inhabitants of the region, the heaps are one core element. As such, the vision for the heaps is that they are to be preserved and developed in their collective function as the 'Mountains of the Ruhr' as well as in their individual, identity-establishing character.

One of the goals of the Green Infrastructure Strategy is the 'Conquest of the Heaps'. It aims at the rehabilitation of as many heaps as possible for purposes of recreation, leisure and tourism. In turn, some heaps are to be developed solely for nature preservation purposes and shall not be accessible for the public. The RVR has the remit to formulate a utilization concept for all heaps in its possession, as described in section 3.3.

3. Slag heaps as PLACES of identity

As described in section 2, the Ruhr Metropolis is constantly under transformation and with it the change in meaning of certain *places*, such as its heaps. In the following, focus is set on the transformation of the heaps, the history of them becoming anchor points of the region's green space system and the outlook on their future strategic development.

3.1 Heaps as restricted and dangerous PLACES

Coal mines and slag heaps are inseparably as the latter mostly consist of mining overburden - meaning the non-coal material as a byproduct of coal production. This is why since the very beginning of industrialization and mining activities in the Ruhr region slag heaps formed. And with the forming of slag heaps, the landscape of the initially flat Ruhr region began to change, giving birth to the 'Mountains of the Ruhr'.

As the slag heaps were needed in close proximity to the coal mines and as was housing for the miners, most heaps were and still are located in the middle of housing areas. All the time the coal mines were in operation, the slag heaps were, like the coal mines themselves, restricted areas. They were part of the industrial grounds and therefore closed and forbidden *places*. Also, the heaps were considered both dirty and dangerous. It was forbidden to walk the heaps as for one they could have still been burning from the inside and for another the material would most likely have been polluted, both being a considerable danger.

3.2 Revitalization and opening of the heaps

During the IBA Emscherpark, the heaps were discovered as GI potentials. Once created as conic rock piles, the heaps were re-modelled into walkable landscape structures. Polluted material was removed

and greening and forestation began. After decades of restriction, the slag heaps were made accessible to the public and especially to the people living in close proximity. For the first time, the heaps were no longer a barrier but a connecting element.

Opening up those former forbidden *places* resulted in a huge benefit for the people living in the Ruhr region. The IBA Emscherpark initiated the promotion of the slag heaps as highlights of the region and created new *places* of identity with different kinds of utilization. Art installations were placed as landmarks on some of the bigger heaps, creating a feeling of 'coming home' for people living in the region. These landmarks are still visible from long distances and are also special *places* to visit for travelers. (Ganser 1999, 60 pp.)

3.3 Strategic Heap Development

Since the heaps were opened to the public, they have experienced an extensive use. Cultural interventions like sports competitions, open-air concerts and other events take place in these amazing *places*. (RVR, 2021)

Today, more than 20 years after the IBA Emscherpark has ended, the region is entering a new phase of change for the heaps: mining activities have fully ceased in the Ruhr region and the last slag heaps are finally filled and in the process of being vegetated. Additionally, the heaps of the IBA require modernization. The RVR uses this window of opportunity to acquire the remaining heaps not already in its possession in order to strategically develop all heaps in the Ruhr Metropolis.

For the first time, both the GI Strategy and a utilization concept for all heaps provide the strategic framework of the future heap development. As a first step, the heaps were categorized regarding their potential use: either for tourism due to their regional significance, for recreation due to their local significance or for nature preservation with ongoing restricted use. As a second step, all heaps are analyzed regarding their potential for renewable energy production. As a third step the region decided to assign a frame concept for those heaps with touristic potential and regional significance, which is introduced in the following.

3.3.1 Touristic Frame Concept

With the planned acquisition of the remaining 23 heaps and the recent categorization of all heaps, a necessity for a concept including the slag heaps with regional significance was asserted. The Austrian consulting and planning office 'pronatour' (www.pronatour.at) was commissioned in the year 2021 to create a new storyline for the touristic heaps and to promote the uniqueness of every single heap. (RVR, 2022)

The result is as simple as brilliant: People of this region live in the "Tops of Ruhr" and every top - meaning each heap - has its own story to tell as well as its own character.

Each touristic heap has a unique setting and is to be equipped with play areas, interventions and other highlights, depending on its character. Physical elements are planned to connect the heaps with each other and virtual elements make it possible to interact with visitors on other heaps. Every heap top shall have areas to rest and invite for a picnic. Furthermore, the 'Mountains of the Ruhr' are to be extended in their potential for mountain biking. A network of mountain bike trails is to be built, connecting different slag heaps and inviting bikers to spend several days in the 'Mountains of the Ruhr'. Last but not least, all heaps shall be equipped with homogeneous signs and points of information that promote an easy orientation on the different heaps. (RVR, 2022)

Every heap shall have its own profile. The heap 'Hoheward' for example with its already installed 'horizon observatory' may be called 'the heavenly heap'. As a visitor, one can experience the sky and the stars, read a sundial and become an amateur astronomer. The heap 'Tetraeder' – potentially called 'the breathtaking heap' - is suggested to become a highlight for families, with a designed slide way down the heap, which will increase the quality and duration of the visitors' stay. The famous landmark on top of the slag heap, the triangular pyramid shaped walkable sculpture, is and will be a *place* of identity not only for the city of Bottrop but for everyone crossing it. (RVR, 2022)

4 Conclusion - Heaps as the 'Mountains of the Ruhr'

The heaps have always inevitably characterized the landscape of the Ruhr region. However, during several transformation processes the heaps underwent a fascinating shift in their identity: The heaps transformed from former forbidden 'gray' *places* to anchor points of today's 'green' infrastructure. Together with the greenways, the heaps now form a backbone of the region's green transformation. And the 'Mountains of the Ruhr' are highly positive *places* of identity for the inhabitants of the Ruhr Metropolis, whose motto is: home is where me slag heap is.

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THE MARINE PROTECTED AREA CONTRACT AS A COLLABORATIVE GOVERNANCE TOOL: THE LAZIO REGION CASE STUDY

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Introduction

The Mediterranean basin is considered one of the most important hotspots of biodiversity in the world in terms of the richness of species (many endemic and rare species in need of conservation) and ecosystems. It hosts 1,215 Marine Protected Areas (MPAs) and Other Effective area-based Conservation Measures (OECMs), covering 171,362 sq. km which places a surface of 6.81% under a legal designation. Over 72.77% of the surface covered is located in the Western Mediterranean, 90.05% of the total surface covered by MPAs and OECMs are found in EU waters (MedPan, 2016). To safeguard and secure the well-being of the species and habitats of the Mediterranean basin, MPAs need to be well-enforced and connected through a network of geographically distinct marine regions allowing marine wildlife to move and disperse securely. This requires a harmonized proper management plan and multilevel governance to operate as an effective protection tool for halting the loss of marine biodiversity and abating human-induced threats, such as fishing, marine traffic, and recreational activities (Mazaris et al., 2019). The Mediterranean is threatened by anthropogenic pressures and climate change and even if it hosts many protected areas, they are not always effective due to the fragmentation of administrative competencies and difficulties in creating networks. Over time networks have been created among MPAs such as MedPan² which aims to promote the establishment, the operation, and the sustainability of a Mediterranean network of Marine Protected Areas.

In order to limit conflicts between nature conservation and local development within a framework of sustainability, the project Interreg Med TUNE UP – *Promoting multilevel governance for tuning up biodiversity protection in marine areas*³ was developed, with the specific objectives (i) to strengthen the synergies and the network of MPAs in the Med area; (ii) strengthen the capacity to adapt and improve the protection measures of coastal and marine ecosystems by involving key stakeholders; (iii) include integrated management of MPAs in national, regional and local territorial development strategies. The project started in November 2019 and finished in June 2022, involving 12 partners under the coordination of Anatoliki, a Greek agency for local development, from 7 Med Countries with the objective to strengthen the effectiveness of Mediterranean MPAs management by promoting the multilevel and multistakeholder governance model of the Environmental Contract applied to marine areas. The project was divided into 3 implementation phases: (i) testing the Environmental Contract tool in 10 MPAs (Fig. 1); (ii) transferring the produced knowledge, methodology, and know-how to

² <https://medpan.org>

³ <https://tune-up.interreg-med.eu>

different contexts and to potential stakeholders beyond TUNE UP target areas (in particular to MPAs managers), through exchanging, transferring and training activities and; (iii) capitalizing the MPA Contract experience, mainstreaming and promoting the tested tool at regional and Med level through exchanging, training and lobbying activities.



Figure 1 - TUNE UP Pilot areas: Thermaikos Gulf, Greece (33.779,00 ha); Cabo De Gata Níjar, Spain (49.512,00 ha); Sinis Peninsula – Mal di Ventre Island, Italy (26.703,00 ha); Karaburun Sazan, Albania (12.428,00 ha); Sečovlje Salina, Slovenia (892,00 ha); Albufera de Valencia, Spain (8.475,00 ha); Former Saltworks of Camargue, France (6.800,00 ha); Boka Kotorska Bay- Sopot and Drazin vrt, Montenegro (15.000,00 ha); Amvrakikos Gulf, Greece (60.104,00 ha); Ventotene and Santo Stefano Islands, Italy 2.799,00 ha). Total surface engaged 216.492,00 ha.

The Environmental Contract originated in France in the early eighties to control pollution and flooding, manage hydraulic structures, and raise stakeholder awareness (Bastiani, 2011), and was later replicated in neighbouring countries, including Belgium (Wallonia in 1988) and Italy (Lombardy Region and then the Piedmont Region in early 2000s) (Scaduto, 2016). The Environmental Contract is based on vertical and horizontal subsidiarity and the direct engagement in this process of the management authorities, institutions, and communities is pivotal for its effectiveness (D’Ascanio et al., 2018).

TUNE UP applied the Environmental Contract to MPAs governance for the first time, introducing the MPA Contract as a voluntary tool for the strategic and negotiated planning for the marine protection, and local development based on the participation of local stakeholders (public, private, associations, and community).

This contribution refers to the application of the MPA Contract in the Lazio region promoted by TUNE UP, analysing, on one hand, the testing phase related to the activation of two Marine Protected Area Contract processes in the “Ventotene and Santo Stefano” MPA in Latina Province and “Secche di Tor Paterno” MPA in the Metropolitan City of Rome, and on the other hand the mainstreaming phase related to the integration of the tool in the Regional legal framework.

Environmental Contracts in Marine Protected Areas

The Joint Methodology developed by TUNE UP for the application of the Environmental Contract in MPAs considers this tool as a flow process composed of three subsequent stages: the Preparatory stage, the Development stage, and the Implementation stage (Palazzo et al., 2021) (Fig. 2).

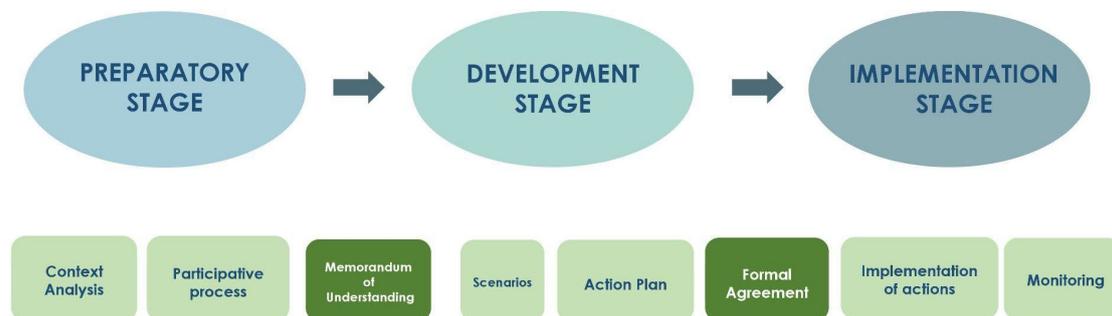


Figure 2 - The Environmental Contract process

The Preparatory stage deals with the Context analysis and the Participatory process. The Context Analysis has to consider: (i) Socio-economic and cultural factors; (ii) Scientific-environmental factors (e.g. habitat and species; environmental heritage); (iii) External drivers of change (e.g. macro trends in the economy; EU and national policies; regional and local regulations; strategies in place in similar areas); (iv) Internal drivers of change (e.g. existing strategies; availability of resources; preferences of residents; status of collaborations among stakeholders and institutions). The Participatory process needs to define criticalities and opportunities for the target area, empower institutions and the community, and build a common view. Then, a first commitment of the process is the Memorandum of Understanding (MoU) which contains the general reasons and the objectives of the Contract, the specific critical issues, the working methodology, and the definition of the governance structure shared between the actors taking part in the process. It is not a mandatory document but it is useful to formalize the commitment to further develop the process. With the MoU the governance structure of the Contract is defined, establishing: (i) the Coordinator, who has the task to rule the overall implementation of the process and promote it to competent public administrations and local stakeholders; (ii) the Management Board, which is composed of public authorities and has political decision-making functions; (iii) the Technical Secretariat, which is the operative body with the task to support the Management Board and the MPA Assembly; (iv) the MPA Assembly, engaging all public and private actors, it can meet in plenary sessions or in the form of thematic and/or territorial laboratories according to the specific needs and phases of the process.

The Development stage is the phase when the intermediate outputs, as well as the final ones, are developed and released. The intermediate output of this stage is the Scenario analysis (Trend, Oriented and Preferred scenarios), useful to define the mid-term implementation strategy of the Contract. The final outputs of the process are the legal-binding Agreement signed by the key stakeholders and the Action Plan, developed according to the objectives that emerged during the process, establishing the priority actions, the roles, and commitment of the signatories, the methods for implementing the actions, as well as the procedures to monitor the implementation.

The last phase consists of the Implementation of the actions and their monitoring.

Testing the MPA Contract in the Lazio region

The Italian National Table of River Contracts was established in 2007 as a working group for the coordination of Italian Local Agenda 21, with the aim of creating a community able to exchange information and experiences and promote the River Contracts in Italy. In 2010, the objectives and purposes of the River Contracts were summarized for the first time in a policy document called the "National Charter of River Contracts", currently adopted by 18 Regions. After a long work carried out in the territories and through the institutions, in 2015, the legitimation of the River Contracts on a

national scale takes place with the inclusion of article 68 bis in the Consolidated Environmental Act, Legislative Decree 152 of 2006. In 2017, a special National Observatory of River Contracts was established within the Ministry of the Environment, in order to give concrete support to the Regions and River Basin Districts in the dissemination of River Contracts. The establishment of the Observatory serves to promote the harmonization of the River Contracts, placing the Ministry in the role of national reference and guide, with a database to follow its evolution and to know its strengths and weaknesses, favouring exchanges and cooperation between the various Italian experiences.

Lazio Region subscribed the National Charter of River Contracts and in 2016 legally recognized the River Contracts in 2014 (Regional Law n. 17/2016). Furthermore, the new "Special Office for Small Municipalities and River Contracts" was established in 2018, which refers directly to the Presidency of the Lazio Region, and the "Regional Technical Forum on River, Lake, Mouth and Coast Contracts" was established in 2019.

In this context, the Department of Architecture of the Roma Tre University promoted, in coordination with the Municipality of Ventotene, the testing of the MPA Contract in "Ventotene and Santo Stefano Islands" SNR/MPA, and then transferred the tool to the "Secche di Tor Paterno" MPA in the coordination with RomaNatura, leading to the signature of the two Memorandum of Understanding.

SNR/MPA "Ventotene and Santo Stefano Islands"

The "Islands of Ventotene and Santo Stefano" MPA has an area of 2,799 ha at sea and both islands are part of the State Natural Reserve (SNR) with a surface of 174 ha. The area includes also three Natura 2000 sites (Fig. 3). The management authority of the protected areas is the Municipality of Ventotene. Specifically, the MPA is divided into three zones with different degrees of protection: (i) zone A: integral reserve which extends along the southern side of the island of Santo Stefano for about 410 ha and 828 m of coastline; (ii) zone B: general reserve which extends for 1600 ha and 5828 m of coastline and includes a large part of the western side of the island of Ventotene and (iii) zone C: partial reserve which extends for 789 ha and 3180 m of the coast and almost entirely includes the northern side of the island of Ventotene. The zoning of the MPA is currently under review and the SNR is still without a management plan and zoning.

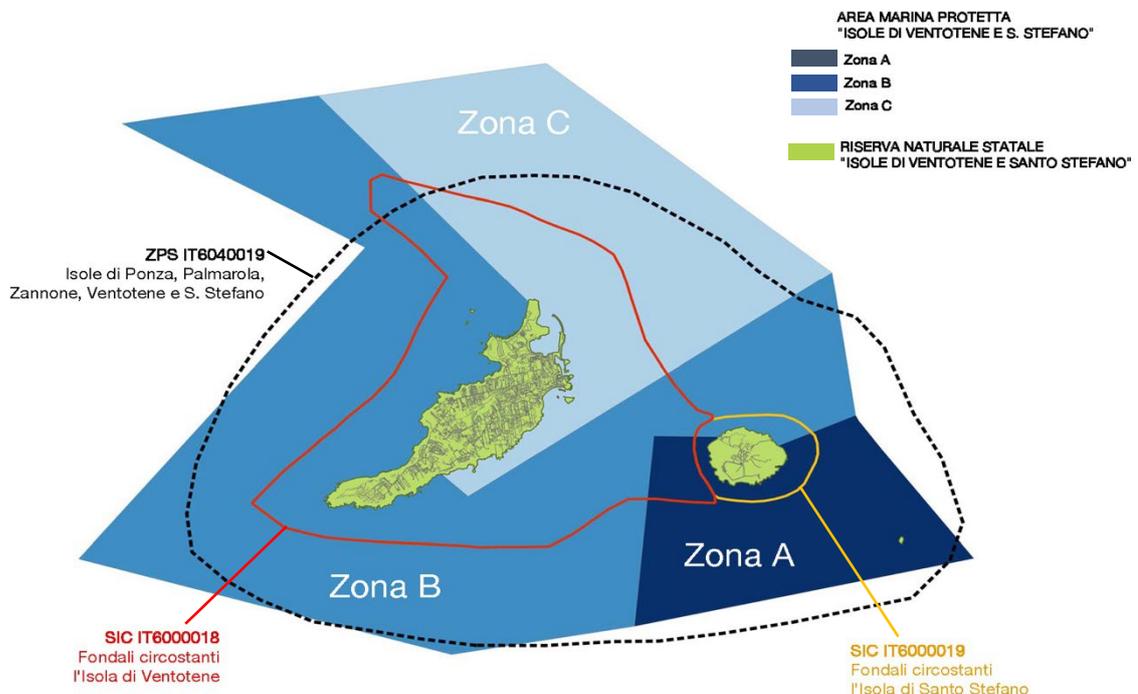


Figure 3 – Natura 2000 protected areas (Special Protection Area and Special Conservation Areas) overlaid on the Zoning of the MPA “Ventotene and S. Stefano Islands” (Source: MPA “Ventotene and S. Stefano Islands”).

The islands of Ventotene and Santo Stefano are part of the Pontine Archipelago in the province of Latina. Ventotene has about 800 residents whose presence decreases to a few hundred during the winter and increases to 5,000 in the summer, while the island of Santo Stefano is completely uninhabited. The latter was a land of confinement since Roman times. In 1795 the Bourbon prison was inaugurated. It became a place of imprisonment for important exponents of modern Italian history during Fascism such as Altiero Spinelli who, together with other comrades, wrote the so-called “Ventotene Manifesto” on the future of Europe. The prison closed in 1965 and was declared a “Property of particular interest” by the Ministry of Cultural Heritage in 1987. It was then declared a “National Monument” in 2008 by a Decree of the President of the Republic and a large coordinated redevelopment project is underway by a Government Commissioner Structure. Ventotene is a well-known bird-watching spot as the island represents an essential stepping zone for a large number of migratory birds. The bird observatory is part of the ISPRA Small Islands Project which has been studying 46 sites of birds’ migration in seven Mediterranean countries since 1988. The results of these studies led to the creation in 2006 of the Ventotene Bird Migration Museum.

TUNE UP launched the Environmental Contract process in November 2020, mapping 69 stakeholders who have competencies, influence, or interests in the pilot area, distributed among national, regional, and local public bodies, environmental and cultural associations, local cultural centres, and higher education and research centres, and a significant number of tourism SMEs. This distribution reveals the predominantly tourist vocation of the area. The participatory process involved around 30 participants including delegates and individuals, representing public and private sector organizations, stakeholders, and citizens, and was divided into information meetings and thematic workshops. Although the actual engagement of the stakeholders in the workshops was strongly influenced by the social distancing imposed by the Covid-19 health emergency and the winter season, the process led to the signature of the MoU in June 2021, that framed objectives shared among the participants: (i) collaboration with the MPA “Secche di Tor Paterno” in order to carry out joint research and monitoring activities; (ii) enhancement of the MPA and SNR; (iii) strengthen the network of local associations and cooperatives among SMEs; (iv) development of sustainable tourism practices; (v) promotion of research and monitoring activities in collaboration with local actors (associations, diving ...); (vi) promotion of environmental education and awareness-raising activities, and; (vii) strengthening of surveillance and control systems.

MPA “Secche di Tor Paterno”

The “Secche di Tor Paterno” MPA is located in the Municipality of Rome and is managed by RomaNatura - Management Body of Protected Natural Areas of the Municipality of Rome. It has an extension of 1387 ha completely submerged. The MPA coincides with the homonymous Special Area of Conservation (SAC). The importance of the site derives from being the most interesting and conspicuous pool of biodiversity located off the coast of the Tiber River: the area appears as a real island on the seabed that rises in a large “desert” of sand and mud. These are rock formations that extend from a few meters deep up to the bathymetry of 50 meters (about 7 miles from the coast), for a length of just under 2 miles, in the area in front of the coast between Tor Paterno and Villa Campello. “Secche di Tor Paterno” is the only submerged Italian MPA and it doesn’t have different degree of protection (general reserve area - B). From the studies carried out in the protected area up to 2004, about 700 species have been identified, including lobster, sea cicada, seahorse, croaker, and Posidonia (Fig. 4), and others less known, such as some cowries (gastropod molluscs). In addition, there are species that only occasionally visit the MPA, such as bottlenose dolphins.



Figure 4 - The *Posidonia oceanica* meadows can cover the seabed from the surface up to 30 - 40 m depth. (Photo of Stefano Acunto)

TUNE UP launched the participatory process of the Environmental Contract in December 2020, involving national, regional, and local public bodies, environmental and cultural associations, local cultural centres, and higher education and research centres. Both information meetings and thematic workshops took place. The objectives framed within the MoU (signed in July 2021) are: (i) monitoring and strengthening biodiversity protection and conservation practices; (ii) study of mitigation measures to counter the effects of climate change; (iii) strengthening the network of local associations and cooperation among companies; (iv) development of sustainable economic practices (fishing and tourism); (v) promotion of research and monitoring activities in collaboration with local actors (associations, diving ...); (vi) promotion of environmental education and awareness activities; and (vii) strengthening of surveillance and control systems; (viii) monitoring of water pollution by marine litter and microplastics).

Mainstreaming the MPA Contract in Lazio region

Many challenges are awaiting marine ecosystems, EU Biodiversity Strategy 2030 set the goal to reach 30% of the protected sea by 2030 (EC, 2020). This issue requests to strengthen environmental governance and management through the empowerment of civil society by fostering participatory approaches (Taylor et al., 2021). TUNE UP experiences have highlighted that the Environmental Contract can be a tool for supporting: (i) the drafting, updating, and implementation of Management Plans in protected areas, capable of promoting communities' and stakeholders' engagement and commitment to the implementation of long-term strategies and (ii) the cooperation among MPAs, for effective and efficient governance and conservation (Ernoul et al., 2021).

In this context, the Lazio Region case study can be considered as a good practice for the legal recognition of the value of the Environmental Contracts as a tool for strengthening the collaboration among stakeholders to protect the natural environment while enhancing local development. In fact, one of the achievements of TUNE UP was the commitment of the "Special Office for Small Municipalities and River Contracts" of the Lazio Region, to: (i) recognize the Marine Protected Area Contracts in order to improve the conservation of biodiversity, the supply of ecosystem services and sustainable development; (ii) financially support the processes; (iii) include the Marine Protected Area Contracts in the Regional Law n.17/2016.

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E-PARTICIPATION IN SLUM UPGRADING

FACILITATING THE ESTABLISHMENT OF A LOCALLY ROOTED LIVEABLE LIFE INDEX TO GUIDE SLUM UPGRADINGB.

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1 INTRODUCTION

Over the years, the term *participation* has become an integral part in the context of urban planning. Its importance has been acknowledged in the improvement of various aspects: relationship building between governments and citizens, stronger levels of democracy and decision-making processes, among others.^{1, 2, 3, 4} Several typologies of participation have been derived from Arnstein's influential "ladder of participation".⁵ In order to pay closer attention to who is participating, in which context and for whose benefit, further steps need to achieve clarity through specificity, if the call for e-participation is to fulfil its democratizing promise. While some forms of citizen participation, such as consultation rely on the relevance of knowledge and opinions shared by citizens, a collaborative activity, such as the LLI, depends more on the quality of data provided by the participants. The LLI views slum dwellers as decisive stakeholders with expert knowledge about their neighbourhood. Their contribution is solely considered in the definition of locally rooted liveable life indicators to form a LLI⁶. A detailed typology of e-participation might allow a more specific analysis of the causal links between different forms of participation and their specific outcomes.

Still, there is a lack of evidence from studies about e-participation potentials for contexts such as slum upgrading projects of Smart Cities. Extending the findings on e-participation in other contexts creates opportunities for mobile application options. In connection to the LLI, e-participation can facilitate slum dwellers' engagement and thereby the identification of relevant locally rooted liveable life indicators. The LLI is based on a procedure, which focusses on the identification of locally rooted liveable life indicators to classify them among categories and establish a guideline for sustainable slum

¹ Gishti, M. (2017): Citizen participation in urban and landscape planning, International Master of Landscape Architecture, Hochschule für Wirtschaft und Umwelt Nürtingen-Geislingen, p. 14.

² Lauria, M.; Slotterback, C. S. (2020): Learning from Arnstein's Ladder: From Citizen Participation to Public Engagement, Taylor & Francis, New York, p. 32.

³ Li, W.; Feng, T.; Timmermans, H. J.P.; Zhang, M. (2020): The Public's Acceptance of and Intention to Use ICTs when Participating in Urban Planning Processes, in: Journal of Urban Technology, Vol. 27, No. 3, p. 55-73.

⁴ OECD (2020): Innovative Citizen Participation and New Democratic Institutions: Catching The Deliberative Wave, retrieved from <https://www.oecd.org/gov/open-government/innovative-citizen-participation-new-democratic-institutions-catching-the-deliberative-wave-highlights.pdf> (20.10.2021).

⁵ Arnstein, S. R. (1969): A Ladder of Citizen Participation, in: Journal of the American Planning Association, Vol. 35, No. 4, p. 214–216.

⁶ Liveable Life Index Definition: The LLI consists of a list of locally rooted liveable life indicators, which display in their entirety a guideline that can be used at policy level to design slum upgrading projects.

upgrading. So far, the concept is based on an analogue approach, developed within the Smart City Bhubaneswar (India).⁷ The expansion of ICT in Smart Cities to an e-participation initiative in form of a digital LLI has the potential to disseminate policy planning information and solicit citizen's inputs in planning. Still, the success of an e-participation initiative depends on the careful selection of the best-matching techniques and ICT tools.

2 Citizen participation in the age of ICT: E-participation

The definitions and existing data on e-participation are based on the findings by the Organisation for Economic Co-operation and Development (OECD), the United Nations (UN) and the EU. There exists no general definition for the term e-participation, still the general consensus is that it can be distinguished among three interactions between governments and citizens: e-information, e-consultation and e-cooperation.⁸ The category *e-information* is linked to the provision of information that encourages and empowers citizen participation, such as online publishing of policies, schedules for online discussion forums and electronic notifications to inform citizens who want to participate. The category *e-consultation* considers interactive tools to conduct a dialogue and receive feedback/inputs from citizens, such as online surveys. It considers measures used to request citizen opinion, feedback and input through chats, blogs, online forums, instant messaging, etc. The category *e-cooperation* considers citizens empowerment to a level that takes into account citizens view when making policy decisions within electronic formats. This category holds the highest level of participation, where decision making of dwellers is highest. Within Arnstein's ladder, this condition would display level 7 and 8 (Figure 1).

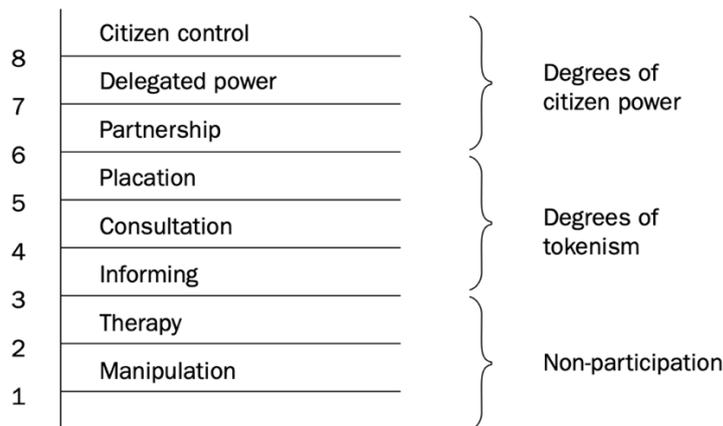


Figure 1: Arnstein's ladder of citizen participation.⁹

3 The establishment of a digital Liveable Life Index

The liveable life concept serves as a basis for analysing slum upgrading from individual perspectives, and for implementing a participatory approach that contributes to a sustained increase in the quality

⁷ Eicker, B. N. (2022): The Liveable Life Index: How locally rooted liveable life perceptions are identified to facilitate the initiation of location specific upgrading projects among supporting institutions and create a liveable environment in informal settlements, using Bhubaneswar as an example (unpublished doctoral dissertation), Hafen City University, Hamburg, p. 113.

⁸ OECD (2020): Innovative Citizen Participation and New Democratic Institutions: Catching The Deliberative Wave, retrieved from <https://www.oecd.org/open-government/innovative-citizen-participation-new-democratic-institutions-catching-the-deliberative-wave-highlights.pdf> (20.10.2021).

⁹ Arnstein, S. R. (1969): A Ladder of Citizen Participation, in: Journal of the American Planning Association, Vol. 35, No. 4, p. 214–216.

of life.^{10, 11, 12, 13} In order to support the identification of liveable life indicators in slums and give guidance for sustainable slum upgrading, the LLI method has been developed.

The LLI consists of four main elements (safety/ society/ infrastructure (physical space)/ service), which derived from local research in six slum neighbourhoods of the Smart City Bhubaneswar and have proven to be the overriding factors.¹⁴ Each element has location-dependent, different sub-elements, for example socialising, sanitation, distance to education facilities, etc. These sub-elements are conditioned by local climate, culture, society, and geography, among others, and reflect a liveable life indicator that shows what needs to exist according to local priorities.

So far, the LLI concept is based on a non-digital approach, developed within Bhubaneswar and based on a traditional form of face-to-face participation, which has several limitations and obstacles. Most face-to-face methods are time consuming for dwellers as well as experts conducting local research.¹⁵ An average face-to-face method would take three to four working-days in order to get expected results. Further, most of face-to-face methods require physical presence of dwellers at a particular place. Moreover face-to-face methods are not transparent enough, as it is not clear how dwellers contributions would be in an anonymous setting.¹⁶ Lastly, also scale and size are counted as a limitation for face-to-face methods. Administrative processes are usually large and complex, dwellers involvement in particular large neighbourhoods requires many resources and can even be impossible.

In contrast, e-participation in connection to the LLI can effectively facilitate the identification of locally rooted liveable life perceptions that characterize realistic solutions and decision making within slum upgrading. Creating an environment of transparency, openness and integrative options allows personal ownership of established solutions and the creation of relationships among stakeholders. It further aims to drive the quality, usefulness and relevancy of information and services.¹⁷ Lastly, also engagement and dialogue among general key stakeholders related to slum upgrading projects are counted as an advantage of e-participation. Communicating feedback and suggestions in an electronic format simplifies transparent articulations and the gathering of general opinions on approaches.

In order to counteract participation limitations within the non-digital LLI, there is a need for participation forms that make participatory planning processes compatible with new urban settings. Focussing on the expansion of Smart Cities, e-participation became a core element of ICT in the process of allowing easier interactions between governments and citizens. Integrating the potentials of e-participation within the LLI approach has the potential to disseminate policy planning information and solicit citizen's inputs. Still, the success of an LLI e-participation initiative depends on the careful

¹⁰ Magalhães, F. (2016): Slum Upgrading and Housing in Latin America, Inter-American Development Bank, New York, p. 13.

¹¹ Wagner, F.; Caves, R. W. (2019): Community Livability: Issues and Approaches to Sustaining the Well-Being of People and Communities, 2nd edition, Taylor & Francis, London, p. 45.

¹² Wagner, F. (2018): Livable Cities from a Global Perspective, Taylor & Francis, London, p. 69.

¹³ Patki, S. Y.; Shah, M. G.; Kale, C. M. (2020): Building Drawing with an integrated approach to Built Environment, 6th edition, McGraw-Hill Education, New York, p. 110.

¹⁴ Eicker, B. N. (2022): The Liveable Life Index: How locally rooted liveable life perceptions are identified to facilitate the initiation of location specific upgrading projects among supporting institutions and create a liveable environment in informal settlements, using Bhubaneswar as an example (unpublished doctoral dissertation), Hafen City University, Hamburg, p. 113.

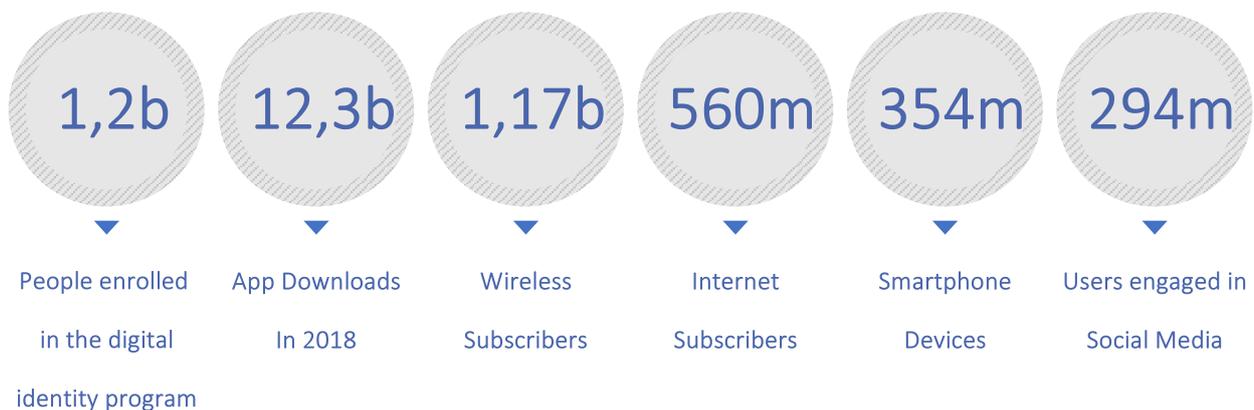
¹⁵ Selle, K. (2013): Mitwirkung mit Wirkung? Anmerkungen zum Stand der Forschung über planungsbezogene Kommunikation und das, was von ihr bleibt, in: Planung neu denken, Vol. 2013, No. 2/3, p. 19.

¹⁶ Aichholzer, G.; Kubicek, H.; Torres, L. (2016): Evaluating e-Participation: Frameworks, Practice, Evidence, Springer International Publishing, Switzerland, p. 109.

¹⁷ Münster, S.; Georgi, C.; Heijne, K.; Klamert, K.; Noennig, J.; Pump, M.; Stelzle, B.; Meer, H. (2017): How to involve inhabitants in urban design planning by using digital tools? An overview on a state of the art, key challenges and promising approaches, in: Procedia Computer Science, Vol. 112, p. 2391-2405.

selection of best-matching technologies and ICT tools. To ensure the acceptance of a digital tool most commonly used in slum landscapes, digital trends with a major focus on mobile phones in the Indian market have been analysed, based on primary and secondary data. India has in the last five years undergone what is called the *quiet digital revolution*.¹⁸ It's internet user base has grown rapidly, which can be traced back to decreasing costs and rising availability of smartphones, as well as high-speed connectivity (Figure 2).¹⁹

Indians downloaded 12,3 billion apps in 2018 and the country had 560 million internet subscribers in 2018, ranking India second in the world behind China. Further, an average Indian internet subscriber spends 17 hours on social media platforms each week and due to the countries lowest data costs in the world, the share of Indian adults with at least one digital financial account has more than doubled to 80% since 2011. It is predicted that internet subscribers will continue to grow, as subscriptions rose by 23% since 2015. Statistics also show that 3G or 4G networks cover 84% of India's population.²⁰ To complement this digital revolution, a wide array of urban upgrading missions dominated India's urban landscapes, such as the Smart Cities Mission, National Urban Digital Mission or AMRUT, of which all move towards adopting ICT perspectives with regards to GIS mapping and drone usage.



¹⁸ ET Government (2021): Smart City Mission: India sets big goals, gears up for 4,000 cities expansion in 2 years, retrieved from <https://government.economictimes.indiatimes.com/news/smart-infra/smart-city-mission-india-sets-big-goals-gears-up-for-4000-cities-expansion-in-2-years/83831631> (03.12.2021)

¹⁹ McKinsey Global Institute (2019): Digital India: Technology to transform a connected nation, retrieved from <https://www.mckinsey.com/~media/mckinsey/business%20functions/mckinsey%20digital/our%20insights/digital%20india%20technology%20to%20transform%20a%20connected%20nation/digital-india-technology-to-transform-a-connected-nation-full-report.ashx> (03.06.2019).

²⁰ GSM Association (2017): Triggering mobile internet use among men and women in South Asia, retrieved from https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2017/11/GSMA-Triggering-Mobile-Internet-Use_Web.pdf (24.01.2020).

Figure 2: India's key dimensions of digital adoption (own representation based on McKinsey Global Institute analysis data).^{21, 22, 23, 24, 25}

As mentioned, the number of mobile phone owners, volume of app downloads and distribution of internet accessibility is rising. With only few formats capable of managing larger participant numbers, independent of time and place, it is most reasonable to make urban participatory slum upgrading planning processes compatible with digital trends (ICT, e-participation, mobile application).²⁶ Approaching the LLI approach in an e-participation-app format has the ability to create a platform through which stakeholders can network and support dwellers in need, faster and more efficient. This includes access to a remote diagnosis of the local requests and deep learning algorithms. Enabling slum dwellers to share liveable life perceptions in the LLI app, will contribute to the storage of requests and corresponding coordinates in the LLI data base. Connecting requests to locations independently of time and place turns an area to which a request is connected, into a hyperlocal area. GPS systems in network-attached mobile devices enable the determination of coordinates. Respective experts can then analyse the stored requests and corresponding coordinates to develop proposals for countermeasures. New data, in the form of requests, locations and countermeasures enter the system continuously, thus enriching the semantic layers of the LLI app. The more data is stored in the system, the more complex facts (requests-locations-countermeasures) can be linked and local solutions optimised. Hence, e-participation via app has the ability to motivate and enhance an effective and sustainable environment for engagement, enabling citizens to e-participate in the design of their living place.

4 CONCLUSION

With the development of Smart Cities, increasingly more investments take place into ICT and new approaches of participation allow services to be offered online. It stands to reason that there exists an increase in citizens that adopt to ICT tools in order to engage in activities, which they believe to be more effective and efficient. To explore the potential of e-participation in promoting citizen participation in slum upgrading processes, in the context of the LLI, it is relevant to raise understanding on the determinants of e-participation. It aims to extend our understanding of communication tools that are convenient for slum dwellers and display already a high social value within their community, such as the increased use of mobile phones. Conducting research in the Smart City Bhubaneswar and discussing secondary research, this study examines citizen's opportunity to continuously participate online in order to establish a locally rooted LLI and initiate according countermeasures.²⁷ Apart of that,

²¹ GSM Association (2017): Triggering mobile internet use among men and women in South Asia, retrieved from https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2017/11/GSMA-Triggering-Mobile-Internet-Use_Web.pdf (24.01.2020).

²² Financial Inclusion Insights (2019): India, Aave 6 Report, Sixth Annual Fii Tracker Survey, retrieved from http://finclusion.org/uploads/file/india-wave-6_final-5-28-19.pdf (18.07.2020).

²³ Keelery, S. (2021): Internet usage in India - statistics & facts, retrived from <https://www.statista.com/topics/2157/internet-usage-in-india/> (09.10.2021).

²⁴ Keelery, S. (2021): Digital population across India as of February 2021, retrived from <https://www.statista.com/statistics/309866/india-digital-population/> (09.10.2021).

²⁵ McKinsey Global Institute (2019): Digital India: Technology to transform a connected nation, retrieved from <https://www.mckinsey.com/~media/mckinsey/business%20functions/mckinsey%20digital/our%20insights/digital%20india%20technology%20to%20transform%20a%20connected%20nation/digital-india-technology-to-transform-a-connected-nation-full-report.ashx> (03.06.2019).

²⁶ Münster, S.; Georgi, C.; Heijne, K.; Klamert, K.; Noennig, J.; Pump, M.; Stelzle, B.; Meer, H. (2017): How to involve inhabitants in urban design planning by using digital tools? An overview on a state of the art, key challenges and promising approaches, in: *Procedia Computer Science*, Vol. 112, p. 2391-2405.

²⁷ Zheng, Y. (2017): Explaining Citizens' Usage: Functionality of E-Participation Applications, in: *Administration and Society*, Vol. 49, No. 3, p. 423-442.

effective e-participation in an anonymous environment requires the development of trust in the entire participation process to ensure good communication and commitment. It has been verified that ICT tools contribute to a rise in trust and comfortable communication.²⁸ With anonymous participation it is expected that recipients are more comfortable to disclose sensitive information.

The results of this study compensate for the lack of literature discussing the factors influencing e-participation in urban slum upgrading. Extending the LLI to a general Smart City scale, it must be considered that the intention to participate online varies by Smart City progress and socio-demographic characteristics. Still, different types of ICT tools such as applications, e-mail, online chatting provide citizens with more choices and allow planners and citizens to communicate.²⁹ At policy level, the present study helps in building strategic plans for the LLI that enhances a sustainable environment for engagement of slum dwellers. Nonetheless, the findings have some limitations. Studies about e-participation are not set in the context of sustainable upgrading in Smart City slums. How to leverage existing findings into new social areas, such as that of slums, needs to be further studied. Enabling participative community approaches in an e-participation format to guide sustainable slum upgrading can contribute to the sustained improvement of the quality of life in informal neighbourhoods.

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²⁸ Stern, E.; Gudes, O.; Svoray, T. (2009): Web-Based and Traditional Public Participation in Comprehensive Planning: A Comparative Study, in: *Environment and Planning B: Planning and Design*, Vol. 36, No. 6, p. 1067–1085

²⁹ Zheng, Y. (2017): Explaining Citizens' Usage: Functionality of E-Participation Applications, in: *Administration and Society*, Vol. 49, No. 3, p. 423–442.

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PLANNING URBAN SOCIAL SPACES AND THEIR INTERRELATIONS: THE CASE OF JERUSALEM

Efrat Eizenberg¹, Yosef Jabareen¹

¹The Technion

Introduction

The literature on space and spatiality suggests that urban spaces are not fixed and self-contained but are rather relational, processual, dynamic, open, socially produced, and nested in a web of social relations (i.e., Healey, 2006; Jones & Jessop, 2010; Lefebvre, 1991). Such a perspective frames social spaces "as webs or networks with diverse morphologies, connecting people and events in one node to others near and far [...that] emerge as nodes in one or more networks" (Healey, 2006: 526). Following Laclau and Mouffe's (2014) conception of urban social spaces as discursive entities and Lacan's notion of fantasy (Lacan, 1997), our recent theoretical framework suggests that urban social spaces are located within a field of social relations in a 'war of position' (Jabareen & Eizenberg, 2021).

This paper excavates the role of planning in forming and defining the interrelations among social spaces and setting up the 'war of position' among them. We argue that spatial planning has a powerful role in constructing the interrelations among different urban social spaces and decreeing the nature of these relations as ranging from antagonistic and exclusionary to equivalent and inclusionary. Since there is no available methodology for such examination, we propose here a methodological framework to examine the contribution of spatial planning to the interrelations among different urban spaces.

The following section presents the proposed methodological framework. Then, the case study of planning Jerusalem is presented. The city of Jerusalem provides a rich empirical case due to the intensive planning efforts undertaken by the State of Israel and the city to manage and transform its contested spaces in the context of the harsh ethnic conflict among its main social groups, Israeli Jews and Arab Palestinians. The finding section is based on the review and analysis of several plans of Jerusalem since 1967, the year in which East Jerusalem was conquered by the State of Israel and then annexed to city. The final section presents the theorization and lessons regarding the 'dark' side of spatial planning (Yiftachel, 2006).

Methodology

We take advantage of the theoretical framework of understanding the interrelations among urban social spaces (Jabareen & Eizenberg, 2021) to propose a methodological framework aiming to capture the contribution of planning to the construction of the interrelations among urban social spaces. It is composed of three interrelated logics that structure the analysis of planning documents. The three logics are the logics of difference and equivalence borrowed from Laclau and Mouffe (2014) and the Lacanian conception of fantasy and imaginary logic.

1. The logic of difference: captures differentiations and divisions among spaces based on people's social categories. This socially oriented logic directs the focus of urban spaces analysis to the composition of different social groups (i.e., class, ethnicity, religion, race, color, education, culture, and other social differentiation). The logic of difference "assumes an essentialist meaning of difference; it defines groups as having different

natures" (Young, 1990: 157). Its application to plans helps grasp the divisions and limits of urban social spaces that intervene and effect processes whereby people differentiate themselves from other people and decide where to live. In this way, the logic of difference helps unravel the role of planning in constructing the categories of 'we,' 'others,' and uncover antagonism and tensions that characterize the process of socio-spatial configuration.

2. The logic of spatial equivalence: generates a relational equivalence in which differences in identity are accepted. It dissolves 'positive differences' and creates real spatial boundaries that include all the desired identities in opposition to "the Others." In the urban context, the logic of spatial equivalence dissolves some differential features among specific groups. Its first order defines the rules of those who should live together within a social space. It defines the social and the spatial frontier of antagonism by articulating who are excluded and are not part of the chain of social and spatial equivalence. Outside the chain of equivalence, marked by antagonistic lines, is everything that is excluded. Applying the logic of equivalence to plans unpacks how institutional planning perceives, constructs, and reinforces the chain of social and special equivalence through the practice of deterritorialization and reterritorialization.

3. The imaginary logic: Building on the Lacanian concepts of ontological lack, fantasy, and desire, we propose the imaginary logic as the third prism for examining the role of planning in constructing urban social spaces and their interrelations. It helps explain how and why specific articulations and practices of spatial formation are constructed, maintained, and transformed. Lacan conceives lack as the foundation of human existence. According to Lacan, "the infant acquires its first sense of unity and identity, a spatial imaginary identity" (Stavrakakis, 1999: 17) that "proceed from a fragmented image of the body" in an effort to overcome the inherent failures and gaps - "the lack of being, properly speaking" (Lacan, 1997: 223). Fantasy, as a narrative, "covers-over or conceals the subject's lack by providing an image of fullness and wholeness on the one hand, while conjuring up threats and obstacles to its realization on the other" (Glynos and Howarth, 2007: 130). Thus, the imaginary mode would "consist of those discursive forms" through which a society tries to institute itself as 'complete' and 'total' (Laclau, 1990: 92). Especially in a highly contested case as Jerusalem, "when harmony is not present, it has to be somehow introduced in order for our reality to be coherent," and "it has to be introduced through a fantasmatic social construction" (Stavrakakis, 1999: 62–63).

Methodologically, we are looking at the plans of Jerusalem to understand the fantasy that these plans convey and construct. With this logic, we wish to expose the desires, articulated as visions, goals, objectives, and practices aiming to overcome intrinsic incompleteness. The imaginary logic helps capture the political drives of the logic of difference and the logic of equivalence. It is manifested through the construction of different dichotomies, mainly antagonism/sympathy, conflict/harmony, safe/dangerous, familiar/strange, anxiety/happiness, and risk/trust.

Case study: Planning Jerusalem

The 1948 War over Palestine resulted in the establishment of the state of Israel and the displacement and dispossession of some 780,000 Palestinians (Abu-Lughod, 1971). Israel occupied West Jerusalem whereas East Jerusalem fell under Jordanian rule. In the 1967 war, Israel occupied the east part of Jerusalem, annexed it, and incorporated approximately 70 km² into the already existing municipal structure of the Israeli city. This annexation, however, has never been recognized by the international community. In 1980, Israel endowed the annexation of East Jerusalem with constitutional status by enacting "Basic Law: Jerusalem, the Capital of Israel," formally declaring the "whole and united" area of East and West Jerusalem to be "the capital of Israel." Since the annexation of East Jerusalem in 1967, Israel has strived to alter the social-spatial nature of Jerusalem to enhance its geopolitical control over the entire city. Yet, the Palestinians have resisted these policies and produce alternative modes of space production (Jabareen, 2010, 2017).

Jerusalem was selected as a case study for two reasons: first, for its deep ethnic conflict and rich mosaic of segregations between Jews and Palestinians, as well as, among Jews themselves (Bollens 2000).

Second, it has undertaken intensive institutional planning efforts since 1948 by the state of Israel (Jabareen, 2017). At the present, Jerusalem has a population about 951 thousand, 584 thousand Jews, and 367 thousand Palestinians (CBS, 2022).

Israel maintains a centralized land use planning system in which the central government exercises broad oversight over local-level planning decisions. The involvement of the central government is channeled through the hierarchy of plans, from national plans, to district plans, and local plans. This study analyze four types of plans, different in scale ranging from national level to detailed plans at the local level as detailed in Table 1. All these plans are spatial zoning statutory plans, which determine all aspects of land uses, building and construction, including building regulations, rights, and restrictions.

Table 1: The analyzed plans of Jerusalem

Type of plan	Year	Description
The National Outline Scheme #35 – Comprehensive National Outline Scheme for Building, Development and Conservation (Figure 1)	2006	Initiated by the National Planning Board and approved by the Israel Government in 2006. It is the current authorized statutory plan for Israel.
The District Plan #4 for the Jerusalem District (Figure 2)	2008	Initiated by the National Planning Board and approved by the Israel Government in 2008.
Jerusalem Outline Plan - No. 2000 (Figure 3) ⁴⁰	2005-2022	Initiated by Jerusalem Municipality
Neighborhood Detailed Plans (Figure 4)	1968-1991	15 zoning plans for settling Jews in East Jerusalem initiated by Jerusalem Municipality

Figure 1. The National Outline Scheme #35

⁴⁰ <https://www.jerusalem.muni.il/en/residents/planningandbuilding/cityplanning/masterplan/>

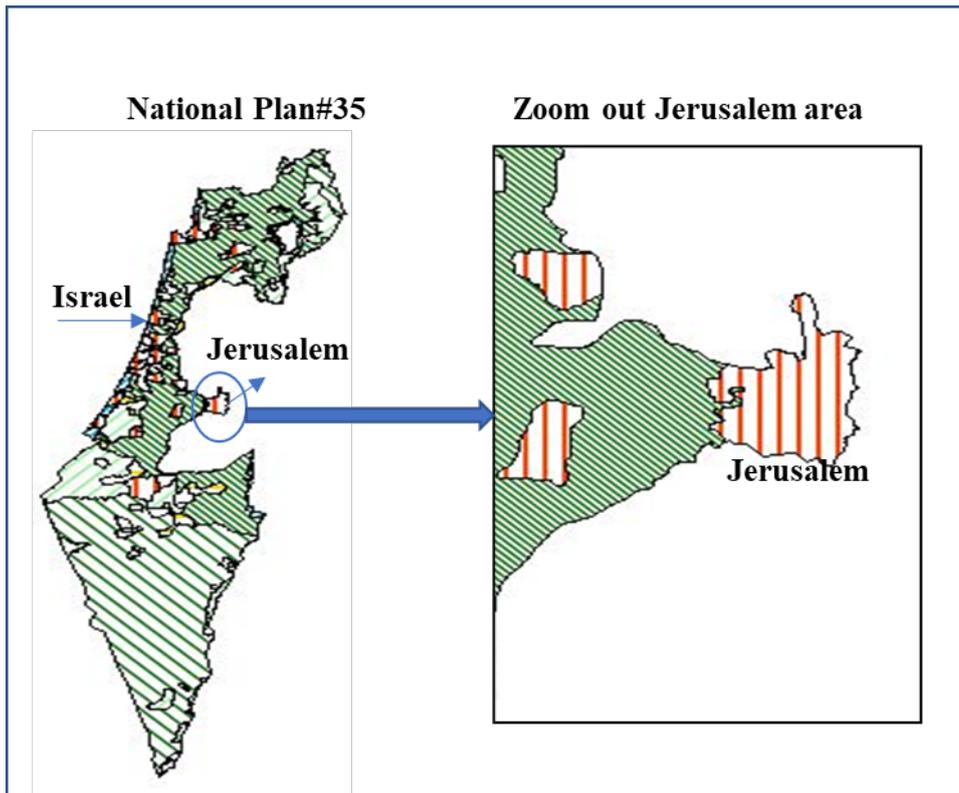


Figure 2. The District Plan #4 for the Jerusalem District

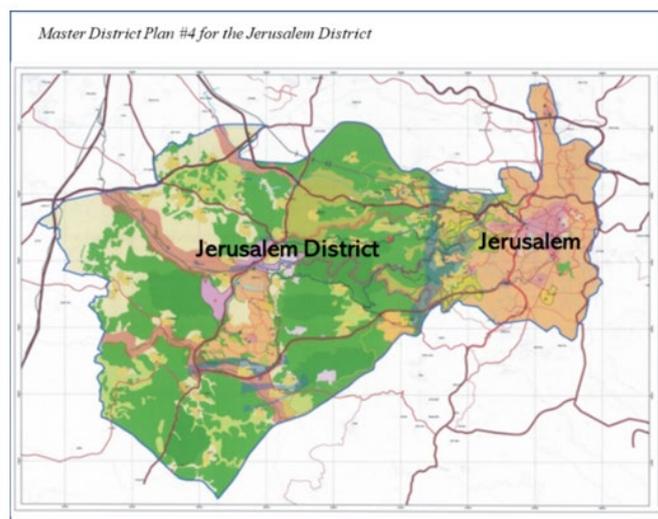


Figure 3. Jerusalem Outline Plan #2000

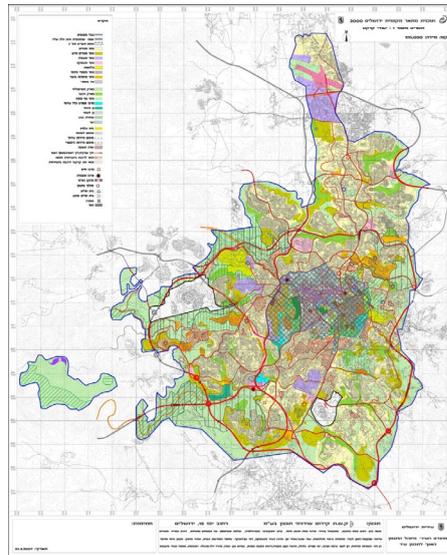
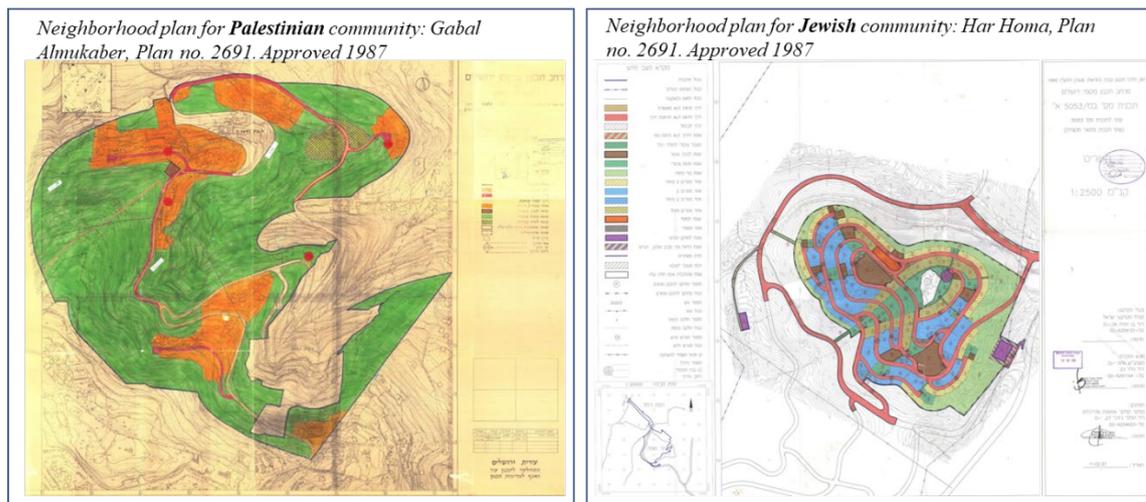


Figure 4. Detailed zoning plans for Jews and Palestinians neighborhoods in Jerusalem



Findings: Planning contribution to antagonism relations

The analysis of the plans is presented along the three logics as follows:

The imaginary logic

The national fantasy is represented in the spatial planning for Jerusalem at the national, district, and local scales by repetitive articulations of Jerusalem as a “whole”, “united”, and “ultimate capital” of Israel. The plans declare West Jerusalem and the occupied East Jerusalem as parts of a “unified” city.

The National Outline Scheme #35 manifests territorial and demographic national fantasies for Jerusalem that can be both understood as aspiring to ensure the future control over the occupied territory of East Jerusalem (Assif, 2008). In prescribing the district and local plans, the protection of a Jewish majority in

Jerusalem and its metropolitan region in the future, the National Outline Scheme #35 wishes to ensure the geopolitical fate of Jerusalem as a “united city” and “perpetual capital” of Israel.

In line with the National plan, the *District Plan of Jerusalem, T.A.M.A.M 1 Correction #30* proposes improvements of Jerusalem’s public image and strengthening its economy and culture in order to attract more Jewish residents. The stated demographic goal of the District plan is to keep the population ratio of 70% Jews and 30% Palestinians for the next 20 years by increasing the Jewish population and decreasing the population growth of the Palestinian population through an intensive policing of what it defines as illegal housing expansion.

At the city level, Jerusalem Outline Plan #2000 (*Jerusalem 2000*) states as its goals the creation of “a statutory framework to continue developing [Jerusalem] as the capital of Israel and a metropolitan center, while maintaining its unique characteristics and ensuring urban quality of life for its citizens” (Jerusalem Plan #2000, 2004: 7-8). Consistent with the national fantasy, and without problematizing its harsh divide into west – Jewish and east – Palestinian parts, the plan suggests to “strengthen the status of Jerusalem as Israel capital, as a center of the Jewish people and as a holy city for the three monolithic religions.”

The plans at these three scales present a fantasy of wholeness and harmony, of one city that represents the nation and the Jewish people while maintaining its significance for other religions. It is a fantasy of a complete and united city, whereas de facto, it is highly contentious and divided city (Bollens, 2000; Jabareen et al., 2019). By ignoring the disconnection between its parts and the uneven development that characterizes them (as clearly shown by the detailed plans) the Palestinians residents of Jerusalem are put, through planning means as the ‘others’, the ‘holes’ and ‘voids’; those that harm the fantasy of wholeness, completeness, and harmony.

The logic of difference

The conception of difference is to arrange urban society along social, race, ethnic, religious, and other affiliations. The division of people in planning can be identified already at the national and district plans. The National Outline Scheme # 35 divides the population of Israel and in Jerusalem into two major groups: Jews and Palestinians. Following these baseline differentiations, a major concern of *Jerusalem 2000* is the demographic growth of the Palestinian community vis-à-vis the Jewish community, the former is presented as a key threat to the city. The Plan (from 2004) suggests that “[...] if the current demographic trends continue in the future without change, the ratio in the year 2020 will be 60% Jews and 40% Arabs.” Therefore, according to the *Jerusalem 2000*:

The demographic trends forecasted for the year 2020 are influenced primarily by a set of political, economic, social and cultural factors, as they have been expressed and managed in recent years. **In order to change current trends and avoid serious future developments**, there is a drastic need for ways to address the main variables influencing the demographic migration balance and differences in fertility rates which ultimately produce the demographic balance. These variables include personal security, employment, housing, education, quality of environment, social and cultural life, municipal services, etc.” (*Jerusalem Plan #2000*, 2004: 204).

Jerusalem Outline Plan #2000, therefore, promotes an aggressive intervention of reducing outmigration of Jews from Jerusalem and to attract Jewish residents from other part of the country (p. 205). The text of *Jerusalem 2000* (p. 1) refers to the explicit demographic policy that “seeks to maintain a ratio of 70% Jews and 30% Arabs” therefore, “the master plan aims to maintain a significant Jewish majority in Jerusalem” (p. 204). At the same time the plan conceives the Palestinian neighborhoods in an antagonist way as “illegal,” “problematic,” “chaotic,” with “unclear land ownership,” and a failure in terms of efficient utilization of the land resources.

The logic of spatial equivalence

Establishing the very basic categories of difference across the planning scales – that of Arabs (Palestinians) and Jews, the plans produce various spatial chains of equivalence utilizing zoning and other planning tools to

achieve the demographic and geopolitical ends. The National Outline Scheme #35 fight the depletion of the Jewish population from the city by proposing an additional expansion of Jerusalem's municipal jurisdiction by 34,500 Dunums (one quarter of its size today), providing national economic and spatial incentives to attract Jews to the city and discourage the outmigration of Jewish families. Furthermore, the plan suggests increasing the density of Jerusalem by 12-24 dwellings per dunums to enhance its capability of housing provision for Jews.

The District Plan of Jerusalem, T.A.M.A.M 1 proposes a transportation that focuses on the interest of the Jewish settlements and neighborhoods not only within Jerusalem but in the wider region including the occupied territories. The system aims to 'unite' West-East Jerusalem by connecting Jewish settlements in East Jerusalem with the city and the region through a system of highways that slices the Palestinian neighborhoods in East Jerusalem and disconnects them. In conjunction with the Separation Wall, the transportation system constitutes physical borders detaching the Palestinian neighborhoods from each other, from the Western city and from the Jewish settlement neighborhoods in East Jerusalem – as a line of antagonism – while at the same time connecting the Jews settlements together (Gush Etzion, Ma'ale Adumim, E1, and Givat Ze'ev) (Adalah, 2008).

The *Jerusalem plan #2000* also takes part in spatially establishing the chains of equivalence and antagonistic lines between the two groups. It proposes different economic, social, and spatial strategies aimed at determining the demographic order of the city posing the "major challenges that the planning policy must meet" (p. 1) as "maintaining a solid Jewish majority in the City" (p. 2). The plan identifies "a number of central challenges [that] if met, would also meet the policy goals" of demographic balancing. To this end, its measures include:

- a) Establishing new neighborhoods for the Jews in the city.
- b) Providing additional housing through building and expansion of existing neighborhoods.
- c) Maintaining housing costs that are sufficiently reasonable to compete with the surrounding suburbs [due to outmigration of non-orthodox Jewish suburbs].
- d) Ensuring the quantity and quality of municipal services [for Jews].
- e) Creating a large number of desirable jobs.
- f) Ensuring good urban quality of life and a positive urban experience.

Jerusalem 2000 acknowledges that "the Arab population suffers from housing problems due to the significant size of the population and lack of financial resources", that the East neighborhoods lack "suitable engineering infrastructures" and public services and that there is an "absence of agreed and consistent policy" for planning eastern Jerusalem among the Israeli political and planning apparatus. Nevertheless, *Jerusalem 2000* does not provide any spatial planning strategies to mitigate these problems among the Palestinian neighborhoods in Jerusalem. In this way, East Jerusalem, is defined by the plan as an antagonistic chain of equivalence that is highly problematic but that will be planned and resolved sometime in the future. The only direct measure proposed by the plan for East Jerusalem, enabling the "densification of the rural villages and densification and thickening of the existing urban neighborhoods and recommends a rehabilitation of the refugee camps within its borders" (*Jerusalem Plan no. 2000: Chapter 7 and 7.2*) is coupled with a main strategy of "firmly enforce the prohibition of illegal building, a phenomenon that is widespread within the Arab sector in the city".

Finally, *Jerusalem 2000* understands the "spatial segregation of the various population groups in the city [as] a real advantage. Every group has its own cultural space and can live its lifestyle. The segregation limits the potential sources of conflict between and among the various populations." This statement seems in sharp contrast with the fantasy of the united and unified Jerusalem. The city plan does not wish to eliminate the boundaries and divides that de facto exist based on three categories: (1) the ethnic identity: Jews and Palestinians; (2) religiosity of Jews: secular, religious nationalist, Orthodox; and (3) socioeconomic differentiation of the Jewish community. **Figure 5** represents the social spaces of Jerusalem based on these distinctive categories. With this figure it is possible to grasp the segregation lines that the Plan wishes to maintain, with the Green-Line (representing the area that was annexed after the 1967 war) most clearly

demarcates the line of antagonism between two chains of equivalence. The chain of equivalence includes the entire Jewish neighborhoods: The Ultra-Orthodox, the non-Ultra-Orthodox, low and high income, within and beyond the Green-Line. Beyond it are the “Others”; the Palestinians, with their neighborhoods seen only based on the national categories with no other categories of identity distinguishing between them.

Finally, the two detailed plans presented in figure 4, both approved in 1987, one for a Palestinian neighborhood and one for a Jewish settlement neighborhood in East Jerusalem, tell the story of planning as the producer and keeper of the chains of equivalence. The different treatment of planning – the well detailed plan for the Jewish neighborhood and the underdeveloped and lacking details plan for the Palestinian neighborhood shows how planning at the national, district and city scales is directly translated into spatial actions of producing social space. The abundant green areas in the Palestinian neighborhood plan are not developed as parks for the benefit of residents but solely constrain the development of the residential areas.

Figure 5. Social spaces in Jerusalem based on the spatial logic of difference and equivalence

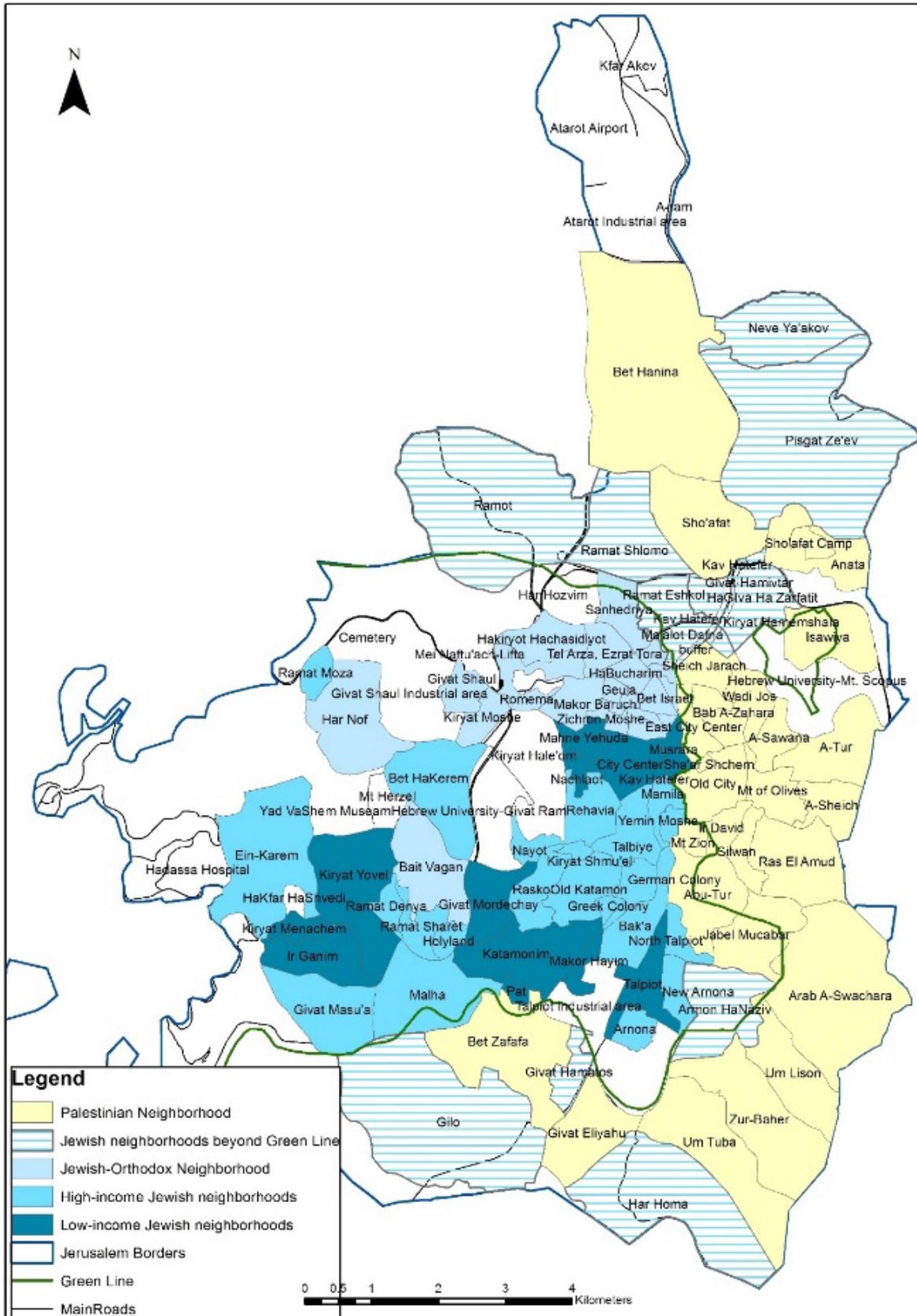


Table 1. The framework of urban social spaces: its logics and their orientations, roles, and outcomes

<i>Logics</i>	<i>Orientations</i>	<i>Practices/role</i>	<i>Planning Manifestations</i>
The imaginary logic	Political and social	Envisioning the wholeness and the space of 'sovereign good'	United, 'wholeness' City, 'Our Capital,' the 'others', the Palestinian demography represented as dangerous to the 'wholeness.'
Logic of difference	Social	Constructing the 'we', the 'others' and the 'other others' based on social affiliations.	A clear distinction between competing categories based on a demographic challenge and strategies for dealing with the challenge
Logic of spatial equivalence	Social and spatial	Rearranging and formulating the urban space based	Differential planning (on all scales) for the different parts of the city. East Jerusalem is not treated by the plans maintaining these spaces outside the chain of equivalence

Conclusions

Applying the imaginary, difference, and equivalence logics to plans at four different scales, we unravel the relations between the political agenda as manifested in the fantasy of harmonious, uninterrupted "we" that is interlinked to the conception of the "other" that is perceived as a threat to the imagined united community. In our case study, the fantasy of Israel's unified, united, and Jewish capital city is threatened by the Palestinian population in what was repeatedly articulated as a demographic challenge. The logics of difference and equivalence underpin the differences of residents, differentiating between them and at the same time transcending and subverting various characteristics in order to constitute a 'collective' and 'complete' identity within a specific social space. With the logics of difference and equivalence as our analytical lens, we portray how planning outputs establish different social spaces, create affiliations among some, and draws clear antagonistic lines with other. Once established in plans, these antagonistic lines become highly immune to change. Planning envisions and directs the 'war of positions' of urban social spaces as well as affords and limits possibilities for their interrelations. With this understanding, we suggest that planning creates and maintains antagonistic lines, intentionally excludes spaces, and establishes them as voids instead of utilizing spatial strategies to eliminate social antagonism and establish the prospect of relations of recognition.

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TRACK 5: GOVERNANCE

FROM EUROPEAN TERRITORIAL TO SPATIAL PLANNING?

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Albeit tentatively, the European Union (EU) got involved in planning, but without a so-called competence in the matter. After working on planning theory and immersing myself in Dutch planning, my research has been on European planning.

As far as the latter is concerned, with my focus on the planning process, I was criticised for neglecting the object of planning. The research on Dutch practice led me first to focus on flexibility in planning. Thereafter, I was seeking to identify the secret of Dutch national planning's success in the 20th Century. That secret I concluded was that it had a 'planning doctrine' conceptualising Dutch territory in easily understood terms with clear implications for what planners ought to be doing to keep the country in shape. My next research on the European Spatial Development Perspective (ESDP) made me appreciate that such a European doctrine was a distant prospect. The EU is not easy to pin down and joint action is problematic, the more so where the sovereign territories of its members are concerned.

But there are other spatial formations: like what the literature calls places (Healey 2010) bringing together ad-hoc constellation of actors. And there are functional areas (not discussed here). The point is, neither places nor functional areas are coextensive with the territories of states nor their administrative divisions for the matter. So, the statutes do not apply, meaning that they require forms of planning fit for purpose.

The context within which such European planning as has been attempted has been taking place in the past has been EU Cohesion policy. Criticising its present state, in so doing drawing amongst others on Telle (2018), Gyelnik and Ocskay (2021) argue for a paradigm shift. Rather than on territories, the focus should be on places. And they dismiss the notion of the EU becoming a super-state. Which chimes well with my having become critical of the state of the art in European planning leading me to explore the wider implications of its demise for how we must view European integration. I have cast this in the form of a critique of 'The Poverty of Territorialism' (Faludi 2018) with territorialism standing for the priority given to, in particular national territories and their subdivisions. As per the subtitle of my book I argue instead for a neo-medieval Europe and European planning.

Gyelnik and Ocskay distance themselves from my neo-medievalism, but I hold that in fact they embrace it. To say the least, their 'experimentalist governance' on which they quote Telle brings them close to it. After all, they recommend Cohesion policy dealing with places and, if anything, places are the ad-hoc social constructs. More in particular, they are formed and exist irrespective of administrative – hence territorial – boundaries. Which leads Gyelnik and Ocskay themselves to propose – variable – spatiality instead of – fixed – territoriality as an organising principle. My claim is that this is very much like under neo-medievalism.

Below I discuss Gyelnik and Ocskay in more detail, only to return, albeit briefly to my own dealings with conceptions of space, whether territories or places or, indeed functional areas (the latter not discussed here). This represents somewhat like a paradigm shift away from focussing on procedural planning theory towards

paying attention to the object of spatial planning. For this see further below. Discussing Gyelnik and Ocskay dealing with EU Cohesion policy comes first.

A Paradigm Shift in Cohesion Policy?

Gyelnik and Ocskay (2021) ask for such a shift. EU Cohesion policy has, they say, reached a dead end. Based on current practices, efforts to improve its performance are doomed to fail. Far from disagreeing, as indicated, my purpose here is to show that their alternative which they describe as experimentalist governance focussing on places identified from case to case is close to the very neo-medievalism from which they take their distance. My argument, too, is that spatial planning should no longer be seen as uniquely and exclusively territorial and as such a matter for the relevant authorities. More about this my views in the next section.

As it should, the title of the Gyelnik and Ocskay paper on ‘The paradigm shift: the logic of the brick wall’ – with ‘brick wall’ standing for stubborn efforts, doomed to fail as they are, to make current EU Cohesion policy work – indicates where they stand: They are critical of the unwillingness of member states to compromise on their sovereignty and territoriality. Which implies a critique also of the principle of, what I call the production of democratic legitimacy by way of elections must take place territory by territory. This leads, after all, to a systematic disregard for their interdependencies. (Faludi 2021a)

As indicated, Gyelnik and Ocskay also question of ‘neo-medievalism’ in my book. In so doing, they focus – to my mind wrongly – on the associations which the term evokes with the historic Middle Ages. For instance, they observe that presently ‘...people live in a fundamentally different world...’ At the same time they concur with Jan Zielonka (2014) and others, including myself, who hold ‘...that the universalistic identity narrative of the nation state ... is no longer the monopolistic worldview. Its totalising discourse has weakened...’ To which they add that ‘...the revolutions of transport and communication have radically extended the frames of our spatial orientation shedding a brand new light on locality (locus) and territoriality.’ This is good enough for me for claiming that they in fact embrace my critique of territorialism.

They also broach the issue – to be discussed below – whether there are other, what I like to call ‘meta-spatial planning theories.’ After all, they conjure up before our minds an interconnected world which cannot be tamed by actions taken territory-by-territory. Clearly, alternative conceptualisations are called for. Their asking for a new light on locality and territoriality in fact amounts to precisely such a call. So, there is an opening for reconciling Gyelnik and Ocskay with neo-medievalism. But in all fairness, they adduce one more reason for rejecting the association with the Middle-Ages. It is that, while ‘...medieval subjects of the king received their spatial narratives defining their local-regional identity ready-made, the identity of the postmodern people is permanently fluctuating between different discourses of space ... National narrative is just one among them. Therefore, the meaning of territoriality in the age of the internet gains a rather vague character which does not make it easier to define territorial cohesion.’

Now, I fully agree with the observation of postmodern identity fluctuating. As regards whether this is different from the Middle-Ages, without being expert on the matter, the spatial imageries, certainly of the higher clergy, of merchants and some layers of the nobility must have reached well beyond the local. Duly appointed by the seven electors, the Emperor himself had to present himself in Rome to be crowned by the Pope. Which implies a notion of space way beyond the local. And at times the spatial imagination extended, of course, to the Middle East whereto the crusaders and their followers went, relying on scant knowledge of what was awaiting them, but at least with awareness that there was a world beyond the immediate daily routines they left behind.

But, clearly, this is just a minor issue of interpreting historical evidence. Their main point – on which I fully concur with Gyelnik and Ocskay – is that the meaning of territoriality has become complex. Which is what I wished to convey in Faludi (2018) when referring to neo-medievalism in its subtitle. Like with others invoking this trope, this was meant to provoke thinking about the present being fundamentally different from a

modernist make-belief world under which we are supposed to live in well-defined territories. Which is why I am sure Gyelnik and Ocskay and I could settle on (a) the universalistic identity narrative of the state losing its monopoly on interpreting, let alone managing the world, (b) revolutions in transport and communication shedding new light on locality and territoriality.

Of course, and with this I touch upon the heart of the matter raised by Gyelnik and Ocskay in their critique of EU Cohesion policy, I agree also that the vagueness and complexity of present-day territoriality makes defining territorial cohesion a complex matter. Here, a brief reminder seems apposite: When territorial cohesion popped up in the abortive 2004 'Treaty establishing a Constitution for Europe' and was finally promulgated in the Treaty of Lisbon to come into force in December 2009, member states understood territorial cohesion as referring to the internal cohesion of their territories. At the same time, they did not savour the idea of the European Commission gaining more say in the matter. So, lines set out in the, already rather timid 2008 'Green Paper on Territorial Cohesion' (European Commission 2008) notwithstanding, the United Kingdom, then still a member, and also the Federal Republic (represented by the Ministry of Economic Affairs responsible for Cohesion policy) made it very clear that the Commission converting its mandate into a new Community competence proper would meet with resistance. To this day, this continues to be the case, which is why territorial cohesion in the EU Treaty remains moot. Territories are the sovereignty realms of the member states. There is grudging acceptance by the net-contributors of net recipients receiving substantially more from the Community coffers than they. Which is why, to the extent that EU Cohesion policy is deemed to be at all acceptable, it is above all a matter for the member states, with the further distribution of funds over their regions and so forth remaining subject to their control as the gate-keepers.

It is with respect to this, the continuing practice of EU Cohesion policy that Gyelnik and Ocskay propose their alternative, 'experimentalist governance.' Such a form of governance would be tantamount to asserting a more pluralistic spatial structures. So, rather than that structure being circumscribed by the extant government hierarchy, with Stefan Telle (2018, 55) they say that '...regions should be analyzed as social constructs.' If so, regions would be understood as being 'soft' rather than 'hard' spaces. Indeed, Gyelnik and Ocskay (2021, 190) contrast '... "modernist" regional policy concentrating on equality with "post modern" cohesion policy emphasising "freedom".'

To my mind this all but means ad-hoc spatiality replacing formal, institutionalised territoriality. Indeed, Gyelnik and Ocskay say, instead '...of bounded reality, soft spaces have a fuzzy character [S]oft spaces are created and re-created ... in an experimental way, very often independently from national or EU level agendas. ...' Well, I could not agree more! The same is true for Gyelnik and Ocskay comparing this paradigm shift in European regional policy with the Copernican Revolution putting forward a new, heliocentric model of the universe. Sure! And, as with Copernicus (and later Galileo) raising objections against conventional cosmology, so with this new proposal for European regional policy: As per the title of Gyelnik and Ocskay's paper, it hits a brick wall.

It could hardly be otherwise. To change current practices under which regional and local actors must match their spatial needs with the intervention logic of a EU Cohesion policy agreed in a tug-of-war between the Commission and member states would amount to a revolution. Instead of this old intervention logic, Gyelnik and Ocskay (2021, 20) say that '... European Cohesion should be built up brick by brick...' Their reasoning is that competitiveness rests upon local energies combined with global interconnectedness. From here they proceed to outlining their experimental model in ways perfectly compatible with what 'neo-medieval' European spatial planning would look like. So, they begin by dismissing the overall aim of Cohesion policy, convergence within an EU space defined in terms of the sum of national territories. Instead, they take a leaf out of the place-based philosophy of the 2009 Barca Report focussing on the notion of territorial capital. And they propose replacing the term territoriality with spatiality. To which they add that the '...recent pandemic showed us that locality and regionality can have a special added value based on non-reproducible local knowledge and social capital (even over the administrative boundaries) that represents a potential worth

exploiting. Spatial cohesion can create new innovative ties and solutions and give a new impetus to local, national and European growth. Investing more in locality and allowing for softer policy design involving local stakeholders would mean a paradigm shift. Instead of thematic concentration, the EU needs spatial concentration and competition between regions as engines of global competition.’ (ibid)

I could not agree more. Which is also the case with Gyelnik and Ocskay identifying this as a paradigm shift following Thomas Kuhn:

‘Kuhn stated that once the quantity of anomalies reaches the critical point, the scientific revolution creates the conditions for a new paradigm, a new matrix or a new vocabulary. The new paradigm should be incommensurable with the old one: even if the terms are the same, their meanings are changed. In this way, a paradigm shift creates a new discourse and a new institutional set of power relationships, a new reality. For sure, it is exaggerating to assert that our proposal represents a paradigm shift. But perhaps we are just too “cowardly” to try it...’ (Gyelnik, Ocskay 2021, 21).

Why this timidity? A paradigm shift seems upon us. The next section discusses one that I myself have gone through.

My Own Paradigm Shift

Here I expand on how my research on European planning has led me to fundamentally change my ideas about spatial planning. The research has first of all confronted me with views of the EU, whether a nascent federation with a territory of its own or a collection of member states, each holding sway over its own territory. In either case, the object of planning is a territory, the difference being merely one of scale. Territories themselves are givens. Changing them involves international law, making adjusting them for enabling them to cope with new circumstances tough business. But not so with spaces which are defined by the activities they facilitate and which shape them in turn.

This has consequences for planning. Where territories are concerned, planning is formal, dependent on the law. Its modus operandi is to throw up barriers, like in zoning. And, of course, the ultimate barrier is the border of the territory beyond which planners have no say. Spatial planning as against this is adaptive, seeking to overcome existing barriers as and when needed. The two types build on different meta-theories of space treating it, either as a set of fixed power containers or as the malleable outcome of negotiations and compromise concerning the location of activities.

It will be clear where my sympathies lie: In ‘The Poverty of Territorialism’ (Faludi 2018) I have criticised the conceptualisation of EU space as the sum of the territories of its members. This makes any meaningful European planning well-nigh impossible. States focus on their territories and on above all on their voters on whose consent their rulers ultimately depend. Unfortunately, the meta-theory of space which I have labelled territorialism is not only maladapted to an interconnected world, it also invites populism. (Faludi 2021b) Recognising space as constantly adapting to evolving relations on the ground is an antidote to populism.

I have come to discuss fundamental notions about space as the object of planning taking long detours from investigating Dutch 20th-century planning to exploring European planning. The initial focus, in particular on Dutch national planning did not invite reflecting on nations of space, let alone on territorialism. The issue was to learn how planners had succeeded in managing massive post-war development. This was a case of national planning that has worked by pursuing what a colleague and I identified as a ‘planning doctrine.’ (Faludi, Van der Valk 1994) The doctrine conceptualised Dutch territory as the legitimate object of deliberate government action and identified the necessary planning policies.

Now, when turning to European planning, I figured soon that to expect something like a European planning doctrine was unrealistic. (Faludi 1996) I now see this as my first attempt to grapple with what the EU is: Nothing like one large state, nor a federation, but then what? Trying to answer, I became interested in spatial

formations other than territories, figuring that each was asking for its own form of planning. Where conventional planning derives its rationales and powers from the sovereign state controlling its territory, as ad-hoc formations, what are called 'places' – see Gyelnik and Ocskay above – are different. They are what in Faludi (2015) I have once called no-man's lands. After all, formally speaking, nobody is responsible, not in a direct way anyhow. Also, places can be smaller – a landmark, a scenery, an ancient townscape – and larger, like a mountain range or a water catchment area – than administrative territories. The common characteristic of places is that there is no permanent governmental body responsible.

Elsewhere (Faludi 2021c) I seek to systematise this by identifying territories, places and also functional areas as three different types of objects, each requiring a different meta-spatial planning theory. They are associated with different mandates. For territories, these are the mandated of democratically legitimated authorities exercising territorial sovereignty on behalf of the people. Being the objects of ad-hoc concerns of equally ad-hoc (but not necessarily short-term) coalitions of actors, the mandates and attendant responsibilities for places are less clear. As the name suggests, functional areas are the concern, usually of single-purpose agencies with limited but, dependent on the nature of service concerned very effective mandates. The point is that the three meta-spatial theories and attendant mandates do not coincide. Which seems logical but is a vital issue for the notion of territorial sovereignty: how to square more or less ad-hoc concerns for places, much as the need to manage functional areas with the – in principle absolute – sovereign control over the realm of the state?

European planning faced this issue from the start. Here, the EU construct – the topic of endless arguments – comes into play. Not a federal state – in fact not by a long way – the EU nonetheless looks after common concerns. What those concerns are needs to be agreed upon by member states coming together in so-called Intergovernmental Conferences. There they conclude what are in fact international treaties. But spatial planning has never been discussed. When a competence, if not for spatial planning, then at least for 'territorial cohesion' was introduced, the Commission could have taken the initiative for adopting a directive or a regulation. But this would have been subject to member states agreeing and the European Parliament giving its consent. The outright refusal of at least some member states to even contemplate the matter meant that this was a non-starter.

So much for the briefest of accounts of, give-and-take twenty years of, in the end fruitless efforts to create something like European planning.

Conclusions

In 'The Poverty of Territorialism', I myself have not invoked the notion of a paradigm shift. I could – maybe should – have done. Be that as it may, if we only could agree on my invoking neo-medievalism amounting to the same as what Gyelnik and Ocskay mean: a shift away from an overly simplistic view of the EU as a collection of member states to a much more complex, and spatially less clearly defined entity, the management of whose space requires a differentiated approach, then we would be in business.

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STUDY ON THE CAPACITY OF NINE CITIES IN THE GREATER BAY AREA TO COPE WITH CLIMATE CHANGE BASED ON THE RISK CITY THEORY

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Introduction

To a generally acknowledged extent, climate change has changed this world, especially transformed human's attitudes towards development pattern of modern society and living pattern in man-made environment to more cautious ones, in the meanwhile driving people to realize that so called "inherent differences" among different social groups might collapse because negative effects brought by climate change, or risks in a more academically way, do not just aim at the weakness [1-4]. Risk society, of which the definition and theory framework have been constructed and developed by Ulrich Beck, Anthony Giddens and many other scholars since 1980s, stresses on this historical transformation, regarding modern society as an aggregation of endogenous risks [5]. It explains that, after modern industrial system was finally established, sources of the main risks that human need to face changed from exterior environment to our interior society, mostly due to shortsighted economic goals [6]. Also, this new type of risks could expand beyond boundaries of space and time and cover all societies globally, which are difficult to predict and control [7]. Therefore, how to recognize and manage these risks should be seriously considered to make the whole society more sustainable. Seen as the most representative creations by human society, cities would support over 75 percent of the global population in 2050 [8], providing them with spaces, facilities and services for daily life and production, while also exposing them to risks related to climate change more frequently. In a word, when cities are planned along modern industrial pattern, potential risks are likely to be overlooked, which would on one hand contribute to climate change and on the other hand cause lacking of capacity to protect people and property from these risks [9].

Risk city theory is put forward by Yosef Jabareen and could be seen as an extension from risk society theory. In this theory, “risk”, “trust” and “practice” together form the connotation of “risk city” (shown in Fig.1), with risk and trust both affected by local social and cultural cognition and affecting the relation between the public and the authorities, and practice being the representation of resource allocation to react to emergencies. Under the global background, Planning Coping with Climate Change (PCCC) is introduced to construct the practice and assessment framework of risk city theory, which consists of 6 parts as shown in Fig.2: Utopian Vision, Justice, Comprehensive Urban Governance, Ecological Economics, Adaptation and Mitigation. Utopian Vision serves as a key incentive for city reform. Justice is assumed to guarantee rational allocation of resources when facing climate impacts. Comprehensive Urban Governance provides systematically institutional support to managing the use of hardware facilities. Ecological Economics aims at creating guaranteed and energetic markets for cleaner production and consumption to improve economic development in a greener way. Adaptation mainly refers to reducing vulnerability to guard against potential climate threats with the analysis of indeterminacy, application of measures, and calculation of urban vulnerability matrix. Mitigation mainly refers to reducing occurring probability of climate risk by reasonably using natural capital, using more renewable energy and maintain natural form as far as possible [10]. More detailed information could be found in Fig.3. To be concluded, risk city theory regards risk as one kind of tool to allocate power and resource, which does not blindly pursue economic growth but seriously treats with climate change to make living conditions safer and fairer [10]. For cities in which economic development has reached a certain level, risk city theory could help assess their capacity to cope with climate change, therefore making more feasible plannings to construct more stable shelters for the people. Since the benefits of this theory has not been widely known in China, which has experienced a period of roughly rapid urbanization and faces the stern situation caused by climate change, there are both theoretical and practical meanings to apply it to assessing whether cities in China are prepared enough to cope with climate crisis and what efforts should be taken.

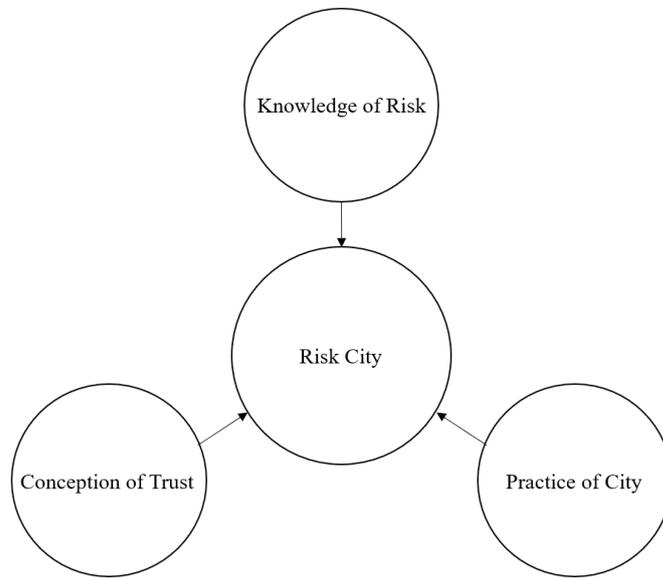


Fig.1 Connotation of risk city

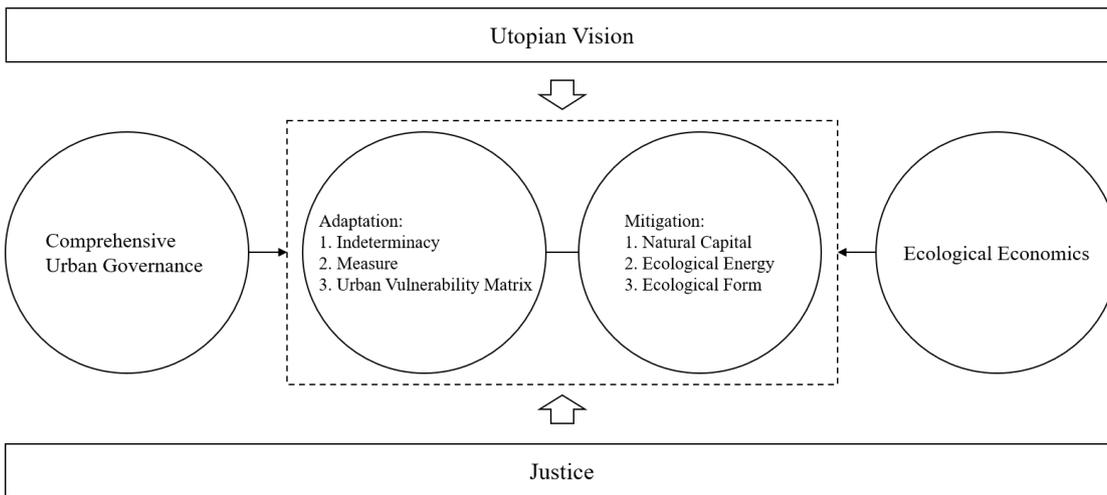


Fig.2 Practice and assessment framework of risk city theory

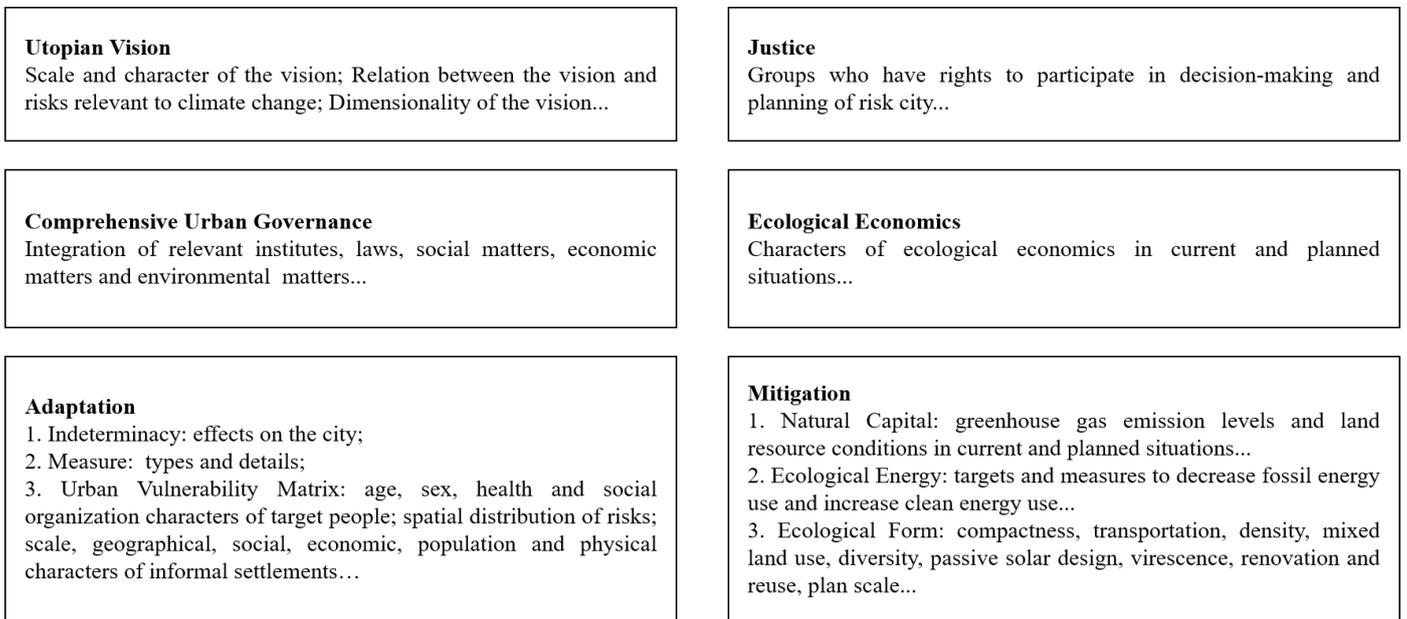


Fig.3 Detailed information of the practice and assessment framework of risk city theory

Methods and Materials

In this paper, integrity, continuity and equity are selected as fundamental principles to assess the capacity of target cities coping with climate change. Integrity means considering matters that could promote or hinder climate crisis as much as possible, and plays the role to guarantee that the assessment results could cover enough items. Continuity holds the idea that this capacity should not be static but constantly adjusting both in time and space scopes, therefore driving the assessment work being able to consider dynamic changes as climate condition and city development stage changes. Equity, which comes from the core concept “trust” in risk city conception framework, helps make sure that each type of related groups could actually become a powerful force to prevent cities from climatic damages.

Upon these principles, the capacity is divided into 2 parts. One part is current capacity, which could be concluded from the efforts already taken into coping with climate change. The other part is future potential, which could be reflected from plans coping with climate matters specifically or referring to these matters under a more macroscopical background. Since both current capacity and future potential could consist of numbers of indicators to assess, it is quite essential to select several representative indicators.

Current capacity are made up of 5 indicators: ratio of investment in relevant public facility management industry, which is the specific value of investment in public facility management industry related to coping with climate change to total investment in fixed assets within one city; growth rate of energy consumption per unit of GDP, which could tell the degree to which one city’s economic development relies on energy consumption; growth rate of industrial waste gas emission, which could be clear to see whether the main part

of one city's production is being cleaner or not; per capita area of park and green space, reflecting one city's eco-friendly level in individual view; greening rate in built up area reflects one city's ecological moderation potential on climatical risks.

Based on the assessment framework from risk city theory, indicators representing future potential are still divided into 6 clusters, but given some more detailed items. For Utopian Vision cluster, "specific vision description" is needed to see if the plan of one city takes a more reasonable blueprint into consideration and how this blueprint could face climate crisis. For Justice cluster, "recognition on social differences", which means taking capacity gaps of groups from different economic and social levels into account, and "emphasis on public participation", which means placing bottom-to-top decision-making mechanism in an important position, are used. For Comprehensive Urban Governance cluster, the more relevant matters are brought into the plan, the higher "covering extent of relevant matters" would be got, which could be highly related to a more effective governance system. For Ecological Economics cluster, "green finance construction" and "cleaner production and consumption" are introduced, with the former aiming at creating a new pattern for the trading market, and the latter trying to change and perfect current producing and consuming habits into cleaner ones. For Adaptation cluster, firstly "potential risk forecast mechanism" is needed to observe whether emergencies would break out and what consequence would they cause, concentrating on the breadth of risks and the reaction speed to them; next comes to "systematic and detailed measures", calling for decision makers to formulate rigorous and feasible measures decreasing losses brought by risks; "vulnerability among territory space" and "vulnerability among population" are following, respectively describing differences of tolerance capacity among different types of territory space and population when facing similar risks and finding out which types of territory space and population should get more attention and aids. For Mitigation cluster, as one of the most hotspot topics, "target of greenhouse gas emission" is an indispensable item; since immoderate land use is also an important cause to frequency of occurrence of risks in one city, "reserve land for adjustment use" against the unordered construction and development is essential; "improvement on energy system" is fundamental to the whole assessment framework with the respect to the fundamental position of energy planning in risk city theory; last but not least is "emphasis on urban form", which explores whether spatial arrangement could strongly affect one city's environmental condition and how this potential link might take effect. The complete assessment framework is shown in Fig.4.

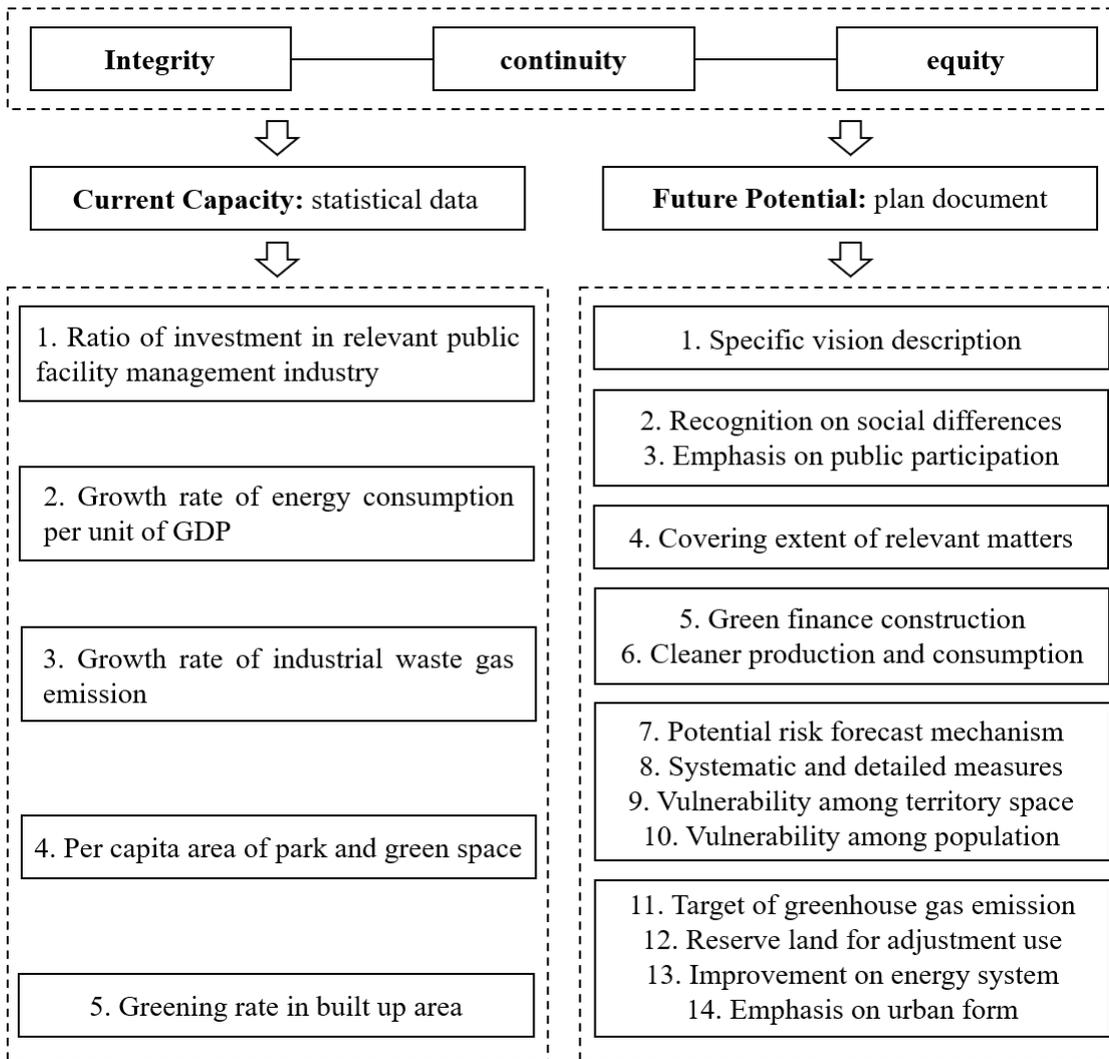


Fig.4 Complete assessment framework in this study

The study objects are 9 major cities located in the Guangdong-Hong Kong-Macao Greater Bay Area of China: Guangzhou, Shenzhen, Foshan, Dongguan, Huizhou, Zhongshan, Zhuhai, Jiangmen and Zhaoqing. Being the urban agglomeration with almost the highest urbanization rate (over 80%) in China, the contradiction between rapid expansion and high-quality development in urban area is quite prominent. Nearby the South China Sea with originally humid and hot climate, these cities are quite sensitive to global warming and have to face various of risks mainly from energy, water, ecological system and extreme weather aspects. In 2019, the *Outline Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area* was carried out by the top government of China, which could be seen as one of the most historic resolutions for China's new pattern of opening-up and gave huge chances and challenges to the included cities for exploring future-oriented urban development strategies. Since a more harmonious relationship between these cities and ecological system

and more attention on urban emergency management and related supporting facilities are called for, it is meaningful to apply the risk city theory to assessing the capacity to cope with climate change of these cities, with the target of providing the whole nation with possible demonstrate effects.

To assess current capacity of target cities, relevant data from each city’s statistical yearbooks are analyzed, of which the statistic time scale is from 2015 to 2019. As for future potential assessment, 9 typical planning documents respectively belonging to target cities are selected as most recent, appropriate and authoritative as possible, with their overall information listed in Table 1.

Table 1 Overall information of the selected planning documents

City Name	Plan Name	Plan Type	Plan Maker
Guangzhou	Guangzhou Sponge City Special Plan 2016-2030	Special Plan	Guangzhou Land Resources and Planning Commission
Shenzhen	Shenzhen Geological Disasters Prevention and Control Planning 2016-2025	Special Plan	Shenzhen Land Resources and Planning Commission
Foshan	Foshan Territory Spatial Master Plan 2020-2035 (Public Draft)	Master Plan	Foshan Natural Resources Bureau
Dongguan	Dongguan Land Use Master Plan 2006-2020	Master Plan	Dongguan Natural Resources Bureau
Huizhou	Huizhou Land Use Master Plan 2006-2020 (Adjustment and Perfection Edition)	Master Plan	People’s Government of Huizhou
Zhongshan	Zhongshan Territory Spatial Master Plan 2020-2035 (Public Draft)	Master Plan	Leading Group Office of Zhongshan Territory Spatial Master Plan
Zhuhai	Zhuhai Master Plan 2001-2020 (Revised in 2015)	Master Plan	People’s Government of Zhuhai
Jiangmen	Jiangmen Master Plan Outline	Master Plan	Jiangmen Natural Resources Bureau
Zhaoqing	Zhaoqing Territory Spatial Master Plan 2020-2035 (Public Draft)	Master Plan	Zhaoqing Natural Resources Bureau

Results

Statistic distribution of the 5 indicators representing current capacity of target cities from 2015 to 2019 are shown in Table 2 and Fig.5- Fig.9. Generally speaking, among 9 target cities, 7 cities own full data during the specified time period, leaving Jiangmen lacking data of growth rate of industrial waste gas emission from 2018 to 2019, with the data from 2015 to 2017 only covering industrial sulfur dioxide and smoke dust emission. As for Zhongshan, data of growth rate of industrial waste gas emission from 2017 to 2019 are lacking while the

data from 2015 to 2016 only cover industrial sulfur dioxide emission, and data of per capita area of park and green space and greening rate in built up area from 2017 to 2019 are not counted. Statistical results are listed as followed:

Ratio of investment in relevant public facility management industry: Zhaoqing and Zhuhai owned the highest average levels while Dongguan and Zhongshan owned the lowest, while other target cities' levels ranged between 7% and 10%. From 2015 to 2019, Guangzhou, Shenzhen and Dongguan generally showed an annually increasing track. Foshan, Huizhou and Jiangmen almost remained steady. Zhuhai had an obvious decrease before the increasing track occurred and the level in 2019 still did not reach the level in 2015. Zhaoqing had a huge increase until 2017 and although it fell a little in the following 2 years, the level in 2019 was much higher than that in 2015.

Growth rate of energy consumption per unit of GDP: Foshan and Zhaoqing owned the most average decreasing rates while Huizhou is the only city owning a positive number rate, while other target cities' levels ranged between -6% and -3%. From 2015 to 2019, Dongguan, Zhongshan, Jiangmen and Zhaoqing generally presented diminishing tracks on this decreasing rate. Guangzhou, Shenzhen, Foshan and Zhuhai showed generally steady tracks. As for Huizhou, this item become positive number after 2016, which made it the only city whose economic development still quite relied on energy consumption.

Growth rate of industrial waste gas emission: Huizhou was the only city whose average growth rate was negative number and Dongguan presented the highest average growth rate, while other target cities' levels ranged between 5% and 11%. From 2015 to 2019, Huizhou was the only city in which this item was all negative numbers during the 5 years. Zhuhai showed a generally decreasing track and the growth rate in 2019 become a negative number. Foshan once decreased its industrial waste gas emission but the later track was increasing. The industrial waste gas emission of Guangzhou, Shenzhen, Dongguan and Zhaoqing generally showed annually increasing tracks. Since enough statistics were not counted for Zhongshan and Jiangmen, these two cities were not analyzed in this part.

Per capita area of park and green space: Zhuhai owned the highest average level of this item and Foshan had the lowest, while other target cities' level ranged between 15.50 and 18.50. From 2015 to 2019, Shenzhen, Huizhou and Zhaoqing generally showed decreasing tracks in this item. Guangzhou, Foshan, Dongguan, Zhuhai and Jiangmen presented increasing tracks on the contrary. Since enough statistics were not counted for Zhongshan, this city was not analyzed in this part.

Greening rate in built up area: Zhuhai owned the highest level in this item and Zhaoqing owned the lowest, while other target cities' levels ranged between 40% and 47%. From 2015 to 2019, Guangzhou, Foshan and Jiangmen generally showed an annually increasing track. Shenzhen, Dongguan and Huizhou generally kept steady. Although Zhuhai behaved the best in average level, a decreasing track occurred during the 5 years. The greening rate of Zhaoqing increased from 2015 to 2017, however experienced a decreasing period in the later years. Since enough statistics were not counted for Zhongshan, this city was not analyzed in this part.

Table 2 Average levels of each city for each indicator during the 5 years

	Ratio of investment in relevant public facility management industry (%)	Growth rate of energy consumption per unit of GDP (%)	Growth rate of industrial waste gas emission (%)	Per capita area of park and green space (square meter)	Greening rate in built up area (%)
Guangzhou	8.97	-4.28	5.04	17.12	43.31
Shenzhen	9.78	-3.89	10.48	15.94	44.60
Foshan	8.78	-7.18	8.90	15.07	42.71
Dongguan	5.15	-5.49	13.57	18.40	46.51
Huizhou	7.32	1.92	-14.03	15.66	40.18
Zhongshan	6.56	-3.33	/	/	/
Zhuhai	10.49	-3.06	8.44	20.03	50.11
Jiangmen	7.81	-4.62	/	18.16	43.54
Zhaoqing	11.88	-6.13	10.61	17.10	39.63

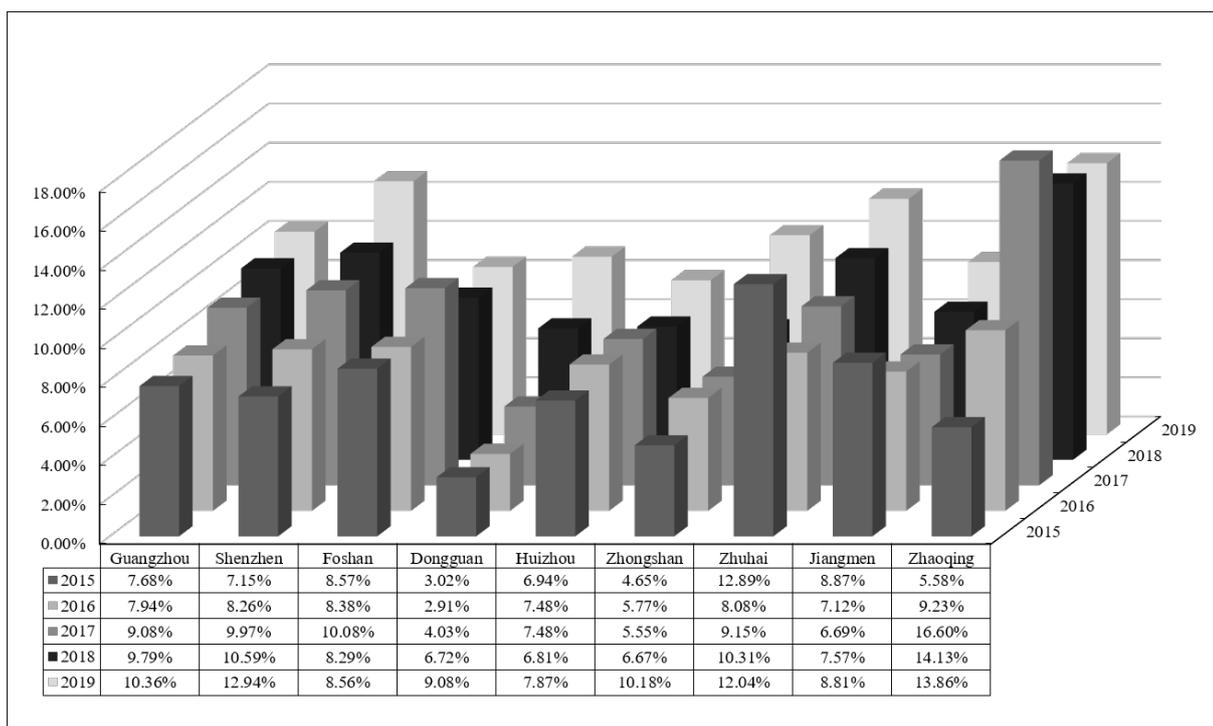


Fig.5 Distribution of ratio of investment in relevant public facility management industry

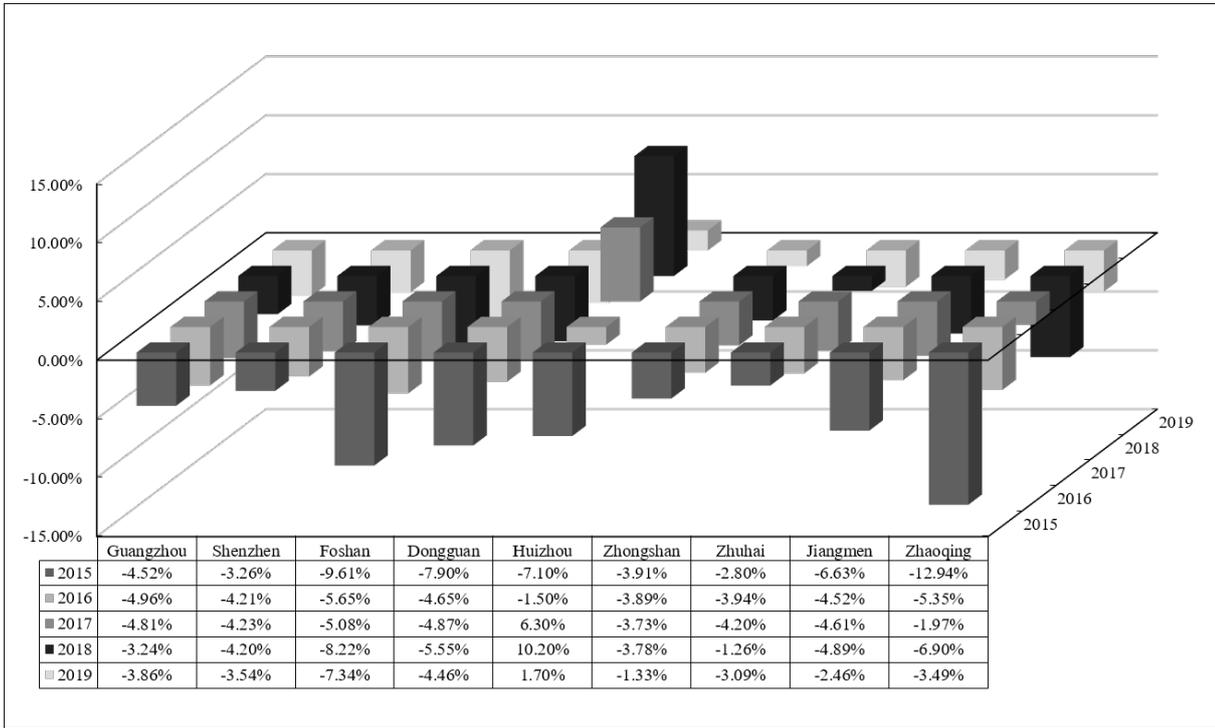


Fig.6 Distribution of growth rate of energy consumption per unit of GDP

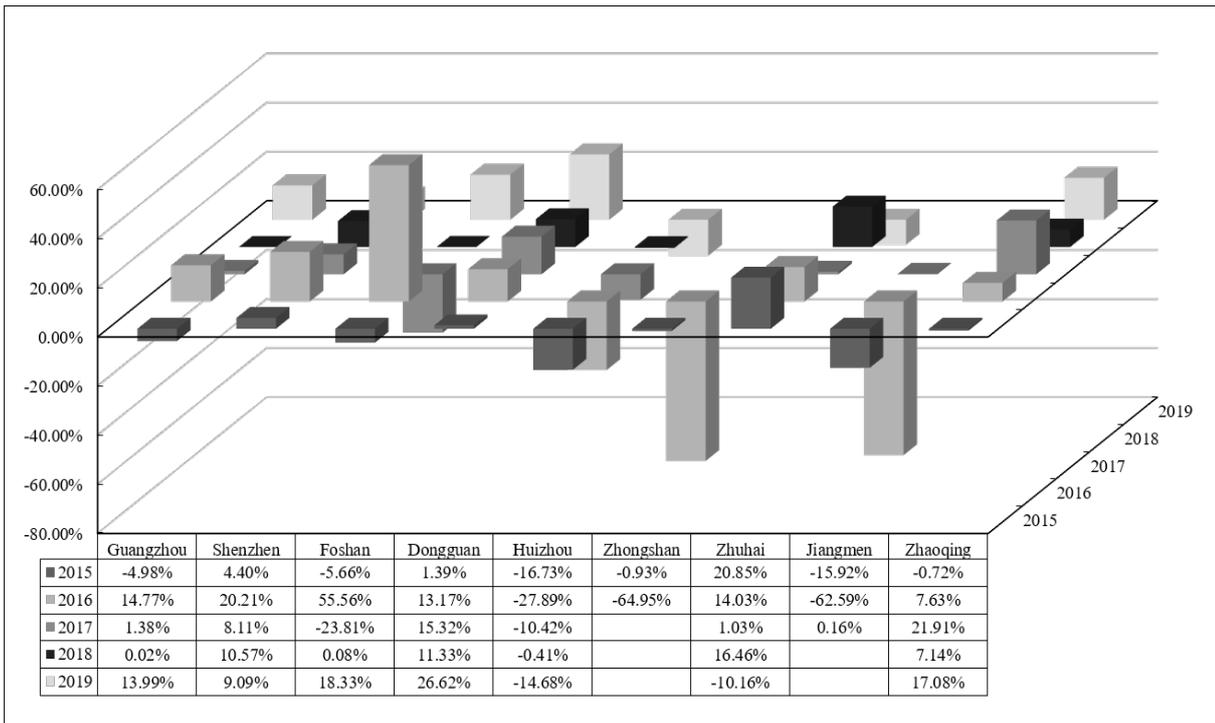


Fig.7 Distribution of growth rate of industrial waste gas emission

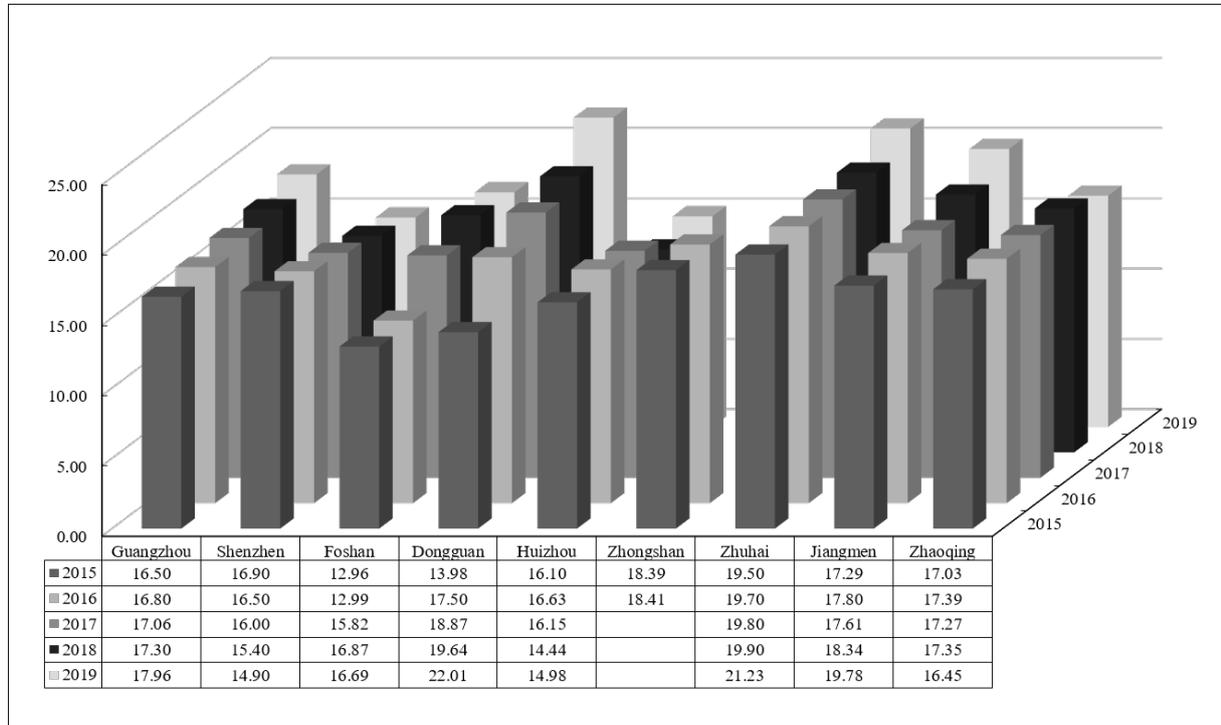


Fig.8 Distribution of per capita area of park and green space

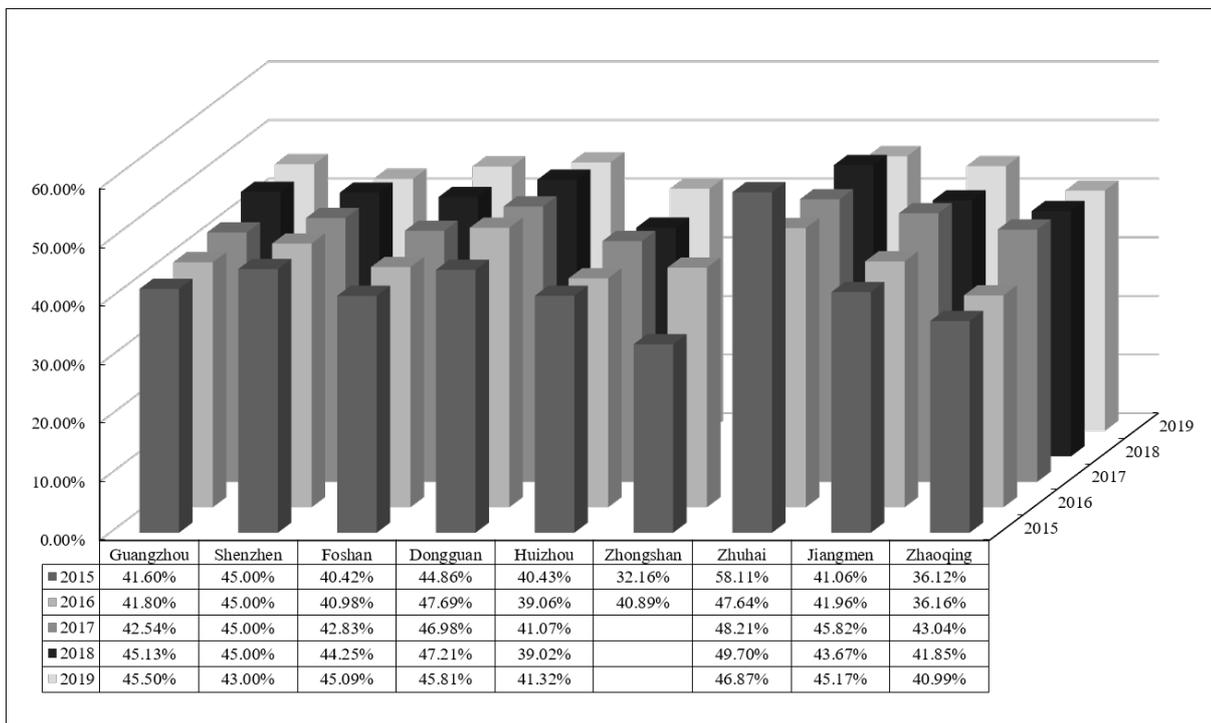


Fig.9 Distribution of greening rate in built up area

According to the assessment method for future potential of target cities, performance levels of the 14 indicators are listed here, which are divided into “specifically mentioned”, “partly mentioned”, “slightly mentioned”, “barely mentioned” (for “covering extent of relevant matters”, levels are divided into “comprehensive”, “relatively comprehensive” and “remaining to be improved”):

Specific vision description: Guangzhou, Shenzhen, Zhongshan and Zhuhai belong to the “slightly mentioned” level, while other target cities belong to the “barely mentioned” level.

Recognition on social differences: Guangzhou belongs to the “partly mentioned” level, while Shenzhen, Dongguan, Huizhou and Zhuhai belong to the “slightly mentioned” level. Foshan, Zhongshan, Jiangmen and Zhaoqing belong to the “barely mentioned” level.

Emphasis on public participation: Guangzhou, Shenzhen and Zhuhai belong to the “partly mentioned” level, while Foshan, Dongguan, Huizhou and Zhongshan belong to the “slightly mentioned” level. Jiangmen and Zhaoqing belong to the “barely mentioned” level.

Covering extent of relevant matters: Zhaoqing belongs to the “remaining to be improved” level, while other target cities belong to the “relatively comprehensive” level.

Green finance construction: Guangzhou and Shenzhen belong to the “slightly mentioned” level, while other target cities belong to the “barely mentioned” level.

Cleaner production and consumption: Zhuhai belongs to the “partly mentioned” level, while Guangzhou, Shenzhen, Dongguan, Huizhou, Zhongshan and Jiangmen belong to the “slightly mentioned” level. Foshan and Zhaoqing belong to the “barely mentioned” level.

Potential risk forecast mechanism: Shenzhen, Huizhou, Zhongshan and Zhuhai belong to “partly mentioned” level, while Jiangmen and Zhaoqing belong to “slightly mentioned” level. Guangzhou, Foshan and Dongguan belong to the “barely mentioned” level.

Systematic and detailed measures: Zhuhai belongs to the “partly mentioned” level, while Guangzhou, Shenzhen, Dongguan, Huizhou, Zhongshan, Jiangmen and Zhaoqing belong to the “slightly mentioned” level. Foshan belongs to the “barely mentioned” level.

Vulnerability among territory space: Guangzhou, Shenzhen, Dongguan, Huizhou, Zhongshan, Zhuhai, Jiangmen and Zhaoqing belong to the “slightly mentioned” level, while Foshan belongs to the “barely mentioned” level.

Vulnerability among population: Shenzhen and Dongguan belong to the “slightly mentioned” level, while other target cities belong to the “barely mentioned” level.

Target of greenhouse gas emission: Zhuhai belongs to the “slightly mentioned” level, while other target cities belong to the “barely mentioned” level.

Reserve land for adjustment use: Foshan, Dongguan, Huizhou, Zhongshan and Zhuhai belong to the “partly mentioned” level, while Guangzhou, Shenzhen, Jiangmen and Zhaoqing belong to the “slightly mentioned” level.

Improvement on energy system: Zhuhai belongs to the “slightly mentioned” level, while other target cities belong to the “barely mentioned” level.

Emphasis on urban form: Guangzhou, Foshan, Dongguan, Huizhou, Zhongshan and Zhuhai belong to the “slightly mentioned” level, while Shenzhen, Jiangmen and Zhaoqing belong to the “barely mentioned” level.

To see the performance of each target city more intuitively, a simple calculation is introduced to this part that levels equal to and higher than “slightly mentioned” and “relatively comprehensive” are counted for each city. Seen in Table 3, Zhuhai gets the highest aggregate of recognized indicators, following which are Shenzhen and Guangzhou, while the performances of Foshan and Zhaoqing are at the bottom.

Table 3 Counting results of the recognized indicators

	Utopian Vision	Justice	Comprehensive Urban Governance	Ecological Economics	Adaptation	Mitigation	Aggregate
Guangzhou	1	2	1	2	2	2	10
Shenzhen	1	2	1	2	4	1	11
Foshan	0	1	1	0	0	2	4
Dongguan	0	2	1	1	3	2	9
Huizhou	0	2	1	1	3	2	9
Zhongshan	1	1	1	1	3	2	9
Zhuhai	1	2	1	1	3	4	12

Jiangmen	0	0	1	1	3	1	6
Zhaoqing	0	0	0	0	3	1	4

Conclusion

Climate change has become the primary challenge that we human have to face, pushing our cities to transform traditional plannings into more environment-friendly ones to cope with varieties of endogenic risks. Based on risk city theory, this study constructs an assessment system to look into the capacity coping with climate change of 9 major cities located in the Guangdong-Hong Kong-Macao Greater Bay Area of China, including current capacity assessing by using statistical data from the yearbook of each city and future potential assessing by setting indicators according to the assessment framework of risk city theory, and the assessing results show some leading cities, like Guangzhou, Shenzhen and Zhuhai, have presented a tendency of change to care more about the link between urban development and climate crisis prevention, with the planning projects of other target cities remaining insensitive to climate change. Due to the differences of city positions, economic development levels, accuracy of planning contents and other objective issues, the assessing results might not be enough to tell the whole truth of whether the target cities are able to cope with risks related to climate change and what preparations should be made to improve themselves. Even so, since excess fossil energy consumption and the following pollutions cause a relatively high level of vulnerability and sensitivity to the ecological environment for these cities, and the social differences among different kinds of groups make the weak more possible to suffer from damages related to climate matters, planning for one city's future must consider cleaner energy system and fairer participation mechanism for the public. Although it is not such easy to transform the planning thoughts from economic development direction to risk prevention direction, for cities which already own sound economic foundation it is quite essential and should be seen as a duty to plan a safer and cleaner shelter for the people.

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PUBLIC SPACE: A NEVER-ENDING PROJECT

ACTOR-NETWORK OF PUBLIC SPACE PRODUCTION

AN APPROACH TO A DEMOCRATIC, PARTICIPATORY URBAN TOOL

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The Necessity of resilient public space

In April 2021, a Polish colleague told us the story of a neighbour who lost her husband and her son in two weeks' time. She was mourning her losses when she woke up and looked through her window and screamed her lungs out one morning. All the trees in the square were gone. She was devastated. The trees had been there since she was married and were a reminder and symbol of her love for her family. It just happened. Nothing could be done about it. Her story touched us deeply while raising the question that, in reality, where is the place of us as citizens in the formation of our very own public spaces? Is it true that only policymakers and spatial designers can decide how we use the space? Can they remove our memories without taking into account our lived experiences? As Henri Lefebvre explained in his book "space production", for having a democratic way of living, the three actors of space production: policymakers, designers and users, should work closely together. Is a democratic way of living not a will for all of us in the end?

Public spaces have always been essential parts of cities, having much to do with basic routines in a city's life (Cybriwsky, 1999). Throughout history, the city has shaped a unique social space as a public space that meets society's intertwined requirements for socio-economic production (Lefebvre, 1991). In pre-modern urban settings, public spaces played the role of arenas for communication. Also, they performed the principal function of facilitating social interaction, with open spaces being used by large numbers of people (Madanipour, 1992). One measure of any city's greatness is its ability to provide signature public spaces for its citizens. Successful public spaces share a significant role in socialising and contributing to the quality of life (Rogers, 2003). As many other urban theorists note, public spaces are also significant elements that define a city's unique attraction points and have higher usage rates than other leisure facilities (Pasaogullari & Doratli, 2004).

Thus, the importance of public space design to our quality of life is now being increasingly recognised in research and policy (De Groot, 1992; Naveh, 1997; Ward Thompson, 2002; Chiesura, 2004). Recent interest in urban design has focused on creating and managing qualitative public spaces in cities (Madanipour, 1999). One of the essential planning tools for enhancing the quality of urban life is thus to design adaptable public spaces that act as vital oases, attracting people to all kinds of daily life activities (Wang, 2020).

The creation of spaces is slow, and the depreciation of the investment costs takes place over a longer time. Nevertheless, the world is evolving quickly. The conditions of cities' public spaces constantly change based on the impact of, for instance, users' expectations, climate change, massive immigration or epidemic health crises. Therefore, public spaces must be resilient and flexible, constantly adaptable to these transformations

as an ally of society. For instance, the Covid-19 pandemic emergency has interested the whole world and, although in different manner and measures, changed the habits and use of people in places and cities (Abusaada & Elshater, 2020; Babalis, 2019; Carmichael et al., 2012; Carmona et al., 2010; Gehl 2010, 2016, 2020; Mehaffy et al. 2019[1]). This is only one of the feasible changes that we have faced recently regarding the use of public spaces. Ongoing research on the necessity of reconnection of cities with nature and new urban typologies such as urban-forest or the emphasis on developing a connected green-blue network within cities are proof of the importance of having flexible and yet qualitative public spaces. The NUA (New Urban Agenda) in 2016 also emphasised and published its agenda over a shared vision for a better and more sustainable future for public spaces. As mentioned several times in this agenda, the flexibility of the public spaces is the key to future proof cities. Accordingly, the flexibility of public spaces is rooted in the presence of diverse, healthy and green areas, safety, inclusivity, accessibility, social interaction, inclusion, dialogue between all people, and constant participation of users (Sepe, 2021).

For instance, the article 37 of this agenda says:

“We commit ourselves to promote safe, inclusive, accessible, green and qualitative public spaces, including streets, sidewalks and cycling lanes, squares, waterfront areas, gardens and parks, that are multifunctional areas for social interaction and inclusion, human health and well-being, economic exchange and cultural expression and dialogue among a wide diversity of people and cultures, and that are designed and managed to ensure human development and build peaceful, inclusive and participatory societies, as well as to promote living together, connectivity and social inclusion (UN Habitat, 2016).”

Thus far, a transparent, practical methodology for making a flexible public space resistant to environmental, social and structural changes is missing. There are not many accessible measurement systems to help us understand how flexible the existing public spaces are. In contrast, there is so much uncertainty about the result of new designed public spaces. Are they sufficient for their users? Are they corresponding to the environmental crises? Are they providing more social inclusion for the cities? How many percentages of a city, neighbourhood and urban block is allocated to the public open space? How can public spaces best be designed for various activities and serve their users' needs well?

In order to have a resilient yet flexible public space: (1) the inter-relation between actors of public space should be optimised; (2) the impact of social, environmental and structural changes in public spaces should be measured in both scientific factual and experienced-based manner.

Public space as part of the 'space production' stands on three main pillars: conceived space (produced by policymakers), perceived space (produced by spatial creators) and lived space (experienced by citizens). Broadly Lefebvre defined 'conceived space' as the space which is theorised by scientists and planners, known as 'representations of space'. Representations that are intangible and entrenched in the principles, imperatives, beliefs and visions of experts, decision-makers and those in a position to impose their notion of 'order' onto concrete reality. The second is 'perceived space', the space of 'spatial practice' defined as where movement and interactions occur, where networks develop and materialise. Consequently, it includes daily routines at an individual level and urban realities such as the networks that link places designated for work, leisure and private life. (Lefebvre, 1991). The third is 'lived space', which is explained as the unconscious, non-verbal direct relation between people and space. The space is occupied through associated images and symbols (Lefebvre, 1991).

The actors of the 'three spaces' are the three agents of public space. The democratic inter-relation between these three actors provides an equal role for all citizens and, therefore, constant participation of users and a qualitative place to live.

Nevertheless, the ways people use public spaces are affected by a wide range of environmental factors (such as an open space's location and accessibility), demographic factors (including a citizen's age, gender, race, ethnicity and socio-economic background), and management factors (including the cleaning, maintenance and policing of a space) (Vitale, 2009; Carmona et al. 2010).

Knowledge about which spatial characteristics influence public space use and how and why they can help spatial creators and policymakers to provide a better qualitative space for people. There has been increasing attention paid to the value of public spaces in urban contexts in terms of recreation, social interaction, and residents' health, therefore designing suitable open spaces conducive to a high quality of public life (Wang,

2020). As urban populations continue to grow around the globe, there will be tremendous pressure on the remaining open space in cities (Wang, 2020). To ensure that urban public spaces are valued and that the best value is derived from these amenities, it will be critical that these spaces are well designed.

With increasing recognition of social and mental well-being benefits of public space (Giles-Corti & Donovan, 2002; Lee & Maheswaran, 2011; Francis et al., 2012; Schipperijin et al., 2010), researchers, designers and managers of public spaces are increasingly searching for the design factors that provide these qualities.

Based on several studies (Whyte, 1980; Madanipour, 1999; Franck & Stevens, 2007), researchers conclude that the design factors related to social aspects of public space are:

- inclusivity: people's engagement in activities; open to all sorts of people; encouraging human contacts and interactions.
- comfort: accessibility for all physical minorities; availability during day/night, week/weekend and seasons.
- safety: being a safe place for all genders and ages.

The other essential aspect of public space design is related to environmental factors. Ecosystem services and aesthetic values depend on the spatial pattern and arrangement of public spaces (Turner, 1987; Geoghegan et al., 1997). For example, public spaces containing higher levels of biodiversity are less vulnerable to exotic species, pollution, and other exogenous shocks (Geoghegan et al., 1997; Schindler, 1990), and therefore can be more resilient against environmental changes and more productive in terms of providing environmental benefits. Likewise, as the theory of island biogeography (MacArthur and Wilson, 1967) suggests, forests contained in fragmented and isolated patches may contribute little to ecosystem functioning (Hunsaker et al., 1990), and recreational potential (Poudyal et al., 2008a) compared to those in contiguous blocks.

From a recreational and aesthetic perspective, a given amount of public space might be better in a single chunk than several small and disconnected patches. This is because larger plots possess greater social carrying capacities, and contain more potential for parks, gardens, or other uses. Based on several studies (Turner, 1987; Geoghegan et al., 1997; Geoghegan et al., 1997; Schindler, 1990; Poudyal et al., 2008a), researchers conclude that the design factors related to environmental aspects of public space are:

- spatial continuation: continuity of green-blue network; balance between mineral and non-mineral materials in public spaces.
- biodiversity: using different plants (summer/winter type) in order to absorb different types of insects, birds and flora and fauna.
- air quality: public spaces are the lungs of the cities, therefore have a significant role in producing high air quality.
- unity: the network of public spaces can be an asset to adaptability towards environmental changes.

The third aspect of public space design, physical environment, provides varied cues and opportunities for physical activity (Giles-Corti and Donovan 2002). From the user's point of view, the characteristics of the physical environment can encourage people to communicate and interact with each other. Thus, the characteristics of public space not only influence the vitality of that physical space itself, but also can be a powerful impetus for the maintenance and development of vibrant, inclusive community life (Shaftoe 2008; Gehl 2010). The main design factors that can be mentioned for physical aspects of public space are:

- welcoming edges and entrances
- accessibility (by foot, wheelchair, bike, public transport)
- congestion level
- flexible use of space
- security
- diverse activities
- public art
- interesting architecture

- protection from the weather
- surrounded with amenities
- maintenance
- materiality
- sense of place

Therefore as discussed above, to have a resilient yet flexible public space: one should consider (1) the interrelation between actors and (2) the impact of the social, environmental and structural changes in public spaces.

The reality of public space production

However, the reality shows that public space is a never-ending story, an ongoing project reacting over time to specific circumstances for this and future generations. This phenomenon raises a question of management regarding awareness, way of using, maintenance and follow-up. The key to this is an ongoing participatory process between the three main actors of public space: the users, the policymakers and the creators, representing respectively the lived, conceived and perceived space.

The overall known, classical production of public space is based on policymakers' decisions and realization based on the available knowledge of the creators with the exclusive participation of a select group of (potential) users. Unfortunately, reality witnesses more than often, public spaces face a gap between the initial idea, the effective realization and the daily consumption of this open space during the time.

Although the initial design resulted from a 'participation' process, a structured follow-up procedure to examine how these public spaces function and are perceived in reality rarely exists. In practice, policymakers receive scattered, often emotional reactions of a limited group of users, lacking a holistic overview.

Imagine that we go to the doctor once in our life. Only at the beginning and that is it. Body nor mind evolutions are followed up. What would our life be like then? Well, that is what often happens in the public space now. As an engaged urbanist, we thought of a sort of democratic, intelligent monitoring tool that continuously collects users' feedback regarding the public space. The tool aims to evaluate the use of the space by its public, register and learn from mistakes, share experiences and adjust the design well-thought-out. Like a doctor makes a diagnosis and tries to make the patient healthy again.

The tool supports local governments and private investors to collect objectively the opinions of the users of the public space they invested in. A resilient public space is (1) able to respond flexibly to inevitable changes in demands and conditions during the time, (2) enlarges not only the well-being of citizens, but (3) also economises costs for a local government. Our monitoring tool can be seen as the advanced version of the well-known 'trip-advisor'. Every user will evaluate the public space, guided by several criteria. The platform includes experience and factual data, as basis for the evaluation by experts.

The urgency of a more objective, intelligent monitoring system

Therefore, a clear observing and evaluating methodology is needed to keep up the flexible yet active adaptation of public spaces aligned with the requirements of that moment. We introduce a centralized knowledge platform that continuously gathers data related to each open space's social, environmental and structural aspects, including user feedback and factual data related to the specific case. This input allows the creation of a database of information, making it possible to analyse in-depth and interpret the use and appreciation of user groups of public space by decision-makers and creators in many ways. The mutual

exchange of information and insights defines the basis of an action plan for the public space, indicating quick wins and short or long term actions within an overall vision.

This databased knowledge platform gains its input from an intelligent application, including the questions/statements organized by the social, environmental and structural aspects of public space related to UN's Sustainable Development Goals. To achieve an objective and analysable outcome over a longer time, the formulation of the questionnaire should be stable over the years. It should be well thought out, avoid presumptuousness, and detect interrelations between themes.

We are convinced that the complexity of this process requires a multidisciplinary team working together, such as urbanists, landscape architects, psychologists, data-analyst, communication-participation experts and IT experts. The local knowledge is essential for this R&D team to detail and implements the monitoring tool.

The benefits for the actors

But what are the benefits of this intelligent monitoring tool for the three groups of (1) users, (2) policymakers and (3) creators?

1) Benefits of the tool for users (citizens, residents, workers and visitors)

The term 'users' refers to the general public who uses the space and is not involved in the design or management of that space. Hence, in this democratic approach the users:

- become the leading actor in public space production.
- grow into the ones who care most for the place they live.
- have a better overview of what is going on in their very own neighbourhood for 24 hours.
- turn into a primary source of information by truly measuring the qualities of public space: such as comfort, diversity and vitality, inclusiveness, and image and likeability of the public space. The patterns of individual and collective behaviours and social interactions, needs and ambitions of communities, and rights to space periodically change, highlighting the necessity of extending our knowledge and renewing our understanding of the evaluation of public places (Zamanifard, 2019).
- become active participants in the public space decision-making process.
- increase their participatory actions in future urban development, and consequently, enforce bottom-up renovation and changes, using citizens' daily reports about their experience of public space.
- have a better place to live based on their own active participation and will.

2) Benefits of the tool for policymakers

Through this comprehensive bottom-up approach the policymakers and their administration

- are better equipped to listen to and collect objectively, rapidly and perpetually information of users.
- restore data objectively over decades.
- obtain an overview of the broader network of public spaces.
- interchange data and experiences with the other actors and other cities.
- capture eventual problems and their urgency.
- formulate a valid future project definition.
- define an accurate action plan,
- provide an optimal living environment to achieve satisfied citizens.
- create an exemplary city.

We strongly believe that such a holistic working method for participative public space production will guide decision makers, to reflect and act with impact on the urban quality of life.

3) Benefits of the tool for creators

This bottom-up democratic, intelligent platform also serves the creators of public spaces. Through this platform spatial creators:

- have access to an active and archival learning box, which gives insight in space and time evolution while comparing public space typologies within different cities.
- work with the actual users as the most persistent reality check.
- can derive clear, innovative public space models and design parameters for master planning.
- are able to formulate a more accurate project definition for a specific public space.
- design better future public spaces or renovate existing public spaces.

To give a practical example: studies have shown that the more inclusive a public space is, the more people can use it, increasing the chances of casual encounters. Inclusive public spaces can also strengthen the sense of place and community attachment (Hajer and Reijndorp 2001; Mitchell 2003; Francis et al. 2012). Therefore, for the renovation of the public space based on users' experience, designers can learn how to increase the inclusivity of the public spaces for the users in the new design. In this way, they create an imperative to conduct analyses and establish suitable models for improving users' experience.

- increase the quality of the public spaces, as an essential part of the urban fabric with its green-blue network.

Conclusion

Within this intelligent monitoring application, (1) the socio-environmental changes will be observed faster, (2) the three actors of the public space will be more involved in the development of their neighborhoods and cities, (3) participation will increase, and (4) the sense of belonging of the users will be stronger as well. This is realized by getting the users' opinions and ideas about their own public spaces, analyzing and monitoring those opinions through the lenses of experts (creators and policymakers), and factual data, providing action plans and informing users about future changes in their own local public space projects. In this way, creating flexible yet resistant public spaces will be possible.

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PLANNING TO MEET CHALLENGES IN SHRINKING RURAL REGIONS. TOWARDS INNOVATIVE APPROACHES TO LOCAL PLANNING

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1. INTRODUCTION

Norway's population is increasing, but rural municipalities all over Norway are undergoing depopulation. Of the most sparsely populated municipalities, 75% have had shrinking populations in the last 20 years, often with residents scattered over a large area. In the year of 2019, 71% of all Norwegian municipalities experienced a decline. These demographic developments are expected to continue in the coming decades (NOU 2020:15). Although policy-making and planning have long focused on counteracting these demographic trends, governmental studies show that only massive immigration or a sharp increase in fertility rates can alter this course (NOU 2020:15). For most municipalities, the likelihood of a reversal is very low, both currently and in the near future.

In Innlandet, which is the Norwegian case studied in this paper, 31 of 46 municipalities have had a population decline in the last 30 years (in the period 1991-2021), meaning that they have a lower population number in 2021 than in 1991. The decline varies considerably, from -30 to -1% (see table 1). Some municipalities, especially in the eastern and northern part of Innlandet (figure 3), have had an almost continually decline year by year, while others have years in between with small increase in population numbers. The yearly fluctuations in population development are quite strongly influenced by immigration of refugees to Norway, while the natural population change

(births, deaths) has a more stable and declining development trend. The decline in population numbers is in the long run expected to continue. The age composition has changed and will keep changing to a significantly older population. This situation has recently been discussed in the demography committee's report (NOU, 2020: 15). They argue that the political goals for the districts should not be growth, but to create good communities for those who live and/or run a business there.

Norway has a long tradition of research and policies on rural areas (e.g., Teigen, 2000, 2019), including the local development, planning, and development of rural services (Aasbrenn, 1990; Bråtå et al., 2016). Already in 1990, Aasbrenn termed the situation "the thinning-out society". However, no major research and development projects on local planning, including the role of politicians and political parties, in shrinking rural regions in Norway have been undertaken.

Our contribution is a first step in giving this topic scholarly attention by addressing a rarely asked question in the literature on most rural municipalities.

To what extent is current demographic development reflected in current planning and policy practice in Innlandet? Is there a focus on strategies and measures for population growth? To what extent do politicians and planners think we should change the way we plan based on the expected demographic changes?

The empirical basis for this discussion is data from an initial study of the situation in Innlandet County, Norway, financed by the Regional Research Fund Innlandet. The aim of the initial study is to gain a better understanding of today's planning practice in local and regional development in municipalities and counties, where shrinking is evident. This smaller study is part of the development of a national research and co-operation project to be financed by local municipalities, the regional council, and national and international research institutions.

The structure of the paper is as follows: In Section 2, the theoretical perspectives of planning related to shrinking rural societies are addressed. The case of Innlandet County, the planning context and the institutional framework for planning are then presented in Section 3. Our arguments for using qualitative mixed methods are presented thereafter, we provide an overview of the data in Section 4, and the discussion of the findings subsequently. Finally, we conclude by adding a fuzzier and hybrid adaptation strategy to the existing literature, and the need to develop theories, concepts, and models for more suitable knowledge-based and innovative local planning in shrinking societies.

2. THEORETICAL PERSPECTIVES ON SHRINKING

Beauregard (in Sousa & Pinho 2015) argues that shrinking is a “stigma” that is at odds with the ideals of decision-makers? Further, they underline that current theories and policies may lead to the impression that societies are “doomed” if their populations are not growing. In the literature, there is broad agreement that growth-oriented planning, which disregards the data and insists on unrealistic ideas about growth, has hindered the development of other proactive strategies for dealing with the decline (Lang, 2012,; Sysner 2020). Municipalities and municipal master planning thus fail to recognize the potential possibilities and alternative solutions arising from strategically local master planning with a holistic perspective and a focus on smart and sustainable shrinking (Sysner, 2020). Therefore, current strategies, means, and measures often will be irrelevant. Municipalities may waste scarce resources on unrealistic policies aimed at attracting new residents in competition with other municipalities, consequently disregarding alternatives recognizing shrinkage (Sousa & Pinho 2015; Leick & Lang, 2018; Sysner, 2020).

“Shrinkage” has long been on the international research agenda, mostly with a focus on shrinking cities in North America and in parts of continental Europe (see, e.g., Gans, 1975; Hollander et al., 2009). For rural and peripheral areas, there has been a small but growing body of research on planning in shrinking regions. This research has partly been based on projects aiming to develop approaches for planning in shrinking regions, for example, in Germany (Küpper et al. 2018). What has been the reaction to shrinking in policies and planning? Beetz, Huning and Plieninger (2008) did a study in North-Eastern Germany’s countryside, and revealed four diverging positions: 1) to open up to alternative lifestyles, which accept a lower standard for quality of life as well as other decreasing welfare services;; 2) improvement of competitiveness;; 3) “passive restructuring”, which assumes that people will continue to out-migrate anyway;; and 4) a position that one must not give up the welfare system but keep it as an indispensable good, through support shared between strong and weak regions. Hospers (2014) has, in a similar way, identified four policy responses to shrinking in Europe. He discusses urban shrinkage in general, but we find it relevant for our study: 1) trivializing, where shrinkage is overlooked and denied;; 2) countering shrinkage, with policies directed at attracting new people and businesses to resolve the problem of shrinkage;; 3) accepting shrinkage, and adapting the content of policies to mitigate the effects of shrinkage, improving the quality of life for the current population;; and 4) utilizing shrinkage, where the approach is that quality of life does not necessarily depend on population density, and tries to take advantage of it. For rural areas in Northern Europe, Sysner (2020) finds that there is a general unwillingness among planners and politicians to face the consequences of shrinkage, which can be seen in connection to Hospers’ (2014) response of

“trivializing” shrinkage in cities. In contrast, Sousa & Pinho (2015), discussing shrinking in Europe in general, find that the most common response in planning is to keep a strategy for economic growth with a goal of resuming population growth, like Beetz et al. (2008) “improvement of competitiveness” and Hospers (2014) “countering shrinkage”. Sousa & Pinho (2015) say, further, that this strategy normally fails, whereas both Hospers (2014) and Sysner (2020) state that it seems that an approach of acceptance and adaptation is the most suitable strategy to address shrinkage.

Our review of the research on shrinkage leads us to conclude that has succeeded in revealing the challenges for planning in shrinking regions and contributed to increasing awareness of this issue, but it has also discovered a general unwillingness among planners and politicians

to face the consequences of shrinkage (Sysner 2020). There have been some interesting contributions to new theoretical and practical approaches (see, e.g., papers from the special issue of European Planning Studies on “Re-thinking non-core regions: Planning strategies and practice beyond growth” (Leick & Lang 2018)). Nonetheless, the need for the further development of theories, concepts, and models, as well as approaches to planning in shrinking regions, is pressing. Researchers such as Sousa and Pinho (2018) state that there is no theory on planning for shrinkage, and that the literature is unclear and confusing. This is particularly so for rural and peripheral regions (Sysner 2020).

From the applied perspective, ESPON (2020:31), for example, calls for “... practical guidance and support for local action, across a wide menu of interventions, [to] increase its potential for real changes”, and that approaches for shrinking areas must be based on evidence and reflect an analysis of pathways to shrinkage. ESPON (2020:31) emphasizes the need for a policy for shrinking rural areas that “... reflect(s) broader societal objectives than economic growth, such as inclusion, spatial justice, and wellbeing, and support a Just Transition – towards a sustainable society”. In Norway, this issue is highly relevant because local (municipal) planning is fundamental, because the municipalities have extensive responsibilities within their territory, such as welfare services, education, infrastructure, and societal development.

Hagen and Higdem (2019, 2020a) stress the need for innovation in planning, including policy development, to address the issues arising in shrinking rural societies. This also calls for innovation in planning processes, methods, and models (Betts et.al., 2008), where co-creation between public, private, NGOs, and other actors is vital for collaborative innovation (Torfing et al., 2016).

3. Case and planning context

The county of Innlandet is in the south-eastern part of Norway (Figure 1). The population numbers about 371 000, and the density is 7 persons per km² (compared with 15 for Norway). There are some small cities in the county, the three largest being Hamar (29 000), Gjøvik and Lillehammer (both about 21 000 inhabitants) (Figure 2). The population is to a large degree, and increasingly, settled in these cities and other smaller settlements, making much of Innlandet a peripheral region in a permanent population perspective. It is, however,

attractive for second homes, with about 90 000 second homes, mostly located in the mountain areas and in municipalities with small population numbers (Statistics Norway, 2022). Most of the second homeowners come from outside the county, mostly the Oslofjord area. Other important industries are agriculture, forestry, tourism, and some branches of production of goods.

FIGURE 1

FIGURE 2

The population of Innlandet has increased by 4% in the last 30 years. The development has, however, been highly uneven among the 46 municipalities, with the population decreasing for 31 and increasing for the other 15, with changes ranging from -30% to +24% (Figure 3 and Table 1). The general picture is that the large are getting larger and the smallest smaller. It is those 31 municipalities with a long-term decrease in population that are under study in this paper. It is also in these municipalities that an ageing population is experienced most strongly and earliest. Estimates for future population development in Innlandet are subject to great uncertainty, caused in part by international and national migration. Statistics Norway (SSB) estimates that the decline will continue until 2040 in 20 of the 31 municipalities, whereas another institute has in general criticized the estimates from SSB as being too optimistic for the most peripheral municipalities (Vareide, 2021). The likelihood of a significant break in the population trend in these municipalities seems to be low.

TABLE 1

In the planning system in Norway, responsibilities are divided and shared between the three levels of government: national, regional (the counties) and local (the municipalities).

Municipalities have extensive responsibilities within their territory, such as welfare services, primary schools, infrastructure (local roads, water, sewage etc.), land-use planning and societal development. The 356 municipalities of Norway are all political-administrative entities with equal status as autonomous bodies, grounded on a principle of municipal self-government. The municipalities are required to plan for societal development (comprehensive planning) as well as the municipality's organization of public services (PBA 2008).

The municipal council itself directs the planning process (§3-3). Municipal master planning for societal development in Norway is a strategic policy-making activity embedded in a multi-level democratic system (Hanssen Sandkjær et al., 2018). The planning serves as a common arena for public, private, and citizen actors to voice their interests, and the municipal council makes the final decisions. The purpose of planning is to “promote sustainable development in the best interests of individuals, society and future generations” (§1-1). The municipality is responsible for formulating strategy and policy for local development that is holistic and sensitive to the local context, which is embedded in the municipal master plan (§ 11-1). The master plan is based on the municipal planning strategy (§ 10-1), which is to; “comprise a discussion of the municipality's strategic choices related to social development, including long-term land use, environmental challenges, sector activities and an assessment of the municipality's planning needs during the electoral term“. Through the measure of a Planning strategy, the Planning and Building Act of 2008 therefore provides a strong platform for municipalities' strategic policy-making. Further, the political parties have a long practice of developing party programmes that deal with community development. Sometimes there may be some form of interaction between party programme work and planning.

4. METHOD

The research was carried out in the winter and spring of 2021, as a part of an initial project called “Realistic Planning”¹. The study consists of the 31 municipalities in the Inland County with a long-term decrease in population (Figure 3 and Table 1). The data consist of i) a document study where we reviewed the societal part of the municipal plan and the planning strategy for all 31 shrinking municipalities. The societal part of the municipal plan should, according to the planning and building act (PBA 2008), “decide on long-term challenges, goals and strategies for the municipal community as a whole and the municipality as an organization” (§11-2, own translation). It thus includes both goals and strategies for

the whole society (for example related to the development of jobs and demography), and for the more specific services and tasks for which they are responsible

(for example primary schools and elderly care). The planning strategy is, simply put, a plan for what plans the municipality needs to develop or update for the next four years.

According to the law this strategy “should include a discussion of the municipality’s strategic choices related to community development, including long-term land use, environmental challenges, the sectors’ activities and an assessment of the municipality’s planning needs during the election period” (§10-1, own translation). We also see that the plan includes both the community perspective and the more specific perspectives of the service sectors. Concerning the latter, what is included in both these documents is often excerpts of challenges, goals and strategies taken from separate planning documents related to the different sectors or from written input to the documents from the sectors’ administration.

We have also reviewed Innlandet County’s regional planning strategy and regional political programmes. In addition, we have assessed the local political party programmes in six of those 31 municipalities. Finally, we have reviewed Innlandet County’s regional planning strategy and regional political programmes. li) We have conducted four workshops, two with politicians and planners in Innlandet County and the others with the municipal executive board in two municipalities. The experiences from the workshops were subsequently analysed with Nvivo. lii) Finally, we have conducted 10 semi-structured interviews with top politicians at regional and local levels, i.e. mayors, county mayor and central party politicians, also analysed with Nvivo.

This mixed set of qualitative methods provides for an inductive approach and analysis (Stake, 2000) based on several aspects of planning practices, including politicians’ understanding, local policy-making in party programmes, interviews with leading politicians, and of course the planning documents describing today’s situation and future perspectives. From our position, the politicians form an understanding of the range of possibilities and hence, the framework for the planning activities.

We have restricted the analysed planning documents to the societal part of the municipal master plans, and the planning strategies. Hence, a total assessment of all types of municipal plans including plans for separate themes or sectors, would have given a broader and more comprehensive study. A more comprehensive study would also include more interviews with planners, politicians and other actors involved in planning at different levels, especially at the municipal

level.

The inductive approach of the analysis, and the questions we asked our data, is based on our research questions: a) to what extent is current demographic development reflected in current planning and policy practice, and b) is there a focus on strategies and measures for population growth, and c) to what extent do politicians and planners think we should change the way we plan based on the expected demographic changes?

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5. RESULTS AND ANALYSIS

Municipal planning strategies and the societal part of the municipal plan

In Table 2, we have summarized our findings from analysing the planning strategies and municipal plans for the 31 municipalities in Innlandet under study. Based on our research questions, and inspired by earlier research on policy and planning responses to shrinkage, we have 105ommune105ter each municipality as to whether these documents show that they have: a) goals/visions for population growth (either as a general goal/vision or an underlying goal below in the goal hierarchy) , b) goals for stabilizing population number, c) explicit emphasis on the existing population, and d) an adaptive approach (adapted towards a shrinking population) towards the provision of main services. Where these responses are clearly identifiable in the documents, it is indicated with an X, whereas in the instances where it is not so clear it is indicated with a small x in brackets. These categories emerged from theories and through the analysis of the documents. The categories are not mutually exclusive, and this will be discussed below as an important finding from this study.

TABLE 2

All municipalities include statistics and prognoses for population development, including population numbers and age composition in their plans, so this is well known, presented, and communicated. Despite this, most municipalities (20) have goals for population growth in the coming years, and a few have goals for 105ommune105ter population numbers, which is also unrealistic for most of them due to the prognosis. It is those municipalities with the strongest negative population prognosis, that, to the largest degree, have goals for population growth. Several of the municipalities with goals of population growth put a quite strong emphasis on strategies for making them more attractive, especially so they can attract young people

and families. Some of them are strongly influenced by Telemarksforskning, a Norwegian research institute whose consultants have developed what they call an “attractivity model”, with indicators for attractivity connected to settlement, industries and for visitors, and where they say that municipalities that succeed in developing their attractivity may be the “one exception Against the general trends” (Aastvedt, et al., 1999). In Søndre Land municipality, having 5. 535 inhabitants in 2021, Telemarksforskning have done an analysis in connection with the new societal part of their municipal plan. In the planning strategy Søndre Land municipality writes:

“Telemarksforskning estimates that if the municipality succeeds in improving its attractivity and the development in the country does not worsen considerably, the population number in Søndre Land can be about 5,700 inhabitants in 2040. If the attractivity in the local community is kept at about the same level as today it is estimated that the number of inhabitants will be about 4,700 in 2040 (Søndre Land kommune, 2020. Our translation).

Søndre Land municipality will follow this up by developing strategies and measures to reverse the population decline.”

Most of these municipalities do not consider or reflect on the gap between actual population development and their goals for population growth in their planning documents. However, some do, and Skjåk, with 2 165 inhabitants, is an illustrative example. In their planning strategy (approved in October 2017), they say that “Population numbers have decreased by more than four hundred persons in the last 30 years. If the development when it comes to births, mortality, in- and out-migration does not change, one must expect that it also will be a decrease in the coming years” (Skjåk 106ommune, 2017:9–10, our translation). In the same document, when they discuss their experiences with the existing societal part of the municipal plan, they state that “The main experience with this plan is that some of the goals should be adjusted to a more realistic level, among others population development.” (p. 4, our translation). In their new societal part of the municipal plan (approved in 2020), three scenarios are presented, one they call “pessimistic” with a decreasing population, one “modest” with a stable population and one “optimistic” with an increasing population. Then, it is stated that “The danger is that it is the pessimistic scenario that is realistic, but we must work towards the optimistic one”. (Skjåk 106ommune, 2020, p. 14, our translation). In explaining why, they must do this, there is a discussion in the document of the age structure and where they say that among others, due to their many years of experience with a high proportion of old people, those challenges are not necessarily dramatic for them. Then, it is stated that “But a society needs young blood to keep its vitality, and that makes it necessary for incentives for population growth. The future

strategies for the municipality must have this as one of its main goals.” (p. 10, our translation). This illustrates that despite their recognition of the need for more realistic goals, this is not followed up in the new plan. In our view, the scenario, which includes a decrease in population, is connected to so many, and only, negative societal developments (increased 107 ommune 107 ter 107 d 107 of national/regional services, empty houses and schools, etc.), compared with the two other scenarios, thus making it unacceptable for the municipality to have realistic goals for population development when scenarios are developed in such a way.

At the same time as most municipalities have population growth as a goal, most municipalities have a more adaptive and realistic approach when it comes to demographic development connected to the parts of the plans that consider main services (especially primary schools/kindergartens and healthcare). As Table 2 shows, more than half of the municipalities that have population growth as a goal, simultaneously have an adaptive approach to services. The arguments typically used are both connected to demographic prognoses for changes in population numbers and age structures in their own municipality, implying for example the need to evaluate how many schools are needed in the municipality in the coming years. But often it also refers to general trends in Norway connected to demography, especially more older people, expected tighter public finances for such services, and difficulties in recruiting personnel. This implies that there will be a strong need for innovation connected, among other factors, to making the services more efficient, use of welfare technology and more private/public/NGO co-production. For example, when Grue municipality describes challenges within health and welfare services (under the main heading “National expectations for societal and service developments”), some of their bullet points are: “be able to deliver good/good enough services within a sustainable economic ‘frame’.

This means a service delivery that is more cost-effective”; “It will be necessary for solutions where as many as possible can stay home longer,—with some need for services”; “implement welfare technology”; “have enough qualified and competent personnel for all the tasks that the municipality must solve”. (Grue municipality, 2016.:22, our translation). _

A few of the municipalities do not have goals connected to population development, neither growth nor 107 ommune 107 ter, possibly indicating a kind of 107 ommune 107 ter 107 d 107. But some of them, such as Gausdal, Sør-Aurdal and Etnedal, rather have a quite strong focus on the existing community. Hospers (2014) discusses this in connection with the response of accepting shrinkage. Having said that, it is important to stress that all municipalities, including those with population growth as a goal (often one of many goals), of course, deal with the existing community, and not only about potential in-migration etc. For example, in Gausdal the vision is “Together we make it happen”,

and they will work together with inhabitants, local industry and NGOs, among others on the following areas: good everyday lives, a close and active local community, a greener municipality, public safety and preparedness, sustainable land use and sustainable economy. Connected to “a close and active local community” it is, among other things, stated that “We want Gausdal to be a local community where inhabitants of all ages participate, take joint responsibility and experience inclusion. A sustainable local community we best create and develop together”. (Gausdal municipality, 2019).

Party programmes vs planning—dilemmas

We have assessed party programmes in six municipalities with population decline and expected population decline within centrality classes 4, 5 and 6. Overall, the programmes give the impression of great political commitment to their municipality.

Population development and settlement pattern are given attention in one or more of the party programmes in 5 of 6 municipalities. Most programmes signal an ambition to maintain population and secure settlement. Some programmes are clearly concerned about the importance of reversing a shrinking population trend. Many programmes are mainly concerned with what contributes to the municipality becoming a good society to live in, as a permanent resident and as a cottage (leisure home) resident.

We found no party programme that clearly provided a realistic planning perspective for population development. At the same time, in the one municipality that did not directly mention population development, the political programmes were clearly offensive regarding societal development.

The number of political parties in these six municipalities varies between 6 and 2. The material is too small to say anything about any differences between the various political parties. Many of the party programmes report that population development is simultaneously an important and difficult topic. The programmes vary in length and thoroughness. Many of these parties are small, run by only a few people. Together, they cover many different topics or factors that the individual political party believes are important for population development. There are topics such as the conditions for various types of business, labour market, housing, housing plots, cottages (leisure homes), welfare services, kindergartens, schools, municipal employer policy, internet capacity, transport, recreation, nature and environmental protection, sports and culture, and voluntary organizational life.

Local and regional politicians and planners

All informants agree on the need for developing a new planning practice that addresses shrinkage. All the politicians we interviewed, except one, thought that one should have a more realistic approach to population development. This one thought it was both politically desirable and even possible to reverse the decline in growth. However, there are different assessments in predictable political (ideological) directions, on whether the rural municipalities, the shrinking regions, should or ought to plan to have a decreasing population as the planning horizon. Although there are variations, the main position among politicians is that, to a certain degree, is a result of a conscious government policy aiming at. However, there were differing views, somewhat depending on party affiliation, about the extent to which national policy had a decisive impact on population development.

For politicians, it is challenging to plan within a framework having a declining population as the realistic result. The explanation is that such a framework or planning will be regarded as the parties' primary preferred goals and visions for the future, meaning of services, downscaling of activities and reduction of the number of schools and, not least, depopulation. One top politician states: "A party programme has a long horizon containing visions, ambitions and dreams. Planning may not to a similar degree be based on dreams, it is much more concrete. The recipe for success is when these two perspectives can meet, that is the refraction-point between realistic plans and visions, ambitions and dreams".

Unsurprisingly, the interviewed planning officials hope for and recommend a more realistic approach to planning than the politicians.

Most informants agree that the planning focus should change from population growth to giving attention to citizens living and working in the rural municipalities and counties. Several of the rural municipalities in the Inland have more holiday homes than inhabitants (ssb.no). This means tourism plays a major role in business and job opportunities. It also implies that the number of inhabitants varies greatly, for example during holidays. Most informants are positive about holiday homes and the possibilities the part-time inhabitants create for local and regional societal development.

6. DISCUSSION

Our study illustrates how challenging it is for shrinking municipalities to break with established practices and modes of policy development into a more sustainable and non-growth or de-growth position. The "stigma" of shrinking (Sousa & Pinho, 2015) is certainly at odds with the ideals of the

local politicians. At least when we notice how politicians formulate themselves orally in debates and in writing e.g., plans and party programmes. The stigma manifests itself as a political comprehension of defeat and negative downward spirals if the planning horizon should be realistic in terms of a non-growing population. Such stigma will, from a political point of view, lead to a pessimistic apprehension of shrinking societies being far from attractive for inhabitants to live in or move to. The innovative potential of a realistic approach (Hagen & Higdem, 2020), where development in a non-growth situation is possible is not directly and distinctly found in the policy agendas in these municipalities.

On the one hand, our study reveals that municipalities, despite undergoing long-term shrinkage, dismiss it as a premise in their master planning, and continue to plan for growth, much like shrinking rural areas and cities in other countries. It further suggests that the response in planning and policy cannot be determined by only one type of response, but that several responses may appear simultaneously, connected to different parts of the societal (master) development plans, thus, making the plans incoherent and contradictory.

The most important of such simultaneous responses, is when the planning documents have goals for population growth as well as strategies for the adaptation of main services to a shrinking society. Such discrepancy within the planning documents is not surprising and may have several explanations. We already know that the municipalities may fail to sufficiently link together the different planning types in the planning system (Hanssen Sandkjær, & Aarsæther 2018).

Master planning is an arena where politicians steer and develop policy for societal development (pbl 2008), and the planning expertise may be neglected, as our informants suggest. Plans for public service provision, however, traditionally lean more on the planning expertise and the factual data for future dimensioning of services. Our study, therefore, suggests that there is adaptive capacity in the shrinking areas regarding services. Such adaptation may be troublesome, but economically necessary. However, a missing link to the overall master planning and societal policy development, takes realism further from policy development and the political parties. Although they are, of course, well-known facts for politicians when addressing the budget and coping with the local protesters when their small school is being closed, it does not tap into the overall policy-making. Therefore, we argue as our data suggest, that politicians do not dare to bring a realistic perspective policy-making in shrinking societies, although many of them might just want to signal and work towards a more realistic approach. In the context of varied responses to a shrinking society, it is important to note that our data suggest that municipalities also deal with the existing community, and collaborate with inhabitants, local industry, NGOs and so on, in their planning documents.

Hence, municipalities do not address the potential of in-migration as the sole success criterion even though the overall goal is population increase.

A more realistic planning position will obviously challenge ways of thinking, traditions, and economic systems where growth is regarded as a necessary as well as a desired development. It will also challenge what is politically rational practice for a politician and for a political party. Not least, a political party is dependent on gaining trust and support in elections. How can a political party and a politician achieve this even if, or precisely because, one recommends a realistic approach?

Incoherent planning responses

Municipalities in Innlandet have, as mentioned, quite varied responses to shrinkage, and in relation to responses internationally we find several similarities, but also some notable differences. In comparison to North-East Germany (Beetz et al. 2008), we find “improvement of competitiveness” to a large degree in Innlandet, and also “passive restructuring”, in Innlandet meaning adapting services to shrinkage (and often simultaneously, as discussed above). We do not find any positions where the standard and level of welfare systems and services are discussed or questioned, as Beetz et al. (2008) found in Germany. How welfare services can continue to be delivered at a high level in the future are, however, often discussed in municipalities in Innlandet, due to expected tighter finances, more old people, and lack of workforce. Why there are such differences between Germany and Norway is not under investigation in this paper. However, we can speculate that it can be connected to the national economy, and we think that even questioning the principle of equal welfare services in the whole country might be just another stigma in Norway, in the same way as 111ommune111ter shrinking in planning. Compared with what Hospers (2014) found as responses to urban shrinkage in Europe, we find three of them in municipalities in rural Innlandet, but not “utilizing shrinkage”, where one tries to take advantage of the shrinkage. As our analysis suggests, several municipalities in Innlandet may at the same time have goals for population growth (like Hospers’ “countering shrinkage”) as well as a practical and economic adaptive capacity for shrinkage towards future service provision (like Hospers’ “accepting shrinkage”). By finding several responses simultaneously, we can add this messier or hybrid response to Beetz et al.’s (2008) and Hospers’ (2014) types of responses, which might be labelled an “incoherent response”. As discussed above, we do not find this surprising due to how the Norwegian planning context, including documents, is designed. We do not know why this has not been revealed or commented upon by earlier research in other countries. It could be connected to differences in planning systems, differences in methods (what planning and policy documents have been studied), and that one has been looking for ideal types of responses.

7. CONCLUSIONS

The main conclusion is twofold. On the one hand, our study reveals that municipalities, despite undergoing long-term shrinkage, dismiss it as a premise in their master planning, and continue to plan for growth, much like rural areas in other countries.

On the other hand, our study suggests that the responses in planning and policy are quite varied, and that there are municipalities and politicians that are highly aware of that their plans and policies are unrealistic, but are confused about how to handle them, and what the alternative options for the future may be. Our study illustrates how municipalities may adapt to shrinking in their plans for public service provision and that there are some municipalities that do not focus on growth, but emphasize the current population and quality of life. This indicates that there can be cases that can be interesting to learn from in future studies.

Following Hospers (2014), we introduce a hybrid adaptation strategy.

Overall, today's planning practice in rural areas in Norway has not been able to, dared to or wanted to, relate to the most likely developments of a shrinking population. This has had vital and negative implications for these municipalities.

Consequences -

It is crucial, therefore, both to develop knowledge of why local planning in Norway disregards shrinkage as well as the consequences this has for planning and the future of rural societies, and to develop theories, concepts, and models for more suitable knowledge-based and innovative local planning that can meet this complex societal challenge.

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FIGURE AND TABLES.

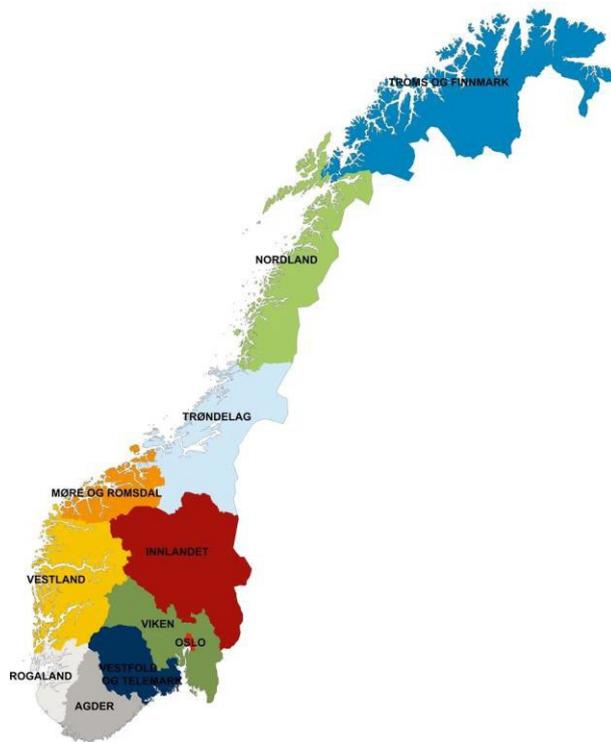


Figure 1. Counties in Norway. (Source: Regjeringen.no, 19.12.2019, https://www.regjeringen.no/contentassets/8b2f4434bb024962801a18b06d4888e4/nye_fylke_r_med_navn_hoy_jpg.jpg)

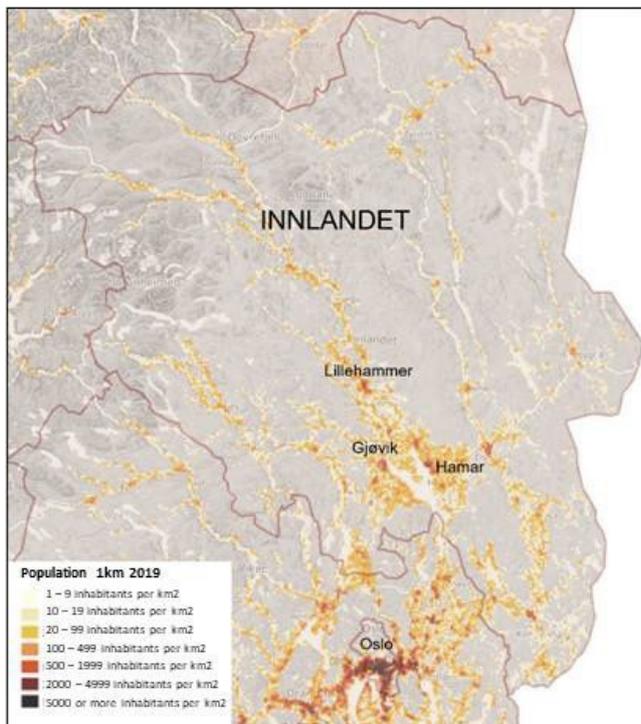


Figure 2: Inhabitants per km² in Innlandet 2019 (Source: Statistics Norway, 2021, <https://kart.ssb.no/>)

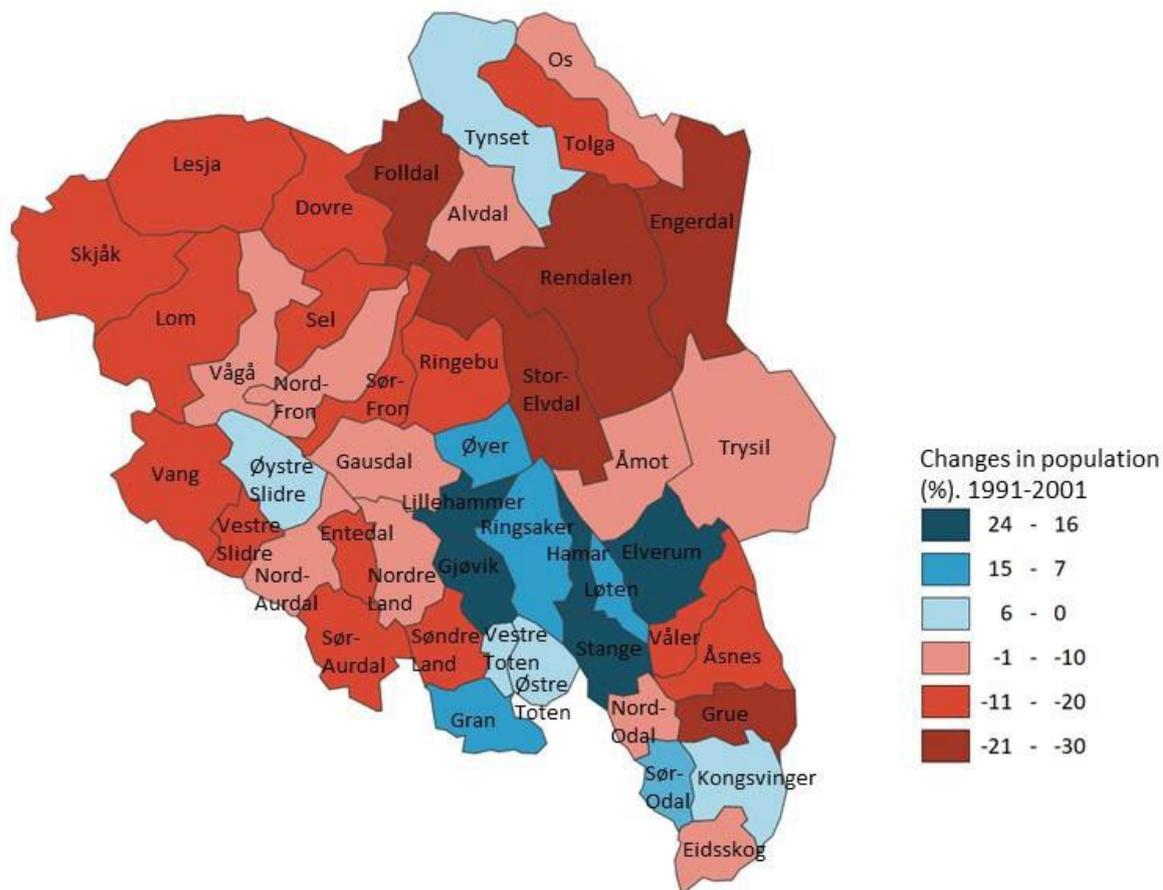


Figure 3: Changes in population (%) in municipalities in Innlandet. 1991-2021. (Source: Statistics Norway 2022)

Municipality	Pop. 1991	Pop. 2021	Change pop.	Change %
Rendalen	2496	1741	-755	-30 %
Stor-Elvdal	3337	2378	-959	-29 %
Engerdal	1677	1250	-427	-25 %
Folldal	1989	1518	-471	-24 %
Grue	5774	4545	-1229	-21 %
Etnedal	1565	1257	-308	-20 %
Lesja	2454	1980	-474	-19 %
Våler	4408	3587	-821	-19 %
Dovre	3071	2512	-559	-18 %
Sør-Aurdal	3549	2904	-645	-18 %
Lom	2651	2204	-447	-17 %
Tolga	1877	1563	-314	-17 %
Vestre Slidre	2529	2120	-409	-16 %
Åsnes	8540	7227	-1313	-15 %
Skjåk	2574	2183	-391	-15 %
Ringebu	5182	4408	-774	-15 %
Sel	6381	5592	-789	-12 %
Sør-Fron	3493	3064	-429	-12 %
Vang	1784	1573	-211	-12 %

Søndre Land	6305	5579	-726	-12 %
Trysil	7316	6580	-736	-10 %
Vågå	3945	3564	-381	-10 %
Os	2032	1870	-162	-8 %
Nord-Fron	6167	5705	-462	-7 %
Gausdal	6448	6023	-425	-7 %
Nordre Land	7038	6581	-457	-6 %
Eidskog	6451	6099	-352	-5 %
Nord-Odal	5326	5038	-288	-5 %
Nord-Aurdal	6515	6360	-155	-2 %
Åmot	4422	4338	-84	-2 %
Alvdal	2430	2405	-25	-1 %
Vestre Toten	13358	13459	101	1 %
Kongsvinger	17464	17851	387	2 %
Tynset	5398	5537	139	3 %
Østre Toten	14314	14871	557	4 %
Øystre Slidre	3107	3236	129	4 %
Sør-Odal	7428	7914	486	7 %
Gran	12626	13611	985	8 %
Løten	7045	7625	580	8 %
Øyer	4586	5093	507	11 %
Ringsaker	31399	34897	3498	11 %
Gjøvik	26250	30395	4145	16 %
Stange	17645	21072	3427	19 %
Elverum	17406	21292	3886	22 %
Hamar	25454	31509	6055	24 %
Lillehammer	22889	28493	5604	24 %
Innlandet	356095	370603	14508	4 %

Table 1. Population numbers and change in numbers and %, 1991 – 2021. Municipalities in Innlandet County and Innlandet. Sorted by %-change. (Source: Statistics Norway 2022)

Municipality (name)	Population growth is a goal	Goal of stabilizing pop.	Emphasis on current pop.	Adaption of main services
Eidskog			X	(x)
Grue	X			X
Våler	X			(x)
Trysil	X			X
Stor-Elvdal	X			(x)
Rendalen	X			(x)
Engerdal	X			
Tolga		X		
Folldal	X			(x)
Os	X		(x)	
Dovre	X			X
Lesja		X	(x)	X
Skjåk	X			(x)
Lom	(x)			
Nord-Fron	X			
Sel	X			X
Gausdal			X	
Søndre Land	X			X
Sør-Aurdal			X	X
Vestre Slidre	X			
Nord-Odal	X			X
Åsnes			X	X
Åmot	X			
Alvdal	X			
Vågå		X		X
Sør-Fron				
Ringebu				X
Nordre Land	X			
Etnedal			X	X
Nord-Aurdal				X
Vang	(x)			

Table 2: Long term goals in planning strategies and municipal plans for the thirty-one municipalities in Innlandet

VISUALIZATION ANALYSIS OF FUTURE CITY RESEARCH BASED ON CITESPACE

Jing Han ¹

¹ Tongji University

1. Introduction

Humans' exploration of "future cities" has never stopped. The experimental history of the future city is a development history in which human beings gradually meet their own needs and dreams through technological tools. With the great development of science and technology in recent decades, the economic structure and social organization of cities are undergoing unprecedented reorganization and transformation. In addition, the global COVID-19 pandemic has caused a lot of confusion and suffering. Thinking and answering about the future direction of cities, and what adaptive changes will be adopted in urban planning, is the key challenge that current urban researchers, planners and even all sectors of society are facing. It is also a lasting proposition that needs to be continuously deepened and improved in the future. The international academic community has always attached great importance to the research and practice of future cities. Comprehensively examining the outcomes of existing scientific papers on *future city* and clarifying its development context and evolution trend are necessary prerequisites for constructing future city theory and helping urban decision makers to formulate future urban development paths.

2. Methods and data

2.1 CiteSpace

Bibliometrics is a scientific quantitative analysis method that integrates mathematics, statistics and philology. CiteSpace is a bibliometric software that focus on exploring the potential knowledge contained in scientific carriers. It was developed by Professor Chaomei Chen of the Drexel University and his team. It can measure relevant literature through co-citation analysis theory, etc., and draw a series of visual maps, so as to analyze the research status and trends of a given field. This paper uses CiteSpace to quantitatively analyze the literature and information related to future city, in order to grasp the overall situation and key points of global future city research.

2.2 Data retrieval process and resulting dataset

Comprehensively comparing the data quality and the degree of matching with the CiteSpace tool, this study selected the Web of Science Core Collection (WoSCC), the world's largest and most comprehensive scientific publication database, as the data source. The following literature search strategies were applied on 30 May 2022 (Table 1):

Table 1. Literature search strategy.

Data sources	Science Citation Index Expanded (SCI-Expanded) Social Sciences Citation Index (SSCI) Arts & Humanities Citation Index (A&HCI)
Timespan	From 2000.01.01 to 2022.05.30
Retrieved content	Full records and cited references
Query	(TS = ("future* city*" OR "city* future*" OR "future* urban*" OR "urban* future*") AND LA=(English) AND DT = (Article OR Proceedings Paper OR Review)) AND PY = (2000-2022)

After deduplication, a total of 1933 valid records were obtained, including 1854 papers and 79 review articles.

3. Macro overview: disciplines and topics involved in future city

3.1 Category co-occurrence network

What scientific fields are involved in research on cities of the future? Web of Science assigns one or more subject category labels to each article it indexes, making it easy for readers to know what fields of research each article describes. When a document cites research results from different disciplines, it means that there is a cross-border combination relationship between these different scientific fields of knowledge, and this relationship must be recognized by the author. When enough authors agree on the same relationship, then the relationship can be considered to have stable and reliable significance in this research direction.

CiteSpace, v. 5.8.R3 (64-bit)
 May 31, 2022 8:56:18 AM CST
 WOS: C:\Users\WUS Lab\Desktop\读研小论文-基于CiteSpace的未来城市研究知识图谱分析\data3\data
 Timespan: 2000-2022 (Slice Length=1)
 Selection Criteria: g-index (k=25), LRF=3.0, L/N=10, LBY=8, e=1.0
 Network: N=295, E=610 (Density=0.014)
 Largest CC: 277 (93%)
 Nodes Labeled: 1.0%
 Pruning: Pathfinder

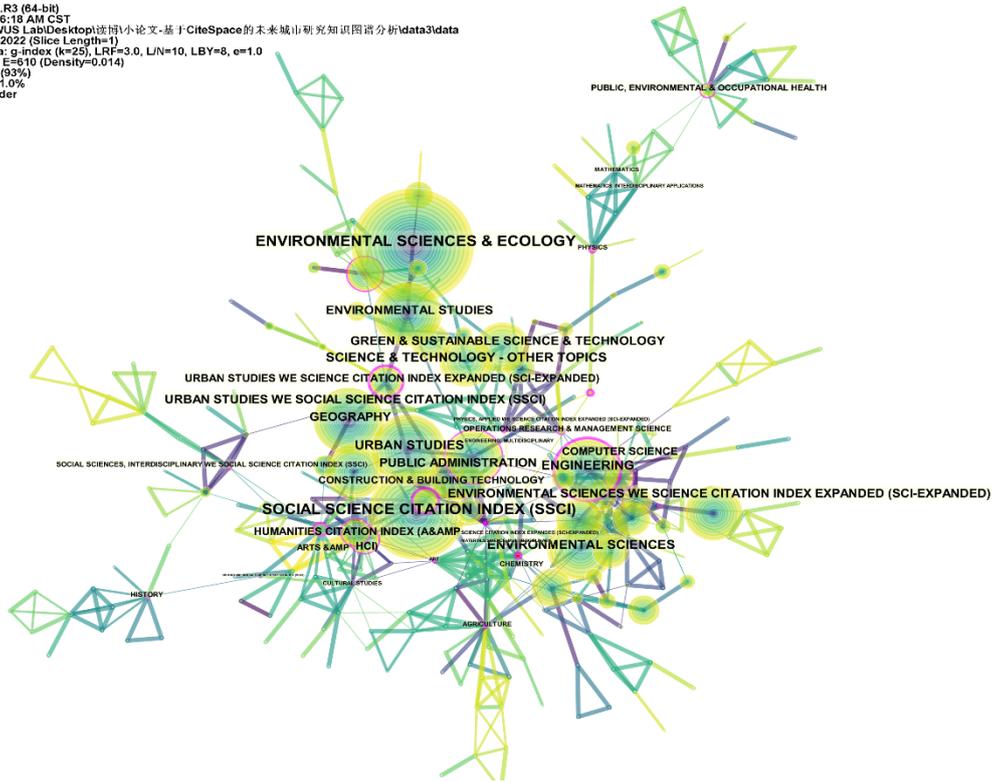


Figure 1. Disciplines involved in future city

Figure 1 shows a simplified category co-occurrence network by Pathfinder that preserves the most prominent connections. Each node is depicted as a series of tree rings, the darker the color, the earlier it was referenced. The size of the node indicates how many times the relevant scientific field has been cited. As we can see, the most common categories are Environmental Science & Ecology and Social Science, with the largest circles, followed by Urban Studies, Science Technology – Other Topics, Green and Sustainable Science & Technology, Geography, and Public Administration. Although Chemistry, Physics & Applied, Multidisciplinary Engineering, Agriculture, Art, Construction & Building Technology, Material Science, Culture Studies, Humanities, Computer Science, HCI, History, Mathematics, Operations Research & Management Science were cited much less often, they are all structurally significant nodes. Such nodes are shown as purple rings, the thickness of which indicates their degree of betweenness centrality, a measure related to the transformative potential of scientific contributions. Such nodes tend to bridge different stages of development in the scientific field. Engineering is an important subject area with both large scale and high centrality, and it is a major core position for future urban research.

3.2 Dual-map overlay

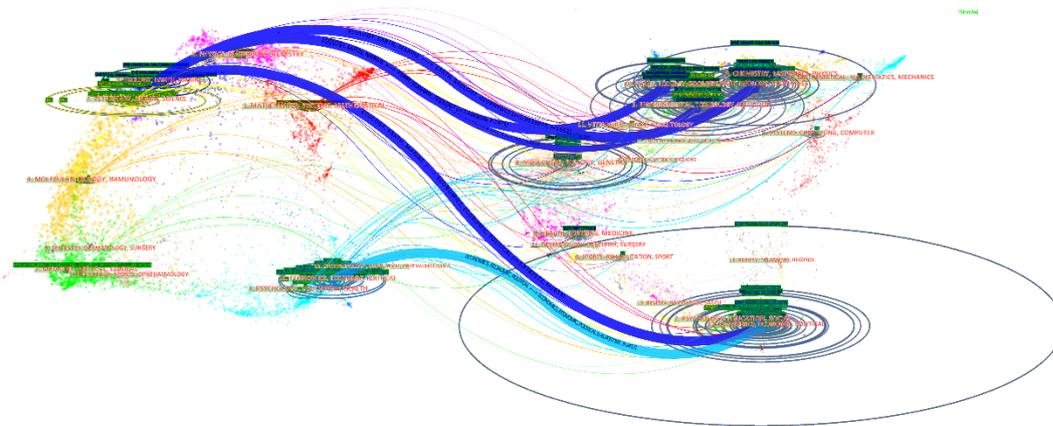


Figure 2. Dual-map overlays of both the citing and cited articles related to future city

Dual map overlays depict both citing and cited objects in one uninterrupted view, making it easy to see where citations are coming from and where they are pointing at, helping to study interdisciplinarity at both the source and the destination. On the basis of the global scientific journal map, the publication status and citation relationship of 1,933 reference articles collected in this study and their 49,591 citing paper were superimposed to form an analysis map of future urban research fields based on double-map overlay (Figure 3).

In this figure, the left side is the distribution of the journals where the citing documents are located, which represents the main discipline to which future city belongs, and the right side is the distribution of the journals corresponding to the cited documents, which represents which disciplines the future city mainly cites. The former can be regarded as the field application of future city, and the latter can be regarded as the research basis of future city. The vertical axis of the ellipse represents the number of publications, and the horizontal axis represents the number of authors.

It shows that scholars from many disciplines such as Mathematics & Systems, Medicine & Clinical, Molecular & Biology & Immunology, Physics & Materials & Chemistry, Psychology & Education & Health have published papers related to future cities (Figure 3). Veterinary & Animal Science has the highest number of publications. The adjacent Ecology & Earth & Marine disciplines are the second. The dark blue curve shows that the research output of the discipline of Ecology & Earth & Marine is mainly based on the four disciplines of Earth & Geology & Geophysics, Plant & Ecology & Zoology, Environment & Toxicology & Nutrition, and Economics & Political on the right side of the map. The cyan curve shows that research in the Economics & Political discipline has largely derived from the existing knowledge base of the discipline itself.

4. Micro understanding: the intellectual structure of future city

4.1 Co-cited reference network and clustering

The literature co-citation map can help people analyze the evolution of the inquiring subject through the key nodes, clusters and colors in the map, and the co-occurrence word map is more conducive to people to see clearly the hotspots and their evolution, especially with the burst term detecting functions. Figure 3 shows a hybrid network of co-cited references and burst terms on future city. Each cluster involves both citing and cited articles.

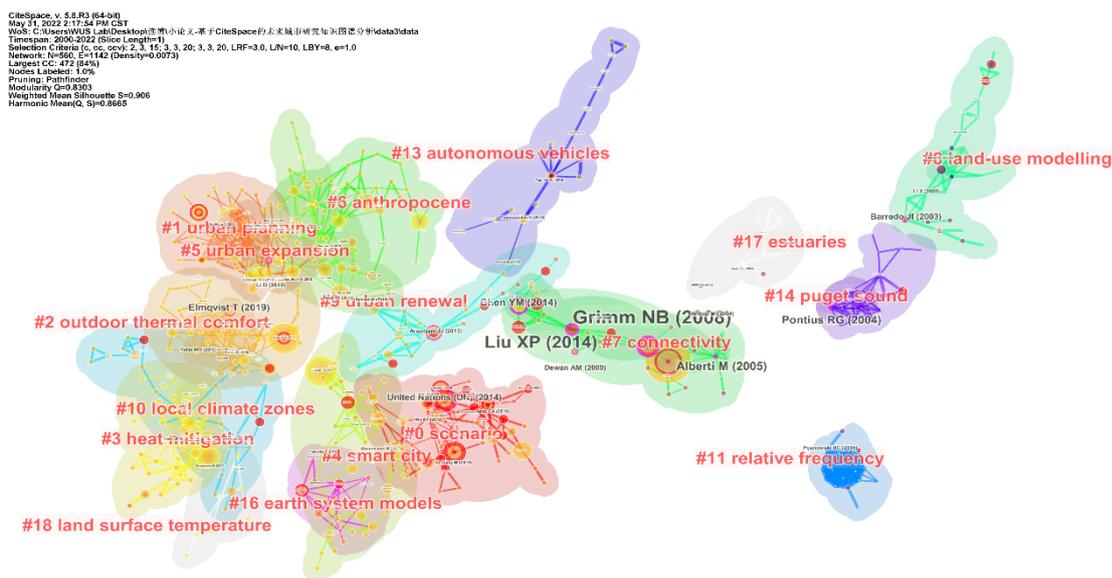


Figure 3. a hybrid network of co-cited references and burst terms from titles and abstracts. Clusters are labeled in red text. Articles are labeled in black. Burst terms are displayed in light red text. Red circles indicate articles with citation bursts, that is, rapid increases of citation counts.

The size of the node (and label) represents the frequency of the reference, and the larger the node, the higher the article's cited frequency. The most cited articles are often considered landmark articles because of their seminal contributions. Cluster #7 and #0 each has 2 articles in the top 7 landmark articles. The most cited article in our dataset is Seto KC (2012) with 59 citations, followed by Arsanjani JJ (2013) with 35 citations and Liu XP (2001) with 34 citations (Table 2).

If the rings are surrounded by purple circles, it indicates that the node occupies an important centrality position in the network - they are highly connected to other nodes such as hubs, or positioned between different groups of nodes. The articles with high betweenness centrality scores (Table 3) can be seen as landmark works in our broadly defined context of future city.

If some annual rings of nodes are filled in red, it indicates that these references have experienced sudden changes (like burst) during the research period. Burst has two properties: the intensity of the burst and the duration of the burst. Table 4 lists the six references with the strongest citing burst in

the entire dataset. The first article with a strong citation burst is from Cluster #7 on connectivity. Interestingly, two 1998 articles (both in cluster #8) are by the same author.

If a node excels in above two measures, then it has both structure centrality and citation burst, making it the most important pillar article in the entire map. It is essential in the structure of the entire knowledge system, and has strong heuristic, foundational, and heritage significance, as measured by the Sigma indicator (Table 5).

Table 6 lists the top 6 main clusters in the co-cited reference network by size, that is, the number of references in each cluster. Other small clusters are not as representative as the larger ones and are not listed. The quality of a cluster is also reflected in its silhouette score, which is a measurement of cluster homogeneity or consistency. Homogeneous clusters tend to have silhouette values close to 1, ensuring tight connections within the same cluster but loose connections between different clusters.

Table 2. Most cited references.

Citation counts	References	Cluster #
59	Seto KC, 2012, P NATL ACAD SCI USA, 109, 16083	7
35	Arsanjani JJ, 2013, INT J APPL EARTH OBS, 21, 265	2
34	Liu XP, 2017, LANDSCAPE URBAN PLAN, 168, 94	4
27	Seto KC, 2011, PLOS ONE, 6, 0	0
22	Grimm NB, 2008, SCIENCE, 319, 756	7
20	United Nations, 2018, WORLD URB PROSP 2018, 0, 0	1
20	Moghadam HS, 2013, APPL GEOGR, 40, 140	0

Table 3. Cited citations with the highest betweenness centrality.

Rank	Centrality	Reference	Cluster #
1	17	Pijanowski BC, 2005, INT J GEOGR INF SCI, 19, 197	11
2	16	Elmqvist T, 2019, NAT SUSTAIN, 2, 267	2
2	16	Bagan H, 2014, ENVIRON RES LETT, 9, 0	1
2	16	Al-Hathloul S, 2004, HABITAT INT, 28, 609	11
2	16	Acevedo MF, 2008, GEOFORUM, 39, 846	11
2	16	Alkheder S, 2005, 3 INT S REM SENS DAT,0,0	11

Table 4. References with the strongest citation bursts.

Citation bursts	References	Cluster #
11.66	Grimm NB, 2008, SCIENCE, 319, 756	7
7.97	Sante I, 2010, LANDSCAPE URBAN PLAN, 96, 108	0
7.61	Seto KC, 2011, PLOS ONE, 6, 0	0
7.47	Landis J, 1998, ENVIRON PLANN B, 25, 657	8
6.65	Landis J, 1998, ENVIRON PLANN B, 25, 795	8
6.61	Clarke KC, 1998, INT J GEOGR INF SCI, 12, 699	8

Table 5. Structurally and temporally significant references.

Sigma	Burst	Centrality	Citations	References	Cluster #
43.12	11.66	0.38	22	Grimm NB, 2008, SCIENCE, 319, 756	7
3.85	4.54	0.35	8	Liu XP, 2014, INT J GEOGR INF SCI, 28, 148	7
2.37	5.05	0.19	18	Alberti M, 2005, INT REGIONAL SCI REV, 28, 168	0
1.98	4.41	0.17	7	Pontius RG, 2004, ECOL MODEL, 179, 445	8
1.59	7.97	0.06	16	Chen YM, 2014, INT J GEOGR INF SCI, 28, 234	0
1.59	6.61	0.07	10	Elmqvist T, 2019, NAT SUSTAIN, 2, 267	8

Table 6. Major clusters of co-cited references.

Cluster ID	Size	Silhouette	Label (LLR)	Year Ave.
0	51	0.804	scenario	2012
1	48	0.82	urban planning	2016
2	43	0.853	outdoor thermal comfort	2016
3	39	0.867	heat mitigation	2015
4	36	0.857	smart city	2015
5	32	0.924	urban expansion	2015

4.2 Observation in time dimension

The timeline view can show the time span, peak interval, and contextual correlation of the development and evolution of each cluster. Figure 4 is clear that clusters #8 on land use modelling, #11 on relative frequency, #14 on puget sound, and #17 on estuaries were all earlier (1990s to early 2000s) clusters in the future city field. In these research paths, although there are individual citation burst nodes, they basically no longer receive attention after 2010. Clusters #7 on connectivity, #16 on earth system models, #9 on urban renewal, #10 on local climate zones, #4 on smart city and #5 on urban expansion emerged after the disappearance of the previous batch of clusters, and although there have been more concentrated burst nodes and structural centrality nodes, high-profile outputs still lack after about 2018 and 2019. Cluster #0 on scenario has been discussed since 2017, while the popularity has declined in recent years. Other clusters like #13 on autonomous vehicles, #6 on Anthropocene, and #1 urban planning, etc. keep hot and increasing.

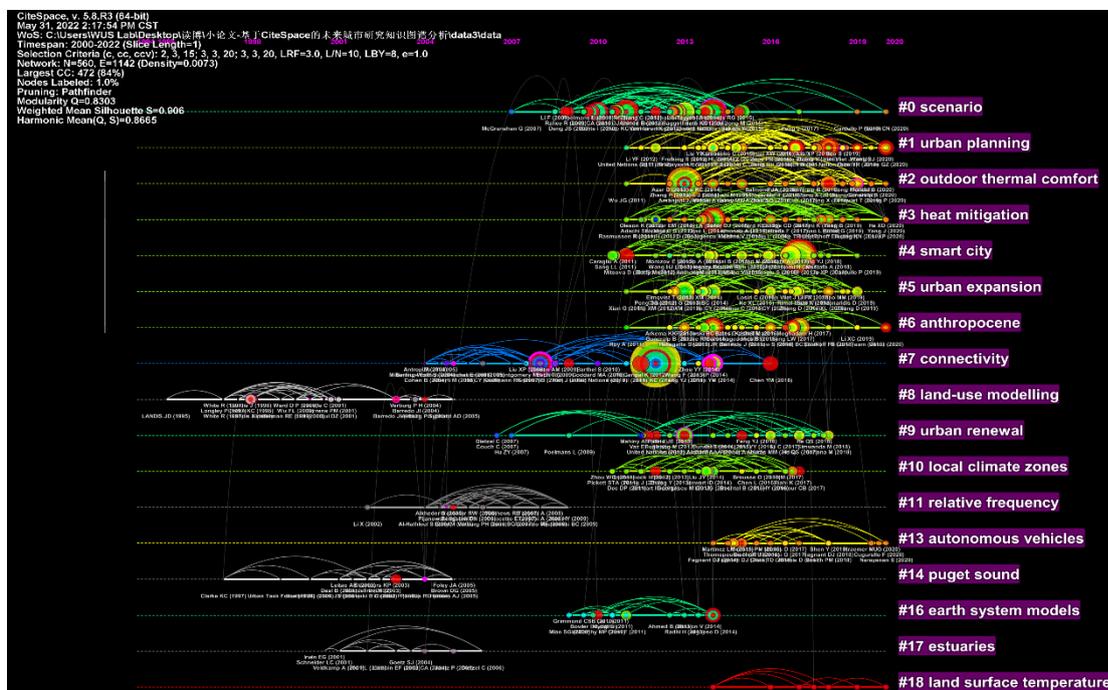


Figure 4. Timelines of co-citation clusters.

5. Structural variation Analysis: emerging trends

The modularity of a network measures the degree to which nodes in a network can be divided into groups, such that nodes within the same group are more closely connected than nodes between different groups. The collective knowledge structure of a scientific field can be represented as an associative network of co-cited references. Such networks will evolve over time. Newly published articles may introduce profound structural changes or have little or no effect on structure.

Figure 5 shows the change of modularity of networks over time. Each network is constructed based on a 2-year sliding window. The number of publications per year increased considerably. It is

noticeable that the modularity dipped in 2007 and bounced back to the previous level before it dropped even deeper in 2009. Based on this observation, it is plausible that groundbreaking works appeared in 2007 and 2009. We will, therefore, specifically investigate potential emerging trends in these 2 years.

Figure 5 shows the change in network modularity over time. Each network is built based on a 1-year sliding window. The number of publications increases steadily each year. It is worth noting that the modularity indicator gradually increased in the first 3 years, and then decreased slowly after 2003. Based on this observation, we consider that innovative work does not emerge in a blowout fashion, but in gentle force. The newly published paper has led to a decrease in the modularity of the network, that is, the originally scattered clusters are "integrated" together to a certain extent. That is to say, the literature published in these years, after accumulation, gradually builds bridges between originally unrelated clusters, thereby causing a slight structural variation in the entire field.

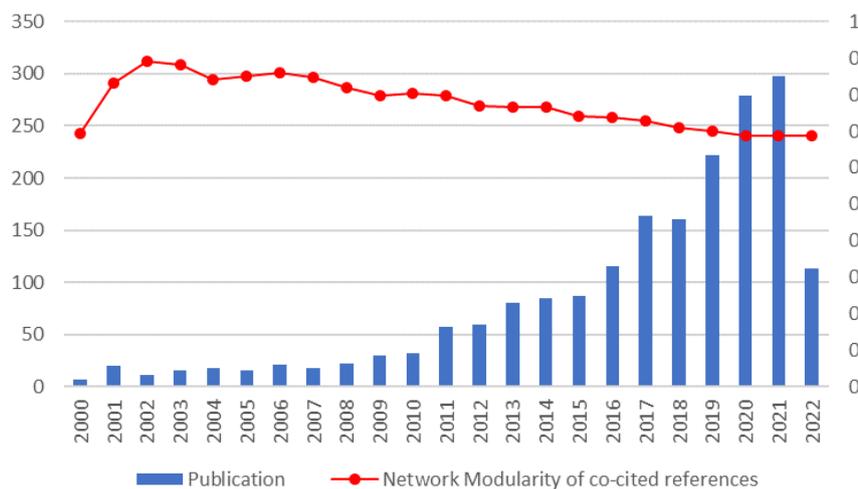


Figure 5. The modularity of the network climbed at the beginning and dropped considerably since 2003, suggesting that nearly no structural changes took place in the long downhill stage.

6. Discussions and conclusions

While bibliometric work is common in other fields, it is relatively rare in the field of future cities. The object of this study is the research status of future cities by different scholars around the world in the past two decades. By conceptualizing the macro-viewpoint of the overall development context and trend of the academic community, as well as clarifying the mainstream research directions, turning points, and important literature of concern, this research hopes to bring some useful references to scholars.

The data for this study comes from WoS, a relatively high-quality paper database, but not all papers are included. Many research results published in other journals were not included in the WoS database and were not collected in this study. Therefore, the results must have certain limitations. To

expand the breadth and depth of the research, it is suggested that other scholars can use different analytical tools to collect data from other databases than WoS. Results can be compared to identify similarities and differences in order to provide scholars with more detailed and valuable research.

In conclusion, the analysis and citation-based extension of the future urban literature outlines the evolutionary trajectory of collective knowledge over the past two decades and highlights areas of active pursuit. Emerging trends and patterns identified in the analysis are based on CiteSpace's computed properties. In a more ideal way, it is necessary to combine bibliometric tools with traditional literature reading and review work, in order to obtain a comprehensive, in-place and accurate grasp of the knowledge base of future cities. In short, there is still a lot of research space for future cities. Scholars need to use different paradigms, methods, and perspectives to explain and measure future cities, and further expand the research field.

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TRACK 4: HOUSING

DWELLING DECAY: HOUSING CRISIS, URBAN INSTITUTIONALISM, AND ITS UNDERSTANDING OF THE QUALITATIVE SHORTAGE

PAST, PRESENT, AND FUTURE OF CHILE'S URBAN HOUSING POLICY FOR THE IMPROVEMENT OF QUALITY AND SOCIAL INTEGRATION (2006 - 2021)

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INTRODUCTION

Since 2006, Chilean housing policy has undergone a paradigm shift by focusing its attention on improving the quality of the urban housing stock. At that time, it was considered that the quantitative housing shortage had a certain degree of control from the state and institutions, with a sustained decrease compared to the Latin American context. However, since 2017, the housing shortage has shown a worrying increase, currently reaching its highest point since the return to democracy in the 1990s.

With a current housing shortage of 739,603 dwellings, representing almost 12% of the total national housing shortage and affecting almost 2.2 million people, 12% of the national population, there is talk of a new housing crisis in Chile.

Migratory and economic crises and the current COVID-19 pandemic add to the various factors that attempt to explain this increase in the housing shortage. However, this crisis is not only a housing shortage crisis, but also a crisis of quality and the persistence of housing and urban environment decay, which, despite an institutional policy to improve urban and housing quality that has been in existence for two decades, has not managed to reduce the gap. In this sense, the current housing shortage can be understood not only from the perspective of the quantity of missing housing, but also as a crisis exacerbated by the quality of the housing and urban stock built. In this sense, institutional factors have not been particularly highlighted as possible causes or aggravators of the housing conflict, in the sense of understanding how the institutional framework has perceived the urban decay and housing shortages.

This article seeks to analyse how the Chilean urban-housing institutional framework has been modelling, through plans and programmes, its *Urban Housing Policy of Improving the Quality and Social Integration of Chile*, in the period between 2006, the year of the paradigmatic shift from housing quantity to housing quality, and 2021, when the housing shortage crisis was declared, as a way of understanding from where the institutions have epistemologically positioned themselves to generate the response to the housing shortage, with special emphasis on the quality shortage.

It is hypothesised that Chilean urban and housing institutions, through their policy of quality improvement, have shifted the focus from subsidiarity to the understanding of housing deterioration, reflecting in interventions that, although they have a narrative in line with the search for quality, are based on proposals of extreme social targeting and lack of territorial relevance, the same principle under which the model of mass housing construction was developed in previous decades. Through documentary and bibliographic analysis, the history of Chile's **Urban Housing Policy of Improving Quality and Social Integration** is reconstructed, under which a series of programmes and plans have been organised to address the qualitative urban-housing shortage. This historiographic analysis allows us to understand where the Chilean institutional framework has been situated to address the quality shortage of its existing urban-housing stock, through various

milestones of the national housing policy that reveal conflicts, rigidity, and institutional centralism, which in turn hinder the recognition of cultural and territorial diversity in the interventions.

This article, as part of an ongoing doctoral research, hopes to be a contribution to the critical review of the policy of qualitative housing shortage, given that Chile has been a reference at the international level with its subsidised policy of access to social housing in previous times and that today, in the context of a new global housing crisis, the institutional responses address the crisis not only as a matter of quantity, but also in a comprehensive manner.

I. CONTEXT

CHILEAN HOUSING POLICY: Housing subsidies and the urban expansion model

After the civil-military dictatorship in the 1970s, a neoliberal development model was established which restructured the state, assigning the market the role of provider of goods and services, including urban development and housing, relegating state activity to a subsidiary and indirect role (Rosas Vera, 2008). The market became the driving force behind public management, the spatial manifestation of which materialised in the implementation of a model of urban expansion and massive housing construction on land devoid of services and facilities.

With the enactment of the National Urban Development Policy of 1979, the urban boundary, established by planning policies prior to the 1973 coup d'état, was declared to have ended, declaring urban land to be a non-scarce good. (Valencia, 2008). In this way the new role of the state, defined merely as a facilitator, set the fundamental principles within the framework of privatisation of state enterprises to provide social rights. Socio-economic reforms that replaced the idea of housing as a "social right" with the concept of a "service", which is attributed a price in the market and can be delivered by both public and private agents (Raposo, 2008).

The *housing subsidy* was consolidated as a predominant mechanism for the financing of housing that would allow access and provision of housing on demand, a redistributive (compensatory) mechanism of wealth for the population that cannot access the real estate market.

According to MINVU's Housing Observatory, the implementation of the subsidy model accelerated production and coverage, with more than 2.3 million housing subsidies executed between 1990 and 2014, 56% of which corresponded to the poorest 20% of the most vulnerable population, considerably reversing the quantitative housing shortage in that period. Mass-produced housing was located on the outskirts of cities, leaving the private market to act in the central housing areas, concentrating a minority demand corresponding to the middle class or those with greater purchasing power and debt capacity (Valencia, 2008).

The new residential landscape resulting from the *urban extension model* was mainly sustained by the so-called "Fondo Solidario de Elección de Vivienda", a social housing programme for low-income sectors without the capacity to borrow on the financial market. This housing programme became the predominant policy for the creation of housing supply, inhibiting a diversified housing policy that respected the different territories and social actors in the country. Homogeneity was imposed: large-scale housing typologies and peripheral locations, without facilities or services, created a new type of shortage, as the "successful model" did not foresee the problem of the accelerated deterioration of the housing stock and its surroundings.

For Rodríguez and Sugranyes (2005), the supposed success in reducing the quantitative housing shortage was possible at the cost of lowering quality standards and, above all, locating the vulnerable population in peripheral and extra-urban areas, generating a series of new vulnerabilities (p.165).



Figure 2: Sector Bajos de Mena, Comuna de Puente Alto, Santiago de Chile. Mass housing production characteristic of the 1990s - 2000s in Chile.

Source: <https://www.uchile.cl/noticias/115045/el-derecho-a-la-vivienda-en-chile-deuda-que-heredamos-de-la-dictadura>

CHANGE IN INSTITUTIONAL PERSPECTIVE: from quantitative shortage to qualitative shortage

Although in absolute terms the housing shortage in terms of the amount of housing required decreased in the early 1990s, in the following decades a series of negative externalities became evident because of this massive construction of housing, mainly due to its low quality, concentrated in homogeneous, peripheral contexts and without the provision of sufficient equipment and services (Imilan et al., 2016).

In 1997, the inauguration of a new social housing complex on the outskirts of the city of Santiago, built with subsidies for vulnerable sectors, represented the event that caused media and institutional tension in the housing policy that Chile had been developing with "success" until then. The recently inaugurated complex, and during the rainy winter storms, suffered serious leaks that damaged the houses, rendering them uninhabitable. The case known as the "Copeva case", the name of the construction company responsible for the project, forced an institutional shift towards the quality of the housing stock built, thus conceiving not only the lack of housing as part of the shortage, but also the quality of both new and existing housing.

In this way, the new institutional shift focused efforts on the construction of a policy that, while recognising the massive construction of housing as a phenomenon that allowed the provision of housing for vulnerable sectors of the population, deepened the problem of inequality due to the low quality of construction, the deterioration of the urban environment and the absence of services. This institutional shift from quantity to quality showed its first efforts in the early 2000s, when for the first time as part of a government plan it showed interest in the issue of citizen security and the recovery of public spaces. But it was not until 2004 when the triad "housing, neighbourhood and city" was established as the three areas in which sectoral public policy would be developed in the following decade, until the present day, with the inauguration in 2006 of the Neighbourhood Recovery Programme "Quiero mi Barrio" (I want my Neighbourhood), realising that public

policies should also address, with citizen participation, those urban environments that suffered abandonment and deterioration, thus moving from quantitative shortage to qualitative shortage. (MINVU, 2009).

Thus, between 2006 and 2010, the new "Urban Housing Policy for the Improvement of Quality and Social Integration in Chile" (MINVU, 2009) was created, which placed the reduction of the qualitative housing shortage of the built city at the centre of the discussion, both in the field of housing and public space, giving way to the creation of different public initiatives in the urban/housing field, with the aim of addressing the shortage in a comprehensive manner. These lines of action would later become part of what, as of 2014, would become Chile's new National Urban Development Policy (PNDU).

NEW HOUSING CRISIS IN CHILE: an opportunity for a comprehensive approach

The indicators for measuring the housing shortage had been showing a constant decrease until 2015, with a record of 391,546 units^{6%} approx. of housing shortages. However, from 2017 onwards, an increase began to be perceived, which explodes in 2021 in the context of the COVID - 19 pandemic. Generating a broad consensus among institutions and civil society that Chile is going through a housing crisis, the most serious in 25 years.

Currently, the housing shortage in Chile is 739,603 dwellings (12% of the total housing stock at the national level), affecting a total of about 2.2 million people⁴². Of this shortage, 58% corresponds to housing deprivation, mainly due to a situation of being in a situation of "allegamiento" or overcrowding, and 42% corresponds to housing with some type of quality requirement, affecting 23.5% of the total housing stock in Chile⁴³, deprivations that are particularly prevalent in the Metropolitan, Valparaíso, Biobío, Antofagasta, Tarapacá, and Maule regions.

Some of the causes identified by the studies for this increase in the housing shortage are the economic crisis resulting from the pandemic, the rise in mortgage loans, the high cost of materials and the increase in rent prices. In this last item, around 400,000 families spend more than 30% of their income on this item, well above OECD standards. On the other hand, precarious settlements, understood as illegal land occupations, have increased. Currently, 81,643 families have been registered as living in "camps" or informal settlements⁴⁴, which aggravates the context of crisis in terms of habitability and pressure on the land market.

All these contextual variables have been combined with the recognised Chilean housing policy model, within the framework of a subsidiary state and a deepened neoliberal system, which relies on the market for the provision of goods and services, the housing market being one of its pillars.

This crisis is in turn an opportunity to review housing policy, so as not to base solution strategies on tried and tested formulas that have already failed. It is relevant to understand the epistemological positions and the epistemological positions for the analysis of the policy of qualitative housing shortage that Chilean urban institutions carried out. The old and new crises can be approached with a new, critical viewpoint and with a view to the construction of a new constitution in Chile.

II. THEORETICAL AND CONCEPTUAL FRAMEWORK

DWELLING DECAY: the urban-housing shortage in Chile

The urban and housing problem of the deterioration resulting from the policy of massive housing construction under a model of urban expansion made it clear that the problem no longer fell only on those people without housing, but also on

⁴² Estudio Cámara Chilena de la Construcción - CChC, 2019 based on CASEN 2017.

⁴³ CASEN 2017

⁴⁴ Estudio Déficit Cero, 2021.

those who had been granted one by urban and housing policies, but of poor quality, lacking services and equipment, thus configuring the problem of "*those with roofs*" (Sugranyes & Rodríguez, 2005). In this way, those who had managed to opt for home ownership were now suffering the consequences of their accelerated deterioration and were dealing in their daily lives with problems of habitability and a lack of services and facilities, and with them outside of employment and economic networks.

The existence of a predominant *qualitative shortage* leads us to explore what happens to this deterioration that is being inhabited daily, where conservation strategies are used by the inhabitants to reverse it and allow them to develop their daily lives in their homes and neighbourhoods.

To understand the shaping of the *Quality Improvement and Social Integration Policy*, it is important to define what we mean by qualitative urban and housing shortage in the Chilean context.

At the end of the 1980s, a study carried out by the Chilean researcher Joan Mac Donald, defined for the first time the qualitative shortage as the difference between the total number of dwellings and those that are considered adequate (Mac Donald, 1986, p.19). It represents those families that have a dwelling for their exclusive use, but it does not meet the conditions to be considered an acceptable dwelling; this would require its improvement or replacement by a better dwelling.

For Sepúlveda et al. (2005), the qualitative housing shortage focused on the housing unit or dwelling corresponds to those households whose dwellings do not have appropriate materials according to the "minimum standards established for the protection of family life" (materiality of walls, roof and floor and state of conservation of the buildings) as well as dwellings that do not have basic services (drinking water, sewage, electricity).

According to Arriagada (2003) it should be stressed that the qualitative shortage is distinct from the component of dwellings to be replaced, since it concerns dwellings that can reach a fully satisfactory standard by being improved through repairs, changes of materials, extensions of surface area, connection to drinking water and sewerage services. Despite the broad definition, there are cases where the qualitative requirements are not explicitly or in detail established by the housing needs studies or, in other cases, the estimation of dwellings with quality problems is not completely isolated from the quantitative shortage.

Institutionally, the housing shortage in Chile is analysed from three main dimensions: the quantitative shortage, the qualitative shortage, related to the adequate quality and maintenance of housing, and from the point of view of access to services and public spaces that meet the needs of the inhabitants (MINVU, 2009).

However, the qualitative shortage is not only related to the adequate quality and maintenance of housing, but also to the quality of access to services and public spaces that meet the needs of the inhabitants (MINVU, 2009).

SUBSIDIARITY: an epistemological and institutional approach to urban-housing policies in Chile

In the Chilean case, the principle of subsidiarity must be understood in the context of an extensive process of political and social transformation that began in the 1970s.

Harvey (2007) argues that the Chilean case was the first experiment in the orthodox application of neoliberal criteria and one of the first experiences of neoliberal governance in the world. This process of restructuring the state under this economic system was conducted abruptly between 1973 and 1989, by a military government that did not tolerate dissent, thus achieving an orthodox application of its criteria in the early years, only to be made more flexible in the later phase with the return to democracy, but which, nevertheless, have remained essentially in force and continue to be applied in Chile to this day (De Mattos, 2016).

In this context, it is understood that the shaping of urban housing policy to improve the quality and integration of Chile and the influences on the institutional context as a background against which public policies in general and housing and urban policies in particular are developed.

In this sense, Chilean urban-housing policy is often analysed in detail as a paradigmatic case in the Latin American context with respect to its access and provision mechanisms from a subsidiary approach and its unrestricted relationship with the implementation of the neoliberal system (Raposo, 2008; Rolnik, 2017). However, it is also essential to understand the consequences of the use of this *principle of subsidiarity* in the context of the urban-housing policies that shaped the *Urban Housing Policy for the Improvement of Urban Quality and Integration*, the object of study of this article, which allows us to approach the perspective from which the urban institutional framework in Chile has been situated in order to understand the urban-housing deterioration.

In the Chilean context, subsidiarity was established as a fundamental part of the type of state set up by the civil-military dictatorship in Chile in 1973 and as an implicit principle in the 1980 Political Constitution of Chile, establishing that the state should only take charge of those functions that the private sector could not carry out⁴⁵. This principle allows us to understand the approach to the various social problems in Chile, as well as the lack of strategies on the part of the state to guarantee a series of social rights, including the right to adequate housing.

From the philosophical field it is defined as a "principle to develop the autonomy of individuals and intermediate bodies of society so that, from the different social fabrics, an integral development of its members is achieved through solidarity cooperation and the help of higher institutions when it is justly necessary" (Arqueros, 2016. p. 78).

The state must also refrain from intervening in areas where individuals or groups in society are self-sufficient. Thus, the Subsidiary State is not only characterised by reducing the state's involvement in economic and social life, but also by encouraging private participation in all spheres of everyday life (health, education, food, housing).

Subsidiarity underpins the logic of targeting as opposed to the universal notion of access to housing, and only guides the consolidation of the private market (Imilan et al. 2016).

It is important to emphasise that despite the innovation in the focus of urban and housing policy to improve quality and social integration by moving from quality to quantity, its financing and targeting logic continues to be present in each of its component elements, so that the subsidiarity approach is a fundamental part of its design and its understanding of urban and housing deterioration.

III. CHILE'S SOCIAL INTEGRATION AND QUALITY IMPROVEMENT POLICY: MILESTONES, PLANS AND PROGRAMMES

The start of quality measurement

The quality of the housing stock began to be measured in 1990, as a result of a study by the Chilean researcher Joan McDonald. In this study, for the first time, the qualitative and quantitative housing shortage was made explicit. This study was based on the 1992 CENSUS and CELADE-ECLAC estimates from 1996 (MacDonald, 2003). During the first half of the

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1990s, public investment efforts in urban projects were resumed through the Urban Parks, Participative Pavements, and Community Equipment and Improvement programmes.

The quality crisis

In 1997, as a result of the winter storms, the first case of social housing, which had recently been inaugurated by the authorities at the time, became known, presented important leaks, which triggered a conflict known as Caso Casas Copeva de la Población El Volcán in the peripheral commune of Puente Alto in the city of Santiago and which marked the institutional turning point to review the construction quality of both the houses and the urban environment under which these houses had been built.

The city as a focus of Government Programmes

The quality conflict became more acute, which is why in 2000, for the first time, the government made city issues one of its political priorities, paying special attention to citizen security and the recovery of public spaces for citizen use. Thus, programmes for the rehabilitation of historic centres and the recovery of public spaces were initiated.

The integrated urban-housing approach

In 2004, urban issues formed an important part of the Government Programme and the three areas in which the sectoral public policy was developed were categorised: housing, neighbourhoods, and the city. As a result, the "Quiero mi Barrio" programme was created and the institutionalisation of a permanent neighbourhood recovery policy was proposed, in addition to coining the concept of *Urban-Housing Policy for Improving Quality and Social Integration*.

This gives way to a critical review and adjustment of the methodology used so far to conceptualise and quantify the country's urban-housing shortage circumstances. It is determined that this concept cannot be understood in a unitary way, as it overlaps the multiplicity of components of the urban apparatus.

Participation in neighbourhood recovery

The year 2006 saw the inauguration of the Neighbourhood Recovery Programme, "Quiero mi Barrio", which introduces the participatory component for the recovery of public space and the provision of equipment on a neighbourhood scale.

Housing improvement

The "Programa de protección del Patrimonio Familiar" (Family Heritage Protection Programme) was also created, focusing on the improvement of social housing, marking a milestone in the policy by adapting the subsidy mechanism that was normally used for the acquisition of housing, this time to improve existing housing that had been built by the state. Social condominiums (high-rise collective social housing) are identified as a special focus of attention in housing improvement.

Comprehensiveness in shortage measurement

In this context, at the beginning of 2009, the effort to rethink the shortage issue from an *integral perspective* began, giving way to the concept of Urban-Housing Shortage,

Post-earthquake reconstruction

In 2010, and because of the 8.8 magnitude earthquake that hit the central and most populated area of the country, an institutional turning point was generated because of the urban and housing emergency resulting from the destruction of the earthquake. In this context, the institutional framework underwent tensions that allowed it to expeditiously manage the thousands of requirements for the improvement and reconstruction of homes that had become uninhabitable because of the catastrophe. This year saw the creation of the rental subsidy, which sought to provide temporary housing for families who needed to improve their homes because of the emergency. This would later become a permanent policy that continues to be implemented to this day, as part of the housing offer for both low-income and middle-class families.

Regeneration of Housing Estates

The year 2012 saw the start of the first demolition of a housing complex corresponding to the “Las Viñitas” complex in the district of Cerro Navia in the city of Santiago. This housing complex was built between 1984 and 1985 and had 1,029 flats of 36 m², organised in 67 three-storey blocks. It was a milestone, since it was the beginning of a policy that has lasted until the present day on the regeneration of housing complexes whose deterioration was irreversible. The action symbolically took over from the state the deficient quality of social housing that had only been in existence for 20 years.

Chile's New Urban Development Policy

In 2014, and because of a broad consensus, the New National Urban Development Policy was created, which provides new institutional guidelines for improving the quality of housing and the urban environment, as well as introducing concepts such as social and urban integration and encouraging new methodologies for measuring the shortage and urban development indicators. However, the implementation of this policy has not been easy, as many of the proposed instruments require profound transformations in the functioning of the state, which so far have not been resolved.

New approach to land management for public housing

In 2018, with the creation of the Central Areas Regeneration Programme, public housing in central areas of large and medium-sized cities was sought to diversify the housing supply. In this way, the purchase of land by the state to build new housing for low-income and middle-class socio-economic sectors is promoted. The purchase of existing buildings is also being explored, which, under rehabilitation processes, are expected to generate more housing units for the supply of protected rental housing.

Socio-political conflict: struggle for Chile's new political constitution

In 2019, in the context of massive social mobilisations, Chile begins a process of constitutional change, and with it the debate on the territory and the guarantee by the State of social rights that allows leaving behind the notion of the Subsidiary State for a Social State of rights. In this context, housing and the city are considered in the draft of the new constitution as social rights.

This opens a new political and social cycle in the country, facing the challenge of generating new public policies that comply with these new guaranteed rights.

New housing crisis

In the period between 2020 and 2021 and because of the pandemic and the socio-political crisis in Chile and an intensive migratory process, the housing shortage deepens, and the Housing Crisis is declared. Recently, the law of social and urban integration was enacted, which among other things seeks, through an Emergency Housing Plan, to address the current housing shortage crisis, but this time posing the challenge of integrating the qualitative and quantitative shortage.

Description of programmes for addressing the qualitative shortage

The policy of quality improvement and social integration is made up of a series of programmes and plans that address different scales, both urban and housing, with the aim of reversing processes of deterioration.

The following table defines the objectives, focus of attention, as well as financing and governance mechanisms, areas that facilitate the analysis of the policy as a whole, in order to reveal the emphasis that urban institutions in Chile have placed on reversing the subsidiarity approach, but which institutional rigidity, as well as the political and regulatory framework, have not facilitated.

PROGRAMME NAME	YEAR OF CREATION	SUBJECT OF ATTENTION	AREA OF ACTION	SELECTION MODEL	FUNDING MODEL	INSTITUTIONAL MANAGEMENT MODEL	SOCIAL MANAGEMENT MODEL	TYOLOGY OF PROJECTS
Programme Public Spaces	2002	Public goods	Urban areas	Call for tenders	investment	Central government + local government	Not applicable	New construction or rehabilitation of public space, and green areas
Neighbourhood Recovery "Quiero mi Barrio" (I love my neighbourhood)	2006	Public goods	Vulnerable urban areas	Call for tenders	investment	Central government + local government + private agencies	Neighbourhood Development Council	New construction or rehabilitation of public space, green areas, infrastructure and urban equipment
Programme Housing and Neighbourhood Improvement	2006	Housing and community equipment	Urban areas	Call for tenders	housing subsidy	Central government + public or private technical assistance agencies	Housing committees	Rehabilitation or improvement of housing, public space, urban equipment
Regeneration Of Collective social housing	2014	Housing and common property under private law	Vulnerable urban areas	Call for tenders	investment + housing subsidy	Central government + local government	Housing committees	Demolition, construction, Housing and common goods
Regeneration Central Areas	2018	Public goods and housing	Central urban areas	Direct	investment + housing subsidy	Central government + local government	Resident communities, management committees.	New construction or rehabilitation of housing, public space, green areas, infrastructure and urban equipment.

Figure 2: State programme for addressing the qualitative shortage

Source: own elaboration

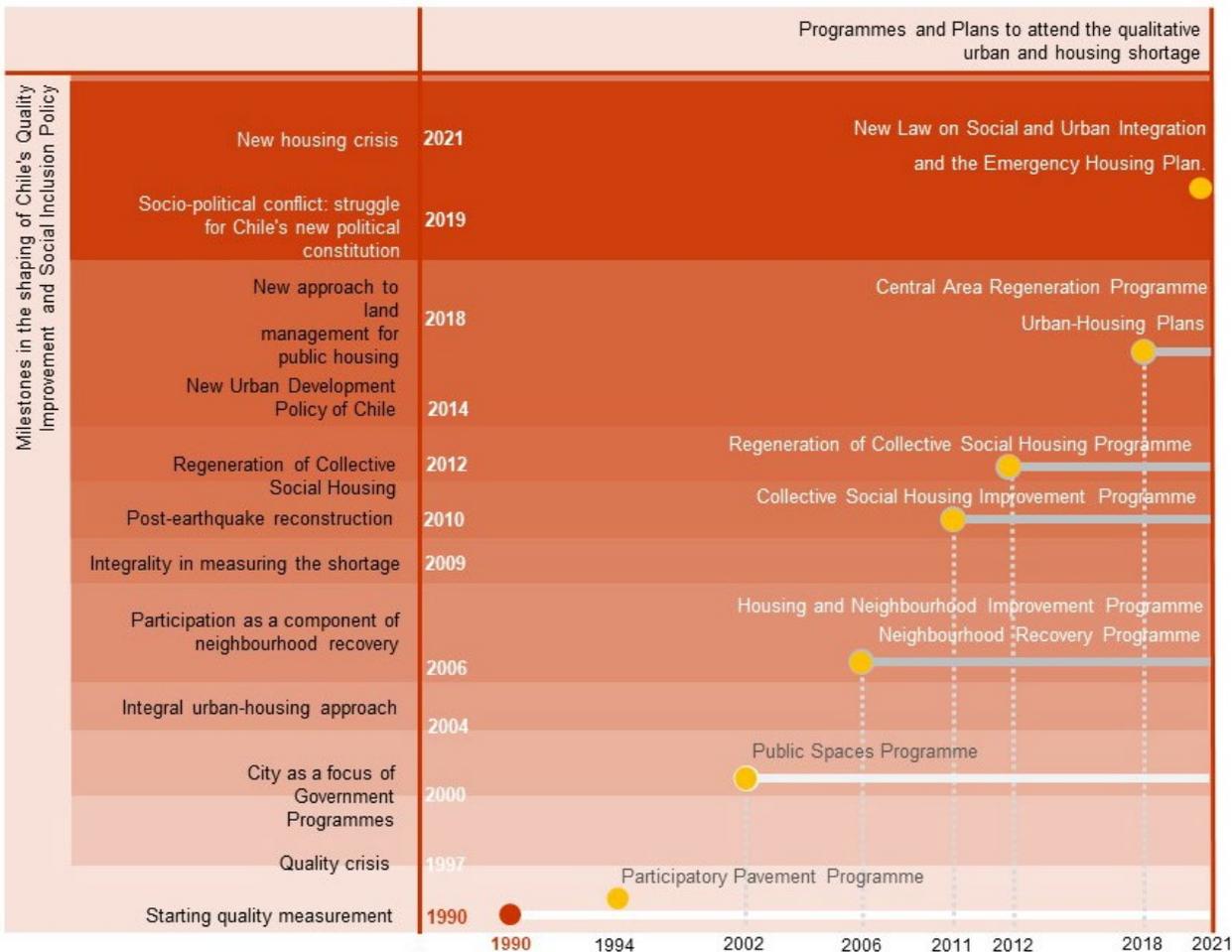


Figure 3: State programmes to address the qualitative shortage and milestones in the shaping of Chile's Urban Housing Policy for the Improvement of Social Quality and Integration
Source: own elaboration

IV.-

CONCLUSIONS

- 1) The historiographical review of urban and housing policy revealed agreements, tensions and debates that shaped different institutional responses to the shortage.
- 2) It is observed that despite the existence and recognition of typological recognition of the territorial scales and of the elements in which deterioration is perceived (housing, public spaces, equipment, etc.), whether urban or housing, the financing mechanisms used are based on the subsidy instrument or on direct state investment, both under mechanisms of targeting and competitive bidding.
- 3) Therefore, the policy of quality improvement is based, as well as the policy of housing provision, on the principle of subsidiarity in conjunction with private markets. The use of housing subsidies in the provision of housing and urban upgrading strategies is an extension of this principle.
- 4) The principle of subsidiarity as an epistemological pillar of Chilean housing policy has mainly influenced the individualisation of actors and benefits, thus reducing the territoriality of the instruments.
- 5) The article opens the debate on the qualitative urban housing shortage and its relation to inhabited deterioration, which allows us to understand that deterioration and the strategies of attention have a socio-institutional construction,
- 6) In this sense, the policy of improving the quality and social integration of the current urban housing stock must understand that the deterioration that it seeks to reverse is inhabited, whose daily strategies must be identified and considered in the institutional responses in order to reverse the shortage in a comprehensive manner.

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TRACK 9: SPATIALITIES

READING NEW URBAN PRACTICE IN SYRIAN NEIGHBOURHOODS IN ANKARA THROUGH FORCED MIGRATION⁴⁶

¹ This article has been prepared by Damla Işıklılar based on the (ongoing) doctoral research thesis named “Towards a New Urban Praxis: Reading the New Concept of Practice Through Socio-spatial Outlook to Urban Refugees: Cases of Önder and Ulubey Neighborhoods, Ankara” under the supervision of Prof. Frank Eckardt in the International European Urban Studies PhD Program in European Urban Studies Institute at Bauhaus University Weimar.

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1. Introduction

As the world is dealing with a Syrian refugee crisis, many countries have been faced with these changes in the urban environment. Especially in Turkey, this crisis has caused socio-spatial problems for both refugees and Turkish citizens. Turkey is one of the most preferred countries by Syrian refugees due to its geographical proximity and has been accepting Syrian refugees who have faced forced migration due to the ongoing war in Syria since 2011. The main reasons why asylum seekers prefer this country are spatial proximity, the existence of a common socio-cultural structure and the immigration policies implemented by the Turkish government (Harunoğulları and Cengiz, 2014). According to the statistics of Presidency of Migration Management of the Ministry of Interior of the Republic of Turkey dated April 2022, Syrian refugees under temporary protection constitute approximately 3.7 million of the total 4 million refugees and asylum seekers from other nationalities.

The capacity of refugee camps for Syrians under temporary protection who were forced to leave their country was not sufficient for the large number of refugees. For this reason, the number of refugees, who have the aim of accessing shelter and employment opportunities, in the cities has increased rapidly. Thus, a new phenomenon called "Urban Refugees", which tries to be integrated into cities socially, spatially, economically has emerged as a daily life practice. However, at this point, which has passed a decade of migration, the phenomenon of transience has lost its sustainability. While the urban environment has been affected by this social trend, there has been a need for more resilient, efficient and long-term effective incentives, alternatives, strategies and solutions for dynamic geographical crisis spaces to create a more socially comprehensive structure.

The aim of this study is to make a socio-spatial city reading through Önder and Ulubey Neighbourhoods of Altındağ Municipality, where Syrian refugees are concentrated in the city of Ankara. The neighbourhoods are located in the Altındağ district of Ankara, near the Siteler industrial zone, which can be considered as a potential employment area for urban refugees.

The concept of the spatial triad developed by the French sociologist and philosopher Henri Lefebvre will be used in the examples of these neighbourhoods to analyse the daily spatial practices of Syrian urban refugees and their representations

in the field, and to read their spatial production. In this article, a comprehensive literature review on spatial triad and forced migration was made. With field studies, the spatial production process in the daily lives of refugees was tried to be understood and empirical studies such as survey analysis, statistical evaluations, and quantification of qualitative data were carried out on Syrian urban refugees in the aforementioned neighbourhoods.

2. Forced Migration and the Concept of Urban Refugee

The concept of urban refugee began to be used in the 1960s and its policy was developed by the United Nations High Commissioner for Refugees (UNHCR) in the 1990s (Crisp, 2017). Over the last two decades, the issue of urban refugees has been gaining more importance on the global refugee policy agenda. There is a rapid urbanization process in the world and more than half of the world's population lives in cities, and in parallel, it is an inevitable fact that the majority of refugees in the world reside in urban areas. Together with the definition of UNHCR, the concept of urban refugee refers to all refugees living outside the camps. Urban refugees are among the most vulnerable groups in low-income countries. According to UNHCR, the urban refugee population worldwide is very diverse; particularly large numbers of women, children and the elderly with certain protection difficulties. Urban refugee populations face special protection needs related to their urban environment because they may be deprived of regular access to basic social services such as security, health, education, and they often face hostile attitudes in the countries where they refuge. Since 2017, UNHCR has prioritized urban refugees for resettlement compared to refugees living in refugee camps.

Forced migration can very simply be defined as forced displacement, meaning a migration movement in which there is an element of coercion, whether natural or anthropogenic, including threats to life and livelihoods (IOM Key Migration Terms, 2022). In many cases, migration brings with it vulnerability and eventually this becomes chronic due to refugees' limited access to basic resources due to socio-economic, cultural and political barriers and inequality of opportunity. In this context, language, legal and administrative barriers restrict these people's opportunities to access daily life opportunities and services such as health, education and employment.

In addition, since refugees do not know the local environment, their knowledge and awareness about local resources and how to use them is not sufficient. One of the most important problems faced by refugees today is discrimination, xenophobia and constant exposure to hate speech brought about by the lack of political representation. In the example of Turkey, especially the language barrier and the lack of skills for the urban workforce reduce the daily living standards of

refugees to a very low level and become the most important reasons for the difficulties they face in accessing opportunities and meeting their basic needs.

Due to the current conditions and insufficient capacity of public services, problems arise in accessing these social services, especially health and education services, for Syrian refugees language barrier is one of the main reasons for these access problems. Skill shortages are also of undeniable importance for the urban labour market, and Syrian urban refugees often work in simple jobs that require cheap labour and physical effort. While men join the workforce mainly as unqualified workers, women generally either stay at home without working or they are observed as beggars in public spaces. Children are employed as unofficial recycling workers who collect waste in extremely bad conditions. On the other hand, unemployed low-income members of local communities are convinced that Syrian refugees are taking their jobs, creating hate speech and directly attributing the cause of the depreciation of the labour market to refugees.⁴⁷

Under these conditions, the fact that local residents see refugees as the source of causes that increase crime and carry the effect of war to Turkey, and as groups who use public resources without doing anything, trigger social tensions and conflicts in local communities to a large extent. The importance of all these aforementioned problems in daily urban and socio-spatial practices is so great that unexpected and large-scale changes have occurred in a very short time due to the changing social psychology and mutual incompatibility, and crisis geographies have occurred, especially in cities where Syrian refugees are concentrated.

3. Lefebvre's Spatial Triad Theory

Space is a social product and each individual plays a role in the production process of space. Henri Lefebvre emphasizes that space is thought of as a geometric formation in literature, whereas space is a living organism. People experience the city and its surroundings in their daily lives. Accordingly, Lefebvre aimed to contribute to the literature by defining a new way of spatial thinking, emphasizing that space is not only an empty space, but also a phenomenon that shapes human society and is shaped by human activities. The results of people's interactions and relationships between each other and space determine the (re)production of space. In addition to being affected by the place they live in; people also create their own spaces. Beyond the material structure of the space, human socio-cultural values, meanings or experiences play a role

⁴⁷ This information was collected through interviews with local government units and field observations in Önder and Ulubey neighborhoods.

in the social production of social space. Space is a concept that can be experienced, conceived, perceived, designed and lived. For this reason, people visualize the results of experiencing their environment in the space they live in and create their symbols in those spaces.

Lefebvre developed a triple model to avoid objective/subjective, mental/material, natural/social duality, and suggested a third possibility for spatial discussions. According to him, primarily, social space is the morphologically or organically built environment and consists of *spatial practices* that connect a network of significantly materially grounded activities or interactions. Secondly, spatial practice constitutes the *representation of space* by being defined abstractly and concretely as a frame of reference or order for a spatial orientation. Third and lastly, the *representational space* consists of meanings and symbols that express the social norms, values or experiences of the space defined as abstract and concrete. All three dimensions of this trio work together like a trivet, and there is reciprocal, complementary and endless relationships between them. Each of them directly affects the existence of the others in the process of social production of social space.

Spatial practices emerge with the deciphering of the space with the life patterns developed by the society and social fabric in daily life, and in fact, the practices produce their own space. The daily routines of individuals shape the spatial practice, and spatial practices enable the space to be perceived and experienced at the level of daily life. Representations of space are created by urban actors, urbanists, architects, planners or artists in line with certain norms and codes. Representations of space, which have been conceptualized through design and fiction processes, are effective in the social sphere with the help of spatial practices. This planned space is a guide for the relations between the subject and the space, thus it has a critical role in the production process of the space. Representational spaces, on the other hand, express the part of the society that belongs to the unconscious, and although there are codes and norms in these spaces, they are not as readable as in the other two examples. Representational spaces can be defined as the spaces of each individual forming the society, not institutions. These spaces, which are actually passively experienced, cover the physical space to create the symbolic use of their objects. For this reason, representational spaces can turn to non-verbal symbol and sign systems.

4. Spatial Triad Production in the Context of Syrian Refugees

The main feature of the refugee movement is that it appeared suddenly and unexpectedly and the refugees did not have a settling plan. Therefore, the choice of place and settlement of the refugees took place spontaneously. Forced migration movement is not only a physical and spatial change, refugees aim to construct their own geography and realize it. In fact,

along with the places, cultures and customs also migrate and shape the migrated places. In the process of defining social identities, the phenomenon of home plays a major role and this social structure constitutes the social production of the space. These variables in urban environments are indicators of the spatial triad and are based on Lefebvre's spatial triad and its interpretations. It includes perceived area, activity, destination and routes, and physical intervention variables.

Syrian refugees are not evenly distributed in urban environments. Because they are personally and socially vulnerable, they tend to concentrate in certain places to protect themselves. Position preferences are primarily motivated by levels of financial resources. Refugees with moderate financial resources or middle income tend to concentrate in settlements, where there are clusters of social, educational and medical services provided formally or informally by immigrants like themselves. The largest group is Syrian refugees with very limited financial resources. They prefer residential areas with the lowest rents and mostly informal residences, and 2 or 3 families can live together in the places they rent. Due to the physical proximity of these low-cost residential areas to unregistered workplaces, where they can easily find daily work, there is a tendency for urban refugees to over-concentrate in these areas.⁴⁸ This lifestyle of Syrian refugees has also increased the domestic density in certain parts of the cities and this is far beyond what was designed in the urban development plans. Changes in residential densities produce new patterns of space use, mainly in the form of commercial uses. Residential areas are also transforming into commercial units. Commercial units in these patterns are often informal, but are very useful among Syrian urban refugees as they provide products and services that Syrians demand between themselves. As a result, new and forced systems are developed that affect daily urban practice.

There is a high level of ethnic density in these urban environments, and as a result of the limited communication and relations of Syrian urban refugees with other social groups, it becomes increasingly difficult to talk about multiculturalism. However, in the urban fabric that defines a kind of ghettoization process, it is very possible to encounter symbolic borders and patchwork spaces that are difficult to manage with official planning strategies of socio-spatial separation.

With the arrival of refugees, the characteristics of neighbourhoods have inevitably changed. Önder and Ulubey Neighbourhoods are adjacent to each other, close to the Siteler industrial zone, and because a part of the industrial zone is located within the borders of Önder district, living and working areas are intertwined. Önder Neighbourhood, where Syrian urban refugees reside in tenant status, has been an urban transformation area since July 2015. Ulubey Neighbourhood, which is evaluated within the scope of the urban transformation decision, is also in the demolition stage

⁴⁸ This information was collected through interviews with local government units and field observations in Önder and Ulubey neighborhoods.

(Mazlumder, 2015). In this sense, these areas are among the renewed neighbourhoods and have gone through important legal, spatial and urban transformation processes. Regarding the urban transformation in the region, it is not known what is envisaged for the aforementioned neighbourhoods due to the blurred understanding of Turkey's urban transformation policy. Önder Neighbourhood was named "Little Aleppo" due to the growing Syrian population with the developing networks and the apparent dominance of Syrian culture in the region.⁴⁹ What is visible is not only the spatial existence of refugees in urban public spaces, but also the problems produced by the gap between living practices and cultures.

4.1. *Spatial Practice of Urban Refugees*

When spatial plans, strategies or policies specific to urban refugees are missing, refugees can produce their own lifestyles. In this context, urban refugees have begun to organize their spatial practices in their daily lives and put them into a system. Syrians prefer to have minimal contact with other parts of the city for their daily social life, and rather to create a social network within themselves. In other words, Syrian urban refugees are included in the region both economically and socially and they change the concept of the city with their active participation. While neighbourhoods are self-sustaining among urban refugees and existing local residents, socio-spatial mechanisms can be said to be portrayed in a self-sustaining way with newcomers and existing locals. However, there is an integration problem between the newcomers or guests and the settled residents of the neighbourhoods.

Although the physical interventions of the Syrians in the neighbourhoods were not on a residential basis, they started to change the appearance of the streets and facades with the effect of the signboards. There are a lot of Syrian bazaars, and food and clothing shopping services in the markets in the neighbourhoods. It has been observed that there is a social and economic solidarity among refugees, especially in terms of commercial activities, and almost all owners of small tradesmen businesses, from food, clothing and service sectors to tailors and barbers, are Syrians. These examples clearly show that urban refugees have established a locally integrated economic structure by performing an economic spatial practice. However, problems such as working illegally in neighbourhoods and in many places, especially in the Siteler industrial zone, or being a tax-free business owner, and the effects of this situation on Turkish neighbours, still have not reached an acceptable solution by all parties. The most common social and recreational activities of Syrian urban refugees are to meet with their friends and/or relatives and go to cafes, that reflect their own culture, and urban parks. Yet urban refugees do not prefer to be a part of cultural activities due to language and cultural barriers.

⁴⁹ This information was collected through interviews with local government units and field observations in Önder and Ulubey neighborhoods.

Another issue that greatly affects daily spatial practice is, of course, due to the global crisis experienced with the COVID-19 pandemic, Syrian urban refugees are among the groups that suffer the most, especially in economic and educational terms. The closure of many business centres resulted in Syrians trying to find ways to increase their income in order to survive and meet their daily needs, rather than taking into account health measures. In addition to economic concerns, urban refugees have been left helpless in the field of education due to the interruption of face-to-face education as a result of the pandemic. Syrian children, who are in a difficult situation due to the lack of technological equipment, which has become the most important tool for online education, are also deprived of special support mechanisms that take care of them. In addition to these, the most effective interpretation in terms of spatial practices in neighbourhoods is that the temporary situation of Syrian urban refugees has changed and the tendency to be permanent has become stronger due to the great limitations in mobility caused by the pandemic.

4.2. *Representations of Space of Urban Refugees*

Representations of space are important to reveal the spatial textures and the effects of the knowledge and ideology of the authorities that reflect the space. When planners, local authorities and decision makers do not intervene in the space in an analytical, integrative and conciliatory way, the actors of the space become users and the users produce their own spaces. Accordingly, urban refugees, as users or new residents, create new spaces for their cultural and social characteristics. Space is produced by them and neighbourhoods can turn into isolated neighbourhoods used only by refugees. This situation is directly related to the problem of social integration. Önder and Ulubey Neighbourhoods have become spaces produced and used by urban refugees, and this situation has become natural for urban refugees living in these neighbourhoods to lead a life disconnected from other parts of the city. Since international immigrants bring their own cultures and lifestyles with them and the phenomenon of forced migration often causes mass migration, it is inevitable that various foreign textures will form in the cities. John Iceland (2014, p.2) defines this situation as geographical isolations associated with “social exclusion and economic marginalization”. According to this, policies that ensure social cohesion between different social and ethnic groups should be developed and implemented. Also as previously mentioned within the scope of urban regeneration efforts in the region, urban refugees have cheap housing opportunities for themselves in not renewed areas, because local people often move to regenerated areas. At this point, decision makers spatially intervene in the physical fabric of the neighbourhoods, although not directly with the urban refugees.

4.3. *Representational Spaces of Urban Refugees*

Representational spaces include the lived and emotional experiences of perceived and designed spaces. The connection between the use of space and the emotional state of urban refugees cannot be ignored. In addition, the production process of representational spaces is also affected by the feelings of refugees and the way they give meaning and value to spaces. In the context of urban refugees, the points where they feel their identities, their favourite places, the places where they feel safe and comfortable, and the feelings about the place they live are considered as tools to produce representational spaces. Representational spaces are not only a place of experience for urban refugees, but also heterotopic spaces where they show resistance to life by going against the norms.

Urban refugees in the neighbourhoods generally feel good and accumulate positive experiences, especially in commercial and outdoor activities. While some of them still feel like temporary guests and wait to return when a safe environment is established in their home country, many of them openly express their satisfaction with their spatial practices in the neighbourhoods. However, the COVID-19 outbreak had a major impact on this guest identity, both in terms of health services, the ongoing situation in Syria, and movement restrictions.

Besides, the tension between the urban refugees and the existing local people does not decrease, and the social dynamics come into play with all their dominance. Due to the country's lack of a conciliatory policy, local people and urban refugees have become enemies. These arguments caused Syrian urban refugees to move to the surrounding neighbourhoods and dynamical change in their geographies. The places of hope they constructed were replaced by experiences shaped by anxiety.

5. Concluding Remarks

Whatever the type of migration, it is a process of displacement and has a powerful effect on the (re)production of space. In this context, the reflection area for the details of the physical, political, economic and social areas of the Syrian urban refugees, the last period urban minorities, has been examined from a spatial triad and the new public space with new urban codes and new urban practices has been focused on.

Aspects of everyday routine must be injected into spaces designed to address the daily issues of a particular society. The spaces developed and designed based on perceived spaces are dictated by associating the lived experience with these spaces, and they define and control what will be felt. However, this identification and control is not always possible. The lived experience field affects the daily routine according to how it is shaped by interacting with the perceived to some extent. However, what kind of effect it creates depends only on the preferred style of relationship of the designed space, which is built with daily ordinariness and routines.

In the light of this information, the heterotopic spatial practice of Syrian refugees in Önder and Ulubey Neighbourhoods points to a crisis on an urban scale, because a high degree of uncertainty, change, risks and threats have system-wide and complex effects. As stated, in the context of Syrian refugees in Turkey, the interventions of planners and decision makers are insufficient. Thus, the representation of spaces, has less effect on the spatial triad, and the perceived space and the designed space establish a relationship between themselves more. From this point of view, it has been observed that the crisis spaces are transformed into heterotopic, isolated spaces of hope by urban refugees and their urban practices are shaped by these tendencies.

The urban crisis is becoming more chronic, with low level of knowledge about predicted impacts and solutions challenging the symbolic level and social consensus. The political way to overcome the mentioned urban crisis is to produce a new policy structure that will take into account all the humanitarian needs of refugees. The planning path, on the other hand, deals with uncertainty parameters and covers dynamics such as housing prices and opportunities, social and educational services and infrastructure capacities in the urban context. From this perspective, strategies that will meet short and long-term expectations should be developed and it should not be ignored that uncertainties and risks are high and needs are urgent. The spatial dimension of urban resilience should be focused, and promising resilience characteristics such as

diversity, resilience, cooperation, flexibility, adaptability and autonomy should be highlighted in these heterotopic geographies.

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GREEN SPACE AVAILABILITY AND ONSET RISK OF COVID-19 IN HONG KONG: A SPATIAL JUSTICE PERSPECTIVE

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1. INTRODUCTION

As concerns arise about the impacts of urban environments on health outcomes and healthy lifestyles, urban researchers are increasingly investigating the associations between the built environment and public health (Ha et al., 2022, Luo et al., 2022).

Public Green spaces (PGS) offer various ecosystem services to city dwellers. The literature generally endorses the view that exposure to natural environments, especially green spaces is vital, for its evidenced benefits to people's health and well-being both through active participation and as a salutogenic environment (Nutsford et al., 2013) (Spotswood et al., 2021). Besides the distance to the nearest green space as a well-known factor, the health benefits of PGS, which has a lag effect and lasts for years (Wang et al., 2021), are also expected to be influenced by the usage frequency, duration, and intensity (Ha et al., 2022).

The concept of spatial justice refers to the manifestation of the principle of justice in spatial production and the allocation of spatial resources (Soja, 2013). It is also concerned with PGS provision as one of the health resources. There was a groundswell of opinion that adequate access to green spaces is a common good for society that all citizens should equally benefit from. More accessible green spaces should be provided for building healthy cities in post-pandemic societies (Luo et al., 2022), although urban planners struggle to allocate UGS evenly (Jian et al., 2020).

The outbreak of COVID-19 poses an unexpected threat to people's health worldwide. As scientific models have demonstrated the effectiveness of social distancing restrictions on slowing down the transmission (Chen et al., 2022), a set of regulations to limit activities, particularly the free use of PGS, are imposed (Pan et al., 2021).

However, many studies conducted during the pandemic show that inequity in the amount of PGS people can access has the potential to translate into inequities in mental and physical health both during and beyond the pandemic (Spotswood et al., 2021). PGS can provide more benefits to vulnerable groups by offering stronger protective effects. Marginalised groups worldwide may expose to a higher risk of certain diseases than more privileged groups for being excluded from access to PGS, particularly those vulnerable groups who are always labelled with lower income and education levels, age, and gender minorities (Sikorska et al., 2020, Sillman et al., 2022).

On the other hand, maintaining a safe distance is challenging in many outdoor areas, especially in increasingly dense urban environments. For instance, despite the number of PGS visitors being decreased at the beginning of the social-distancing restriction, people were reported to have a higher demand for using PGS during the pandemic due to the unavailability of other activities (Liu and Wang, 2021). It is predicted that the total park visitation may exceed the pre-COVID baseline (Geng et al., 2021).

Meanwhile, as the recent evidence shows that exposure to airborne viruses further arises from human population movements between places, higher accessibility to PGS also corresponds to a higher risk of infection spread as using PGS further increase the opportunity for people to meet face to face (Pan et al., 2021). PGS in this sense might give rise to the

number of new cases, and negatively contribute to managing the outbreak of the pandemic by providing chances for people to cluster and spread the disease (Yao et al., 2021).

Eventually, the government needs to release the restrictions to allow citizens to return to “normal” lives. Since the relationship between the availability (i.e., amount and accessibility) of green spaces and covid-19 cases in compact cities remain insufficiently explored (Ha et al., 2022), this research attempts to explore whether PGS with higher availability is linked to higher COVID-19 case rates and whether the PGS access related to COVID-19 case rates is linked to people’s socio-demographic characteristics in compact urban environments.

Following this introduction, this paper is divided into four parts. The first part provides a brief account of the PGS visitation during COVID-19, followed by a general discussion of spatial justice with health considerations. We then describe the methods used to answer our research questions. We outlined the patterns of uneven distribution of PGS and explored the relationships between the availability of PGS and the onset risk of covid-19. The final part presents and concludes our findings, and suggests implications for future studies.

2 LITERATURE REVIEW

2.1 PGS visitation during COVID-19

Researchers have found common ground in terms of the mechanisms through which PGS benefit people’s health and well-being, namely restoration, instoration and mitigation (Browning et al., 2022). To elaborate, contact with PGS can potentially reduce exposure to harmful environmental stressors, foster healthy behaviours, and restore capacities such as providing relief for cognitive processes and stress (Rigolon et al., 2021).

Higher proportions of PGS in proximity in the neighbourhood were associated with lower anxiety levels (Nutsford et al., 2013). Chicago Residents reported lower psychological distress levels during the pandemic if their neighbourhoods had many small green spaces that were dispersedly distributed, or if they lived in urban landscapes that had greater distances between forested areas (Ha et al., 2022). Huang et al. (2020) used Tertiary Planning Unit (TPU) as the analytical unit and found a negative association between population density and the risk of COVID-19. The authors suggested that higher green space density could help reduce the risk of COVID-19 transmission.

Under the social-distancing situation, the behaviour of PGS use has changed significantly as the spaces became the only “out-of-home” option (Liu and Wang, 2021). Larson et al. (2022) reported that most of the college students reduced their park use for fear of the COVID-19 virus. Their outdoor recreation activities were also decreased due to structural constraints, park closures, and shifting social norms. Notably, race is claimed to be directly linked to this behaviour. On the other hand, the necessary activities (e.g., walking the dog, outdoor exercise) increased as Pan et al. (2021). Some people raised their park visitation for their desire to be outdoors, to occupy free time, and for health considerations (Larson et al., 2022). In Hong Kong, people visit country parks or go hiking more to relieve stress and anxiety during the pandemic (Ma et al., 2021). The demand for using PGS for outdoor activities increases. However, the relevant policies range from decreased opening times to opening with limited functions reduce the amount of available PGS drastically, raising concerns about its ability to fulfil people’s essential physical and mental health needs (Liu and Wang, 2021).

2.2 Spatial justice with health considerations

Spatial justice argues for eliminating plausibly avoidable disparities in spatial-related resources among different social groups. These differences could adversely influence vulnerable groups, either economically, socially or structurally disadvantaged, and lead them to more unfavourable situations (Soja, 2013). Spatial justice in public open space contains five dimensions, namely access and management, sociability and diversity, demand and provision, social stratum and information, and social inclusion (Jian et al., 2020). Pursuing spatial justice with health considerations means devoting

efforts to maintaining people's equal opportunity to attain their full health potential, including equal access to available health-promoting resources, such as green spaces (Braveman, 2017, Jian et al., 2021).

PGS tend to matter most in dense areas. People living in these environments are at a higher risk for health and well-being owing to increased air pollution, traffic noise, less available open area, and smaller living spaces (Rigolon et al., 2021). These issues disproportionately affect different segments of the population. As a finding reached by a number of papers, low-earning individuals were more dependent on recreation activities with lower cost, yet, their access to PGS was constrained compared to wealthier people, while the older group suffered more from inequitable distributed PGS because of limited mobility (Rigolon et al., 2021). Although previous evidence has proved that PGS present stronger protective effects for socially vulnerable groups relative to other populations (Markevych et al., 2017), the epidemic has exacerbated the

unfavourable conditions in low-income areas, which were already facing reduced availability of PGS (Spotswood et al., 2021).

3 METHODOLOGY

We selected Kowloon, Hong Kong as our case study. As one of the world's most densely populated coastal cities, Hong Kong people were reported as "suffering from a lack of urban life" – the PGS provided are far beyond satisfactory in terms of quantity and quality (Jian et al., 2020).

3.1 Dataset and data processing

The COVID-19 case data which covers a time range from 23 January 2020 to 6 February 2022 were obtained from the COVID-19 daily press release¹ published by the Department of Health of Hong Kong. The dataset provides detailed information on all the confirmed cases (e.g., age and the geographical locations recorded during the incubation period). Notably, the government stopped sharing detailed case information from 6 February 2022 due to the high number of new cases per day. The spatial statistical unit (Large Street Block Groups, block) of the 2016 Hong Kong Population Census data was used as the spatial representation proxy in this study. In total, Kowloon consists of more than 500 blocks. The census data contains people's socio-demographic information, such as age composition, gender, and ethnicity. 3D Pedestrian Network data used in this research were published by the Lands Department of Hong Kong. The data of the PGS that was published by the Hong Kong Leisure and Cultural Services Department cover 367 open spaces of 500 square metres or more in Kowloon, including parks, children's playgrounds, and rest gardens.

3.2 PGS availability

In order to calculate the availability of PGS in Kowloon, we divided the spaces into three categories according to their size and service capacities: regional PGS (>5ha), district PGS (1ha-5ha) and local PGS (500m²-1ha). As the accessibility of PGS is one of the crucial indicators to demonstrate service efficiency, we used the PGS area per capita within the reachable area of each block to indicate the availability of PGS. Network analysis was conducted as the most suitable method for the reachable area calculation because of its merits in accurately estimating actual walking distances (Sikorska et al., 2020). The method considers travel routes rather than using the commonly used fixed-distance buffer or calculating Euclidean distances, which is likely to underestimate the travel time (Huerta, 2022). A walking distance of 1250 metres was assigned to the regional and district PGS and 400 metres to the local PGS. The reachable area of 400 metres corresponds to the

¹ <https://www.coronavirus.gov.hk>

commonly acceptable 5-minute walking distance recognised in the literature to reach the local PGS (Schindler et al., 2022). The final calculations yielded PGS availability for all 537 blocks in Kowloon.

3.3 Multiple Regression analysis

Two regression models were used to explore the relationship between onset ratio and PGS availability for each block: the generalised multiple linear regression (GMLR) model and the geographically weighted regression (GWR) model. The dependent variable is the onset ratio of each block, the independent variables are population density and PGS availability. The regression results are divided into nine groups: (a) GMLR for all ages, (b) GMLR for children (< 15 years old), (c) GMLR for the elderly (< 65 years old), (d) GWR for all ages with auto-bandwidth, (e) GWR for children with auto-bandwidth, (f) GWR for the elderly with auto-bandwidth, (g) GWR with self-defined bandwidth (20 neighbours) for all ages, (h) GWR with self-defined bandwidth (20 neighbours) for children, and (i) GWR with self-defined bandwidth (20 neighbours) for the elderly.

4 RESULTS

A higher possibility of infection rate of COVID-19 can be observed in economically deprived areas (e.g., Sham Shui Po and Wong Tai Sin). Notably, Sham Shui Po has high onset rate, low medium income, and limited regional PGS availability at the same time (Figure 1). No obvious difference can be observed in terms of the onset ratio for different age groups (Figure 2).

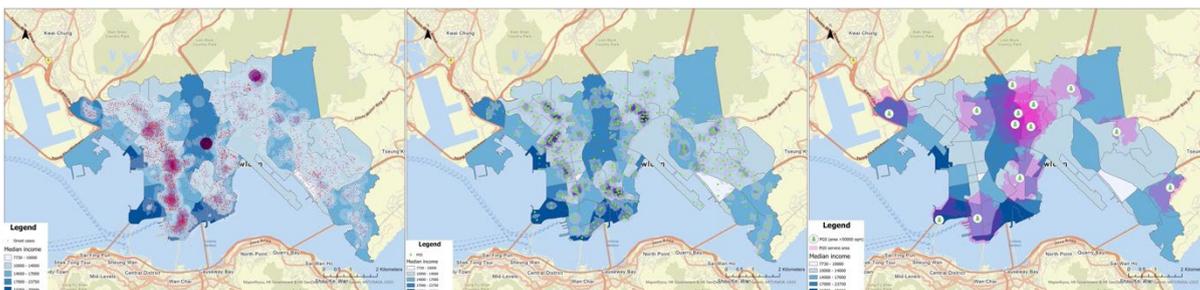


Figure 3 medium income and COVID-19 case density (left); PGS density (middle); and Regional PGS (right).

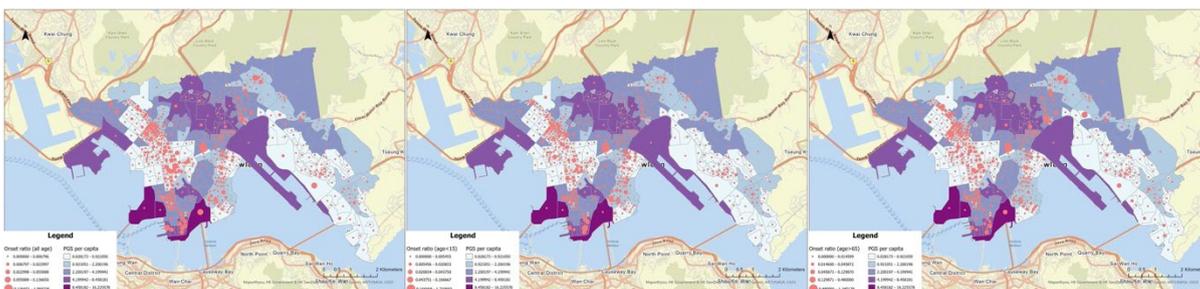


Figure 4 onset ratio for all age groups (left), children (middle), the elderly (right).

At the global scale, the results of the GMLR model indicate that the PGS availability and onset ratio exhibit a positive correlation coefficient close to 0, which can be interpreted as almost uncorrelated (Table 1). The correlation coefficient improves slightly after introducing a GWR model with automatic bandwidth (Table 2). It should be noted that the automatic bandwidths were all around 300 in these three groups (i.e., *d*, *e*, and *f*), which are still close to the global scale. It is likely

that the excessive bandwidth is causing the GWR model to approach global regression. After several tests, we set the bandwidth to 20 neighbours as the fit of the model improved significantly (Table 3) (Yao et al., 2021).

Table 1 Multiple regression models results

	a	b	c
Multiple R ²	0.008	0.005	0.001
Adjusted R ²	0.004	0.001	0.001
Coefficient PGS availability	0.001	0.001	0
Coefficient population density	-0.07	-0.004	-0.07
AICc*	-	-	-
Bandwidth	-	-	-

Global scale

*Akaike information criterion

Table 2 Multiple regression models results

	d	e	f
Multiple R ²	0.04	0.04	0.04
Adjusted R ²	0.007	0.008	0.11
Coefficient PGS availability	-	-	-
Coefficient population density	-	-	-
AICc	-1109	-1225	-1369
Bandwidth	318	286	353

with auto-bandwidth, local scale

Table 3 GWR model with self-defined bandwidth

	g	h	i
Multiple R ²	0.69	0.68	0.64
Adjusted R ²	0.47	0.46	0.38
AICc	-1220	-1365	-1391
Bandwidth	20	20	20

Bandwidth=20 neighbours

5 DISCUSSIONS AND CONCLUSIONS

Understanding the relationship between the PGS availability and COVID-19 risk for different age groups could offer guidance for authorities to cope with the pandemic. This preliminary study examined the claimed coupled effect of PGS availability on the COVID-19 cases distribution with considerations of age-based social vulnerability in compact urban environments. Using Kowloon, Hong Kong as a case study, we adopted two multiple regression models, namely GMLR and GWR to test the coupled effect at the street block level. The explorative analysis results suggest that in general, at the global scale, there is no significant correlation between COVID-19 prevalence and PGS availability for different age groups. As the existence of such a correlation cannot be completely rejected at the local scale, it is possible that the local PGS availability corresponds to a higher risk of COVID-19 transmission than the district and regional ones as the local PGS are smaller, and people would be harder to maintain proper social distance. However, the role of PGS availability and the mechanism of the process require further evidence.

Socioeconomic vulnerabilities are typically seen as mediating or moderating factors when studying the health-promoting effects of PGS. Surprisingly, our findings are not in consonance with many previous studies that claimed the age-based vulnerable groups such as children and the elderly are likely to benefit more - both physically and psychologically – from PGS in the COVID-19 pandemic (Rigolon et al., 2021). We found no significant correlation between the COVID-19 onset ratio and PGS availability for the elderly and children at both global and local scales. Age-based inequalities do not necessarily exist when it comes to the coupled relationship between PGS availability and COVID-19 cases. However, it is undeniable that PGS can actively interfere with people's ability to fight infection (Spotswood et al., 2021).

Cities are dynamic and complex systems that are influenced by a variety of internal and external factors. Apart from PGS availability that considers PGS area, and 3D pedestrian road network accessibility, several other variables of the built environment could potentially impact disease transmission in dense and compact environments. For example, Huang et al. (2020) identified a spatially heterogeneous relationship between the certain built-environment variables (e.g., land-use diversity) and the risk of COVID-19 transmission in Hong Kong, while Yao et al. (2021) observed a strong correlation between the COVID-19 cases and the road network configuration. The appearance of PGS in the immediate environment does not necessarily link with people's usage and contact. There are many factors that influence people's PGS visitation as mentioned above. The effects of PGS availability are not significant in this study.

The following limitations of this study could help explain our results. First of all is the data uncertainty, as the geographical locations of the confirmed cases provided by the Hong Kong government include several places they have visited during their incubation periods. The accurate place where people get affected cannot be identified.

As highlighted by Huang et al. (2020), different analytical units or case study areas may produce different results. This preliminary study only considered PGS that are larger than 500 m² and regarded all PGS as homogenous environment resources. Apart from PGS, HK has many other types of accessible green spaces, including brownfields, public open spaces in private developments, and informal pocket spaces that are constantly used by the elderly who live nearby. Taking into consideration of other factors in the analysis might generate different results.

In the middle and later stages of the epidemic, as cities gradually lift restrictions on mobility, and the large number of confirmed cases that cannot be traced back to their source, we suspect that the urban environment may gradually decouple from the number of confirmed cases and the risk of transmission from the use of PGS will gradually decrease, with the benefit outweighing its risk. These hypotheses warrant further investigation.

Prolonged self-isolation can lead to adverse psychological effects. In the long run, governments worldwide need to strike a balance between allowing PGS and reducing the risk of pandemic transmission. Pathways toward building a healthy city must prioritise the equitable provision of PGS and attach greater importance to the health-promoting effects of PGS.

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IMPORTANCE OF RECLAMATION OF POSTINDUSTRIAL AREAS NEAR CITIES, CHALLENGES TO OVERCOME AND HOW IT CHANGES CITY INTO SMART CITIES

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Introduction

To provide better life style and wellbeing to human is not only the task but also for surrounding organism, an eco-efficient city administration design. Relating my dissertation topic climate resilient city –evolution of an urban ecological system focused on eco efficient city administration.

Upper Silesian region which is shared between Poland and Czech Republic where the majority of area is shared by Poland. This area are famous for its underground coal mines , since centuries mines are operating these places(1)(2). Many towns are dependent on these mines. Upper Silesia area is the key area which is a central part of Europe where it is easy to move to all the parts of Europe.

Czech Republic when the mines are planned to open authorities relocate the people, Poland where most of the underground mines are operated near to the city where the people are not located. These mines play a crucial role in the urban ecology balance in these areas

For the mining operation many towns, and other areas are demolished, Czech city Karvina is an example(3). By relocating people and the problem in the balance of ecology by destruction of natural habitats of several animals and organisms let them migrate to other places.

Once a mine had started it should have an closing date, in the operating time of the mines people of these places have many benefits to work in these mines, there by lesser unemployment and increase the wellbeing of life style. Once if its closed the community depending on these mines are affected ,unemployment, urban shrinkage ,migration of people to other cities for in search of job, reduce the attractiveness of the city, less interest on new development and establishment in these places. Discussing about the main challenges to accomplish these strategies

Research review

The biggest city in upper Silesia Katowice, 82000 of jobs rely on coal production are found on these Katowice wider metro political area (4). This is also a reason mining is consider as the back bone of the economy. Once the coal mines are closed these 82000 people works on these become jobless. This is where the reclamation plays the role cities like Radzionkow,Sosnowiec are totally depend on coal mines once it had closed the cities majority of people become jobless. Urban shrinkage was one of the issue, the city was depended totally on the mine suddenly once its closed a huge area is abandoned this resulting those places to result in no attraction (5)(6). People decided to go to other cities because there are no development in these area less chances to find new work. Czech Republic a small area in Upper Silesia is shared with Poland geographically similar. With large resource of coal. The coal mines in Czech Republic are formed by relocating people from those places. So once the reclamation process is done the strategies used after the reclamation in Poland may

not be suitable for the Czech region. Ema heap Ostrava, Landek park Ostrava, Dino park Dubrowa and Karvina lypiny golf court. one among the successful post reclamation strategies in Upper Silesian region of Czech Republic.



fig 1 Czech reclaimed area



fig 2 Polish reclaimed area

Data on reclamation

Reclamation is done a botanical park is built on the Radzionkow area does change the fate of people by having job opportunities in these area and thereby making area attractive. Many local firms and other companies are already open there branches in these area there by locals can have jobs here and the value of the place is also increased.

In Katowice an old closed mine area is reclaimed and Katowice cultural zone is built over there thus it changed a abandoned area into an attractive area.(7). The black city of Katowice turns into green attracting many companies who want to expand there franchises in Europe

Sosnowiec a city in the Upper Silesia once the mine had closed the area is reclaimed and turned into an urban forest where an anthropogenic man made forest and self-grown plants are grown over there. This urban forest changed the presence of an abandoned area into something attractive to the city not only that a place for the organisms and animals which was once moved from these places when the mine had started have a safe place to return. Not only that but also new species can evolve in these places. .This is an example of balancing an urban ecology.

Ruda Slaska by photo stabilization method the contaminated zinc heap is covered by clay and new soil layer is laid grass are grown on there. Crags and sharp rocks are removed. A cheap infrastructure, walking path, view point, open air gym, cycling path, BBQ area with wooden table area and benches Visited by dozens of people every day weekend hundreds of people(8). Ruda Slaska mine area is in very close to the urban area it covered a large area. The area reclaimed does make a good space for the people in these urban area to spend a quality time. Utilization of the space very usefully there by increasing the wellbeing of the people living near by. This is a good example of an eco-efficient city administration with the resources available make the maximum use and made it into success.

Zabrze underground coal tunnel turns into a boating and walking tourist area. The Guido coal mine tunnel which is used to move freshly cut coals from the mines. The mining tunnel is 200 years old. The 1100 meter canal, part of the Queen Luiza mine tunnel, is the longest route of its type in Poland and one of the longest in Europe. The adventure takes place 40 meters under the Silesian city and it is the latest attraction in a process that has seen Zabrze repurpose its former coal mining infrastructure for tourism. 2.5 hour tour journey which is on foot and journey finishes with a 30 minute boat ride is the latest attraction in a process that has seen (9).Zabrze repurpose its former coal mining infrastructure for tourism. There is a chapel and pub in the thus tunnel. This is an example for reclaiming an old underground mine that not only makes the city attractive but also it cause a tourist flow and there by getting an economic benefit.

Poland agrees to close the last coal mine in 2049, by leaving so much areas to be reclaimed and by having these kind of strategies after reclamation will help the people and the organisms.

This where the Poland had new initiative in providing job in renewable energy sector could provide 186000 jobs in 2030.(4)

But there are many strategies which had done after reclamation in Czech regions

,Landek which is former coal mine where it is not considered as a total reclaimed area but a part of it is reclaimed. This Landek park museum was constructed 25 years ago on the oldest mine in Czech Republic called the Ansel mine. Today it shows the history of mine, sporting facilities and camping area. The camping is area is widely used by people in some season for some festival times like colors of Ostrava more than 1500 place for tents and 50 caravan spaces are provided. Bike park ,children sand lab, accommodation villas, small football court, family gym,mini zoo like many facilities are provided for visitors in these Landek park.A successful reclamation which not only made the place famous but also let visitors know about the history of mining, create an area in the urban area for recreation for families and economically beneficial too(10).

Ema heap Ostrava, is a hill formed from the mining waste in the suburbs of Ostrava,315 meter high it is the one of the highest points in this area offered a very good view on the city and the surroundings. This heap was created from the wastes from the nearby mines. A fire which was lit inside in ema heap in 1960 was still burning smokes are visible from some parts still. The surface of the hill is reclaimed there are trees, plants and birches are covered in these area now(11).

Many people are visiting these area daily its considered as the highest point so for enjoying the view of city it's a main spot of attraction in the city. As a result of this surrounding areas values are increased many houses are built near to the hill.10 year ago these place was really abandoned the recent house construction in the area shows the increase the value of the area. These shows these kind of reclamation can be successful. Not only increases the value but bringing back the value of these areas it also bring back nature and vegetation in this areas(12).

Durbrowa Dino Park in Orlowa largest dino park is constructed on this old underground mine. There are models and attractions are literally packed a main spot of families to spend there time. This is also a reclaimed land using a good strategy to improve the areas beauty and made it famous, every day many visitors including families and school children visit there. As there is an entry fee for the visit and there are snack bars inside really befitting economy (<https://www.dinopark.cz/cz/ostrava>)

Karvina old city was totally destroyed people were relocated ,Havirov city is formed this was a city for the mining workers then the city was gradually evolved. The church Peter of Alcantra is a n example of underground mine on the old city the church was the only existing structure. This church is an identity or proof which shows the importance of reclamation (13).



FIG 3 peter of alcantra

Karvina underground mines, these mines are currently active and mining is done from there. The old mines in the Karvina were reclaimed and turned into golf courts, urban forest ,meadows, changes water way for Olza river. The golf courts were used by professionals, individuals and other people .Karvina-Lipny golf court was constructed between two operating mines, it has been further extended into a 18 holes golf court(14). These post reclamation strategies changes a barren land into people friendly areas and the meadows, vegetation can attract organism return back to those places.

The Czech Republic have been planned to shut down all mines in 2033 or 2038 and there will be so much successful reclamation strategies (15).

Discussion

Before the mines are opening there should be a plan to reclamation but most of these mines are more than centuries old the EIA(Environmental Impact Assessment) criteria was different from now to that time as there was not a step to discuss peoples opinion(16).So many places people are against the post reclamation strategies or maybe they do not cooperate or there will be fails in the post reclamation strategies. Peoples mentality is very crucial in the post reclamation strategy in Karvina many places are reclaimed the river banks and the other meadow area but people do not want to build homes or do other investments in these areas. In Karvina relocated people they find there new homes and are very much adapted to the new living surroundings so they do not want to leave it and start from the beginning again. But in Poland these underground mines which are near to the urban areas most of the reclamation strategies are successful .Ruda slaska and Zabrze are the examples for this. But in Czech parts Landek park, Ema heap Ostrava, Karvina lipny golf court and Dino park are successful reclamation. There were certain protest on the urban forest people are happy to have area clean than having an urban forest The areas in Radzionkow and Sosnowiec are also successful reclamation but not economically benefitting but of course the botanical garden and urban forest do make the city much more attractive. Now the mentality of people on Urban Forest is changing people are becoming much more acceptable in these when knowing about the benefits.

The balanced ecology with organisms and human being can be balanced in these areas where everyone have their own abundant space while reclaiming these areas successfully we can achieve it

This is a study of how postindustrial mining areas can be successfully used after reclamation these strategies can be used in many regions across the world .Nevertheless the research needs further more analysis and study for finding out the percentage of success from these areas how many people are employed after these strategies the return back of the organisms in the urban forest and botanical gardens.

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A COMPARATIVE ANALYSIS ANALYSIS OF URBAN TEMPERATURE(AIR/SURFACE) AND HEAT ISLAND INTENSITY USING S·DOT AND LANDSAT8 IN SEOUL OF SOUTH KOREA

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1. Introduction

1.1 Background and purpose of the study

More than half of the world's population lives in cities, and according to the United Nations, about 70% of the world's population will live in urban areas by 2050, given the current trajectory of urban growth. (United Nations, 2010) The growth of these cities causes climate change and aggravates abnormal weather phenomena such as heatwaves. This heatwave phenomenon causes the Urban Heat Island (UHI) phenomenon, which is one of the phenomena that occurs with the progress of urbanization, which refers to a phenomenon in which the air and surface temperature in the downtown area are higher than in the surrounding areas. (JA Voogt TR Oke, 2003) The UHI phenomenon worsens the urban environment, such as heatwaves and tropical nights, and threatens the life and health of urban residents. As a result, about 50% of the population is concentrated in the metropolitan area, which is about 10% of the national land area, and various urban problems such as an imbalance in national land development and the UHI phenomenon are occurring mainly in the metropolitan area. As a result, the average outdoor temperature was 13.5°C in the 2019s, 1.1°C higher than in the 1960s, and it is a continuous increase. It affects the climate change and the natural environment of downtown areas, impairs the quality of the urban environment, and threatens the health of urban residents. If the city's temperature continues to rise and climate change and destruction of the natural environment intensify, the quality of the urban environment may be compromised, which will endanger the health and life of city residents. Accordingly, from 2020, through the Smart Seoul Urban Data Sensor (S·DoT) construction project, the city of Seoul is building an industrial ecosystem using policies and city data to solve urban problems and improve citizens' lives. Therefore, this study aims to present the possibility of using urban data sensors (S·DoT) by examining the temperature of Seoul and the surface temperature data of LANDSAT8, calculating and comparing the thermal island intensity of the air temperature and the surface temperature.

1.2 Scope and Method of Study

1.2.1 Scope of the study

The spatial extent is Seoul, the capital of the Republic of Korea located in Asia. Seoul is the tallest city in Korea, 497 km long and 1-1,5.m wide, in the form of a basin crossed by the Han River. It covers an area of 605.24 and consists of 25 autonomous districts and 426 administrative dong, with a population of 9.55 million.

The temporal range is March 30, 2021. The city data sensor used in this study was installed in March 2020 and data is

provided from April 2020. In the case of Landsat 8 satellite imagery, data is provided at a cycle of 16 days. The temporal range of this study were selected based on the image data of March 30, which was the lowest at 0.02% among the six days with less than 10% cloudiness among 21 years.

The content range is to figure out the difference between the heat island intensity of Seoul using city data sensor S-DoT and national meteorological observation and the heat island intensity of Seoul using LANDSAT8.

1.2.2 Method of study

First, research directions were established by investigating the characteristics and prior studies of S-DoT sensors through theories and literature related to urban heat island phenomena. Second, each heat island intensity is calculated by obtaining the surface temperature and air temperature except for the aquatic area, conservation mountain area, and natural green area through the LANDSAT8 image, S-DoT air temperature data, and national weather observation (AWS) data. Since S-DoT is installed only in Seoul and there is no data on the outside of Seoul, in this study, S-DoT in urban areas and AWS in the suburban areas were used to calculate heat island intensity. (Park Haekyung, 2021)

Finally, the temperature of Seoul is examined through the S-DoT air temperature data of administrative districts with three or more S-DoT and the land surface temperature data of LANDSAT8, and the heat island intensity of the air temperature and the heat island intensity of the surface temperature are compared.

2. Review of urban heat island phenomenon and previous research in Seoul

2.1 Definition and Characteristics of Heat Island

The urban heat island phenomenon, which is known as the most obvious cause of urban temperature rise, is a phenomenon that occurred during the rapid industrialization and urbanization since the mid-20th century. (Oh, Kyu-Shik, Hong, Jae-Joo., 2005)

The isotherm forms a closed curve because the temperature of the urban heat island is higher than that of the surrounding area. In the late 1810s, Howard discovered the urban heat island phenomenon for the first time when he discovered that the nighttime temperature in London's urban area was about 2.1°C higher than that of the surrounding suburbs. (Luke Howard, 2008)

The urban heat island phenomenon is characterized by the low albedo of the asphalt and concrete pavement surfaces constituting the urban area, which absorbs a large amount of solar radiation energy, thereby accumulating heat energy near the surface of the earth and increasing the area that reflects and absorbs sunlight. It is caused by an increase in surface temperature due to the extension of high-rise buildings. In addition, since smog generated from factory and automobile fumes stores and re-discharges atmospheric heat, a vicious cycle is repeated, which greatly affects not only environmental pollution but also global warming. In particular, forests or green areas are the most important factors for reducing the urban heat island phenomenon and have a great influence on the reduction of urban temperature. The problem with the urban heat island phenomenon is that tropical nights occur due to an increase in temperature, and the number of days and the number of people suffering from heat illness increases, resulting in a natural vicious cycle due to the heat island phenomenon.

Seoul, Korea's largest metropolis, has undergone reckless development and destruction of green areas due to rapid urbanization that began in the 1960s. has increased. In addition, as a result of analyzing the number of days of heatwaves and tropical nights in the past 48 years from 1973 to 2020 the Korea Meteorological Administration, the average number of heatwave days in the past 48 years from 1973 to 2020 was 10.1, whereas the last 10 The year was 14.0 days, which increased by 3.9 days. (Korea Meteorological Administration, 2020)

This is expected to intensify the heat wave and heat island phenomenon in Seoul. Seoul Open Data Plaza

(<https://data.seoul.go.kr/>)

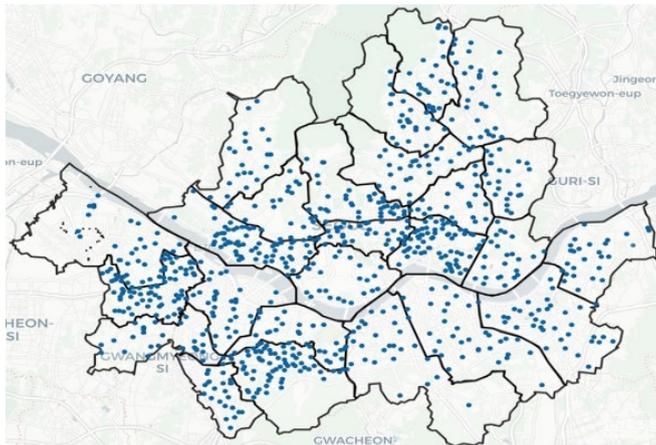
2.2 S-DoT city-data sensor and Landsat8

S-DoT city-data sensor is an abbreviation of Smart Seoul Data of Things, which means that data (Dots) are gathered to become a Smart Seoul. The purpose is to establish policies to improve citizens' lives and to build an industrial ecosystem using city city-dataset on sensors installed throughout Seoul using the Smart Seoul Network (S-NeT)'s Internet of Things (IoT) network, city city-data is a part of the project to establish a collection, distribution, and utilization system and to lay the foundation for scientific administration based on data.

The measurement items are 10 types of data on urban phenomena (fine dust, temperature, illuminance, noise, etc.) and civic behavior (floating population, vehicle movement, etc.) It is measured and provided to the general public in units of an hourly average. Data can be found at the Seoul Open Data Plaza.

Standards for installation are equal installation (424 administrative buildings), autonomous districts (residential, commercial, open space), and policy demands (construction sites, fine dust dust-generating cities, garages, visitor clusters, etc.). A total of 1,100 S-DoT installations have been completed by 2021, and a total of 2,500 S-DoTs will be installed by 2022. This is about 30 times more than the Seoul National Weather Service (AWS). <Figure 1> The installation site is installed at a height of about 3 m, such as CCTV and props, and it is close to the actual living environment of citizens. In this study, the temperature data of the S-DoT city-data sensor was used.

<Figure 1> S DoT Installation Location Map



Source: 1100 S-DoT installation areas in Seoul (provided by Seoul City)

Landsat8 is an Earth resource exploration satellite launched by the United States National Aeronautics and Space Administration (NASA) and launched in 2013. Landsat8 orbits the Earth in a cycle of 16 days, the scene size is 185 km x 180 km, and it can acquire about 740 images per day.

The Landsat 8 satellite is equipped with a measurement system of an Operational Land Imager (OLI) and a Thermal Infrared Sensor (TIS). The OLI (Operational Land Imager) multi-spectral sensor composed of 9 spectral bands has a spatial resolution of 30 m and provides a thermal infrared band. In the case of TIRS (Thermal Infrared Sensor) consisting of two thermal infrared bands, it is received with a resolution of 100 m, but the USGS provides it to users after applying a resolution matching process to 30 m. Landsat satellite data can be accessed from Earth Explorer (<http://earthexplorer.usgs.gov/>) with a 16-day revisit cycle. In the Republic of Korea, artificial satellites such as Arirthe and satellite (multipurpose utility satellite) and Chollian (public geostationary orbit satellite) are on mission, but they have not yet been stabilized enough to be used for research, so they are not disclosed to the private sector. As one of the most used artificial satellites in research using

satellite images, such as Landsat in the US and Sentinel in the United States/Europe, etc.

<Table 1> LANDSAT 8 Band Information (USGS)

Instrument type	Band	μm (wave band)	Resolution
OLI	Band Coastal/Aersol	0.43 - 0.45 μm	30m
	Band 2 Blue	0.450 - 0.51 μm	30m
	Band 3 Green	0.53 - 0.59 μm	30m
	Band 4 Red	0.64 - 0.67 μm	30m
	Band 5 NIR	0.85 - 0.88 μm	30m
	Band 6 SWIR 1	1.57 - 1.65 μm	30m
	Band 7 SWIR 2	2.11 - 2.29 μm	30m
	Band 8 Pan	0.50 to 0.68 μm	15m
	Band 9 Cirrus	1.36 - 1.38 μm	30m
TIRES	Band 10	10.6 - 11.19 μm	100m(Resampled to 30m)
	Band 11	11.5 - 12.51 μm	100m(Resampled to 30m)

2.3 Review of Prior Studies and Differentiation

The urban heat island phenomenon has a major impact on human life in general. Various studies are being conducted at home and abroad to analyze and solve these problems of the urban heat island.

First, it is a prior study related to heat island intensity (UHII). (Pingying Lin et al., 2017) derived the effect of pocket parks on UHI intensity and the relationship between UHI and five urban planning indicators by performing in-situ climate measurements and morphological analysis of 12 points in Hong Kong. (Seo, Kyeong-Ho., Park, Kyung-Hun., 2017) measured the summer temperature (LST) in 2009 through surface analysis classified into urban land and non-urban land to analyze the intensity of the urban heat island (UHI) in Korea, and MODIS It was found that the regions with the highest temperature and UHI intensity recorded from satellite images were concentrated around major cities, and correlations between the urbanization rate, UHI intensity, and tropical beasts were derived.

Second, it is a preceding study related to LST (Land Surface Temperature) using Landsat data. (PK Srivastava et al., 2009) obtained satellite data from 26 October 2001 and 2 November 2001 using visible and near-infrared(VNIR) and high-resolution thermal infrared (TIR) of Landsat-7 ETM+ for India. was utilized. The estimated LST identified the effect of surface characteristics on surface temperature. (Gordana Kaplan et al., 2018) analyzed the correlation between land surface temperature (LST), NDVI, and NDBI calculated from Landsat 8 data in the summer of 2013 and 2017 for Skopje and Macedonia. (Lee, Jong-Sin., Oh Myoung-Kwan., 2019) analyzed the feasibility of using the surface temperature using the satellite image of Landsat 8 and the temperature data measured through AWS to improve the resolution of the LST on the ground.

(Jee, Joon-Bum et al., 2014) analyzed the surface temperature calculated from MODIS, Landsat, Landsat, and Landsat 5, 7, and 8 satellites using the surface altitude, land use, and AWS temperature in some areas of the metropolitan area including Seoul. Landsat 8 revealed that the MODIS surface temperature and AWS temperature were similar to the trends, and the surface temperature calculated from the satellite showed a high correlation with the AWS temperature located in downtown rather than suburban areas.

Third, it is a preceding study related to air temperature using city sensors. (Park, Haekyung., 2021) compared the heat island intensity of Seoul by using the Seoul city sensor S · DoT (Smart Seoul Data of Things) and the national weather observation temperature (AWS). It was found that the temperature was 1.5°C higher.

(Park se-hong, Bae woong-kyoo., 2020) analyzed the spatial and temporal structure of Seoul's urban heat island by using near-surface temperature data from regional detailed observation data (AWS) to analyze changes in the urban heat island of Seoul.

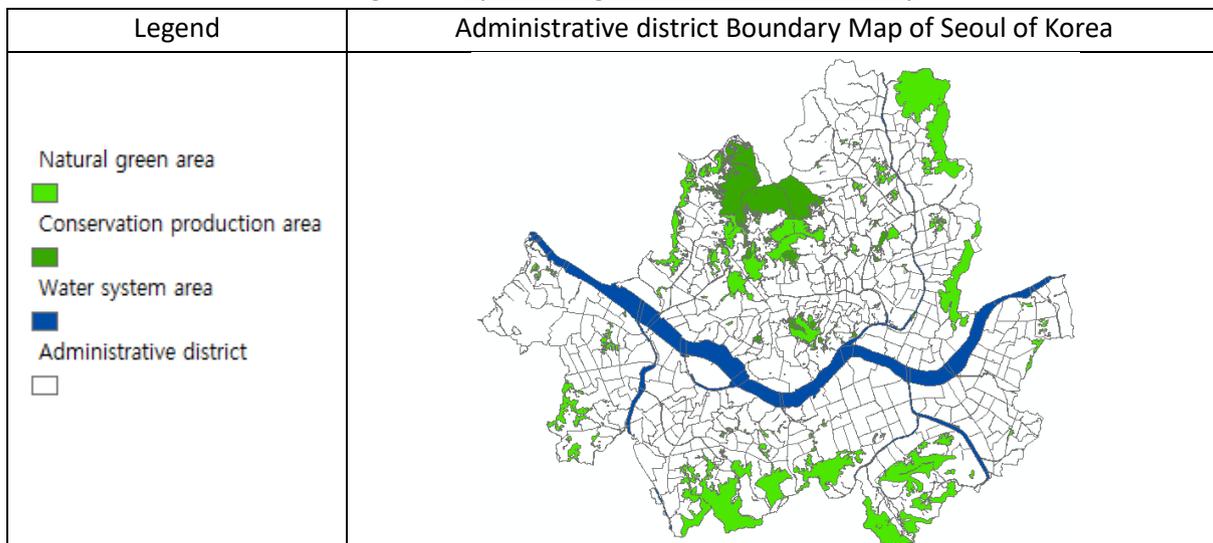
As a result of the analysis of previous studies, most of the domestic and foreign studies used Landsat data and National Weather Service (AWS) data to calculate the heat island intensity value, and there were few research cases using city data sensors. Therefore, in this study, by utilizing S·DoT (city data sensor) data for Seoul, the possibility of using S·DoT (city data sensor) by examining LANDSAT8 data and Seoul temperature, calculating and comparative analysis of heat island intensity was understood.

3.1 Analysis method

The analysis method of this study was analyzed in four stages: theory and literature review, S·DoT (atmospheric temperature)/Landsat8 (surface temperature) calculation, heat island intensity map production, temperature comparison, and heat island intensity map comparison.

First, previous studies related to the urban heat island phenomenon and S·DoT (urban data sensor)/Landsat satellite were reviewed. Second, using the temperature data of S·Dot on March 30, 2021 and the image data of the Landsat8 artificial satellite, the air temperature map and the surface temperature map of the water system and conservation mountain areas are produced. Third, a heat island intensity map of air temperature (S·DoT) and surface temperature (Landsat8) is produced using data from 17 points of the National Weather Service (AWS) in the suburbs. Fifth, Temperature(Air/Surface) data of S·DoT and Landsat8 and heat island intensity are compared. For an empirical study, in this study, in the process of calculating the surface temperature of Landsat8, the area except for the same area was considered in consideration of the fact that the conservation mountain area, natural green area, and water system may distort the average surface temperature by lowering the average value for each dong. It is used to create a map, and comparatively analyzes Temperature(Air/Surface) data and heat island intensity for administrative districts with three or more S·DoTs.

<Figure 2> Spatial range excluded from the study

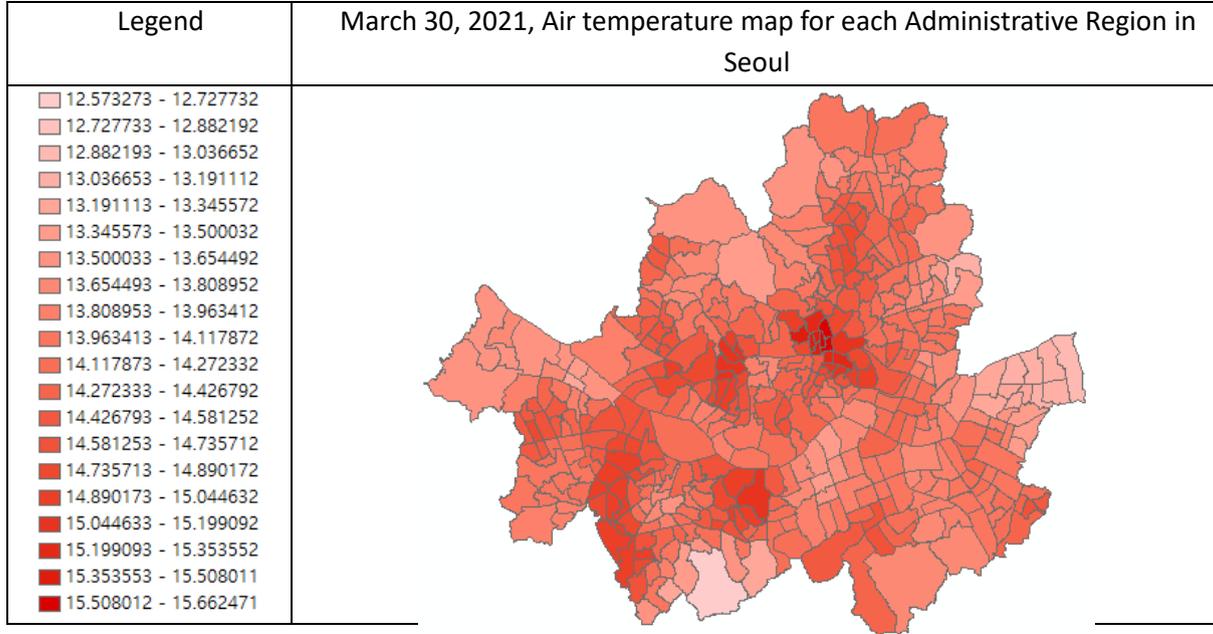


3.2 S·DoT air temperature calculation

In order to produce an urban heat island map, first, data from March 30, 2021 are collected through the Seoul Open Data

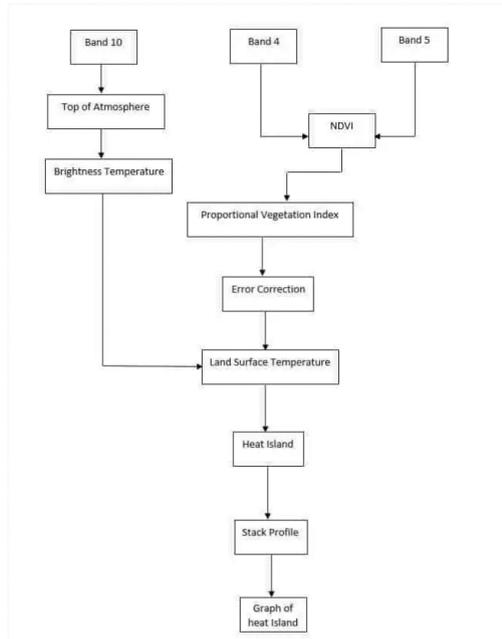
Plaza. Data processing and integration were performed using Microsoft Excel and ArcGIS programs. Second, for the reliability of the previously collected temperature data, it is corrected by deleting data showing no change in the data value for a certain period of time or showing a large difference when compared with other points. Third, ArcGIS calculates the temperature at the same time of the video data of Ladnat8 on March 30, 2021, excluding the water system and green areas, and uses the Kriging interpolation method to produce an air temperature map for each administrative building.

<Figure 3> Air Temperature Map Using S-DoT



3.3 LANDSAT Surface Temperature Calculation

<Figure 4> LST(How to calculate the surface temperature)

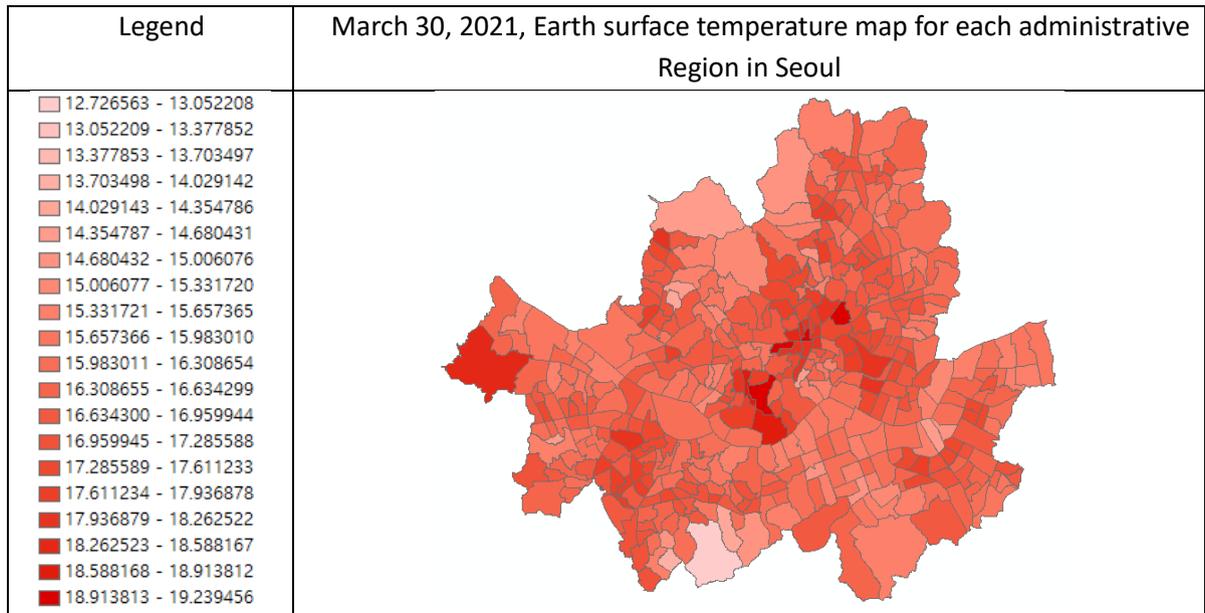


To extract data using satellite images, programs such as ENVI and GIS can be used. In this study, Arcgis 10.4 was used and the “Raster Calculator” Tool was used to calculate the surface temperature. In this study, we applied the automatic mapping

algorithm introduced by (Avdan, Jovanovska, 2016) because the other approach is much more time-consuming and more susceptible to false estimates to obtain surface temperature (LST) values from the Landsat-8 satellite at 30 m spatial resolution. was calculated.

In the same way as the air temperature map for each administrative dong, the surface temperature map for each administrative dong is produced using the surface temperature except for the water system and green areas.

<Figure 5> Surface Temperature Map Using Landsat 8



4. Comparison of Temperature(Air/Surface) of S·DoT and Landsat8 and comparison of heat island intensity

4.1 S·DoT heat island intensity calculation

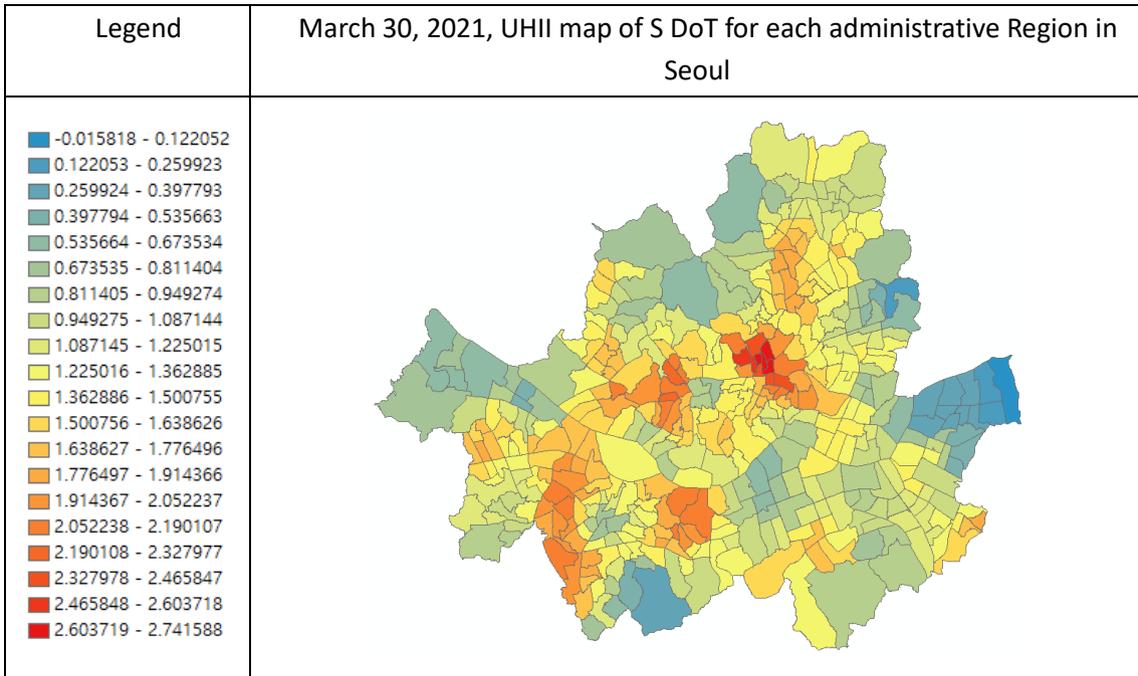
In order to calculate the heat island intensity of S·DoT in Seoul, it is first necessary to collect temperature data in the suburbs of Seoul. Since S·DoT is only operated in the Seoul area, average temperature data was collected by selecting the National Weather Service (AWS) data operated by the Korea Meteorological Administration for temperature data in suburban areas. In this study, the heat island intensity was calculated using Equation 2, which is the difference between the average temperature of each point and the suburban temperature.

Second, using the calculated heat island intensity, a heat island intensity map was produced using the Kriging interpolation method in the same way as the temperature and temperature map production method. After ArcGIS using ArcGIS Raster to point tool, the interpolated Seoul zeal intensity value the s wase a made point by cell unit. ArcGIS using the Spatial Join tool, was combined with the map of administrative dong in Seoul to produce an average map of heat island intensity for each dong.

<Table2> Urban heat island intensity calculation equation

Division	Formula	Note
Equation 1	$\Delta Tu-r = Tu(a)-Tr(a)$	Tu(average) =Average temperature of Seoul branch Tr(average) =Suburban point average temperature
Equation 2	$\Delta Tu-r = Tu-Tr(a)$	Tu =Seoul branch temperature Tr(average) =Suburban point average temperature

< Figure 6> S-DoT heat island intensity map

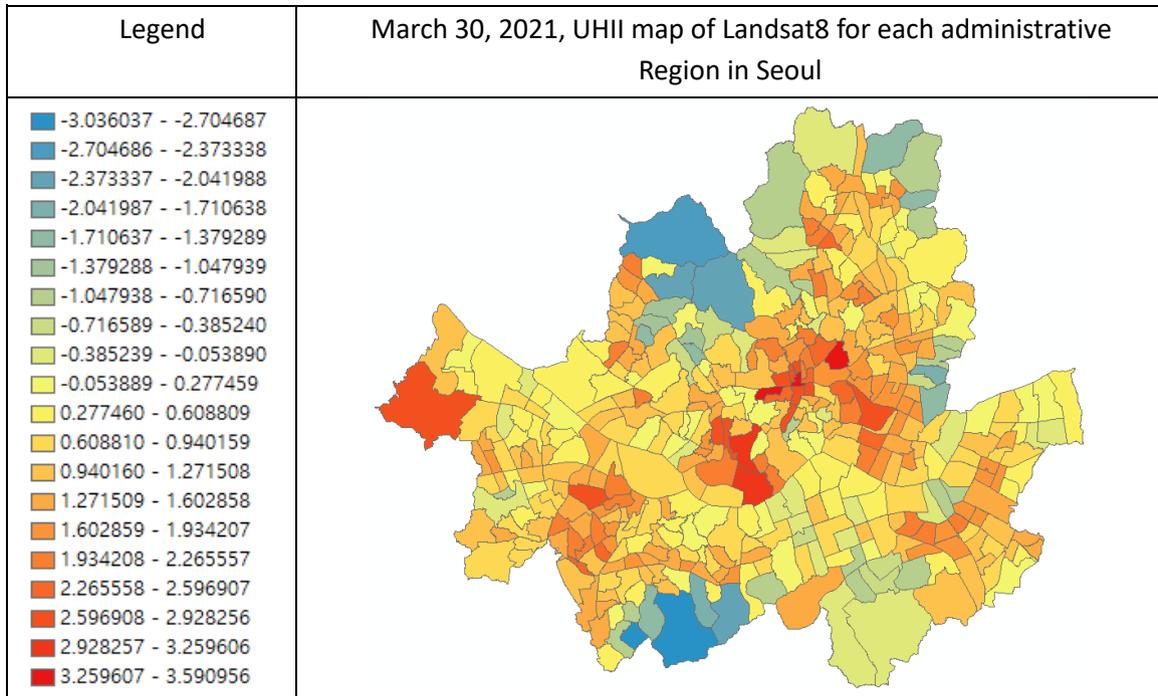


4.2 Landsat8 heat island intensity calculation

To calculate the heat island intensity of Landsat8 in Seoul, first, to collect the same suburban temperature as S-DoT, use the Arc gis Buffer tool to calculate the average distance of each AWS point from the center of Seoul to set the suburban range Suburban LST was collected. And the heat island intensity was calculated using the same urban heat island intensity calculation formula as S-DoT (Table 2). ArcGIS, using Arcgis' Raster to point tool, Seoul's heat intensity values were pointized in cell units. Third, using Arcgis' Spatial Join tool, it was combined with the map of administrative dong in Seoul to produce an average map of heat island intensity for each dong.

In this study, green areas such as urban nature parks and bojeon mountain areas and the water system of the Han River can be distorted by lowering the average value when calculating the average surface temperature for each dong. were excluded from this study.

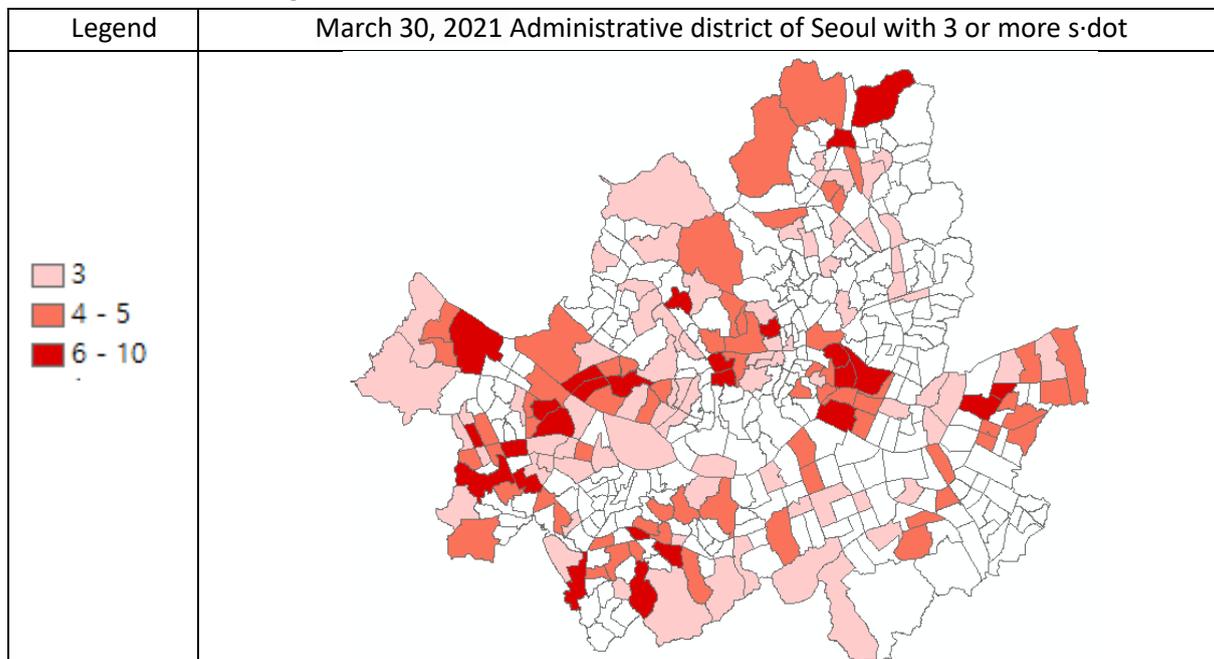
< Figure 7> Landsat8 heat island intensity map



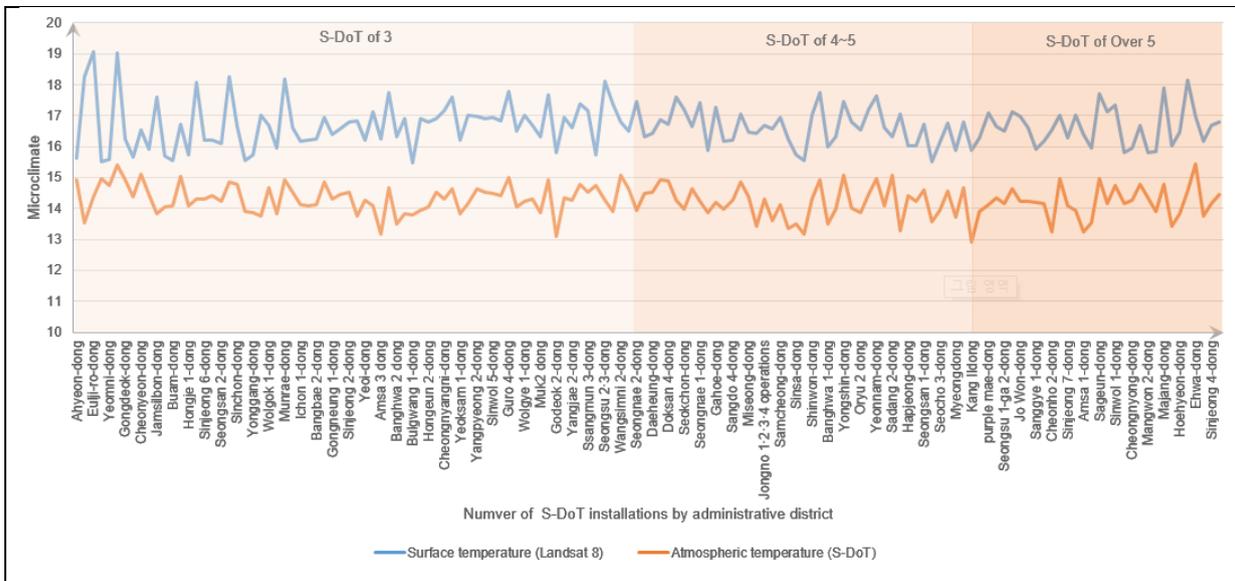
4.3 Comparison of S·DoT and Landsat8 Temperature(Air/Surface) data and heat island intensity

For an empirical and sophisticated comparative analysis, administrative districts with three or more S DoTs were used, and the temperature and heat island intensity were compared for a total of 144 administrative districts.

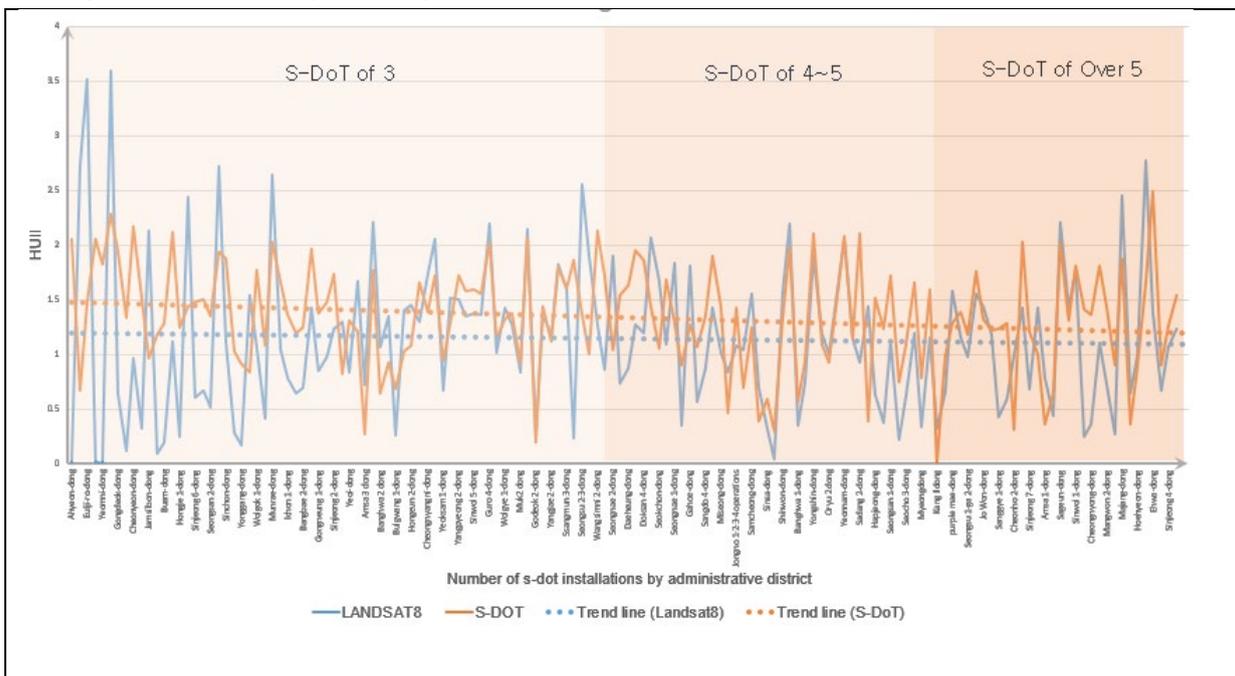
<Figure 8> Administrative district of Seoul with 3 or more s-dot



< Figure 9> Temperature(Air/Surface) Comparison by Administrative Region of Seoul



< Figure 10> UHII Comparison by administrative district of S·DoT and Landsat 8



First, Temperature(Air/Surface) data of S-DoT and Landsat8 were examined. In the case of Landsat8, the difference between the Seoul temperature and the suburban temperature was about 0.15°C, whereas in the case of S-DoT, there was a large difference of 0.87°C or more. In addition, the air temperature (S-DoT) and the surface temperature (Landsat 8) showed a difference of about 2.4°C, and as the number of S-DoTs increased, a similar pattern was shown.

Second, the heat island intensity of S-DoT and Landsat8 was compared. The heat island intensity of S-DoT ranges from 0.08 to 2.74, while that of Landsat8 is -2.77 to 3.59, showing a large difference in heat island intensity of 0.85. Also, <Figure 10> The heat island intensity of S-DoT and Landsat8 was compared according to the number of S-DoT. The difference in thermal island strength at the point of three S-DoTs is 0.22, and the difference in thermal island strength in administrative districts of four S-DoTs is 0.17. Also, looking at the heat island intensity regions of S-DoT and Landsat8, Jongno, the center,

and Yeongdeungpo Guro, where industrial areas are densely concentrated, were found to have the same high heat island intensity in S·DoT and Landsat8 as well. However, in the case of the airport building where the airport is located, S·DoT showed 0.67 and Landsat8 showed 2.72, showing a difference in heat island intensity of 2.05.

5. Conclusion

In order to specifically analyze the urban heat island phenomenon that is becoming serious with abnormal weather changes in Seoul, this study attempted to compare and analyze the Temperature(Air/Surface) and thermal island intensity of urban data sensors (S·DoT) and Landsat8. To this end, air temperature maps and surface temperature maps were produced by collecting temperature data from S·DoT and video data from Landsat 8 satellites on March 30, 2021, and heat island intensity maps were produced using national weather observation (AWS) data from suburban areas. Through this, the difference was investigated by comparing and analyzing Temperature(Air/Surface) data and thermal island intensity, and the following conclusions were obtained.

First, As a result of examining the data of LANDSAT8 and S·DoT, in the case of LANDSAT8, the temperature in Seoul and the suburbs showed a difference of about 0.15°C, whereas in the case of S·DoT, there was a large difference of 0.87°C or more. This can be seen as the difference between the measurement environment and installation location of S·DoT and AWS. The installation location of the S·DoT is installed at a height of about 3m to measure the temperature in the area directly affected by the urban environment, while the AWS is located on the roof, so it is judged that the temperature is slightly lower than that of the S·DoT. Also, as a result of examining the Temperature(Air/Surface) data of S·DoT and Landsat8, the temperature difference was about 2.4°C. This appears to be the difference between the surface temperature and the air temperature.

Second, the result of comparing the heat island intensity of S·DoT and Landsat8 according to the number of S·DoTs, the difference in heat island intensity was 0.85. The difference was 0.22, and the difference in the heat island intensity of administrative buildings with 4 or more S·DoTs was 0.17. Through this, it could be seen that the trend of heat island intensity according to the number of installed S·DoT was getting closer, and the possibility of using S·DoT could be seen. Also, looking at the heat island intensity regions of S·DoT and Landsat8, Jongno, the center, and Yeongdeungpo Guro, where industrial areas are densely concentrated, were found to have the same high heat island intensity in S·DoT and Landsat8 as well. However, in the case of the airport building where the airport is located, S·DoT was 0.67 and Landsat8 was 2.72, showing a large difference in heat island intensity of 2.05. This is judged to be a difference according to the number of installed S·DoT.

This study is meaningful in that it presented basic data for the study by producing a heat island intensity map using high-density S·DoT to understand the degree of urban heat island and extracting more sophisticated urban heat island areas compared to Landsat8. In addition, it is significant that the feasibility of using S·DoT was presented by more empirically comparative analysis of the heat island intensity of S·DoT and Landsat8. Even with these results, the following limitations exist. In the case of S·DoT, there are disadvantages in that data builders have to arbitrarily judge errors and because temperature interpolation is performed between points due to the limitations of the Arc GIS spatial interpolation method, it is necessary to pay attention to the selection of an appropriate interpolation method according to the target area and data distribution. In addition, there are administrative buildings with a large difference in heat island intensity even at a point where the number of S·DoT is large, which seems to be due to device errors and installation locations. Based on this study in the future, it is necessary to study concrete solutions to the urban heat island phenomenon by using S·DoT data for additional periods and regions.

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TOWARDS A TOPOLOGY OF PLANNING THEORIES – RE-ORGANISING PLANNING KNOWLEDGE IN THE 21ST CENTURY

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1. Spatial planning as a discipline

Planning is an iridescent term. A glance at the literature shows how diverse the term planning can be understood, for example as state action, as spatial distribution of different zones or infrastructures, as governance arrangements of different actors, or as civil society engagement for the common good, and many more. Planning practice is defined accordingly in abstract terms in the literature: Planning as "linkage between knowledge and organised action" (Friedmann and Hudson, 1974, p. 2), i.e. connecting knowledge and action, or as an attempt to control the future ("planning as future control", Wildavsky, 2018, p. 128) or "planning activity as practice of knowing" (Davoudi, 2015, p. 317). Gunder (2010, p. 299) described planning as the ideology of how we define and use space, whereas Brooks (2019, p. 9) understands planning as the process by which we try to shape the future. These and other definitions do have in common a strong orientation towards the future (i.e. it is not just a description of the present), which is accompanied by a direct normative orientation towards action. As Alexander (2016, p. 92) already noted, the problem with all these definitions is not that they are not true, but rather that they are too abstract for a definition. These definitions are hardly sufficient in narrowing down what is (and especially what is not) meant by the term spatial planning. It is undisputed that the future orientation of spatial planning undermines a concrete analytical understanding, "the object of planning, future action, routinely involves the unique and novel" (Forester, 1982, p. 3). Nevertheless, or perhaps rather because of this, it is essential to explain the underlying understanding of planning.

However, our respective understandings of planning are dependent on our theoretical perspectives, shaping our reality(ies) and perceptions, determining our problems and solutions, and how society deals with it. In this process, theories serve as lenses, as glasses through which we grasp the world out there, make it tangible and discussable, cast it into constructs of realities and define all our assumptions. One of the profound experiences in dealing with planning theories has been the realisation that these theoretical lenses can be changed, so that at one time spatial distribution issues are in the

foreground, at another time the actors behind them and their possibilities for action. What changes by switching the perspective is all-encompassing: the problem definition, the approach to the solution, the methods and forms of knowledge selected, the possible aims to be achieved, and not least the fundamental understanding of what we call spatial planning. It is therefore all the more astonishing that in many discussions and publications it is precisely the study of planning theories that is degraded as being of little benefit to practice (Alexander, 2016, p. 95).

With this article, we engage to contribute to a re-organisation of knowledge for planning in the 21st century. Numerous challenges, be it the impacts of climate change and adaptation and mitigation strategies, or societal polarisation and the question of appropriate decision-making, require an accessible planning knowledge to be combined in interdisciplinary contexts as well as transdisciplinary research questions with society. Therefore, we urgently need to restructure our planning knowledge for a fundamental integration of spatial and planning perspectives on these challenges, but also its paradigmatic limitations and blind spots. First, we introduce a novel systematisation of planning knowledge according to the specificity of future orientation in planning knowledge (section 2). In the following we investigate a systematisation of multiple levels of planning theories according to their action orientation (section 3). In section 4 we present the entire Topologie of Planning Theories based on the relation of different planning theories towards each other in the knowledge field with different ontological and epistemological orientations. In concluding remarks we reflect upon this systematisation and explain the benefit from this re-organisation of planning knowledge.

2. Systematicity and knowledge in planning

But what do we mean by systematisation? At the core of this is the question of how planning knowledge can be grasped, how it can be distinguished from everyday knowledge, and how it can be justified. Following Hoyningen-Huene (2013), this is a question of the systematicity of knowledge. If knowledge is systematised within a discipline, we can speak of a scientific area of study - in distinction from the largely unstructured everyday knowledge. The extent to which spatial planning actually constitutes such a scientific field or not is controversially discussed (Behrend/Levin-Keitel, 2020). As shown, spatial planning and its understandings are diverse, as are the theoretical perspectives that can be taken on it. Systematisation of theoretical approaches generally helps to identify and relate essential differences but also commonalities of single theories. Comparable to a matrix or a fabric of knowledge, the purpose of systematisation is not to separate and exclude individual theoretical contributions, but rather the basis of any science for orientation and directions in the field of knowledge. Existing systematisation in the field of planning theories - like the divide into substantial and procedural theories by Faludi (1976) or the temporal differentiation in generations or historical phases (Rittel and Webber, 1973) - turned out to be useful as analytical categories, but less helpful in deepening planning theories focussing primarily on actions or on knowledge that is directly linked to actions (Alexander, 2001; Alexander, 2016; Amin and Roberts, 2008; Dalton, 2007). However, as Phil Allmendinger (2002, p. 96) results: *“Planning theory now has a diverse and fragmented landscape. The need for a typology to help organize and explain these positions in relation to different schools of theory, other disciplines and planning practice is as necessary as ever.”*

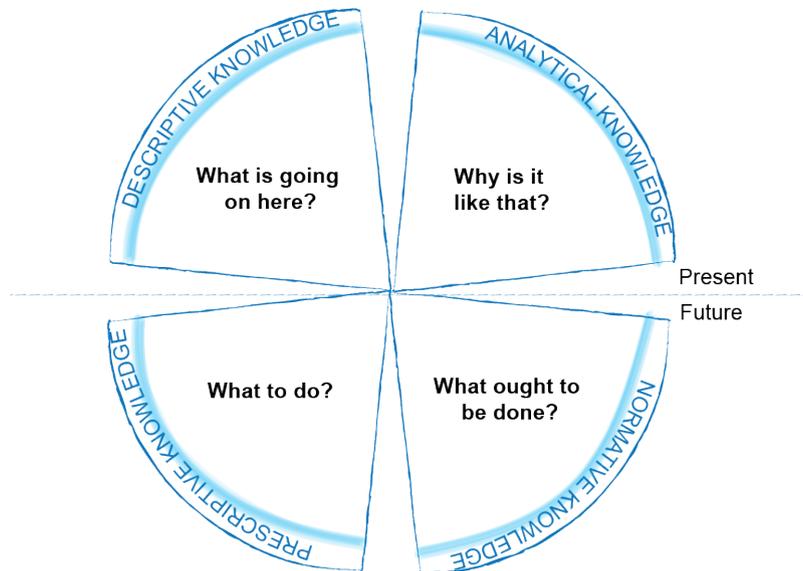


Figure 1: Different forms of present and future oriented knowledge in planning (own illustration)

What constitutes planning varies depending on the knowledge claims to current realities or future imaginings (Rydin, 2007; Campbell, 2012; Davoudi, 2015). A critical reflection of these forms of knowledge lead to conclusions regarding its ontological positions and the already mentioned action orientation towards a wishful future: knowledge about the present is not the same as knowledge about the future (fig. 1). The distinction between knowledge about the present state and the future causes a key misunderstanding between planning practitioners and academics: According to Campbell (2012) planning practitioners expect improvements in terms of the present - and accordingly what should be done right now. Knowledge concerning the future, on the other hand, is much more normative and able to question current practices by changing perspectives - but there is little research on this (Campbell, 2012, p. 138), and reveals the difficulty of translating such findings into practice. Important to understand about these different forms of knowledge (knowledge about the present and about the future) is the inherent differentiation along their action orientation and direct translation into practice accordingly.

3. The multi-levels of planning theories

To advance the discussion, we give a contribution based on the characteristic starting point of the orientation of planning knowledge towards the corresponding action field planning (practice): The Topology of Planning Theories. The topology, in contrast to a typology, does not aim to identify individual types and distinguish them from each other as sharply as possible. On the contrary, the aim of topology is rather to locate single theories in relation to each other in a field of scientific knowledge. For instance, communicative planning theory represents a way in which planning and planning processes are to be understood and exercised as a social task, while incrementalism, for example, has a much stronger reference to action and is directly action-guiding. The peculiarity that planning sciences, compared to other disciplines, always exhibit a high degree of action orientation and that this is simultaneously reflected on different theoretical levels serves as a first differentiating feature in the Topology of Planning Theories (fig. 2): Planning as an expression of a society (social theories) on a macro level, planning as an expression of a specific activity and task in a society (holistic planning

theories) on a meso level, and planning action as an expression of specific activities to influence or control the future (action oriented theories) on a micro level.

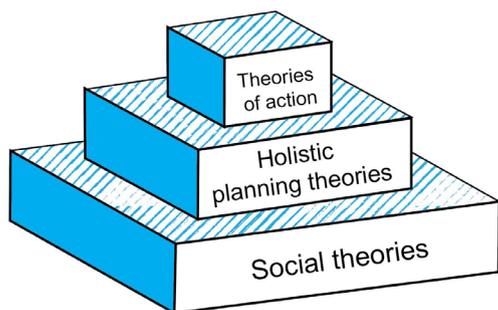


Figure 2: Multi-levels of planning theories (own illustration)

3.1 Grand theories based in social sciences (social theories)

Planning theories that stem or can be derived from a changed understanding of society (and the state) are referred to as social theories in the Topology of Planning Theories. In planning science, social theories serve to represent the embedding of planning in an overall social system. Strongly influenced by normative knowledge elements, the question here is how we want to live as a society. Social theories try to capture central features of society in concepts. For instance, the capital-critical ideas of Marxism determine a fundamentally different role and understanding of spatial planning than the discourse ethics of Habermas. At the same time, social theories are always a source of inspiration also for the planning sciences and planning itself, in its task as a public authority to help shape societal challenges - e.g. ideas about the city of tomorrow. Usually, social theoretical approaches are only partially transferred to the field of planning sciences, according to the principle of "best fit" or "pick and choose". Planning theories tend to be embedded in these social theories, or build on them as a fundamental understanding (as underlying level of the pyramid). What is challenging here is the often utopian character of social theories, such as what a Marxist state should look like and what role planning should then play, or how consensus-oriented planning should also be implemented in politics (discourse ethics).

Social theories are relevant to the planning sciences for several reasons: First, they describe the society or a utopia of it in which planning processes are organised and institutionalised. Depending on the reference to a social theory, the goals, contents and methods of public policy therefore also change. Thus, against the background of discourse ethics (Habermas), decision-making processes differ significantly from rational planning processes - especially with regard to participatory approaches or the social legitimisation of decisions. Second, following on from this, social theories have an influence on the definition of the tasks of planning. They influence attitudes, values and self-conceptions of the individuals who are socialised in this society, all within planners.

3.2 Holistic planning theories

Holistic planning theories attempt to describe planning as a holistic practice and to grasp it as an overall construct. These theories try to understand spatial planning as an agglomeration of actions, but without giving too much normative orientation. Rather, they are decisively based on descriptive knowledge. This is based on the idea that systems and their properties are to be considered as a whole and not only as a composition of their parts. Although planning and its practices are analysed in subcategories, planning as an institution, practice and action cannot be fully understood from the interaction of its individual parts. This requires a superstructure, i.e. strategy in strategic planning or culture in planning culture. The holistic claim of holistic theories results from the attempt to analyse and understand planning as such, with a certain frame (or lens). Either cultural theory or strategic management theory frame planning as such and identify cultural or strategic elements to describe planning practice. Fig. 2 shows that this meso level of planning theories builds on social theories, but does not contain any concrete recommendations for action due to its holistic approach.

In this context, holistic planning theories make an important contribution to planning science in many respects: First, holistic planning theories are neither utopian in character nor directly action-related, but refer to descriptive-analytical forms of knowledge about spatial planning. Some holistic planning theories also serve as a means of critique of existing planning practices or approaches. For instance, while the analysis of planning cultures in different European planning systems reveal the structural and institutional differences in how planning is constituted, the wider impact of planning cultural practices can be understood and explained in conjunction with cultural interpretation and understanding of roles. Second, it is striking that these holistic perspectives of planning can be identified predominantly in retrospect. Through retrospection, actors, actions and processes can be traced, but a form of controllability of the future is rarely involved. Thus, the claim of communicative planning can be exemplified in past planning processes, or planning cultural configurations can be identified, but a direct controllability of the future is not depicted in these planning theories.

3.3 Action-oriented planning theories

Planning theories that provide concrete guidance for action are described in the Topology of Planning Theories as theories of action. They describe the procedure of planning in concrete planning steps, phases and processes. Planning theories that can be read more or less concretely as instructions for action are decisively based on regulative knowledge for controlling planning processes. Starting from the rationalistic approach of synoptic planning, some of the approaches have been further developed as a critique of it, as a reality check of rationalist planning, so to speak. Theories of action translate theoretical frameworks into concrete instructions for action. In doing so, the theoretical framework is not directly defined with it, one can rather think of it as the underlying social theory and the holistic understanding of planning embed the framework for the concrete planning tasks, but do not deterministically prescribe the course of action: thus, incremental planning, i.e. planning step by step, is based on the holistic idea that planning functions as a political process. Then planning as a political process provides the basic understanding, and incremental planning translates this into concrete guidance for action.

This micro level of planning theories points out how the future could be planned and foreseen. They are characterised by their more or less action-guiding nature, focused on practices. It is about how planning processes can be carried out and

in most cases implies a narrow understanding of planning, the public authority planning. This becomes clear in the synoptic planning model or in incremental planning theories such as muddling through. A crucial characteristic is the orientation towards process designs, cycles or linear. Their differentiation according to linear process steps or circular, less linear processes with learning loops, is merely important for the internal distinction. Due to the degree of concretisation, these theories of action prove to be very useful for planning practice and in the teaching of planning sciences.

3.4 The field of planning knowledge

This first order systematisation of planning knowledge along the specific action-orientation allows a specification of the object of knowledge, either societies as such, planning within societies or planning as concrete and precise steps of implementing normative ideas of a desired future (multi-levels of planning theories, fig. 2). In a second order systematisation these theoretical pyramids can be located in the field of planning knowledge (fig. 3). Or, in other words, the pyramids of theoretical levels in planning sciences have different positions within the field of planning knowledge. Whereas the field of planning knowledge is described primarily in terms of the respective being of the planning theory, i.e. what constitutes the inherent understanding of planning, in terms of knowledge, i.e. what the planning theory can know and recognise as knowledge, and in terms of the degree of normativity, i.e. what planning should do. Each of the three dimensions of scientific theory are inherent parts of planning theories and enable differentiated positioning in relation to other theories and scientific approaches. The three dimensions are closely linked in the theories and often result from each other, for instance a consideration of future-relevant knowledge always plays on a strong normative orientation, because the desired future is already a valuation: whether it is the green city or the smart city vision. The dedicated aim of locating theories in the field of planning knowledge is to present the perspective of the respective theory, its inherent knowledge, its opportunities, but also its limitations. The location in the field of planning knowledge is decisively determined by the question of the extent to which several realities are recognised and how they are dealt with (ontological dimension). Ontological questions deal with a number of basic questions, e.g. about existence, being and becoming or reality. In relation to planning theories, basic ontological positions become interesting when it comes to the recognised realities, i.e. planning practices. Questions of this dimension refer to which realities are (not) recognised in the respective understanding of planning, how spatial planning deals with other realities and who, how and what is planned. What is decisive is the being of planning and the recognition of other (planning) realities and practices. Three different manifestations of theory can be derived in its pure form, rationalist planning theories (assigned to (ontological) realism), critical realism (based on critical perspectives of a joint reality at least) and constructivist planning theories (based on social constructivism). The shape of planning theories thus reflects the relationship between built space or technology - i.e. a plannable reality - and individual or social behaviour or societal consequences. Classically, theories of rationalist planning and communicative planning are often described as paradigms in planning sciences, and describe two extremes in the continuum of one and several realities recognized.

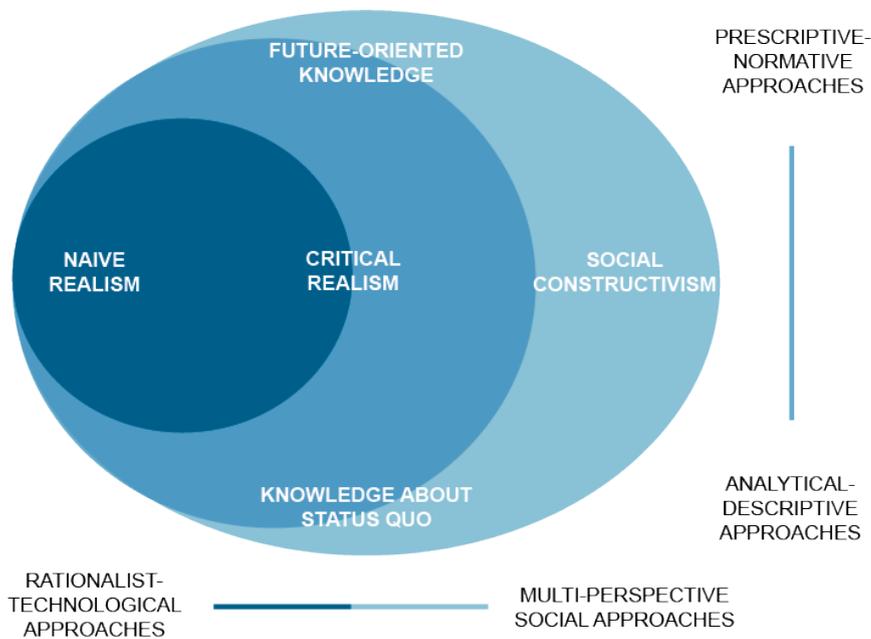


Figure 3: Field of planning knowledge (own illustration)

Naive Realism in planning theories: If the theory assumes one single reality that is measurable and sufficiently describable, the respective planning theory is located in the realism realm and emphasises a rationalist understanding of planning. Here, the planner collects all available and required information and argues with the help of (apparently objective) logic towards a decision. It is the ratio, i.e. an intellectual performance, on which decisions are made and which legitimises them. For this, the bases must be as objective and clear as possible; calculations and measurements are particularly suitable, such as density, accessibility, or socio-demographic surveys, which can usually be expressed in numbers. The ontological shape reveals itself in the question of what reality is represented and in particular how the desired future can be (objectively) described and made measurable. In terms of content, a rationalist perspective is expressed in theories such as the 15-minute city or spatial types according to population density. While the former is based on findings of accessibility and can thus be measured in terms of distances and time required, the latter is due to the subdivision of urban and rural areas according to population density.

Social constructivism in planning theories: Planning theories introduce further perspectives on reality that go beyond one's own perception of a reality and require dealing with it. The planning theories that can be classified here - and this includes the majority of modern and postmodern planning theories - require dealing with different constructions of reality and strongly understand planning as a social process of negotiating different constructions of reality. These are represented by planning theories such as communicative planning, which involve a multiplicity of actors and thus realities that uncover these realities in joint processes and must be taken into account in planning. Here, the degree of recognition of these multiple realities varies from an acknowledgement to a development of a common reality as a basis for decision-making and planning. In terms of content, theories such as Spatial Justice should be mentioned here, which refer to social justice issues and different constructions of reality. Methodologically, these need to be captured and discussed socially, in participation procedures and joint learning and decision-making processes.

Critical realism in planning theories: The position of critical realism assumes that a real world exists and can be explored and experienced. Unlike naive realism, however, critical realism recognizes that the world is not immediately and directly recognizable through human perception, but is significantly shaped by human cognitive processes. For planners, it follows that all perceptions must be critically examined and the respective fallibility of perception by human senses must be addressed. In many cases, it cannot be conclusively clarified whether a perception is right or wrong, but instead it must be made transparent that such a final decision often cannot be made and that there is at least the possibility that a perception considered to be true or right can nevertheless be wrong. This makes it all the more important to explain the foundations and assumptions on which decisions and strategies are based.

4. Concluding remarks

With the Topology of Planning Theories, we establish a denser interlocking of planning theory with regard to its theoretical presuppositions and its reference to action than has been the case so far. In previous approaches to systematising planning theories, dichotomies are usually opened up, as in the comparison of substantive and procedural theories. As fruitful as simplification and demarcation can be at the theoretical level, it does not adequately reflect the interrelationships in practice and does not do justice to the interconnections in theory. As already indicated, not only do the different understandings of planning already reveal epistemological positioning (e.g. with the question of how many realities are recognised), but the dimensions of knowledge contained in planning theories also play a fundamental role for the basic theoretical assumptions. Building on a detailed presentation of both the scientific-theoretical foundations (realism and social constructivism, etc.) and the types of knowledge in planning (future and present, ethical-normative orientation, etc.), we have developed a tool for clearly presenting these basic assumptions and thus inherent potentials and limitations of individual theories - especially in their relations to each other, in the theoretical field of planning knowledge.

The presented Topology of Planning Theories, introduces a systematisation that reduces the theories in planning to their basic components. With the attempt to break down the different epistemological aspects of planning theories and thus to describe theoretical fields in planning science, modes of operation and claims to validity of the theories are made explicit and existing dichotomous representations are at least weakened. This is explicitly not a typology, i.e. the consideration of typical features constituting a certain class or category, but a topology, which relates the considered aspects to each other (in this case planning theories with regard to their ontological and epistemological basic assumptions). The different levels of planning theories presented at the beginning of section 3 (the pyramidal structures) can be positioned in the field of planning knowledge, thus emphasising their relations to each other. Basically, the Topology of Planning Theories provides a framework to deal with the presuppositions of planning theories and their respective concrete elaborations through theories of action. Therefore, the links between the different theories become clear. The Topology of Planning Theories nevertheless contributes significantly to a dismantling of implicit systematisations of planning theories and reveals the interrelations of planning theories with each other, according to their inherent knowledge than has been achieved in previous systematisation approaches.

Lastly, the Topology of Planning Theories represents a reordering of knowledge for planning in the 21st century. Numerous challenges, be it the impacts of climate change and adaptation and mitigation strategies or societal polarisation and the question of appropriate decision-making, require a rethinking and reorientation of planning approaches. To realise this, an

ontological turn in planning science is needed. The focus on what constitutes planning is a necessary preliminary step to successfully turn off at the bifurcation described above. Only in this way can the urgently needed foundation be laid, which is necessary for the theoretical considerations. Before forms and sources of knowledge are discussed and normative implications debated, conceptual clarity must be established and the respective understanding of planning made explicit. The Topology of Planning Theories is an important first step in this process. It enables a systematic presentation of different approaches to planning theory, which often stand side by side on an equal footing and are compared with each other, even though, they have different goals and practical orientations. In this respect, the Topology of Planning Theories should not be seen as the solution to the problem, but as a preparatory part of potential pathways for thinking. It is an instrument to disentangle and order the different threads of planning theory. Building on this, further theoretical considerations can then be made, which should contribute to an authoritative understanding of spatial planning.

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ROOM FOR UNCERTAINTY IN INFRASTRUCTURE PLANNING

HOW CONTINUOUS CERTAINIFICATION BY DECISION MAKERS RESULTS IN MORE UNCERTAINTY

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Dealing with uncertainty: a struggle for decision makers

Infrastructure planning is increasingly confronted with a dynamic environment and an engaged society. This necessitates decision makers to interact with their environment, resulting in the adoption of adaptive and participative planning approaches such as combined infrastructure and (organic) area development (De Roo et al., 2020). Giving room to stakeholders and to unforeseen developments implies incorporating uncertainty in planning and decision making and increases the complexity of planning. In current infrastructure planning, decision makers seem to struggle to find a balance between giving room to uncertainties on the one hand, and keeping the decision-making process manageable on the other hand. This often results in attempts to reduce uncertainties, in 'certainification' (Van Asselt et al., 2007; Klijn & Koppenjan, 2016). This focus on certainification prevents adaptive and participative approaches in planning from reaching full maturity (Hajer et al., 2010; Albrechts, 2012).

This paper is based on a recent study (Veenma, 2021) and aims to provide a better understanding of how decision makers in practice deal with uncertainty in their interaction with other actors. The term 'decision makers' refers to elected administrators as well as policy officers who support these administrators in the preparation and implementation of policy. This paper focuses specifically on area-oriented infrastructure planning – i.e., infrastructure projects explicitly designed to improve the quality of a local area (Arts et al., 2016; Heeres et al., 2012). By studying the planning and decision-making process in area-oriented infrastructure projects in practice, insight is gained into the process of interaction between relevant actors in the decision making. Based on this, the research provides recommendations on how to achieve a better embedding of adaptive and participative planning approaches – and thus more 'room' for uncertainty – in planning practice.

Influencing decision making by dragging the policy problem

In our study, uncertainty is about the extent to which actors involved in a decision-making process *perceive* uncertainties. In line with Friend and Hickling (2005), three forms of uncertainty are distinguished – cognitive, normative and strategic uncertainty, i.e.: “uncertainties about the working environment”; “uncertainties about guiding values”; and “uncertainties about related decisions”. For practical reasons, we assumed in the study that individual actors belong to a group of like-minded actors, *advocacy coalitions* (Sabatier & Jenkins-Smith, 1993). These advocacy coalitions attempt to influence decision-making based on their shared values, causal assumptions and problem perceptions, their *policy beliefs* (Howlett

et al., 2009; Sabatier & Jenkins-Smith, 1993). The advocacy coalitions influence planning and decision-making by either reducing uncertainties (*certainification*), increasing uncertainties (*decertainification*), or accepting uncertainties, using one or more available instruments (their *policy mix*, Howlett et al., 2009). A *policy mix* consists of ‘substantive instruments’ (e.g., research) or ‘procedural instruments’ (e.g., participation). Based on Howlett (2018), a further distinction can be made between ‘authority instruments’ (e.g., political-administrative agreements) and ‘organizational

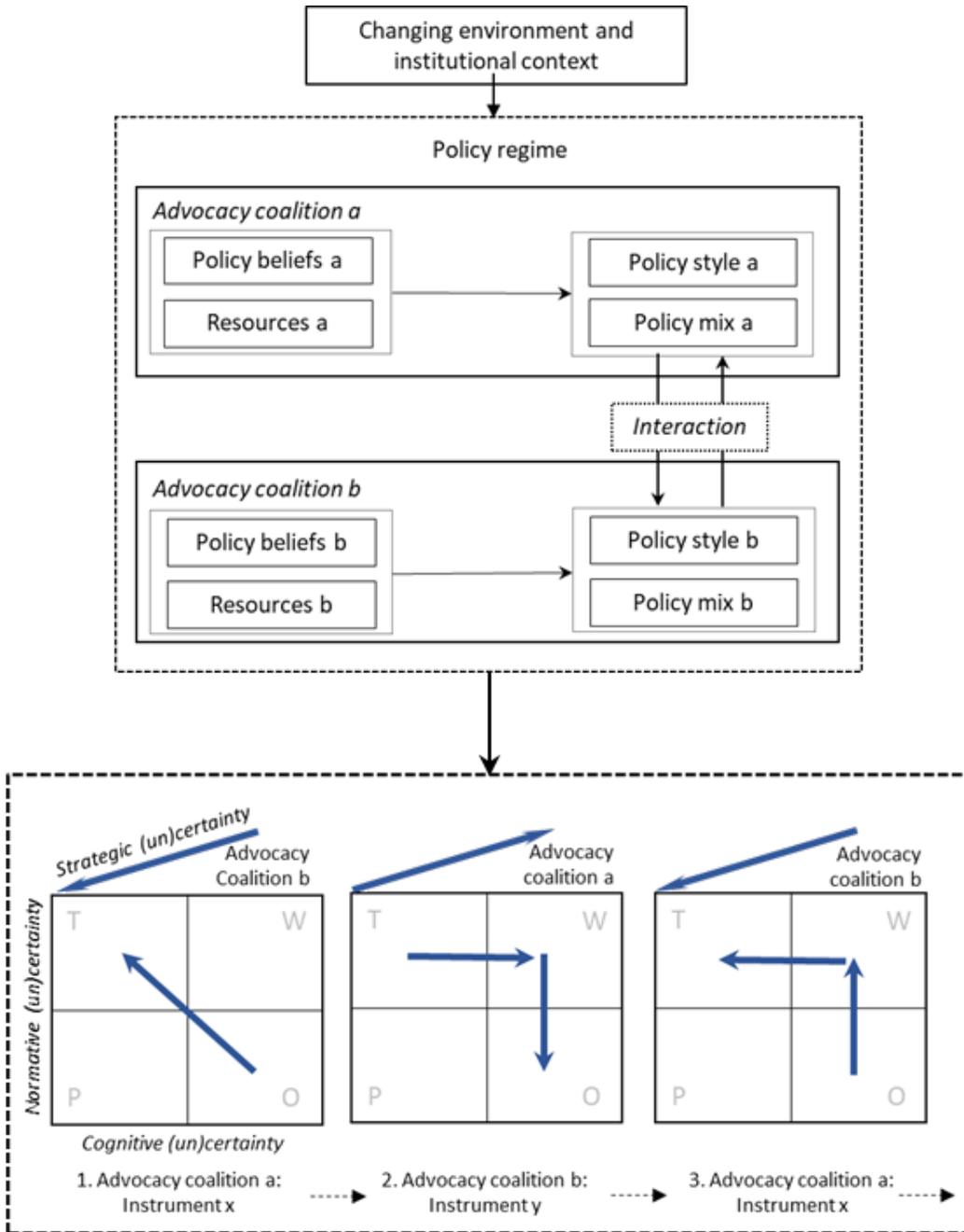


Figure 1 The theoretical perspective using an example with two advocacy coalitions (T, W, P and O respectively represent a technical, scientific, political and untamed policy problem)

instruments’ (e.g., area development). In the present study, it is assumed that the policy style and policy mix of an advocacy coalition are determined by the policy beliefs and *resources* (available instruments) of that advocacy coalition. The policy

beliefs, resources, policy mixes and policy styles of all advocacy coalitions in a policy area are called the *policy regime* (see top part of Figure 1), after Howlett et al.'s (2009) concept of 'policy regime' and Sabatier and Jenkins-Smith's (1993) 'Advocacy Coalition Framework'.

To analyse the dynamics in the decision-making process, a 2x2-matrix of four types of policy problems (see, for example, Christensen, 1985) was used. In line with Klijn and Koppenjan (2016) and Veenman and Leroy (2016), cognitive and normative (un)certainty were used as the dimensions (axes). To also place strategic uncertainty, a third dimension to the matrix was added. Actors (and their advocacy coalitions) may have an interest in presenting an issue as a technical, scientific, political or untamed policy problem in order to steer towards a specific approach of the policy issue (Turnhout et al., 2008). The attempts of actors (and their advocacy coalitions) to use their policy mix to increase, decrease or accept perceived uncertainties results in the 'dragging' of a policy issue within the 2x2 matrix (see for an example the lower part of Figure 1).

During the lengthy decision-making processes in infrastructure planning the environment will often change. This involves: *external developments*, such as an economic recession or climate change; and a changing *institutional context*, such as changing policy rules or an altered political constellation. Such changing environment may lead to a different approach in dealing with uncertainty by the actors and their advocacy coalitions (change of policy style and policy mix; see Figure 1).

A multi-case study research approach

To gain the aimed insight into the process of interaction between relevant actors and how they deal with uncertainty in the decision making in infrastructure planning, three cases were studied in-depth. According to Flyvbjerg (2001), the essence of social scientific research is to consider practice within the context in which it takes place. To this end, different perspectives – 'narratives' – on practice must be collected with an open mind, through interaction and dialogue with those involved. This has been elaborated in this study through a large number of stakeholder interviews (130) and validating focus group discussions. The interviews and discussions were complemented by an in-depth analysis of reports and recordings, policy documents, research reports and newspaper articles related to the cases.

For generalizing the research findings based on a limited number of cases, Flyvbjerg (2001, p. 77) recommends the study of 'critical cases'. Based on the criteria 'information-oriented selection' and 'maximum variation cases' (Flyvbjerg, 2001, pp. 78-79), the following three cases in the province of Overijssel in The Netherlands were selected (see Figure 2):

1. The upgrade of the provincial road N340 between Zwolle and Ommen. This upgrade originally started as part of the national 'Sustainable Safety' program (Duurzaam Veilig). Nowadays the upgrade of the N340 is presented as part of the Vechtdal Connection (Vechtdalverbinding), which also includes public transport and cycle paths.
2. The redevelopment of an airport runway and site as part of the area development Airport Twente. This redevelopment first focused on civil aviation and nowadays on realising a high-tech business park called Technology Base Twente.
3. A bypass of the river IJssel near Kampen as part of the national Room for the River programme, as well as part of the area development IJsseldelta-South, also including nature development and housing.

The decision-making process for these three area-oriented infrastructure projects was studied over a protracted period of 20 years, between 2000 and 2020. To analyse the interaction between decision makers and other actors in their dealings with uncertainty, the decision-making process was 'split' into a number of phases and, within that, into a number of steps. In each step, an actor (and his advocacy coalition) attempts to increase, decrease or accept perceived uncertainties using his policy mix: the policy issue is being 'dragged' within the 2x2-matrix.

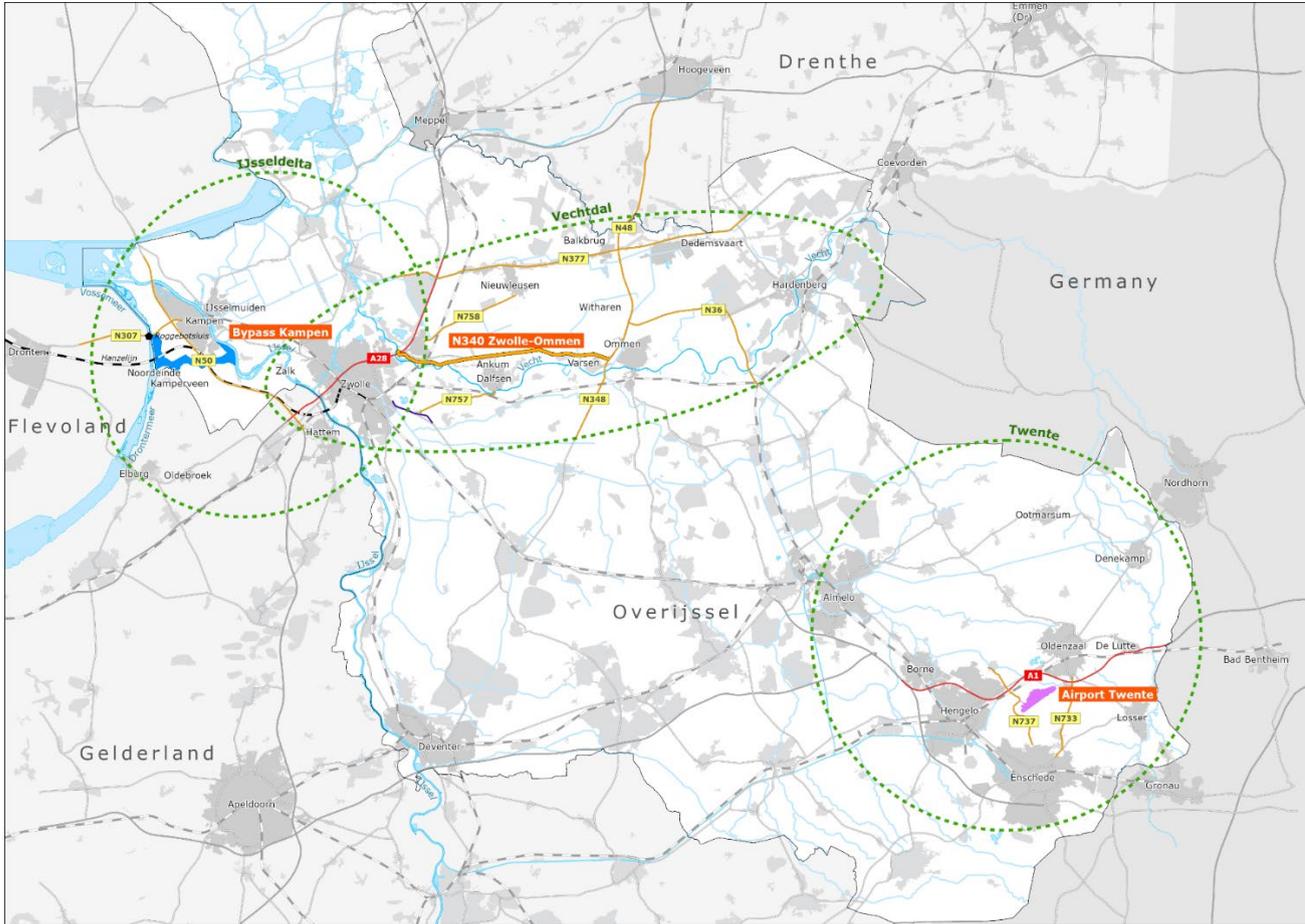


Figure 2 Overview map of the cases Bypass Kampen, N340 Zwolle-Ommen and Airport Twente

Patterns in dealing with uncertainty

In the decision-making process of all cases studied, three distinctive advocacy coalitions can be distinguished: an ‘economic’ advocacy coalition with policymakers who focused on economy and employment; a ‘green’ advocacy coalition of actors opposed to the proposed plan because of its environmental impact (‘opponents’); and an ‘ambivalent’ advocacy coalition of actors seeking a balance between economy and environment. In all cases, no agreement between these advocacy coalitions about the implementation of the infrastructure plan existed. As such, they all formed a *contested community* (Howlett et al., 2009). In this contested community actors and their advocacy coalition attempted to steer the decision-making process in the direction they wanted by using a dedicated mix of instruments: the policy issue was being ‘dragged’. The study reveals four main patterns in the interaction between decision makers and other actors (and their advocacy coalitions) in the ‘dragging’.

1. Certainification by decision makers leads to decertainification by opponents

Decision makers continuously strive for certainification during the (protracted) decision-making process, in particular by deploying authority-based, substantive instruments, such as institutionalized research. By this, as actors in the economic advocacy coalition, they especially intent to influence public representatives in the ambivalent advocacy coalition. From literature, however, it was expected that decision makers would also use process instruments, such as participation (see

e.g. Howlett, 2018), but in practice that proved not to be the case. Contrary to decision makers, actors in the green advocacy coalition ('opponents') attempted to increase the uncertainties that decision makers had reduced, in order to allow (their) alternatives to emerge. So, the action of certainification resulted in a reaction of decertainification. The harder decision makers tried to reduce uncertainties, the harder opponents tried to increase those uncertainties again. This was true for all the three cases. Various scholars have observed a similar action-reaction mechanism (see, for example, Klijn & Koppenjan, 2016).

The green coalition also seemed to focus on public representatives in the ambivalent advocacy coalition. So, in the studied cases both the economic and green advocacy coalitions competed for the favour of the ambivalent coalition to strengthen their respective positions. Interestingly, opponents used the same instruments as decision makers to increase uncertainties. Our study shows that this 'mirroring' of instruments occurs for all types of instruments, also for instruments such as area development (see point 2 below) and lobbying.

In the cases, decision makers did not seem to be aware of the potential impact of their choices in dealing with uncertainty. For example, the choice to use further research to reduce uncertainties, mostly led to a more severe discussion about figures and further polarization (a 'report war', Klijn & Koppenjan, 2016), even in the political arena. In the case of Twente Airport this ultimately led to a political-administrative crisis.

2. *A boomerang effect leads to problematic decision-making*

Our study shows that decision makers in their pursuit of certainification sometimes achieved the opposite – i.e. that uncertainty increased. This 'boomerang effect' occurred, for example, when decision makers initially included a restricted number of alternatives in the decision-making process (such as only 100km/h-variants for the provincial road N340), and public representatives or the EIA Commission decided that *the scope was narrowed* too soon. Widening the scope led to the problem that the arena of supporters and opponents of alternatives was then already set. As a result of this polarization, uncertainty increased and the decision-making process took extra time.

In using research as an instrument to reduce uncertainty, decision makers were also confronted with a boomerang effect. As stated in point 1, polarization was reinforced by the fact that more research led to more discussion about data. One of the underlying problems is that decision makers failed to take sufficient account of the *interrelatedness of the different kinds of uncertainty*. For example, policymakers failed to reduce cognitive uncertainty on the viability of an airport in Twente through research, because of the strong dependence with strategic uncertainty about the arrival of market parties.

Not only the interrelatedness between different kinds of uncertainty, but also the *interrelatedness between plan components* created a boomerang effect. In all three cases, decision makers tried to increase the support for their infrastructure plans – and thus to reduce uncertainties – by means of combining the infrastructure plan with area development. Or as Woltjer (2002) argued, area development as a 'public support machine'. However, the addition of area development increased the complexity of the decision-making, and hence increased uncertainty. For example, in the area development IJsseldelta-South opponents tried to prevent the bypass from becoming navigable by using nature regulations, in order to ultimately prevent a planned housing development.

3. *Decision makers strive for certainification over and over again*

When policymakers encountered difficulties with the use of authority-based instruments in their attempts to reduce uncertainty, they also deployed other instruments – in particular organization-based ones such as participation, area development and a more adaptive approach. By using these more 'open' instruments it appeared that more room for

uncertainty was created. However, in practice, decision makers also seemed to use these instruments to reduce uncertainties. For example, when stakeholders were allowed to have their say through participation, this occurred within strict conditions. In the IJsseldelta-South, participants were allowed to contribute with ideas about *variants* for the location of the bypass, but they were not allowed to introduce their own *alternatives* (like higher dikes). Conditions were set to control the participation process and ultimately to prevent uncertainties to increase. Participation was more focused on 'reaching consensus' instead of 'mapping out diversity' (Van Asselt & Rijkens-Klomp, 2002).

In line with this, also the concept of 'area development' was not used for an open planning process involving all relevant stakeholders. Instead, area development was added to the infrastructure plan to reach a package deal in the political arena (see point 2 above). In all three cases, the use of area development as instrument led to an 'area-oriented infrastructure plan' instead of an '(integrated) area development' (Leendertse, 2020). As a result, the decision-making process became more difficult, because of disappointed stakeholders and public representatives.

Even when policymakers explicitly incorporated uncertainties in their plans through an adaptive approach, they appeared to be prompted more by a quick start of the realization of the plan – and thus to reduce uncertainty, and less by the underlying philosophy of adaptive planning. For example, policymakers presented the bypass near Kampen as a 'robust, no-regret measure' in order to *directly* realize the bypass as part of the area development IJsseldelta-South.

4. *An adaptive approach by decision makers leads to certainification by other actors*

Interestingly, when decision makers actually did give room for uncertainties through an adaptive approach, *other* actors demanded more clarity and therefore less uncertainties. With an adaptive approach, policymakers gave leeway to respond to uncertain developments. Other actors were not always content with that leeway and preferred to have more clarity on the plan. For example, when the national government chose for a spatial reservation for a bypass near Kampen, in the future to be constructed depending on uncertain climate change effects (a nice example of an adaptive approach!), regional decision makers wanted more clarity on the consequences of that spatial reservation – especially for the planned housing construction in that area. Another example is the organic area development of Technology Base Twente. There were 'only' certain conditions within which this area development was given substance. Local residents wanted more clarity in advance about the type of companies that would establish themselves because of the consequences (such as noise pollution), and surrounding municipalities because of potential competition with their own business parks.

These findings are in line with Van der Pas et al. (2012), who stated, that "adaptive policy is less transparent, more vague, and harder to explain to all stakeholders" (p. 321). The resistance of other actors to an adaptive approach often resulted in decision makers once again opting for certainification (see point 1 and 3 above).

Getting out of the certainification-decertainification loop

Decision makers strive – and keep striving – for certainification throughout the decision-making process of infrastructure projects. They find it hard to make room for uncertainties and at the same time keeping the planning and decision-making process manageable. This explains their persistent preference for the use of authority-based instruments, such as (institutionalized) research and political-administrative agreements. Although planners are discussing participative and communicative planning approaches (De Roo et al., 2020), this way of dealing with uncertainty still strongly resembles a more traditional rational planning and the underlying technical planning paradigm (De Roo et al., 2020) in infrastructure planning.

The environment in which decision makers in infrastructure planning operate changes during the protracted decision-making process, which forces decision makers to adapt their planning approach. Although decision makers adapt to this

changing environment – for example by using more ‘open’ instruments like participation – they only do so gradually and mostly when they are forced to do so or to get out of an impasse. Even when there appears to be more room for uncertainty through the use of these more ‘open’ instruments, decision makers mainly opt for control and certainification. In practice, using more ‘open’ instruments means, that decision makers *add* elements of the communicative planning paradigm and the complexity planning paradigm to the technical planning paradigm. For instance, when policymakers choose for stakeholder participation, there is still an important role for research in this participation process, and participation is within strict conditions.

In their strive for continuous certainification, decision makers awaken a reaction of decertainification. In other words, certainification creates decertainification by opponents. In their pursuit of certainification, however, decision makers, take (too) little into account responses of other actors. Opponents can increase uncertainty by mirroring their use of instruments on that of decision makers. Interestingly, the same instruments can be used differently by both decision makers and opponents. This is particularly evident when research is used, prompting a discussion on data or a ‘war of reports’. In all cases the pursuit of certainification led to a futile certainification-decertainification loop, polarization, and a cumbersome and protracted decision-making process. A possible explanation for the persistent attempt of decision makers for certainification, even when this leads to a more problematic decision-making process, is that they seem to feel able and confident that they can reduce uncertainties, and underestimate the ability of opponents to increase those uncertainties once again.

Based on our study, we argue that decision makers need to get out of their uncertainty reduction reflex, knowing that this will cause opponents to increase uncertainties resulting in a problematic planning and decision-making process. Decision makers should give more room for uncertainty by embedding adaptive and participative approaches in their planning practice. The challenge is to create an arena and institutional setting in which actors from different advocacy coalitions are involved in open dialogue, with enough leeway to bring in one’s points of view and ideas. For this, decision makers should not try too rapidly to reduce the leeway given to stakeholders – and therefore uncertainties – in the planning process. They need to seek a balance between certainty and uncertainty in stakeholder participation. This means, that decision makers should offer scope for alternatives, ideas and plans of other actors, and should not ‘funnel’ too quickly on basis of on their own alternatives. Further, given the differing views of stakeholders and different perspectives on uncertainty about (for example) future developments (such as economic growth or political-social priorities), stakeholders should be included in joint fact finding. A stronger ‘fact base’ may result in enhanced trust and support.

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REDEVELOPMENT OF TRANSPORT INFRASTRUCTURE AS DRIVER FOR ACCELERATING SOCIETAL TRANSITIONS.

A REGENERATIVE PERSPECTIVE ON INFRASTRUCTURE PLANNING

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Introduction

The planning and development of transport infrastructure networks increasingly involves environmental degradation, climatic impacts and societal trends. However, infrastructure planning has mainly focused on the gradual improvement and expansion of transport infrastructure networks themselves. In practice, infrastructure planners have rarely reflected on the role of infrastructure networks in enabling or constraining broader sustainability transitions. This may be about to change. In many Western countries transport infrastructure networks have been developed in the early to mid-twentieth century and much infrastructure approaches its 'best before' date and enters the phase of transition and renewal. That much transport infrastructure is physically deteriorating and changing as a result of ageing is clear: in the USA a considerable part of the 1 trillion dollar Infrastructure Plan of the Biden administration will be invested into infrastructure renewal, in Germany plans are afoot to increase investments into the renewal of the railway network of over 50% up to 86 billion euro, and in the Netherlands the Replacement and Renovation Program of Rijkswaterstaat of 1 billion euro a year is expected to grow vastly (Hijdra et al., 2015). The significant need of infrastructure refurbishment presents a 'window of opportunity' to broaden the infrastructure redevelopment options in order to enable wider sustainability transitions. That is, transport infrastructure renewal could create conditions favouring, for example, on-going transitions such as the energy transition or the transition towards a circular economy. A growing amount of literature emphasizes that investments in the transport infrastructure network can be utilized as a driver for accelerating wider transitions (e.g., Hijdra et al., 2015; Leendertse et al., 2016; Arts et al. 2021). Given the fact that transport infrastructure investments are often location-specific and project-based, it is important to not only focus on the institutional conditions of the infrastructure system in isolation, but more focus on how transport infrastructure renewal projects relate to spatial developments instigated on the basis of transitions in other systems.

This paper wants to raise a discussion in planning to utilize transport infrastructure as a means to accelerate social transitions through regeneration – using infrastructure as an underlying facilitating structure for joint infrastructure and area development. For this discussion we will use recent PhD research carried out within the Faculty of Spatial Sciences of the University of Groningen. This Faculty has a strategic partnership with Rijkswaterstaat, the main infrastructure manager in the Netherlands with regard to road and water infrastructure. Under the strategic partnership, several PhDs have been

completed since in the last decade. We use the evolution of the subsequent PhD researches to support our arguments for the discussion in this paper.

As the main theme in the development of the respective studies, two issues at the interface of infrastructure planning and spatial planning are dominant:

- The importance of integration as a basis for planning i.e., transport infrastructure and area planning not as separate approaches but as an integrated planning approach;
- The utilization of infrastructure as a structuring element in this integrated planning approach.

The challenge of infrastructure redevelopment

The planning and realization of transport infrastructure is intrinsically related to processes of change. In addition to the fact that the planning and realization of transport infrastructure takes place in a changing environment, and that infrastructure itself induces change in that environment, the use of the infrastructure itself is also subject to change. Vehicles are becoming more and more autonomous, while logistics and mobility are intertwined, mobility is increasingly taking place on-demand and new forms of shared transport are emerging. This leads to all kinds of new transport configurations. Finally, even one of the most robust elements in infrastructure planning, the physical network, appears to be subject to change due to (accelerated) aging and wear because of more intensive and different traffic as well as changing climate conditions. Today, implementing the replacement and renewal of outdated transport infrastructure is seen as one of the biggest challenges in infrastructure planning.

To illustrate this challenge, in the Netherlands alone, this involves at least 85,000 bridges and viaducts, 3,000 kilometers of quays and sheet piling and 130,000 small civil structures, such as weirs and culverts. About 20 percent is in the hands of the central government (i.e., the main transport infrastructure network), the other 80 percent belongs to municipalities, provinces and water boards. In the Netherlands, more than 1 billion euro a year is currently spent on the renewal of civil infrastructure. A recent study (I&W, 2018) expects this amount to gradually increase to 3 to 4 billion euro in 2040-2050. In total, approximately 50 billion euros more will be needed over the next three decades for the renewal of the Dutch transport infrastructure.

Traditional maintenance focuses on the (one-to-one) replacement of old and worn parts in order to leave the existing situation intact as much as possible. At the same time, we also see that at the moment an intervention must be made in the infrastructure network, the question arises whether the intervention is an opportunity for improvement of the existing spatial situation in order to achieve a quality improvement – i.e., sustainable (re-)development. Willems (2018) describes (based on I&M, 2016) *three approaches to renewal* (NB: his study he focuses on waterway renewal; see Figure 1). First, the “one-to-one renewal” approach entails the replacement of individual infrastructure assets executed one-by-one by the national government, in which the functionality remains untouched. Second, the “minor renewal” approach involves a change in functionality on the local scale, resulting in the involvement of a greater number of local stakeholders. Likewise, transactions with these parties may result in covenants in which the national government facilitates additional aims of regional and local parties. Third, the “major renewal” approach considers the replacement of specific assets as part of wider spatial, regional developments. Transactions, then, operate on a larger geographical scale with more distant stakeholders. In the three approaches the value pursued shifts from sectoral to societal.

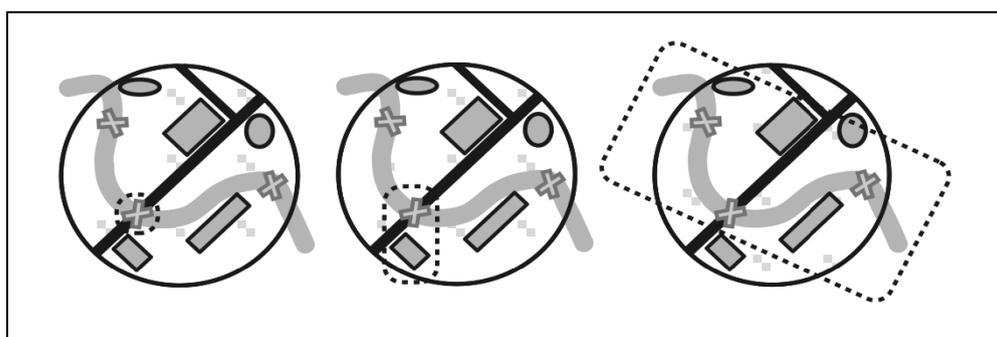


Figure 1. Three approaches to renewal of infrastructure (Willems, 2018)

Hijdra (2017) studied how *value management* can be used for the redevelopment of the Dutch waterways when searching for extra societal value when renewing transport infrastructure. Value management has recently emerged from the public administration literature and is finding its way in planning. Value is herein defined as the sum of all interests and the extent to which these are served (‘pareto-efficiency’). An important process in this is the *brokering of interests*. This brokering aims to find maximum value out of all possibilities, as opposed to the usual linear process in which value is pragmatically defined as one solution for a specifically defined problem. Interests are often different and conflicting. This requires smart planning processes in which the search for mutual benefits for the various public and private parties is the key (see also Leendertse 2015).

However, in reality infrastructure planning is still strongly budget-driven and environmental and areal challenges are only linked if this is opportune from the point of view of project control and risk management (Arts et al., 2016; 2021). Infrastructure planning is at its best area oriented, but there is generally no question of integrated area planning (see Heeres, 2017). According to Willems (2018), “the functional scale remains rather sectoral and mono-functional. Although a more integrative perspective is advocated, individual interests prevail over societal benefits.”

In his study, looking for typical patterns in infrastructure decision-making in relation to adjacent area development, Veenma (2021) recognized a constant shift between giving more space to area development - in particular to create support for decision-making – and systematically limiting uncertainty by strongly regulating that space in order to be able to make targeted decisions (*certainification*). From studied cases, he recognized that infrastructure decision-makers only proceed with area development if they are 'forced' to do so. Also, participation takes place within strict frameworks and is mainly aimed at 'reaching consensus' and less on 'mapping out diversity'. He concludes that one-sided and too quick reduction of uncertainty may (or will) lead to polarization and difficult decision-making, exactly the opposite of what is often intended. In his recommendations, he pleads for giving (more) room in infrastructure planning to uncertainty – i.e., to the wishes and ideas of stakeholders and to related challenges in an area (*decertainification*).

A trend to inclusive infrastructure planning

Yet there is an increasing interest in function mixing and function combination aimed at synergistic benefit (Heeres, 2017). Transport infrastructure networks, such as road, rail and waterway networks, cannot be separated from the area they make accessible or the areas they connect. Areas in turn need infrastructure to function (Arts, 2007; Arts et al., 2016; Heeres et al., 2016; Leendertse, 2020; Arts et al., 2021).

Ever since Mitchell and Rapkin's (1954) provided evidence that transport demand is a function of land use, the interrelation between land use and transport has received much attention by scholars and practitioners, developing the notion of land use and transport integration (LUTI, see Van Geet, 2021). In LUTI the 'I' may stand for integration or interaction. Whereas the latter is focussing the *functional interactions* between land use and transport, the former is focussing on ways in which the dialectic relationship between transport and land-use can be used in the pursuit of synergies and how *integrated planning* of land use and transport can serve broader societal objectives. This paper mainly focusses on this latter interpretation of LUTI.

In planning the contextual factors are becoming increasingly important. The number of actors involved is increasing and becoming more assertive and the interaction between these actors is increasing, making conflicting interests and the importance of regional challenges increasingly visible. The planning of transport infrastructure in relation to the adjacent area is thus shifting from sectoral and separate (mitigation), via participatory (fitting in) to integrated, in which the area challenges are central (Hamersma, 2017; Heeres, 2017). As a result, infrastructure planning and spatial planning are increasingly converging (Heeres et al. 2012; Arts, 2007).

Radulescu (2022) proposes *living labs as a worthwhile creative and collaborative planning approach (co-creation)* for this conversion. Co-creation brings stakeholders and challenges together in a process of 'brokering interests' through dialogue (see also Hijdra, 2017; Heeres, 2017). Co-creation fosters cooperation, interactions, coordination and innovation and involves a diversity of viewpoints. By linking local, regional and national actors, issues and goals it enables integration. However, being relatively new in spatial and infrastructure planning, co-creation is often not part of the formal planning and decision-making processes. Her study now focusses on the positioning of living labs and co-creation in the multi-level governance setting of infrastructure planning. As the further examples in this paper show, living labs and co-creation are

promising tools to develop inclusive solutions (see also Leendertse et al., 2022). But there is no co-creation without space to be able to be creative (Leendertse et al., 2016).

The lack of physical and institutional space (Spijkerboer, 2022) is a decisive factor in the trend to this inclusive planning. Within the sectors of transport infrastructure and area development the physical space for (new) development is decreasing. After all, the physical space has already largely been filled in and infrastructure networks have largely been constructed. In addition, institutional frameworks and preconditions play an increasingly prominent role in infrastructure planning and area development. On the one hand, policy and practice are looking for a foothold in the great dynamics, while on the other, projects are increasingly fixed in rules regarding the environment, process, market involvement, and so on. Willems (2018) argues that *institutional barriers* hinder change because of institutional fragmentation and the dominance of the infrastructure manager. Furthermore, the infrastructure manager currently obstructs more inclusive approaches, because it favors a more mono-functional perspective on renewing assets. Finally, the measures already taken by the operator seem to suffice and are limitedly challenged by others, which also diminishes the need for more radical change. Willems speaks of *institutional sedimentation* i.e., new institutions that complement existing institutions rather than succeeding them. Established institutions thus remain dominant. However, he also recognizes *institutional bridges* that enhance change such as actors' ambition to do more than 'just' renewal.

Van Geet (2021) concluded that pursuing an integrated planning of land use and transport infrastructure requires mixes of complementary instruments that are employed at different stages of the policy process. Procedural instruments play a prominent role in establishing processes of land use and transport integration as they can help to overcome the resource interdependencies associated with the development and delivery of integrated goals on land use and transport by steering interaction in policy networks. Based on a study of the Dutch infrastructure policy design he concludes that there is a continuous *incongruency between policy objectives and instruments* to implement the policy. They are in a continuous process of fitting to each other, thus influencing institutional space (see Van Geet et al., 2019). Spijkerboer (2022) argues that institutional barriers are often the result of complex and nuanced interrelations between formal and informal institutions, both within individual sectors and in guiding the interactions between them. By pursuing *institutional harmonization*, actors can organize institutional space within and among the various institutional frameworks involved to enable spatial integration – institutional space and physical space are dovetailed. Institutional space is herein conceptualized as something that objectively exists among the various institutional frameworks that guide actors, but this space can be perceived and experienced differently. According to Spijkerboer (2022), institutional harmonization can be seen as a key process in organizing institutional space, by limiting the barriers that result from existing formal and informal institutions and creating enabling conditions among various institutional frameworks that guide actors from various sectors.

Infrastructure as underlying structure for infrastructure and area integration

The word infrastructure is a literal combination of the Latin 'infra', which means under, and "structure." Infrastructure therefore is an underlying structure that facilitates areal functions. Literally an underlying supporting structure (see Figure 2).

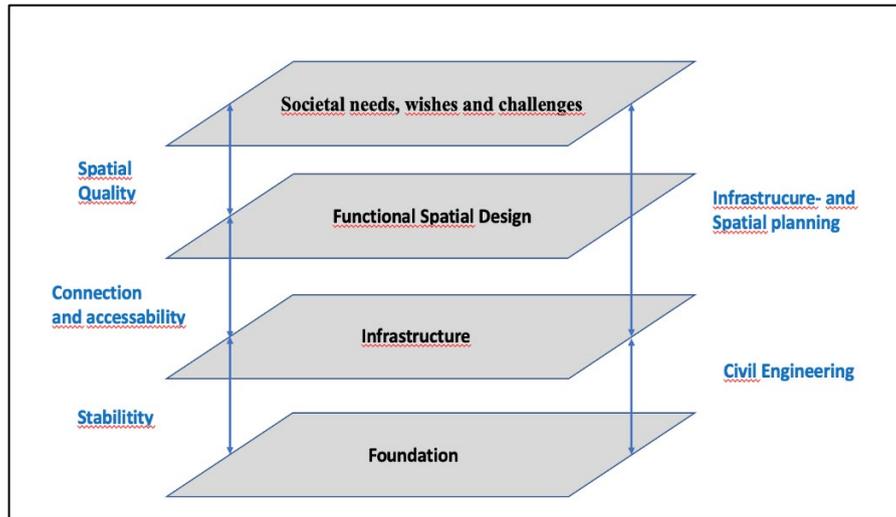


Figure 2. Infrastructure as an underlying structure that facilitates areal functions (multi-layer model)

(Leendertse, 2020)

In areas economic and social functions such as living, working, recreation are performed that create value. This value arises because of the mutual connection of and interaction between these functions through transport infrastructure. Areas also gain value through connection with other areas. Transport infrastructure provides connection and makes areas reachable and as such adds value to an area. A transport infrastructure network in itself has only limited value, but becomes valuable by offering connection and accessibility.

A much-described example of this structuring potential of infrastructure in the Netherlands is the reconstruction of the A2 passage through the city of Maastricht. Verhees (2013) studied this case to look for enablers for integration of infra and area development. In this project, infrastructure and adjacent area development are interwoven in the planning and realization. The development of the plan was outsourced to construction consortia through the contracting of a Design Build Finance and Maintain contract. These consortia had to involve citizens in the planning process and were therefore confronted with arranging the support of the environment for their plans i.e., the responsibility for brokering the interests (see also Heeres, 2017; Hijdra, 2017). Consortia were allowed to use (future) revenues of the area development on adapting the infrastructure (for example, covering the additional costs for a tunnel) in order to arrive at an optimally integrated plan. For the role of the clients (public authorities), Verhees introduced the concept of meta planning as a form of adaptive and conditioning planning aimed at creating conditions that, on the one hand, left sufficient room for the market parties to develop solutions and, on the other hand, provided sufficient direction to fulfil policy goals. In the plan development, the infrastructure directed the area development above and adjacent, but conversely, the area development acted as an enabler for the development of that infrastructure. Due to *a competition effect, a conditioning government and the financial reciprocity of infrastructure and area planning*, infrastructure and area development are linked, which ultimately led to a better solution (see Figure 3).

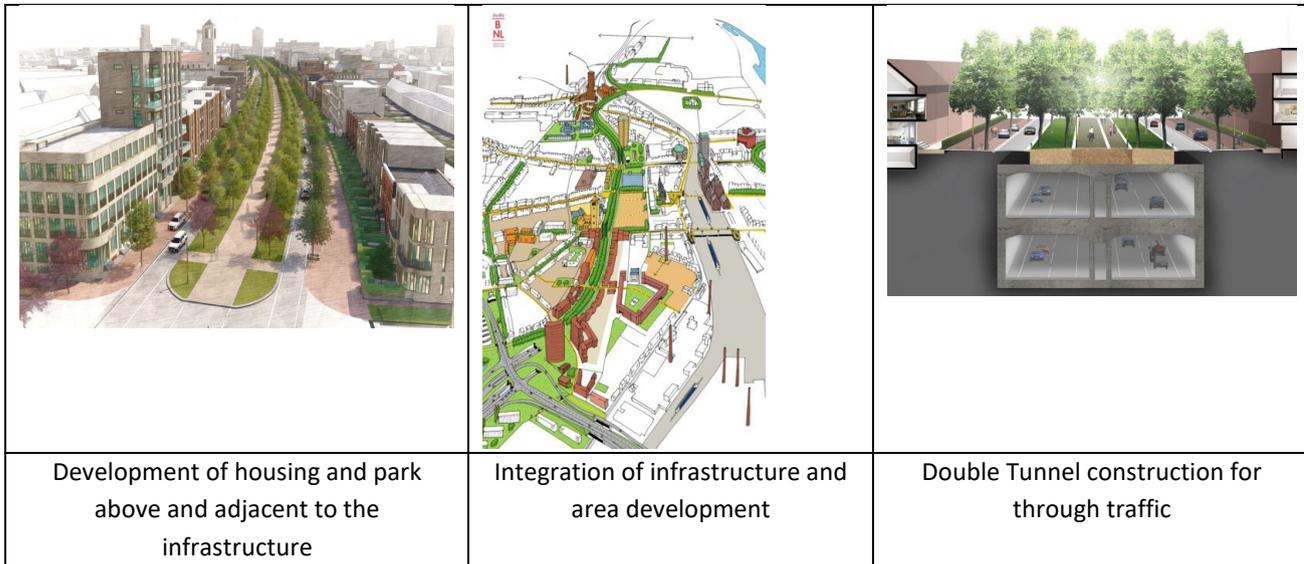


Figure 3. 'De Groene Loper', the final plan for the A2 passage through the city of Maastricht

The huge infrastructure challenges as mentioned earlier offer a great opportunity to use transport infrastructure as a driver for societal transitions such as the energy transition, climate adaptation, the transition to a circular economy, and so on. Instead of just renovating or renewing, infrastructure planners need to look for opportunities for combination, synergy, multiple use of space, etcetera. A planning aimed at regeneration of infrastructure, whereby transport infrastructure is connected to the area in order to add value to area functions and to act as a catalyst for the societal challenges of the area in order to strengthen transitions.

Let us illustrate the potential of such an approach with another case, the Living Lab A58 in the southern part of the Netherlands (Kerkhofs, 2022). The Living Lab A58 is an experimental environment in which the infrastructure manager (in this case Rijkswaterstaat) together with local citizens, market parties and public organizations search for integrated solutions for climate change. Infrastructure must be made climate-adaptive, which means, among other things, that provisions are made to mitigate flooding caused by intensive rainfall. Water is in fact waste for the infrastructure; it must be disposed of quickly. This wastewater is then be treated as peak discharge via the drainage system of the water boards. On the contrary, agriculture (particularly in the south and east of the Netherlands) faces a water shortage in the summer, also partly as a result of climate change. Currently, this water shortage is often compensated by pumping up groundwater. A possible synergy arises if waste water from the infrastructure – after (ecological) cleaning – is used for the drought problem, possibly by using buffers which can be developed as nature areas. The problem of infrastructure drainage resulting in wastewater then becomes the source for agriculture in dry periods. This creates a circular water flow between the infrastructure and agriculture sectors. A side effect is that less groundwater needs to be pumped up, that surface water is drained more regularly and that nature development is facilitated. A win-win-win situation for the infrastructure manager, agriculture, nature organizations and water boards. In this example, infrastructure is used as a driver for synergistic solutions for environmental challenges. In order to function as a driver, *an integrating theme* appears to be all important, such as 'circularity' in this case.

From renewal and renovation to regeneration

Many societal challenges and transitions are underway. Regional and infrastructure planners are increasingly confronted with this. Because transport infrastructure is literally a supporting structure for areal functions, infrastructure can be utilized as a support for these challenges and transitions. In fact, the huge renewal and renovation challenge infrastructure planning is facing offers an opportunity to strengthen the transitions. Traditional replacement old-for-new is the easiest way to renew and renovate, but does not do justice to the major challenges our areas are facing. Moreover, the renovation and replacement of infrastructure is about assets that are already there and that will remain in place for at least another 50 to 100 years. This means, that area planning and the replacement and renovation challenge of infrastructure as part of infrastructure planning are interconnected in space and cannot be considered in isolation from each other. We therefore argue that the renovation and replacement of infrastructure should be utilized much more widely and that it should be integrated into a joint infrastructure and area planning. But what does that mean in practice?

Planning is a process. Addressing functional interrelatedness between infrastructure and other land uses within a fragmented stakeholder context of institutional interdependency involves a careful process of creating, assessing and exploiting added value ('brokering of interests'). Based on the discussion in this paper we (see also Heeres, 2017) recommend the following:

- Determine – at the beginning of every stage of a planning process – whether and to what extent an area-oriented approach in addition to infrastructure planning is needed and may lead to added value;
- Organize the planning processes as a co-production. The purpose of co-production of area-oriented plans and designs is to find relevant combinations between infrastructures and other land uses;
- To exploit the potential merit of actors' complementarity in the creation of integrated plans and programmes for implementation, it is essential that the commitment of actors is not without obligation. The establishment of coalitions may be formalized in covenants or other types of agreements about cooperation between various actors at the infrastructure-land use interface;
- Set up collective business cases to redress the balance between spatial scales. Area-oriented planning focuses on improvements to the land uses at the regional and local area scale. Business cases may help to redress the balance between gains at the networks and gains at the regional and local spatial scale;
- And last but not least, create room for opportunities and facilitate actors to search for win-win synergies by facilitating interaction and dialogue.

By linking renewal and renovation of transport infrastructure assets to the world of area development, replacement becomes more visible and politically more interesting ('sexy'). Investment in infrastructure replacement can then become an incentive to define and co-finance area development and a driver for accelerating societal transitions – a window of opportunity. Then renewal and renovation of infrastructure assets becomes regeneration of infrastructure as part of sustainable re-development of the surrounding area.

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RESEARCH ON THE SUITABILITY OF URBAN BLUE LINE DELINEATION UNDER THE TERRITORIAL SPACE PLANNING SYSTEM

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1. Introduction

Urban river and lake systems are an important factor in maintaining the balance of urban habitats, and are of great significance to the improvement of urban habitat, urban economic development and urban construction. However, with the accelerated urbanisation process, the excessive pursuit of land development dividends and the long-term inappropriate urban development model have led to the over-expansion of construction land and the destruction of the water system environment and ecology, resulting in the phenomenon of "city into water" in many cities today.

The urban blue line (hereafter referred to as the blue line), as the core control line for planning the protection of urban water bodies in the Chinese context, contains the territorial boundaries for the protection and control of urban surface water bodies such as rivers, lakes, lakes, reservoirs, canals, and wetlands. Today, blue line planning is still generally oriented towards water management by water conservancy projects, and its content is mostly developed to focus on the engineering and functional characteristics of water as a resource and safety risk (Wu Yan et al., 2020), to address water facilities to manage water system pollution and water system flooding and drainage, and to enhance water system safety and water sensitive area conservation through cross-sectional design and plan zoning (Song Wanzhen et al., 2019). In recent years, the academic community has conducted some in-depth research and practical exploration on urban blue line research, mainly focusing on the objectives of blue line planning, design concepts, planning elements, alignment delineation, as well as the exploration of the main body of blue line preparation and management and reflections on river use and management, and has gained some control experience in the practice of cities such as Shenzhen, Guangzhou, Shanghai and Beijing (Yang Peifeng and Li Jingbo, 2014; Yu Lu and Ding Nian, 2010; Chen Yewei, 2018), but the existing studies are insufficient for the delineation of the specific blue line and the blue line management system, and the delineation of the existing blue line still presents the realistic problem that the delineation differs from city to city, from department to department, and from normative ordinance to normative ordinance, which needs to be solved urgently. This paper responds to the existing problems to a certain extent by constructing a blue line delineation system of "three zones and two lines" and clarifying the management authority and responsibility system of water-related departments in the context of territorial spatial planning, in order to effectively solve the problems related to the delineation and implementation management of the blue line.

In China, there is a multiplicity of water-related laws and water-related authorities, which has led to the problem of overlapping authorities and intertwined water-related regulations. Most water-related authorities draw various blue lines based on their own interests. Throughout the national governance system, "Flood Control Law of the People's Republic of China" "Water Law of the People's Republic of China" and "Urban and Rural Planning Law of the People's Republic of China" are the fundamental laws that guide the delineation and management of the urban blue line. Under this, "Regulations of the People's Republic of China on River Management" issued by the State Council

delineate the scope of river and lake management from the perspective of state administration and constrain the management of urban water systems. Furthermore, the “Guidelines for the Preparation of River” and “Lake Shoreline Protection and Utilisation Planning”, the “Specifications for the Preparation of River Basin Planning” “Specifications for Urban Water System Planning” and “Technical Rules for the Management of National River (Lake) Shoreline Utilisation promulgated” by the Ministry of Water Resources and the Ministry of Housing and Construction propose in more detail the delineation of the relevant water system control line with flood prevention and drainage as the core principle. In contrast, the "Urban Blue Line Management Measures", a guiding document that points to the core of the Blue Line, has a vague textual semantics that allows localities to exercise discretion in the preparation of Blue Line plans, determining the line types and names of various urban water system control lines. This has led to inconsistencies in the interpretation of water -related norms and terms between the planning and water conservancy departments, and major differences between the two systems in terms of how water bodies are delineated and defined. Reflecting this in the territorial space, the delineation of the local planning blue line often varies between the urban water control line and the urban waterfront green area (urban green line), resulting in different names, types of control lines, and departments responsible for control line management in the local urban blue line preparation system .

2 From a "multiple" to a "unified" regulatory system

The formulation of blue line planning is an effective means of managing urban water systems, but the actual preparation of blue line planning is not yet regulated and guided by special rules for the preparation and implementation of planning (Qiu Qiang, 2009), and the implementation process suffers from a single element of blue line control, lack of systematic integration with planning, and overly broad delineation. There is an urgent need to establish unified norms and standards for the delineation of the blue line, to coordinate the affairs of water -related departments, to implement the integration of multiple regulations in the territorial spatial planning system, and to ensure the blue line coverage and effective control of water systems within the city.

2.1 Multi-objective integrated planning as a guide

As a multi -objective comprehensive plan, the river blueline plan needs to integrate the three major aspects of natural ecological conservation, socio -economic development and cultural landscape enhancement. The planning strategy for water management in the Dutch Delta aims to "create space for rivers and lakes", and the scope of river and lake management extends from the traditional physical boundaries to the ecological corridors around rivers and lakes, industry and culture, and the upstream and downstream boundaries of rivers. "originality" and tapping into the economic and cultural elements of the river and lake system to bring positive benefits to the city, and proposes Perception value, Use value and Potential value, emphasising that river functions and coastal land use need to adapt to the needs of time and function (Cao Zhejing, 2018).

From the perspective of comprehensive integration of urban-water relations, the delineation of the Blue Line also needs to be combined with the planning and design of waterfront space, and the use of shorelines within the control line should move from traditional rigid management to a combination of rigid and flexible multi -governance, actively interacting with the use of shoreline space. In the case of flood control and shipping safety, the shoreline should be made more hydrophilic, and local "straightening" or "straightening" should be carried out as appropriate, so as to create a diversified shoreline and achieve a better relationship between the city and the water.

2.2 Clarifying "Horizontal and Vertical" management responsibilities

In the context of the sectoral reforms introduced at the 18th National Congress, the newly established natural resources department has incorporated water resources management and registration functions as its basic functions, and is responsible for co-ordinating the planning of surface water and groundwater resources in rivers, lakes and seas, but in practice the main authority for river management remains with the water resources department, and the natural resources department has not yet been able to incorporate The natural resources department has not yet been able to fully integrate urban blue line management into its functions. The fact that there is no unified body to guide the implementation of the Blue Line is also a reason why the Blue Line planning needs to focus more on strengthening the collaboration mechanism between departments.

River and lake management and protection is a complex system project involving upstream and downstream, left and right banks, different administrative regions and industries, so the State Council issued the Opinions on the Comprehensive Implementation of the River Chief System, which specifies the river chief system as the core and promotes a coordinated management system among water resources, housing and construction, and natural resources. Although this vertical management system for water-related matters has been relatively well developed, there is still a mismatch and lack of clarity in the 'central-local' authority and expenditure responsibilities (Research Group on Improving Water Governance System, 2015). Therefore, it is still important to clarify that the lower-level natural resources and water resources departments are the responsible units for the joint delineation and management of the Blue Line within the framework of the river chief responsibility system, and to submit the results of the Blue Line compilation to the higher-level river chief office in a timely manner for reporting.

The division of powers and responsibilities between departments should follow the principle of integration of implementation and delineation, management and approval (Bao Cunkuan, 2018). In addition to the top-down hierarchical transmission from the Ministry of Natural Resources, a unified delineation approach and outcome requirements, the new round of territorial spatial planning still requires collaboration with functional departments at the same level, such as water conservancy, urban construction and transportation, as well as experts, scholars and the public, to form a synergy of social governance.

3 Blue Line integration under the territorial spatial planning system

As a guideline for planning in the new era, "ecological civilization construction" runs through the whole process of territorial spatial planning, and the effective promotion of urban development needs to achieve a win-win situation for both the environment and the urban economy (Niu Shuai and Sun Yanqi, 2019). The selection of control lines for territorial spatial planning, while emphasising uniformity, should also control the flexibility of the control rules and the rigidity of the control content, and the management of the traditional urban blue line needs to be inherited and continued (Zhang Xiaodong et al., 2020); for the preparation of water-related special planning content, the mandatory conditions of the overall territorial spatial planning need to be strictly followed, and the water-related planning specialties should be incorporated into the For the preparation of water-related special plans, it is necessary to strictly follow the mandatory conditions of the overall territorial spatial plan and incorporate water-related special plans into the detailed planning (Pan Haixia and Zhao Min, 2019).

3.1 Construction of a Blue Line system controlled by "Three lines and Two zones"

In addition to the planimetric elements of urban surface water control, there are also vertical elements such as river bottom elevation and river section form, which need to be clarified in the special water system planning as a complementary part of the improved blue line delineation (Song Xuan and Zhao Yihan, 2018). Here, we discuss the co-ordination between the planning and water conservancy departments in terms of planimetric control, integrate the

existing control line types, optimise and unify the urban blue line delineation, and compose the urban blue line planning system by delineating "three lines and two zones" (Figure 1 - Figure 2).

River (lake) water control line is the original water conservancy department provisions of the outer edge of the control line and the upper mouth of the river, that is, divided into the river (lake) in the embankment belongs to the outer edge of the river embankment backwater boundary, in the river (lake) without embankment design flood level line or the highest historical flood level line to determine the water control line. The role of this line is to clarify the scope of control of water conservancy departments and waterfront demarcation, is the baseline of river (lake) protection, is a rigid control line. The river (lake) shoreline control line is a control line type that is incorporated into the management of the planning department with the objective of building an ecological buffer zone, and is also the control line that determines the largest water corridor in the delineation of the blue line, generally with the waterfront first municipal road waterfront side as the boundary. The waterfront grey -green infrastructure line and the green line are among the control lines whose lines are considered for setting the width, based on different levels of rivers (lakes) for delineation, and are flexible control lines.

The river (lake) centreline is a line to meet the needs of river navigation, similar to the road centreline, and the water control line and shoreline control line are established as the central axis of symmetry. It includes the main stream and the centreline of the river, and serves to clarify the course and location of the river, and is convenient as a basis for the construction of new rivers, widening, dredging and other water conservancy projects, and can be used as an administrative boundary for some provinces and cities (counties) along the river, and is a rigid control line.

The area between the river (lake) shoreline control line and the river (lake) water control line is part of the waterfront ecological shoreline area, where access to municipal roads and waterfront development should be strictly controlled, but reasonably limited landscaping and facilities can be built. By introducing positive shoreline planning concepts such as sponge cities or floodable landscapes, positive interactions between people and water bodies are created to enrich the urban waterfront and shape vibrant public open spaces.

Those between the water control line of the river on both sides belong to the water body protection zone (the lake is the area within the water control line), which is managed by the water resources department, and the necessary water facilities can be built within the zone, subject to the approval of the water resources department.

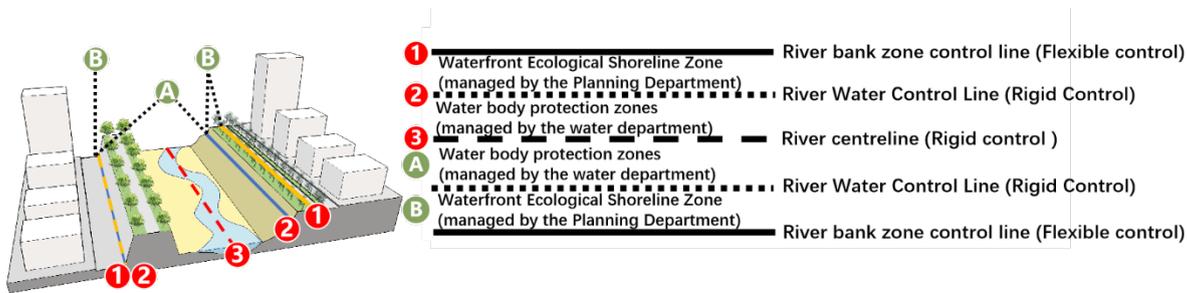


Figure 1: Schematic representation of the "Three lines and Two zones" of the river

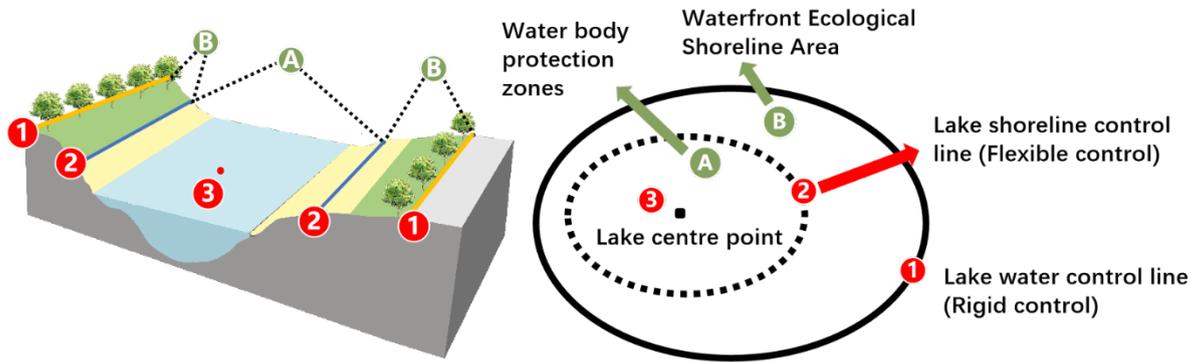


Figure 2: Illustration of the

"three lines and two zones" of the lake

3.2 "Line rights" to achieve waterfront synergy under spatial use

Prioritisation of space use: The key to the rational use of water-related space is the prioritisation of water system use rights. Using Maslow's theory of needs as a reference, the use of water space must be prioritised to meet the basic functional needs of water bodies, supplemented by the higher needs of human activities. In general, the right of use should be prioritised to ensure the effective operation of the water space based on flood control and drainage, water resource protection and water source maintenance; secondly, the ecological space consisting of bermed land and ecological shoreline along the water body should have the emergency function of resilience prevention and mitigation in addition to the function of nourishing water and soil, and can be used as a flood storage area in the face of water disasters; furthermore, the construction of waterfront space on a near-human scale and the activation of Industrial space is an important support to promote the economic development of waterfront areas, and is also the most advanced spatial demand in the right to use water system space, which needs to be implemented on the basis of meeting the former spatial demand (Figure 3).

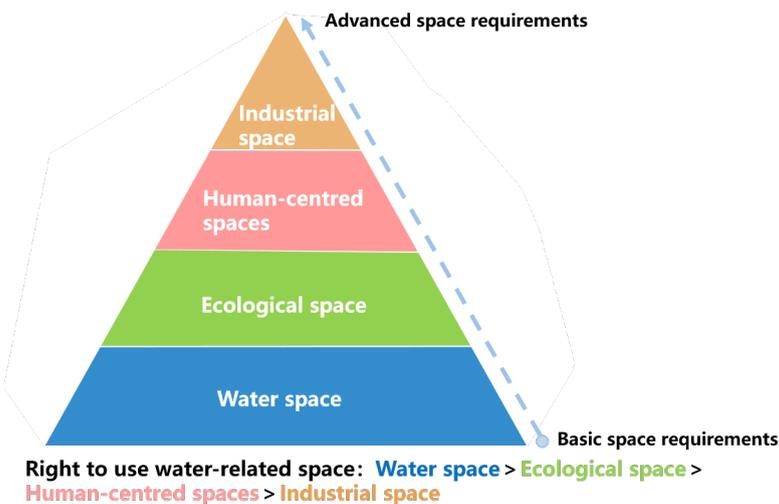


Figure 3: Priority relationships for water-related space use rights

3.3 Rigid and elastic combination to coordinate the "Three zones and Three lines"

The "Three zones and Three lines" of national land space include urban, agricultural and ecological space, as well as the red line for ecological protection, the red line for the protection of permanent basic agricultural land and the

boundary line for urban development. When the blue line conflicts with other spatial elements, a combination of rigid and flexible control and management methods is required. The ecological space contains various types of water systems such as urban wetlands, rivers and lakes, and the results of the Blue Line delineation can present the spatial pattern of urban water systems and provide spatial pre-control for the overall evaluation of ecological functions in the "double evaluation", and serve as a basis for determining ecological corridors.

Urban green line coordination: the shoreline between the land area along the river and the water control line can be greened or created as a park, and the area of waterfront green space can be counted as part of the urban green space rate. There are two types of control accounting for the urban water surface rate: firstly, the area of protected water bodies within the water control line of rivers and lakes in the urban construction zone is calculated; secondly, the water systems connected to external water in non-water sites such as the current parks (G), educational sites (C) and residential sites (R), but without flood control and storage, can be counted as part of the urban water surface rate without changing their original nature, and the implementation of Flexible control.

Urban yellow line coordination: water source protection zones, raw water pipes and drains, water conservancy projects and water abstraction, drainage, flood control and storage and other related waterfront municipal facilities should be allocated to the urban blue line for management; the urban blue line and the yellow line may overlap, with the overlapping parts implementing both requirements.

Road red line coordination: where there is a waterfront road along the water body, the blue line should be articulated with the road red line, and the waterfront road is recommended to adopt the road embankment in one, and the blue line should include the road. Strictly control the road land into the river and lake protection area, river (lake) embankment with construction conditions need to be reviewed by the water conservancy department before intervention and construction, but shall not occupy the area of the water body protection zone. For the bridge and tunnel across the river (lake) also need strict approval link, optimize the design scheme as much as possible to reduce the damage to the water body.

Urban purple line coordination: for the already established historical and cultural districts, if new river networks or diversions and widening are needed in their vicinity in the preparation of the blue line, the existing construction should be respected and reasonably avoided, and for the original historical and historical districts built on the river, the heritage protection line can be overlapped with the blue line (Si Ma Wenhui and Gong Daoxiao, 2015), and the overlapping part should be implemented simultaneously with both. The overlapping part should be subject to both planning control measures.

Coordination between the ecological red line and the basic farmland protection line: When the Blue Line area is a water source protection zone or a soil and water conservation zone, the watershed control line should overlap with the ecological red line to implement rigid bottom -line control. When the Blue Line conflicts with the basic farmland protection line, the basic farmland protection line should be reasonably revised to meet the balance of occupation and replenishment of basic farmland, while maintaining the Blue Line unchanged.

4 Conclusion

The Blue Line is essentially a means and mode of spatial intervention. In the context of the construction of a new system of territorial spatial planning, traditional planning must also move from relatively flat construction control to comprehensive scientific spatial governance. The newly established natural resources department is responsible for the integration of spatial resources in the national territory, and from the perspective of ensuring water resources and water security for urban development, as well as maintaining the sustainable development and use of national resources, water systems and water bodies should be integrated into a more scientific and rational, as well as more active and comprehensive planning and management. In the face of the growing urban water conflict, it is important not only to fill

in the many problems of the past blue line delineation, but also to place water conservation ahead of planning and design in new areas, and to focus on the restoration of small watersheds in urban regeneration. A detailed environmental resource assessment should be conducted at the planning and design stage, and then a comprehensive blue-green space plan should be proposed (HeYing, 2019;Li Chen, 2012).Through pre-assessment tools such as ecological and environmental assessment of water systems, census of urban river and lake systems, identification of water body values, combing of urban river network structures, and public demand research, water bodies with economic, social and cultural values (not limited to those affecting flood control and drainage) are identified in advance, and the functions of water - related departments are co-ordinated through the River Governor's Office, and relevant departments such as natural resources and planning, water conservancy and water affairs carry out pre This will greatly reduce the cost of implementing the Blue Line and is more in line with the principle of ecological protection as a priority in territorial spatial planning. Through the establishment of a good blue line control system, coupling urban water relations and promoting the optimisation and enhancement of water - related spatial quality to meet the needs of high -quality and sustainable urban development.

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ROLE OF PUBLIC SPACES BETWEEN BUILT HERITAGE AND LIVING CITY: THE CASE OF CHANGLE GATE IN ZHENGDING, CHINA

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1. Public space in historic cities

Public spaces are ‘stages upon which the drama of communal life unfolds’ (Carr et al., 1992). They stimulate communication and integration among people of different social classes and groups. Their interaction with public life help establish connections between human beings and the urban environment. Thus, public spaces are endowed with cultural and emotional meanings, becoming the essential element of shaping and manifesting local identity (Čamprag, 2017).

In historic cities, public spaces support memories and stimulate contemporary urban life, which is crucial to perceiving and enjoying the historic urban landscape (Pezzetti, 2019). Public spaces and built heritage in the layered morphology of historic cities together form ‘a correlated entirety that can be read and designed as a unique palimpsest’ (Pezzetti, 2017), providing opportunities for contemporary interventions. Such interventions are always subject to two extremes: one is the continuity that preservation imposes, and the other is the necessary changes as responses to development (Čamprag, 2017). Interventions compromising between these two extremes inevitably involve a voluntary ‘filtering’ of the historic city, powered by various agendas and interests.

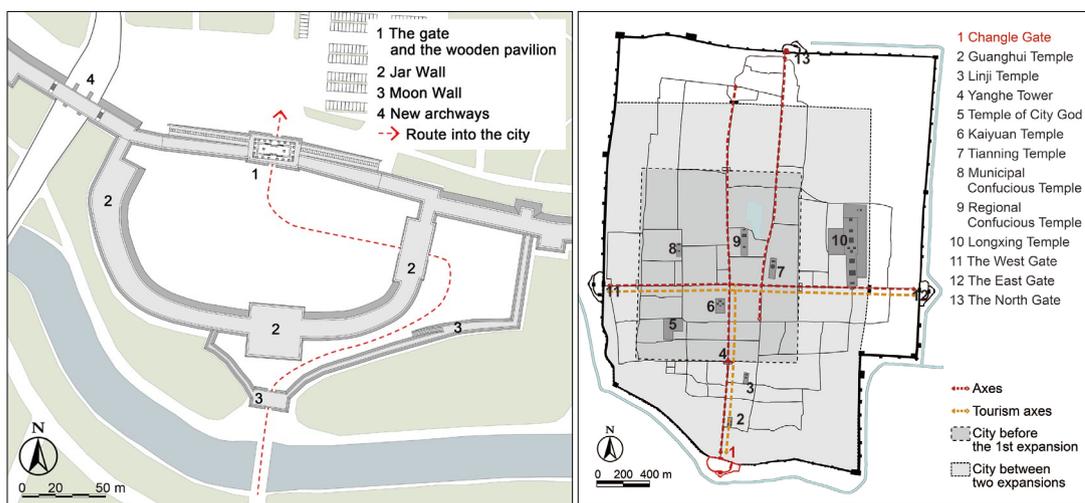


Fig. 1 Changle Gate, layout restored in 2013-2019. Source: author

Fig. 2 Expansions of the city of Zhengding. Source: author, based on Zhao, 2017

These interventions and ‘filtering’ should be based on sufficient knowledge of the pre-existing urban structure and texture and fully involve public life. This way, they will be able to enhance the correlated entirety into a regenerative structure that eventually integrates built heritages into the contemporary living city (Pezzetti, 2017).

Unfortunately, not all interventions were carried out in this way. Built heritage and historic cities are no longer merely cultural or historical objects in the increasingly affluent and leisure-oriented contemporary Chinese society. Still, they are also regarded as resources for city development strategies, especially tourism. The authority of ‘filtering’ that decides what to preserve has thus been taken over by the powerful tourism industry and the political force that collaborates with it (Čamprag, 2017), who also have replaced public life to dominate the production of Public spaces around built heritage (Chen, 2018). Built heritage sites and the past and memory they are carrying are used as symbols to create ‘themed’ public space, i.e., create an ambience of a fantasy that could stimulate activities and consumption (van Melik et al., 2007). Instead of being the link between built heritage and the living city, such themed public spaces tend to create an estranged and self-contained unit (Liu and Pezzetti, 2022) with the built heritage at its centre, refusing to interact with the rest of the city.

This paper focused on the built heritage of *Changle Gate* in *Zhengding* and its surrounding area, which have recently undergone tourism-oriented re-development. The role of the newly produced public spaces between *Changle Gate* and the city of *Zhengding* and their potential impact on the city is analysed.

2. *Changle Gate* and the tourism axes

Changle Gate, consisting of a gate with a wooden pavilion, a *Jar Wall*, and a *Moon Wall*¹ (Fig. 1), is the south gate of *Zhengding*, a small historic city in North China. The city was first built as a military town in the 4th century B.C. and expanded two times in 762 A.D. and 1449 A.D. (Zhao, 2017) (Fig. 2). The present *Changle Gate* and city walls were constructed during the second expansion with rammed-earth covered by grey bricks (Xu, 2018).

Changle Gate was at the southern end of the north-south Avenue, which has always been one of the major structural axes



Fig. 3 *Changle Gate* restored in 2001, the walls were left with bare rammed-earth; aerial photo. Source: Xu, 2018

Fig. 4 *Changle Gate* restored in 2013-2019; aerial photo. Source: Zhengding Municipal Bureau of Culture and Tourism, https://mp.weixin.qq.com/s/FsOb_fF-Pec0nl6rKBnMRg

of the city (Fig. 2) and was called the *Dragon Vein* (龙脉) according to *Fengshui* principles. The expansions elongated and doubled this axis and re-affirmed its persisting role in the overall urban structure (Liu and Pezzetti, 2022). The small village called *Nanguan*, formed outside *Changle Gate* for trade and transport purposes, further extended this axis out of the city.

¹ *Jar Wall* refers to the walls surrounding the gate, resembling a jar; *Moon Wall* surrounds half of the *Jar Wall*, resembling a crescent. They make a winding route into the city for defense purpose.

In 1937, the Japanese invasion damaged *Changle Gate* and destroyed the wooden pavilion. For the following decades, they were left unattended until 2001, when the local government restored *Changle Gate* and a few sections of the walls (Fig. 3). In 2013, the city walls were listed as a *Major Historical and Cultural Site Protected at the National Level*, marking the commencement of several re-development projects, which were finished by 2019. The walls were re-covered with bricks. The *Jar Wall* and *Moon Wall* were reconstructed to their original layout. Three new archways were opened west of *Changle Gate* for vehicle movement.

The city formulated a strategy to develop so-called 'suburban tourism' by attracting tourists from the large city of *Shijiazhuang*, 15 km south of *Zhengding* (Lan, 2004). South Avenue became the focus as one of the 'tourism axes' in this strategy since there were on its sides several key heritage sites (Fig. 2). The *Changle Gate* area that directly connects to *Shijiazhuang* by major roads was emphasised as the southern end of this axis.

Multiple tourism-oriented projects were carried out (Fig. 4, 5). The residential buildings north of *Changle Gate* were demolished for a green square and a parking lot (A, B in Fig. 5). The lands between *Linji Temple* and *Guanghui Temple* were cleared to construct a park and another parking lot (C, D). The agricultural fields east of *Changle Gate* were acquired for *Yunju Park* (E) and a riverside park (F).

Nanguan village was demolished and replaced by a group of commercial buildings with antique-style façades. The agricultural fields on both sides were transformed into parking lots (G) and an open-air event venue (H).

3. Role of the new public spaces

This section talks about the role and impact of the new public spaces around *Changle Gate* from the perspective of different stakeholders.

A sub-city for tourists

The tourism industry was the primary force behind the re-development of the *Changle Gate* area. Out of a functional concern for mass tourism, vehicular traffic was prioritised. Sufficient, if not excessive, traffic facilities were constructed. Outside the city walls, *Hebei Avenue* was widened to take over the traffic from the *Zilong Bridge* that directly connects to *Shijiazhuang*. Inside the walls, *Guanghui Road* was widened and extended, and the South Avenue was offset to adapt to the new archways. Besides, several large parking lots were constructed as part of the traffic system.



Fig. 5 Changle Gate, Nanguan, and part of the South Avenue; (left) in 2008, (right) in 2019. Source: author

On the leftover lands between the roads, public spaces were produced. The new *Nanguan*, between the major traffic node and built heritage, was created as a themed public space to provide a fantasy ambience (van Melik et al., 2007). Here the complexity of the pre-existing village was eliminated and replaced with total predictability: predictable activities almost identical to other commercial streets, in front of a predictable background of antique-style façades. It offered a place for tourists to escape from the harsh and complex reality and find a sense of emotional security.



Fig. 6 *Along the River During the Qingming Festival*, segment of the city gate; (top) version in the 11th century, (bottom) version in the 18th century.

The rest of the new public spaces were designed as support facilities that offer little opportunity for diversified activities. The emptiness of square A and parking lot B bores visitors passing through *Changle Gate* and stops them from proceeding along the tourism axis into the city. Thus, the new public spaces around *Changle Gate* formed an isolated and self-contained tourist attraction site, suitable for tourism consumption but of little help in promoting tourism in the overall city.

An estranged unit

Changle Gate was one of the most critical nodes along the north-south axis. Before the re-development in 2013-2019, the *Changle Gate* area presented a hierarchical texture: the Avenue - buildings along the Avenue - ordinary courtyard residences - farmlands. This texture affirmed the axis and recorded the process of the axis as an urban generator orienting the urban development (Fig. 5).

However, the new public spaces failed to re-affirm the axis (Fig. 5). The demolition of the courtyard residences erased the physical testimony of the city's development. The offset of the Avenue to the new archways further deprived of its axial role in the traffic system. In contrast, the east-west structure was emphasised. The three large public spaces (A, B, and E) along the significantly widened *Guanghui Road* were arranged without any formal rationale, fully exposing the massive city walls stretching east-west. Once entering the area from the north, one would immediately notice the strong east-west spatial orientation. This arrangement interrupted the north-south axis, separating the built heritage of *Changle Gate* and the new *Nanguan* from the overall urban structure.

Furthermore, there were always bustling commercial streets on the inner side of city gates in traditional Chinese cities, as depicted in *Along the River During the Qingming Festival*, a series of ancient Chinese paintings recording rural-urban landscapes (Fig. 6). Instead, the newly developed *Changle Gate* area reversed this traditional layout with commercial streets outside and open spaces inside. *Changle Gate* and *Nanguan* thus formed an estranged and self-contained unit, which is disastrous for the perception of the historic urban landscape.

As for the public space between *Guanghui Temple* and *Linji Temple*, it is reasonable to infer that the decision-makers expected to create visual connections by removing the pre-existing buildings so that tourists could see the three heritage sites at one glance and get interested in visiting all. However, these built heritages were born to be embedded in the city's fabric. Emptiness without form nor meaning can only create separation rather than connections between them. Besides, appropriate signages are enough to arouse visitors' interest. 'Seeing all at one glance' would only lead to boredom.

Exclusion of local community

Local inhabitants were excluded due to the acquisition and demolition of their residences; The features of the new public spaces further kept them away.

Pedestrian movement is essential to successful public spaces (Carmona et al., 2003). However, the design of the *Changle Gate* area lacked pedestrian connections from the neighbouring local community on the north. When a local resident tries to reach *Changle Gate* and *Nanguan* on foot, the six-lane *Guanghui Road* stops him; and the empty green square A and

parking lot B, offering no worthwhile and accessible activities, intimidate him from moving forward. Consequently, locals in their everyday life rarely use the new public spaces except for park C which is closely connected to the local community.

It's necessary to clarify that the locals are not completely rejecting the new *Nanguan*. They indeed visit it, but only when they are also tourists engaged in some temporary social or consumer activity. In their everyday public life that could represent the local lifestyle and local identity, the new *Nanguan* plays little role.

Furthermore, a series of 'denial cues' that convey to locals the message of inaccessibility (Lofland, 1998) is also responsible for the absence of the locals' everyday life. To name a few, parking lot B serving mostly tourists, seems to be telling the locals: 'this space is not for you unless you are also a tourist'. The expensive consumption due to high rent in *Nanguan* is filtering the users. Responding to the strategy of 'suburban tourism', public spaces here were designed to attract from the big cities more affluent tourists capable of bringing profit, rather than ordinary local residents.

4. Reflections

With the analysis in the previous section, one could conclude that the primary purpose of the *Changle Gate* area's re-development was to commercialise this historic area as a predictable place for tourism consumption. It followed a standardised configuration: a symbolic built heritage, a commercial street, a green space, and a group of service facilities. The whole design only ensured each component of this configuration was present. Little attention was paid to the interaction between the components or their relationship with the urban context on morphology or urban life dimensions. In the compromise between the two extremes facing this historic area, the aspects that cannot be easily marketed are filtered out, leaving only those that could contribute to the short-term benefits of tourism (Čamprag, 2017).

The public spaces in this area were thus produced to serve this standardised configuration. Regardless of the spatial and cultural context, they formed an estranged unit around *Changle Gate* with a landscape that did not exist in anyone's memory, imagination, or any artwork depiction. It's an entirely new invention. Rather than integrating the built heritage into the living city and helping visitors to unveil the history residing in it, these public spaces cast a new veil around the already fragmented historic fabric and built heritage.

In present-day China's 'consumer society', objects are no longer consumed only for their usefulness but for their differences and symbolic value. Having filtered out the locality and historical significance of *Changle Gate*, the tourism industry exploited its symbolic meaning to attract tourists and stimulate consumption (Zhang and Deng, 2009). It indeed brought some economic benefit in the short term. But as the layered morphology and stratified historical imprints that carried unique urban identity were eliminated, the *Changle Gate* area lost its real persisting differences. It can only inspire some predictable and homogenous activities. In case some other historic areas in other small historic cities are re-developed for tourism, their novel symbols would easily 'steal' tourists away from the faded symbol of *Changle Gate*.

Even worse, the new public spaces around *Changle Gate* caused social exclusion against the local community. The future performance of the area depends only on tourists, while locals no longer play much of a role (Ward, 2006). The projects only tried to create a purified and abstract image of a fantasised historic area with themed public spaces, leading to the removal of the seemingly 'unclean' courtyard residences and farmlands. Consequently, the *Changle Gate* area lost the most charming aspects of a small historic city: historic ambience and authentic settings of local life. The built heritage was thus subtracted from the living city, unable to generate any contemporary meaning or memory for the present local generation. This tourism development is destined to be unsustainable and will eventually undermine the very foundation on which tourism itself is based.

5. Toward a sustainable future

The role of public space is of great potential in mediating the two extremes facing historic cities. If embedded in the pre-existing urban fabric and fully involving the local life, public spaces can form a framework integrating contemporary life with memory and the living city with built heritage. They could help enhance the historic urban landscape and meanwhile provide a solid foundation for sustainable tourism, achieving a balance among different stakeholders.

But the new public spaces around *Changle Gate* have unfortunately failed to play such a role. Due to the lack of awareness of the historical morphology and exclusion of the local community, they subtracted the built heritage of *Changle Gate* from the living city.

Large public spaces produced for tourism development are becoming common in China in recent years, consuming a tremendous amount of financial and human resources. Efforts should be made to ensure they play their expected role. The reflections on the *Changle Gate* area reminded us of some critical issues in such efforts.

First, historic cities call for comprehensive plans and designs instead of a standardised mass tourism configuration consisting of separate components. Second, although it is neither possible nor rational to restore all the historical features of centuries ago, any changes in contemporary interventions must be based on an in-depth study of the pre-existing city and full involvement of public life and the heritage management authority. Third, buildings of the late 20th century, although not 'ancient' in appearance, also carry the memories of generations and record the urban development of an era. They are unique and should not be treated as 'trash' to be removed even if they are in undesirable conditions. Fourth, unlike Western culture, the Chinese tend to preserve cultural continuity through non-material elements rather than the materials of ruins or relics (Botz-Bornstein, 2012). Projects lacking full knowledge of the site, like the *Changle Gate* area, reduced these non-material factors to the easiest-to-operate façades or the symbolism of individual heritage sites. They failed to realise that the city's layered morphology and public space qualities should also be involved in the historic urban landscape.

There were alternatives to the demolition-construction approach for producing new public spaces in the *Changle Gate* area. For example, some of the pre-existing courtyard residences along the South Avenue were no longer inhabited. Opening their courtyards to the public could be an opportunity to create a unique micro-scale public space system (Dong et al., 2018). For the 'suburban tourism' strategy, the rural-urban landscape, in contrast to the concrete jungle in the big city, could also be a sustainable tourism attraction and an opportunity for public spaces (Pezzetti, 2019).

Providing tourists with opportunities to interact with local people and local life can stimulate a unique attachment of visitors to the place and thus support sustainable tourism (Shang et al., 2020). To this end, the most crucial issue for the *Changle Gate* area is to restore the previous urban space with mixed functions and activities to keep an optimal balance among residents, visitors, and tourists. The impact of vehicular traffic should be minimised, for example, by diverting the traffic with flexible arrangements of one-way streets. To eliminate the 'denial cues', the large public spaces should be divided into human scales, and adequate daily public facilities should be ensured, especially public benches and necessary shading facilities (Chen et al., 2016). The *Changle Gate* area should not be reduced to a sub-city or an estranged unit isolated from the living city. It should be fun for all, not just tourists (Ward, 2006).

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ADAPTIVE GOVERNANCE FOR HEALTH AND SOCIAL EQUITY:
A CASE STUDY OF HANGZHOU'S XIAOYING ALLEY

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Introduction

By 2050, 68% of the world's population will be living in cities (United Nations, 2019). The sprawl of cities has raised concerns about environmental pollution, health inequalities, and many other health issues (Burriss et al., 2007; Corburn, 2009). Governance is generally considered as the interaction and decision-making process in which government, market, and civil society work together to deal with public affairs (Rhodes, 1997; Healey, 2006), and identified to be an important approach in health promotion and health inequality issues (Kickbusch & Buckett, 2010). To address various health challenges, there has been an increasing number of studies in recent years that focus on how urban governance can be adapted in the health domain.

Existing research is mainly rooted in Western countries, with less discussion on China's system and focuses mainly on the macro level, with a lack of attention to grassroots communities. This paper explores the adaptive governance process of a Chinese community in the health domain to bridge the gap. Adaptive governance originated in the field of environmental governance field as a strategy for regulating the social conflict in the management of complex ecosystems and aims to examine how different agents respond to highly complex and rapidly changing governance contexts (Chaffin et al., 2014; Folke et al., 2005). This paper conducts a case study based on the Xiaoying Alley community in Hangzhou. In 1958, Chairman Mao Zedong inspected the Patriotic Health Campaign in Xiaoying Alley, and since then the community has been famous for its health promotion work in China for a long time and was approved as a healthy community by the World Health Organization in 2013. The poor built environment and aging population bring many challenges to the community's health governance, and there are more health inequities than in other communities. The case study helps us understand how grassroots communities in the Chinese context mobilize a variety of actors to govern from a relatively poor conditions to promote health and reduce health inequities. This paper employs a policy arrangement framework to examine the

characteristics of its health governance mode and its shifts in different phases and summarizes the main findings of this paper.

A typology approach from the Institutionalism perspective

A typology approach of governance could help us describe, compare, and evaluate governance activities by conceptualizing an ideal governance mode that includes multiple dimensions of governance characteristics (Bednar & Henstra, 2018; Pierre, 1999). Types of governance modes are generally distinguished by the role of government (Pierre & Peters, 2000). Each type of governance mode consists of a set of governance characteristics to examine the degree of cooperation from different dimensions, and the specific governance characteristics need to be determined according to the research purpose and theoretical perspective (Treib et al., 2007). This paper distinguishes governance modes from the institutionalism perspective. The institution is understood as a collection of norms, rules, and practices that constitute actions in a social context (Harvey, 1989; Powell & DiMaggio, 1993). The institutionalism approach focuses on the institutional environment and the shifts in actor configuration and is adopted by the adaptive governance literature in different fields, providing an appropriate perspective for this paper (Aligica, 2006; Huntjens et al., 2012; Janssen, 2006). Giddens (1986) proposed a structure-agent framework to explain the institutional change, arguing that structure and the behavior of different actors influence each other through the flow of resources, authority, and ideas, and the mode of urban governance will be defined by the above activities (Giddens, 1986), Healey (2006) built on it by considering the insights of Hajer (1995) and Dyrberg (1997) and argues that the interaction between structure and agency could be considered as "institutionalization" at different levels (Hajer, 1995; Dyrberg, 1997). Based on these contributions, Leroy and Arts (2006) defined a theoretical framework called Policy Arrangement (PA) which refers to "the temporary stabilization of the content and organization of a particular policy domain" (Leroy & Arts, 2006). The framework specifically includes four dimensions: actors, power, rules, and policy. Arnouts (2012) developed an analytical framework and proposes four modes of governance: hierarchical governance, closed co-governance, open co-governance, and self-governance, and defines the institutional characteristics of each mode based on the aforementioned concept of Policy Arrangement. The authors do not consider the characteristics of the policy dimension, considering that policies are more focused on specific content than on governance itself (Table 1). This paper employs this framework to analyze the adaptive governance process in Xiaoying Alley, summarizes the governance modes of the Xiaoying Alley community for health and social equity in different phases, and analyzes its adaptation process.

Table1

Comprehensive overview of the four ideal-typical governance arrangements

Source: Leroy and Arts (200

Ideal-typical governance arrangements				
	Hierarchical	Closed co-	Open co	Self
Actors	Mainly governmental actors	Select mixed group of actor	Large mixed group of actor	Mainly non-governmental actor
Power	With government	Pooled	Diffused	With non-government
Rules	Governmental coercion	Restricted cooperation	Flexible collaboration	Non-governmental forerunning

Methodology

This paper conducts a case study of Xiaoying Alley. The data were collected through desk work, interviews, stakeholder workshops, and participatory and non-participatory observations: firstly, policy documents related to healthy city construction in Hangzhou were collected through the internet; secondly, this research team visited Hangzhou twice in November 2020 and October 2021 to conduct in-depth interviews with relevant leaders from Hangzhou Healthy City Construction Guidance Center and other departments to understand the macro-level implementation. Finally, we held discussions with government officials⁵² and some resident representatives from the Xiaoying Alley community. The two main types of government departments are the subdistrict office and residents' committee, which have no counterpart form in the West, with the level of the subdistrict office being higher than the residents' committee.

Results

This paper divides the process of adaptive governance in the Xiaoying Alley community into three phases and summarizes the characteristics of the corresponding policy arrangements, and then identifies three governance modes based on their differences.

Hierarchical (before 2003)

The goal of governance in this phase was relatively simple, mainly to improve sanitary conditions (e.g., eliminating rats), so there were limited types of actors, namely, Patriotic Health Campaign Offices (PHCO) at all levels, subdistrict offices, and community residents, with PHCO at all levels setting the goals at the respective level, and the community residents fulfilling the tasks arranged by the subdistrict offices. Power is concentrated in government departments at all levels, and after the PHCO sets the overall plan and empowers the subdistrict office to set goals and specific plans and organize residents to carry out governance activities. Residents are not empowered by formal institutions but can make suggestions to the government in an informal form. The rules are mainly top-down, the higher-level governments issued relevant orders, and the lower-level streets and communities implemented them by setting specific goals and organizing the public to accomplish the tasks.

In general, the main participants in this phase are mainly the governments, power is mainly held by the government, and the rules are mainly in the form top-down, and therefore the governance mode could be identified as the hierarchical mode.

Closed Co-governance within the inner community (2003-2015)

After the SARS outbreak in 2003, Hangzhou realized that it was difficult to cope with the increasingly complex health issues through a patriotic health campaign, so it studied the experience of Healthy City Movements in Europe and explored the possibility of establishing a healthy city. The governance mode shifted in Xiaoying Alley accordingly.

In terms of actors, participants mainly come from within the community, including two types of participants, one is government participants, including the subdistrict office and the residents' committee; the other is residents and various organizations within the community; in addition, some market actors are also involved, but to a lesser extent, only

according to the relevant needs within the community. This phase of adaptation shift stems from the consensus within the community, with less involvement of the higher-level government and the community as the leading role in organizing other residents and organizations to carry out governance activities, for example, in 2008, the community organized residents to prepare a healthy recipe with doctors from the Zhejiang Medical Second Hospital and looked for corporate sponsorship to purchase electronic screens to promote it throughout the community. In addition, the community has also formed co-management organizations with some residents' representatives, such as the establishment of a sanitation sub-committee in the community, where community staff and residents have their roles to manage the sanitation situation in the community.

Power is mainly held jointly by the residents' committee and resident representatives. Within the government, the practice of the previous phase was continued, with the top-down distribution of power by the PHCO at all levels, and the residents' committee organizing residents and corresponding actors and resources for implementation. In addition, residents were given some decision-making power. A variety of deliberation organizations were established in the community, and residents were able to negotiate with the government on their demands.

In terms of rules, the community has established various mechanisms for negotiation with residents on various community affairs, including health. The social system in China determines that the residents' committee becomes a key actor in grassroots governance. The orders from the higher level need to be implemented by the residents' committee, and the voice of the residents also needs the residents' committee to feedback upwards, so the cooperation and communication in this phase mainly took place between the community and the residents, and other social organizations gradually participated in the negotiation process at this stage, and are involved in the implementation of governance according to the actual needs. On the other hand, the state's requirement for maintaining stability makes communities pay more attention to grassroots opinions, for example, in 2000, Xiaoying Alley set up a communication station for NPC delegates, where community residents can express their opinions on various community affairs and the staff of the station organize relevant resources to deal with them; in 2013, Hangzhou started to fully implement the system of community affairs supervisory committee, which gives residents the institution rights to participate in the community decision-making process.

In general, the actors in this phase are mainly residents' committees, community residents, and various organizations in the community, and the three types of actors formed a coalition to jointly carry out governance to be implemented, and the power is mainly held by the government and residents together, and there was a bottom-up route in terms of rules, and the governance mode could be identified as a closed co-governance mode.

Open and Shared Governance (2016-present)

The social trend has changed during this period. The national health strategy "Health China 2030" which is published in 2016 represented an increase in the importance of public health at the national level, and the "Thirteen Five-Year Plan for Building a Healthy Hangzhou" promulgated in 2016 put forward the requirement of "health in all policies" and the "Healthy Hangzhou 2030" strategy was promulgated in 2017 in further response to the national requirements. Influenced by the trends mentioned above, Hangzhou has increased its efforts to build a healthy city and included the results in the annual government performance assessment, forming a "growth tournament". The governance mode in Xiaoying Alley was also adapted.

In terms of actors, this phase is more diverse in participating stakeholders. The governments at the district and subdistrict levels became more involved in the health governance process in this phase and established alliances with communities and residents to jointly improve the health level of Xiaoying Alley. For example, considering that the residents in the community are aging more severely and are weaker than the general community in terms of health opportunities, the upper-level government-organized resources to create a national model district for elderly services, and set standards for healthy communities, etc. On the other hand, the governments also organized hospitals and other Party organizational units to provide quality and affordable public health services. The participation of social organizations is more active, and the health industry has become one of the development priorities in this phase, with more than 300 senior care-related enterprises introduced in the community by 2017. In addition to this, research institutions are also involved, for example, the Healthy Community Assessment Index for Xiaoying Alley was written by a team from the Zhejiang University of Finance and Economics in January 2018. Some organizations in the community actively participated in the governance process and provided about 4,000 square meters of available public space, which mainly includes elderly care, escort, and daily convenience facilities.

In terms of power, the participation of the higher-level government allows this alliance to have access to more resources, and power is mainly shared among the different actors under the arrangement of the government. To better utilize the capacity of the participants, the Xiaoying Alley community has formed the "Red Wall Gate" Integrated Party Committee as the leading organization, introducing the higher-level district propaganda department, representatives of important units in the community, and representatives of property companies as members. The integrated party committee leads the residents in handling important community health affairs, and also brings in other external organizations and professionals to provide health services. On the other hand, residents have the right to supervise in different ways such as through self-

governing organizations and individual feedback. The community has set up several organizations to solicit residents' opinions on various community health affairs, and the integrated party committee collects the opinions and makes improvements accordingly; in terms of decision-making on important affairs, the practice of the previous phase is continued, and residents can participate in the decision-making process and express their opinions through different routes online and offline.

The rules in this phase are more flexible. In important health issues, such as the prevention and control of the Covid-19, the top-down hierarchy mode is adopted, with the community taking the lead; while in other matters related to the residents' interests, the rules of interaction are more flexible and collaborative, with different levels and categories of actors cooperating. On the residents' side, residents set up diverse autonomous organizations under the guidance of the community's comprehensive party committee, and established a five-step method to solve major problems in the community, including health issues; in addition, the community also focuses on collecting bottom-up feedback, with residents seeking feedback through new media channels such as WeChat. In 2016, a comprehensive community service platform "Red Alley Life Square" was established to provide a place for offline communication between different actors.

In general, the number of participating actors in this phase has increased, and different actors have formed various coalitions for governance; power is more decentralized, and all of the actors can participate in decision-making in different ways; the rules of interaction are also more flexible, and the government has set various systems and facilities to provide a route to feedback for other actors, and the governance mode could be identified as an open co-governance mode.

Conclusion

This paper distinguishes the health governance adaptation process in the Xiaoying Alley community based on an institutionalism perspective. In general, the long-term development process of health adaptive governance in Xiaoying Alley was led by the government, the subdistrict office, the residents' committee, and other actors in the community gradually allied to cooperate; the city government, with more complex governance responsibilities, was less involved in grassroots governance. In terms of participating actors, the number of participants gradually increases and they possessed different responsibilities according to the government's arrangement; in terms of power, the government arranges for different actors to share it. In important affairs the government still holds all the power, while in non-urgent matters the power is shared among various actors through different systems; in terms of rules, there are multiple paths of communication, mainly top-down within the governmental system, and between the governmental and non-governmental entities, bottom-up paths are increasingly being built. However, this paper notes that the government's leading role also makes the governance process problematic in several ways, the most important of which are in the areas of regulation and

facilitating cooperation. In terms of regulation, it lacks the ability to supervise the government. The only regulation comes from the government-led resident organization, which is an informal system. There is no restriction measure when the government chooses to ignore its opinions. On the other hand, the frequency and scope of multi-organizational cooperation need to be improved. The existing cooperation is mainly concentrated between the residents' committee and the residents, and due to the aging degree, the participating residents are mainly the elderly with free time, and the participation of young people with more knowledge and ability is not active, while other organizations participating in governance in the community are limited to enterprises and institutions with a government background, and the willingness of other organizations to participate is limited, which needs further governance adaptation and adjustment in the future.

This case reveals the adaptive governance process of the grassroots community in China to pursue health promotion and reduce health inequalities, and the results confirm the important influence of governments during the adaptation. The findings also raise two questions for further research, the first being whether this characteristic could be discovered in Hangzhou and other cities in China, and the other being which factors contribute to these shifts and under what circumstances the adaptation takes place.

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ANALYSIS OF URBAN SPACE VITALITY BASED ON WEIBO CHECK-IN DATA

A CASE STUDY OF SUZHOU

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1. Introduction

The city is a carrier of all kinds of residents' activities and the core of public activities [1]. With the rapid process of urbanization in China, the spatial structure of cities has been spreading, and in some cities, urban space has been redefined due to the construction of new districts and new cities, and the urban spatial structure has gradually evolved from a single center to a multicenter. In urban planning practice, multicentricity has become one of the common planning tools in major cities in recent years [2-4], and mega cities in China such as Beijing, Shanghai, Guangzhou, and Shenzhen all take multicentricity as the goal of urban development.

The research on urban spatial structure in China mainly involves: theoretical studies [5-6], studies on the characteristics of urban spatial structure patterns [7-9], studies on the relevance of urban structure to social problems [10-12], and the exploration of the relevance of urban structure to social economy [13-14]. The current stage of research mainly explores the spatial structure of cities by using planning and census data as the main data source and geospatial and morphological analysis as the method. However, these data have certain limitations, one of which is that the data accuracy is not sufficient to analyze the urban residents' aggregation within urban space at all scales, and the other is that the data are not real-time and cannot reflect the mobility characteristics of urban residents.

In recent years, with the development of information technology, big data has provided new data sources for urban spatial analysis. Among them, the more widely used are: social network pictures, night lighting data, shared bicycle travel data, heat map data, cell phone signaling data, and online taxi travel data, etc. Scholars such as Ying Long, Lu Yu, and Zhiying Li [15-18] have used these data to analyze urban space. However, these data have problems such as difficulty of access and few access channels for scholars. And the open-source Weibo check-in data provides a reliable alternative. Weibo check-in data records the check-in information of Sina Weibo users, which mainly includes information such as check-in time, check-in content, spatial location of check-in points, and the number of check-ins at check-in points [19]. The Weibo check-in data can be obtained through an API interface, which is easier to obtain compared with the other data which has mentioned before, and has been widely adopted in the current stage of urban spatial research. At present, domestic scholars mainly use Weibo check-in data as a measurement of foot traffic in various spaces and as a method to identify urban functional areas [20-21], but less research has been conducted on urban spatial vitality with this kind of big data.

At this stage, research on the spatial vitality structure of cities has mainly focused on megacities such as Beijing, Shanghai, and Shenzhen [22-24], with less attention paid to general prefecture-level cities. Suzhou, as an important part of the economically developed eastern provinces and cities in China, is one of the representative cities with the highest urbanization rate in China. At this stage, Suzhou has taken the lead in the country to enter the stage of re-urbanization,

and as one of the pilot cities for urban renewal announced by the Ministry of Housing and Construction in 2021, the focus of urban development has shifted from quantitative to qualitative models. The study based on the urban structure activation efforts of Suzhou has a good paradigm role for the rest of cities in China.

To this end, this study analyzes and investigates the spatial structure and spatial vitality of each area through Weibo check-in data, taking the scope of Suzhou city as an example. At this stage, the high-vitality areas of Suzhou are concentrated in the old city area, mainly the Pingjiang Road historical district, and the Jinji Lake area in the east of the Suzhou Industrial Park, with Suzhou Center and the Gate of the East as the core. This paper summarizes the spatial characteristics of Suzhou at the present stage of urban development through the study of Suzhou's urban vitality, and provides a reference for future urban development and spatial optimization.

2. Data and Methods

2.1 Data Source

Weibo check-in data was used in this study to measure users' geographic location and social activities. When users geo-tag posts using Weibo check-ins, their posts are tagged with highly accurate geolocation information. Using the API interface, the check-in information is captured and used as an indicator to measure the activity characteristics of the city's residents and, through time overlay, to capture the dynamic patterns of people's activity across the city. The data were collected over a one-week period (April 26, 2021 to May 2, 2021). The one-week data collection period provides a sufficient sample of data with cyclical characteristics. A total of 4,336 valid Weibo check-in data were collected during the time periods of 9:00-10:00, 12:00-13:00, 15:00-16:00, 18:00-19:00, and 21:00-22:00.

2.2 Research Methodology

2.2.1 Crowd Gathering Density Analysis Based on Weibo Check-in Data

In this study, the temporal and spatial dimensions were overlaid and analyzed in ArcGIS software based on microblog check-in data to reveal the characteristics of changes in the correlation between social activities and urban spatial environment of urban residents during a week's time. With reference to related scholars' studies, the relationship between the density of various types of social activities, the spatial duration cycle of urban activity and urban spatial structure at this scale was further explored using 1 km X 1 km as the unit of analysis [25]. Here, density is defined as the number of people visiting a unit area during a predetermined time period. Combined with previous studies [25], we introduce kernel density analysis as a tool to measure the density values within each unit area, which is calculated as shown below.

$$p_i = \frac{1}{n\pi R^2} \times \sum_{j=1}^n k_j \left(1 - \frac{D_{ij}^2}{R^2}\right)^2$$

Where: k_j is the weight of study object j ; i in D_{ij} is the distance between spatial point i and study object j ; R is the bandwidth of the selected study area.

2.2.2 Characterization of residents' activities in the context of multi-scale spatial environment

In addition, by selecting the two units with the highest spatial activity during the data acquisition period, we conducted a multi-temporal analysis to explore the relationship between urban spatial structure, residents' social activities and spatial activity.

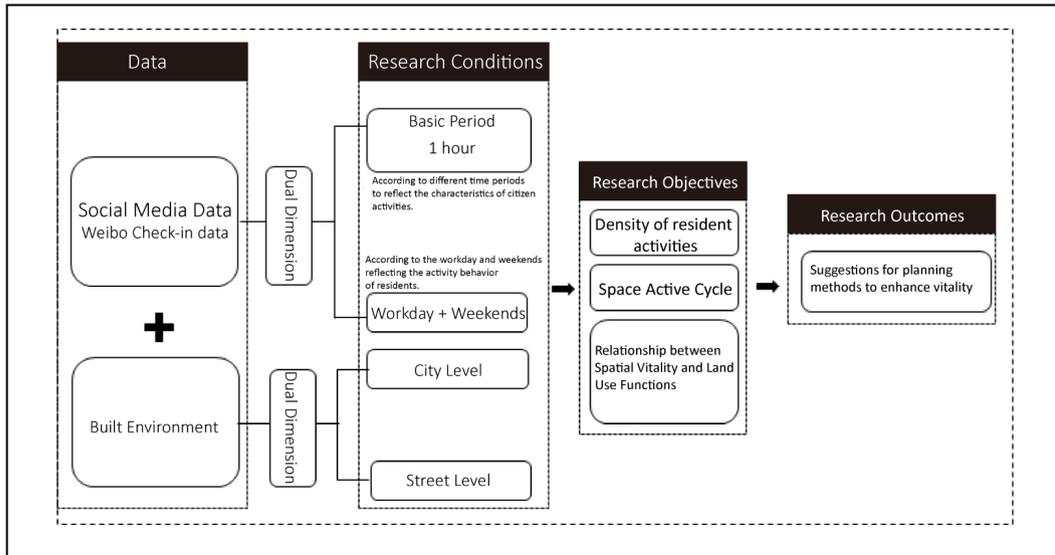


Fig.1 the Research Framework

This study uses the above three research methods as entry points to analyze the spatial dynamics in Suzhou at different scales, and the research framework is shown in Figure 1. The correlation between citizen activities and the surrounding built environment and land use mix was also analyzed by selecting the areas with high activity.

3. Exploration of Vital Space in Suzhou

3.1 Spatial Structure of Suzhou in Urban Scale

Figure 2 shows the physical geographic check-in locations where Weibo check-ins were performed during the study period. These spaces can be categorized into the following six main types: offices, restaurants, parks and tourist attractions, schools and research institutes, medical facilities, and entertainment venues. As can be seen from the figure, within the city of Suzhou, the majority of check-in destinations are still dominated by the old city, with the exception of educational and scientific research check-in locations. The spatial structure of the whole city is still based on the old city as the gathering area of people, and some peripheral areas only have the tendency to gather in the check-in locations in the office category. Recreational check-in locations represented by restaurants, parks and entertainment facilities are even more highly concentrated in the old city. This also reflects from the side that at this stage, in terms of urban spatial vitality, Suzhou is still centered on the old city, and other areas only begin to show a local gathering trend in office space, while other types of check-in locations still do not show an obvious gathering trend, and this phenomenon is most prominent in restaurants and parks and tourist attractions check-in locations.

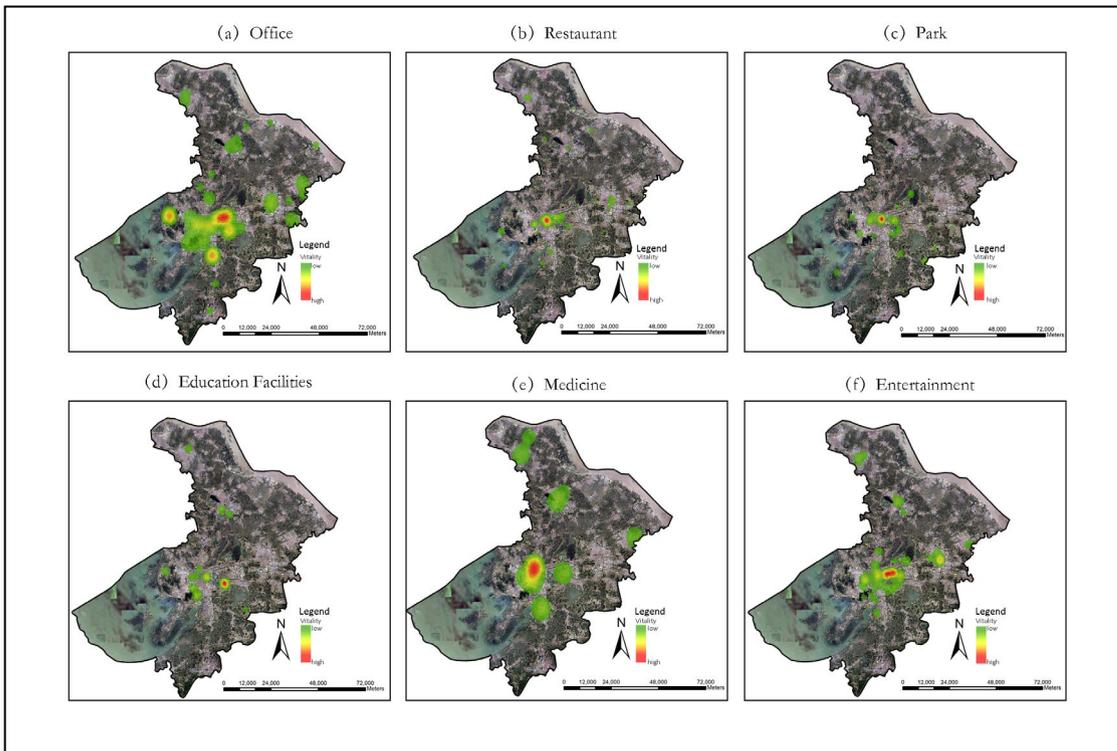


Fig.2 Weibo check-in geographic element classification

Figure 3 shows the spatial distribution of Weibo check-in users under the change of multiple time dimensions. In the figure, as the number of check-ins increases, the color of the display gradually deepens. From the figure, we can see that the areas east of the old city and west of the industrial park are more attractive to the crowd. On weekends, as people have more opportunities to travel and more time to travel, the crowd starts to spread to the surrounding areas of Suzhou, and although the high gathering degree of the old city has weakened, the old city is still one of the main destinations for people to visit. In addition to the old city, the area with obvious gathering effect is the area bordering the old city in the west of Suzhou Industrial Park. This area is located at the edge of Jinji Lake with good landscape resources and recreational facilities, and the surrounding land is rich in functions and has the property of high land compound utilization, which is a more ideal leisure place for the surrounding residents. From the figure, we can also see that, except for Taihu Lake in the west, the vitality of urban space in the north and east of Suzhou is not high, especially in Kunshan City and Taicang City in the east and northeast, which are located on the Suzhou-Shanghai development axis, but the spatial vitality is at a low level.

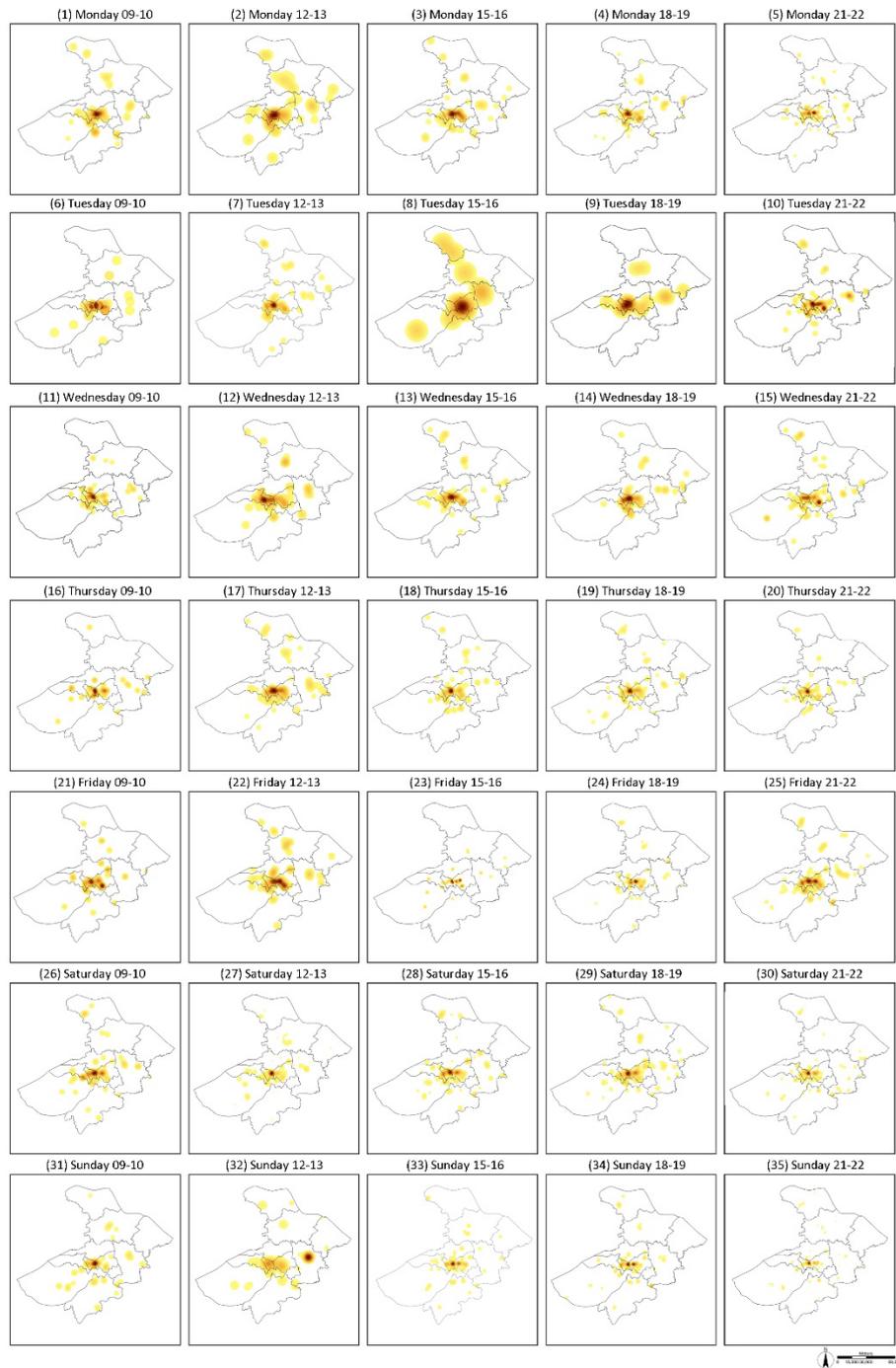


Fig. 3 Weibo Check-in one week density change

In order to further explore the relationship between urban space and regional liveliness with high precision. We use a 1km X 1km grid to calculate the vibrancy of Suzhou city as shown in Figure 4. The spatial vibrancy of Suzhou city with 1km X 1km as the basic unit in the time range of data collection is listed in the figure. According to the figure, two cells, Pingjiang Road Historic District and Suzhou Center, are the areas with the highest vibrancy. In addition to the central city, the areas with high urban vitality in Suzhou are located in the industrial park in the east, where in the western part of the park adjacent to the Jinji Lake area, which forms a high vitality horizontal axial direction with the old city, but the distance is short and the radiation range is limited.

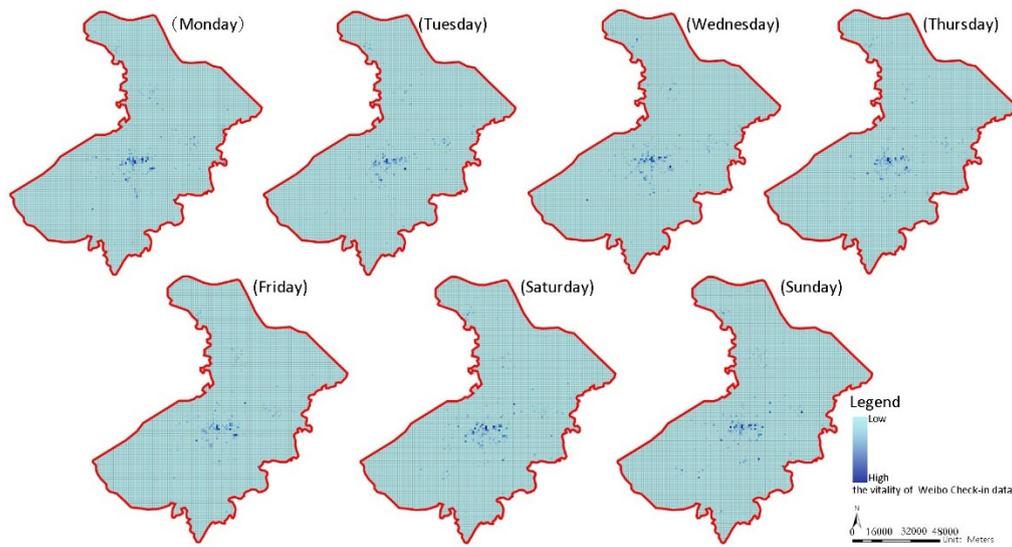


Fig.4 1km X 1km basic unit check-in activity

3.2 Street Scale Suzhou City Spatial Structure

Based on the above, the two basic units with the highest activity levels were selected in Figure 5 for the study related to street-level activity. The study period encompasses weekdays and weekends, with Mondays selected as representative of weekdays due to the regularity of weekday movement. The color of each building (street) in the figure from green to red represents the sign-in intensity of each cell.

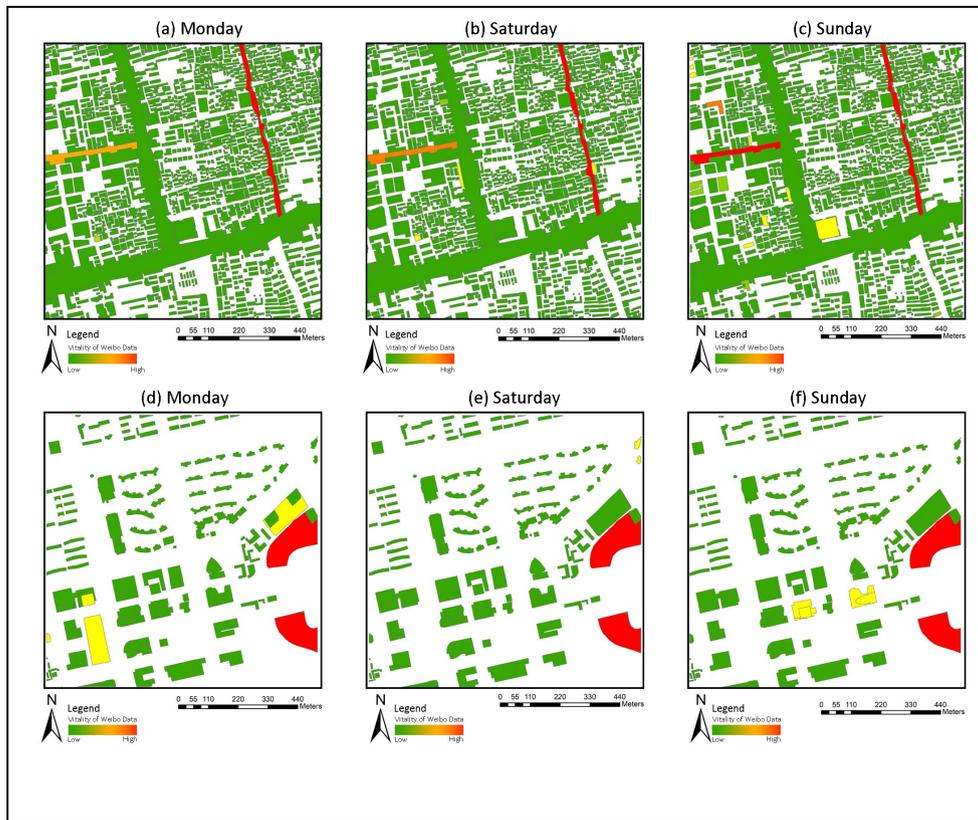


Fig.5 Street-level data of Weibo check-in on working days and rest days

As can be seen from the above figure, (a)-(c) show the old city section of Suzhou, and the areas with high personnel activity in this section are mainly concentrated in the Pingjiang Road Historical and Cultural District and Guanqian Commercial Street. Among them, Pingjiang Road Historical and Cultural District, as the city card of Suzhou, has high activity on both Mondays and weekends. The Guanqian Commercial Street, which is less than 500 meters away from it, is a little less active on weekdays. As a famous commercial complex in Suzhou, Suzhou Center is rich in internal functions and has rich external facilities, which can provide rich activities such as dining, shopping and entertainment for city residents. Therefore, Suzhou Center has a strong attraction to the public on both weekdays and weekends.

To further explore the spatial distribution of citizens under spatial and temporal changes, further analysis of crowd gathering at different time periods at street scale was carried out for these two segments (as in Figs. 6 and 7). The time periods used here are the same as above: 9:00-10:00, 12:00-13:00, 15:00-16:00, 18:00-19:00, and 21:00-22:00, including Mondays (weekdays), and Saturdays and Sundays (rest days).

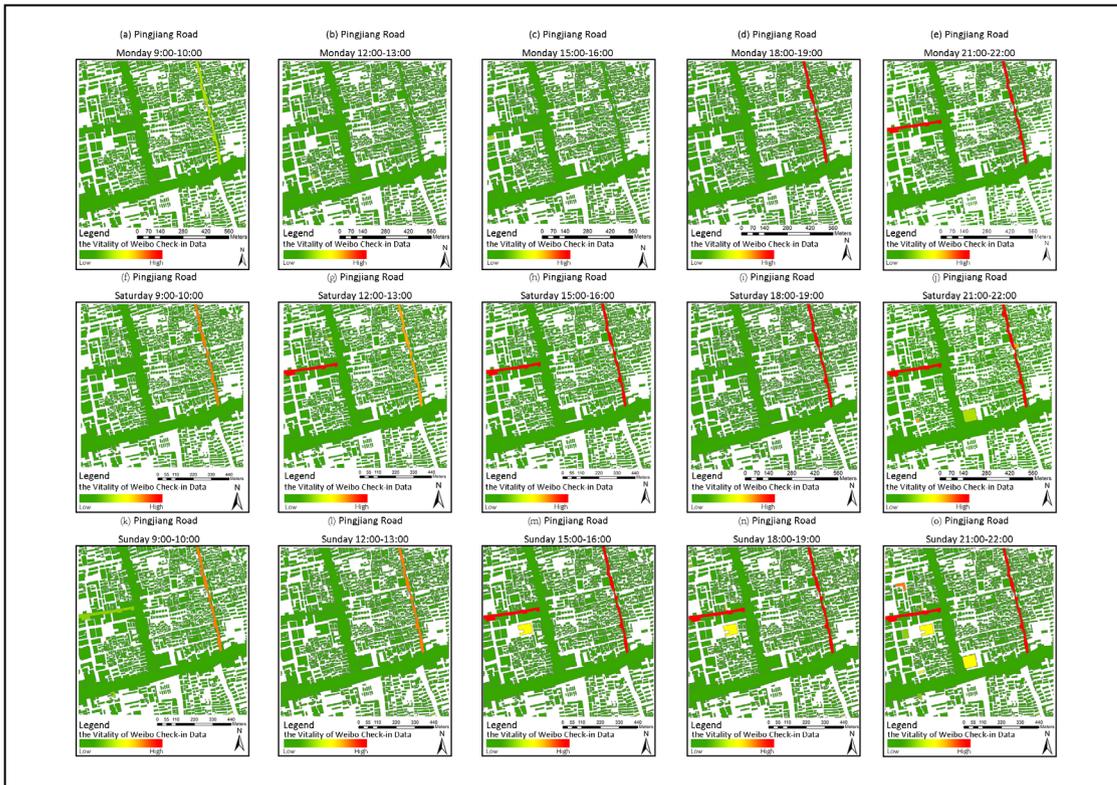


Fig.6_Weibo check-in data of old city by time

As can be seen in Figure 6, the time period in which Guanqian Street is more active during weekdays is after 21:00. The rest of the time, the gathering of people is low. The activity level of Pingjiang Road is similar to that of Guanqian Street on weekdays, except that the time period of high activity is slightly earlier, and there is already a high level of activity during the data collection time period of 18:00-19:00, which is in contrast to the surrounding areas of the board. And the two streets have a high activity level from late afternoon during the weekend. And the various commercial facilities around the two streets also show a certain degree of population gathering during the weekend.

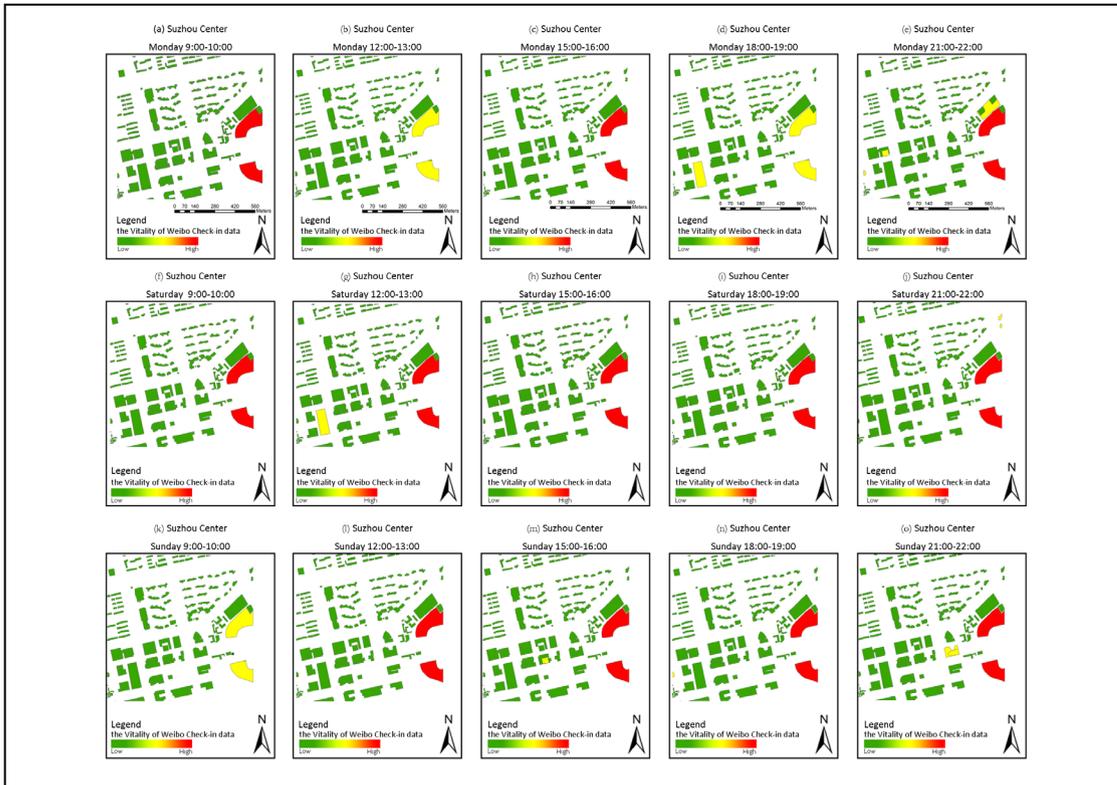


Fig. 7_Weibo check-in data of Industrial Park according to time zones

As shown in Figure 7, Suzhou Center, as the area with the highest activity in the industrial park, has a very high degree of gathering of people compared to the surrounding areas, and the gathering time lasts long. Almost on weekdays and weekends, Suzhou Center has a high degree of gathering. As mentioned above, the highly complex spatial types of Suzhou Center provide a wide range of choices for the public and can attract them continuously during weekdays and weekends.

As can be seen from Figures 6 and 7, as the two segments with the most obvious degree of people gathering in Suzhou, both of them have a large number of commercial and entertainment spaces as the spatial elements to attract people to come. However, a comparative observation shows that it is not guaranteed to provide a high-intensity attraction for places if the business function is single. Take the Pingjiang Road segment as an example, this segment in Pingjiang Road as well as Guanqian Street is to have commercial and residential facilities as the main business form. However, its activity level is not high during weekdays, and there are no more citizens gathering in this area, and only after 18:00 in the evening does the crowd gather at a high level. On the contrary, Suzhou Center is located in the industrial park area. Within 1km of Suzhou Center, there are not only a large number of commercial and entertainment facilities, but also office, residential and tourist attractions and other facilities. The injection of these facilities provides a guarantee that the area will continue to maintain a high level of activity.

4. Discussion

In this study, we used social media data to depict the spatial vitality structure of Suzhou city. From them, we also analyzed the high aggregation of crowds and urban spatial correlation at city level and street level, respectively. Using this feature of citizens' ability to share geo-tagged information on microblogs, social network activities were used to measure the built environment of the city and reflect the behavioral characteristics of citizens. The results of the study show that the check-in areas of check-in users are highly concentrated in Suzhou city, mainly in the west side of the old city and the east side of the industrial park, forming an east-west axial relationship of activity with a high level of dining, leisure and entertainment.

However, the comparison reveals that the duration of regional activity is also influenced by the degree of mixed use of surrounding land. For example, the high activity areas in the office and residential complex functional areas have a longer duration of vitality than the single-occupancy areas.

The methodology explored in this study can also be used as one of the methods to study the dynamic movement of people at the regional level. This study analyzes the dynamic movement of people at city and street scales and verifies the feasibility of this research method. In this way, it can be extended to analyze the dynamic movement of people at the regional level because the microblog check-in data has high-precision geographical coordinate information. In the past, the study of people's dynamic migration at the regional level often required a lot of human and material resources, so the areas where the study was conducted were limited. Now, with the help of microblog check-in data, we can understand the dynamic migration process of people in a larger scale area, and this method can support the analysis and research of urban spatial structure in the future.

5. Conclusion

With the rapid development of cities, both the morphology and spatial nature of cities are changing. As users of urban space, citizens' perception of urban spatial structure has a significant role in improving the efficiency and quality of urban space. However, there are few studies on urban space based on users' perceptions of the built environment and people's activities under dynamic conditions. This study examines the relationship between crowd activity intensity and urban spatial environment structure in the context of quantitative data analysis, using social network data as a carrier, using Suzhou as an example. By using one hour as the basic time unit, microblog check-in data were collected periodically over a week within the Suzhou city area. The study demonstrates how social network media data can be applied to characterize the degree of vitality of urban spatial structures at all levels. It is expected that this method will provide a reference and basis for researchers and designers to understand and perceive the city.

The main findings of this study: First, the spatial structure of Suzhou city is still centered on the old city, and with the development of SIP in recent years, a vibrant development axis with SIP to the west and the old city to the east has begun to emerge. However, the area radiated by the axis is limited, and the radiation is only confined to the old city and SIP. Apart from this area, the vitality of the surrounding areas is still at a low level. There is still a certain gap between this and the "multi-center, cluster, network" spatial layout proposed in the Suzhou Territorial Spatial Plan (2021-2035), especially in Kunshan and Taicang, which are located on the Suzhou-Shanghai development axis, where the liveliness is still at a low level. In terms of improving the liveliness of urban areas, these two areas should learn from the development model of Suzhou's existing high liveliness areas, and add various other facilities around the industrial parks to increase the mixed use of land against the background of many existing industrial parks. At the same time, attention should also be paid to the construction of various leisure and recreational facilities, so as to create a highly complex space with integrated functions for business and living.

Second, this study provides a method for applying social network data to the analysis of dynamic urban spatial liveliness. We show how to depict the urban spatial environment activity level through microblog check-ins, and carry out an analysis of the temporal and spatial correlation with the urban spatial environment in this regard.

This paper explores how to map urban residents' activities into the urban spatial structure. Through this method, big data can be used as one of the data sources to study the spatial structure and spatial characteristics of the city, and this method can better perceive the various scales of urban space from the perspective of space users. It is possible to investigate the relationship between urban residents and various types of urban built-up space environments from the user's perspective, and to provide a reference method for the improvement of spatial quality and the shaping of spatial vitality in urban planning in the future.

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BEYOND GLOBAL GAINS AND LOCAL PAINS - SPATIAL INEQUALITY OF HINTERLAND LOGISTICS

Merten Nefs ¹

¹ TUDelft

Introduction to the gains and pains of logistics

Trade infrastructure and logistical activities have long been a source of prosperity as well as nuisance. The gains and pains of logistics, however, are not distributed equally across regions and cities. Important trade hubs such as Rotterdam or Chicago have built strong trade institutions and accumulated urban wealth, hereby making a successful trade-off between the global gains of trade and the local pains of congestion and pollution (Cronon, 1991; Kuipers et al., 2018). Since the rise of global supply chains, such hubs have grown beyond their city boundaries and formed logistical hinterlands. These extensive areas appear to represent a less favourable trade-off between gains and pains, judging by the increasing criticism against distribution centre developments, regarding landscape degradation, congestion (CRa et al., 2019) and precarious jobs (Bergeijk, 2019). In the hinterland of Rotterdam, the building footprint of logistics has increased fourfold since 1980 (Nefs, 2022), while congestion and labour shortages have also increased steeply and the planning system has been decentralized, giving more responsibility to local governments (Nefs et al., 2022). This paper discusses whether hinterland logistics can be regarded as a spatial justice issue, and how this may be reflected in the local spatial planning discourse.

The concept of spatial justice emerged in the early 1970s, when Harvey and other geographers applied Rawls' (1971) theory on fair distribution of gains and pains to planning, which has gained traction in recent years (Rocco and Newton, 2020; Soja, 2010). This not only relates to infrastructures and spaces, but also the distribution of "*financial, environmental and social benefits and burdens issued from urban development.*" (spatialjustice.blog) Since public goods and negative externalities such as noise are not equally distributed geographically, accessibility as well as proximity play an important role in a spatial justice discourse. As Bret (2018) explains, geographical scales used in such discourses should also be seen as social constructs, which may be used to legitimize the outsourcing of pains to other territories and not-in-my-backyard (NIMBY) positions.

The procedural aspects of spatial justice, or how a planning system may enhance the fair distribution of gains and pains, have been explored by Healey (1996) and Ostrom (2015). Moroni (2020) reminds us that distributive justice cannot cover the full range of social justice issues, since not all goods are scarce, divisible and transferable. This also applies to aspects discussed in this paper, such as e-commerce and nitrogen emissions. The Dutch planning system, rooted in democratic water and land management, often faces land scarcity in light of economic and ecological ambitions. It is therefore understood to have the necessary institutions and motivation to enhance spatial justice (Michels, 2006; Salet, 2018).

Although not always framed as spatial justice, the logistics planning literature frequently addresses distributive problems. For example, the Los Angeles region has seen a conflict between regional gains of logistics developments and their local pains in hinterland areas with vulnerable communities (De Lara in Hall and Hesse, 2012; Yuan, 2019). While the regionalization of distribution centres along the Alameda Corridor has improved the air quality and congestion in downtown LA and in general terms in the whole region, it has significantly worsened living and working conditions in the

Inland Empire region, east from LA. Another recent case of spatial inequality around trade infrastructure is the Belt and Road Initiative (Teo et al., 2019).

Spatial inequality of logistics is at least partly rooted in the inherently unstable and heterogeneous territorial manifestations of logistics networks. As Santos (2006: 163, 176–185) explains, building on the work of Castells and other geographers, such networks constitute a national space at the service of the international economy, creating various territorial dialectics and instabilities: local vs global, slow vs fast, competitive vs lagging, and varying levels of fluidity (adherence to international corporate standards).

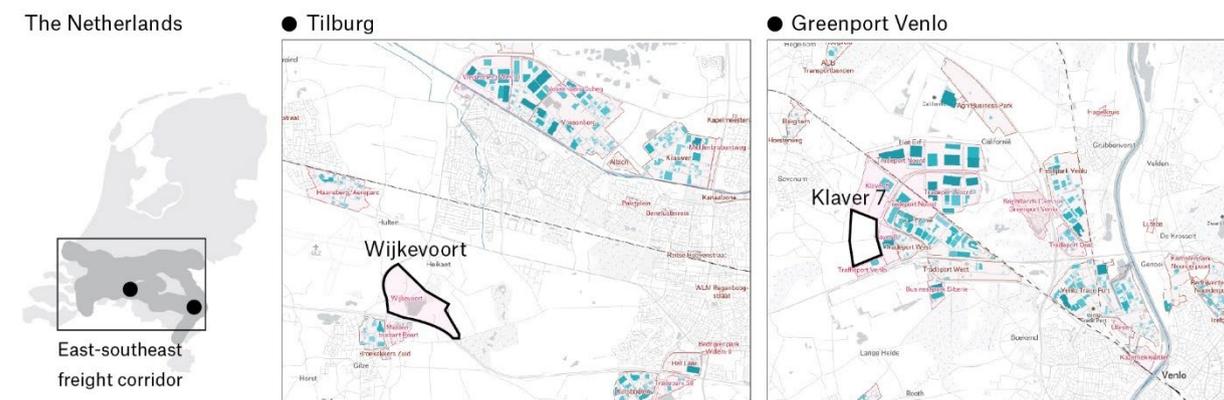
Since the gains and pains of logistics developments are felt on such different scales and among so many different actors, making a good trade-off is extremely difficult. While a company can seek an optimum of costs pertaining to e.g. the service level and location of a distribution centre (Onstein et al., 2019), the societal trade-off is much more complex – involving changing political positions regarding a multitude of gains and pains. Neither societal cost-benefit analyses can fix this – since these still need interpretation and fail to factor in aspects like biodiversity or landscape quality, which are hard to measure (Hickman and Dean, 2018). Nor are spatial-economic models equipped to combine and evaluate this variety of positive and negative externalities (Verhoef and Nijkamp, 2005). As a result, persuasive, coordinative and justificatory discourses remain key elements in deciding on large economic developments with environmental impacts (Healey, 1999), such as logistics.

The literature on spatial justice vis-à-vis logistics and local governance therefore suggests that the trade-off between logistics gains and pains highly depends on discourses, on which Dutch hinterland communities could have a meaningful influence. In the next section, two hinterland cases in the Netherlands shed light on the public discourse on the gains and pains of logistics developments. The purpose of the case study is not to evaluate the trade-offs, but rather to identify spatial justice arguments (gains and pains) in the planning discourse, and analyse these with regard to the local decision-making process.

Two Dutch cases of polemic logistics developments

To identify the discursive arguments of logistics developments in hinterland areas, the paper analyses regional newspaper articles as well as municipal council decisions in two cases (Figure 1), both part of the busy East-Southeast freight corridor and reaching a climax in the public approval process in 2021.

Figure 1: The cases in the logistical hinterland of the Netherlands



Logistics development Klaver 7 (Horst aan de Maas municipality) is the most recent phase of the ongoing Greenport Venlo development, following the 2009 masterplan including simultaneous realization of ecological and recreational zones in the area (Nefs and Daamen, 2022). The expansion of ca. 60 hectares should attract logistics and local small-medium

enterprises. Housing of migrant workers, linked to the distribution centres, has been a hot item in the debate, which radicalized in Facebook groups ('Arbeidsmigranten Horst aan de Maas' and 'Horst Online'). For this case, the 28 most recent articles in De Limburger are analysed, discussing the pains and gains of the Greenport development. *"Thousands of square meters have become prey to the cathedrals of 24-hour consumerism."* (De Limburger, 16-04-2019) For an insider view on the process, an interview was held with commercial director Heerings of the Greenport Venlo Development Company, of which Horst aan de Maas is a shareholder. Heerings: *"If Horst cancels the plan, it will also lose the profits and other benefits, such as space for local scale-up companies."*

Wijkevoort (Tilburg) is an 80ha development of logistics and industry near a motorway junction in an agricultural landscape. More than 500 protest letters were handed in during the approval process and for a year protesters waved banners in front of the city hall every day. Meanwhile, the municipality worries about the high demand for industrial sites and the construction of 25 thousand housing units, whose inhabitants need jobs. For this case, 28 articles from Brabants Dagblad are analysed, mentioning gains and pains of Wijkevoort. Alderwoman Lahlah in Brabants Dagblad (11-03-2022): *"Wijkevoort [...] is really, really, the last piece of rural land being transformed to an industrial estate. It was difficult, not for nothing the debate took 20 years. But you have to decide, the city also wants to grow."* For the paper, an interview was held with alderman Van der Pol, responsible for the adaptation and approval of the plan.

The persuasive arguments used in the media are organized in Table 1. Some of the articles present only gain or pain arguments, the latter usually from the side of citizens: *"Neighbouring inhabitants are not impressed. They feel like victims of the economy."* (De Limburger, 10-03-2020) *"Soon I'll be looking at incredibly high walls. The sheer scale annoys me. And for whom is all this logistics? The benefits are certainly not for the people living in this region."* (Brabants Dagblad, 2020-12-12) Many articles, however, (attempt to) reflect the trade-off that politicians need to make: *"I can't deny that Wijkevoort has opened up several lines of conflict. [...] What's more important is that the development of Wijkevoort makes the conservation of [the other proposed site] Zwaluwenbunders possible, as a green buffer [...]. That is a package deal."* (Alderwoman Lahlah in Brabants Dagblad 11-03-2022) Most gain arguments mention generation of employment and creation of space for either sustainable energy production or local scale-up companies. Most pain arguments emphasize loss of agricultural land and landscape quality, as well as nuisance in the form of pollution and congestion. In Brabants Dagblad, the frequency of gain and pain arguments is slightly more balanced than in De Limburger.

The city council reports containing municipal decisions and coordinative/justificatory statements regarding both developments are gathered in Table 2. These go back a few years until reaching a clear picture of the approval process in 2021. Expert reports play a role in the decision process, most importantly regarding the employment and environmental effects of the development. The decisions regarding Klaver 7 and Wijkevoort follow a similar overall path, leading from the approval of a preliminary masterplan or vision for the area, after which discussion arises and in 2021 a decision is made: Klaver 7 is postponed until the end of 2024 when higher standards can be met, while Wijkevoort is approved – also with increased standards. These elevated standards (higher spatial quality and local added value) are explicitly part of the political negotiations in the council meetings, influenced by the media debate. With regard to Wijkevoort, a remarkable decision was to not organize a solicited referendum, on procedural grounds, a decision that probably saved the coalition but increased the protests. Shortly before the decisive council meeting in November 2021, a talk show was planned with experts including the author of this paper. It was cancelled after complaints in Brabants Dagblad (2021-10-06) that key protest groups had not been personally invited. Alderman Van der Pol: *"The very people demanding openness of affairs around Wijkevoort ended up shutting down the debate."*

Table 1. Frequency of arguments used in regional media articles (n=56)

gains	Brabants Dagblad	De Limburger	total freq.
employment growth	7	7	14
space for sustainable solar and wind energy / energy hub / circular production	3	5	8
creating space for local scale-up companies or residential developments	6	1	7
economic development	5	1	6
enabling e-commerce	1	5	6
compensatory development of ecological corridors and recreational green structures	4	1	5
innovation, value-added logistics activities	3	2	5
municipal land sale profits	2	1	3
TOTAL arguments	31	23	54

pains	Brabants Dagblad	De Limburger	total freq.
transformation, disappearance and deterioration of agricultural landscape and biodiversity	17	16	33
noise and air pollution	5	3	8
lack of space for local small-medium enterprises	3	5	8
road congestion	1	6	7
competition over scarce personnel	1	5	6
jobs not suited for local employees, but rather attracting more migrant workers	1	5	6
heat stress	5	0	5
nitrogen emissions, damaging nearby nature areas	4	1	5
risk of economic monoculture of logistics / lack of economic diversity / low added value	4	1	5
blocking of view	2	3	5
housing issues regarding migrant workers	2	2	4
possible future vacancy of warehouses	2	1	3
loss of recreational area for nearby inhabitants	2	0	2
precedent for further developments	1	0	1
TOTAL arguments	50	48	98

Figure 2. Cartoon by Berend Vonk in De Limburger (2019-03-14). In regional dialect: "Nobody understands how beautiful our Limburg is."



Table 2. Municipal council decisions and statements

date	decision
	Horst aan de Maas
2019-07-03	Establish municipal right to purchase Klaver 7 land
2020-01-01	Consider put Klaver 7 on hold
2020-11-10	Take into account citizen view on Klaver 7 development, safeguarding aspects of traffic, nature compensation and accessibility; approve updated structuurvisie
2021-01-01	Agrofood and manufacturing aim for Klaver 7, instead of logistics services
2021-06-24	Make land use plan and impact study for Klaver 7
2021-08-09	Permit given for housing migrant workers
2021-11-23	Freeze logistics developments, not approving new sites including Klaver 7 for time being
2021-11-23	Municipality to keep strictly to discussed standards concerning spatial quality instead of quantity of land development, including nature and landscape development, measures to ensure livability of inhabitants. Synchronize policy with status of development, only then can development continue.
2022-01-02	No new permits given for housing of migrant workers, verification of quality of existing housing sites, freeze klaver 7 development until the various involved municipalities take responsibility in housing of migrant workers, landscape and traffic issues are solved, and accepted motions are executed
2022-03-25	Reassess land use plan for Klaver 7, to accommodate less XXL logistics and more space for local small-medium enterprises
2022-05-10	Freeze large logistics developments klaver 7, only approving a landuse plan for Klaver 7 focusing on innovative (high)tech firms, with maximum plot size of 3ha, with citizen participation in landscape integration plan
	Tilburg
2018-02-05	Adopt the masterplan for development process of Wijkevoort
2021-01-01	Frame Wijkevoort development in context of knowledge intensive industry stimulation in Tilburg
2021-02-01	Allow smaller companies that do not meet the minimum space requirements of Wijkevoort, to pool together in the development
2021-05-01	Frame Wijkevoort development in context of growing freight traffic, industrial site developments, housing of migrant workers and inner city redevelopment.
2021-05-01	Frame Wijkevoort development in context of creating space for large and middle-size companies in Tilburg, in a sustainable setting
2021-06-14	Establish municipal preference to purchase the Wijkevoort land
2021-06-14	Propose land use plan 2020 for Wijkevoort
2021-08-03	Not organize referendum on Wijkevoort development, having evaluated 27 written protests and regarded these invalid
2021-08-03	Change in plan phases, decision to invest 0.5 million in green structure up front
2021-09-01	Budget decision to realize landscape park Pauwels, Stadsbos 013 and work landscape Wijkevoort, according to economic and landscape ambitions of Tilburg
2021-09-07	Participation in pilot Circulair Wijkevoort
2021-11-09	Establish development guidelines and evaluation process to guarantee the quality of the Wijkevoort development, in social economic, landscape and ecological terms.
2021-11-15	Change sustainable design standards (Breeam) to highest (outstanding), and if not possible the minimum is excellent; higher standards in several spatial quality aspects; minimum of 50% external experts in Quality Team
2021-11-15	Adopt the land use plan of Wijkevoort; declaring not valid the ca. 500 written protests
2021-11-15	Adopt: amendment to improve landscape integration and façade design standards of Wijkevoort; amendment to add health expertise to Quality Team; amendment to act on light pollution; motions to empower the council with procedures to control the developments when they start; motions to dedicate more parcels to local small-medium companies and allow pooling of small companies

Two factors may help explain the postponing of Klaver 7 vs the approval of Wijkevoort: skin in the game and path dependence. First, as Klaver 7 is part of the much greater development of Greenport Venlo, Horst aan de Maas owns merely 8.3% of the shares in the development company, which gives the council the opportunity to view the negative aspects of for instance the XXL warehouses and related migrant workers - as an outside threat. Tilburg on the other hand, has full skin in the game regarding Wijkevoort, with no one else to blame. The municipality had the difficult task to approve either this development or another one located in a delicate cultural landscape area, Park Pauwels.

Secondly, as often happens (Hein and Schubert, 2021) path dependence in both municipalities influenced the political discourse. Horst aan de Maas had entered the Greenport project with the aim of strengthening its local agri-food sector, while realizing nature areas at the same time (Nefs and Daamen, 2022). As it became clear that the Greenport did not attract the desired companies, but rather XXL distribution centres, the municipality became more critical when the development approached its territory. Tilburg feels the pressure of maintaining a logistics hotspot, from its former policies since 2000, employing many of its inhabitants. Another long-term policy choice, to realize Park Pauwels, conflicted with the development of the Zwaluwenbunders logistics site, making Wijkevoort the only available option left.

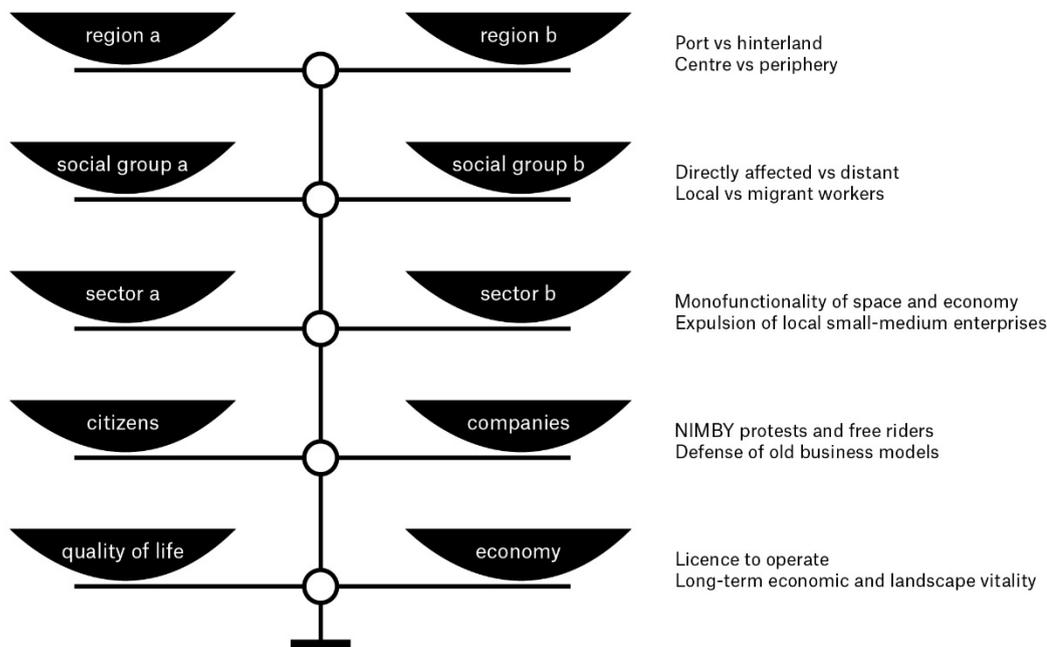
Conclusions on spatial justice in logistics planning

The two cases analysed above illustrate clearly that hinterland logistics in the Netherlands is an issue of distributive spatial justice. The media debate and the local decision-making process show the conflicts of interests between stakeholders as well as the constant trade-offs between gains and pains regarding varying areas and stakeholders, on various spatial scales. There is no evidence, however, of deliberate outsourcing of nuisance to vulnerable social groups in the hinterland, as is described in the case of Los Angeles (De Lara in Hall and Hesse, 2012; Yuan, 2019). Tilburg and Horst aan de Maas should by no means be seen as the periphery of the Port of Rotterdam, and rather as logistics growth poles with strategies and trade-offs of their own. Nevertheless, the debate shows the difficult trade-off between regional – or (inter)national - gains vs local pains. Nimbyism can easily be identified, for example inhabitants trying to avoid the blocking of their view or the arrival of a migrant worker facility near their house. Neither in the media reports nor in the decision making, however, nimbyism seems to dominate.

The argumentation found in the cases allows a more detailed understanding of spatial justice trade-offs in hinterland logistics development, containing at least five distinct layers (Figure 3). The distribution of gains and pains among regions and social groups in a just equilibrium or problematic disbalance are part of the traditional spatial justice discourse. Even when there is no centre-periphery issue like in Los Angeles, the logistical hinterland regions do perform tasks (enabling e-commerce for example) for metropolitan centres and other regions. The question is whether hinterland regions can sufficiently capture the economic development and investments, in green areas and sustainable energy, in return.

The distribution of logistics gains and pains across social groups poses another challenge: a number of low-skilled workers in the area depends on logistics companies for their livelihood. The contracting of migrant workers from Eastern Europe, however, has diffculted the working conditions and unions in the sector as a whole (Bergeijk, 2019). E-commerce seems to be a non-transferable good from which everyone benefits (Moroni, 2020), yet groups with a high consumption pattern benefit more, while the environmental impacts (air pollution, noise, congestion) of distribution centres are felt more strongly by communities nearby. The discourse in both cases addresses the increasing dependence on a single sector (logistics) in the regional economy, demanding more personnel than the region can supply; as well as multinationals acquiring land for large distribution centres, while local small-medium enterprises struggle to find space to scale up their business. Especially this last aspect is taken very seriously by the media and politicians in both areas.

Figure 3. Concept of (distributive) spatial justice trade-offs applied to hinterland logistics



Beyond the interregional, groups and sectors trade-offs, there are also spatial justice trade-offs at play between citizens and companies. This is by far the most entrenched and at times even cynical part of the discussion, characterized by nimby protests - against developing companies or, more often, local governments allowing the development; by free riders - opponents of local logistics developments who eagerly use delivery services anyway; and by companies refusing to give up old business models or to reduce their impact significantly. A great annoyance for citizens and civil servants, mentioned in several of the analysed media and council reports as well as the interviews, are the backroom deals between local politicians and large corporations.

A broader and more productive discourse, sometimes enhanced by experts, concerns the trade-off between quality of life and economic development of a region. While these aspects do not necessarily contradict, there often exists a political tension and spatial conflict between them. It is in this realm that compromises can be found, for example companies increasing their 'license to operate' by realizing part of the ecological and recreational infrastructures in and around the developments. Or government strategies that attempt to strike a balance between the long-term economic development of the region and ecological/landscape vitality.

The analysis identified gain and pain arguments used in persuasive, coordinative and justificatory discourses (Healey, 1999) in the media and council reports of the cases. Even though decision-making has taken into account quantitative and qualitative research e.g. regarding employment and environmental effects, the final trade-off between all gains and pains was not directly supported by research and is rather the result of a media-influenced political debate, built on the five levels of trade-offs described above. Some trade-offs, however, can hardly be made on the local level alone, such as the gain of enabling e-commerce for a large region vs the local noise and air pollution. This paper's advice to planners dealing with hinterland logistics issues is therefore to address trade-offs in all relevant layers of spatial justice mentioned above, by creating a policy context of transparency (especially around lobby by local and foreign companies), deradicalizing nimby agents and stimulating an open critical debate supported by facts and expert opinions.

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CHARACTERISTICS OF URBAN SETTLEMENTS IMPACTING MIGRATORY BIRD SPECIES IN INDIA

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1. Introduction

On a broad level, India can be divided into six types of climate.(Figure 1) (Padmanabhamurthy, 1990) This in conjunction with the country being situated in three of the major global flyways, makes conservation of avian species highly essential. The different climates lead to rich diverse biomes where the migratory birds stop, nest, breed and progress on to their destinations. The grasslands and wetlands throughout the country make effective pitstops for landbirds and water birds alike. With massive urbanisation taking over, these ecological spaces are constantly encroached, leading to a decline in the native and migratory avian species. While there are different initiatives taken by the Indian Government such as the National Action Plan and the Perspective Plan on bird conservation, these are tentative guidelines with no legal binding on urban development. In reality, the National urban planning code (Urban and Regional Development Planning Framework of India) and the urban bye laws are devoid of biodiversity clauses. Optional frameworks such as the Indian Green Building Council guidelines mention incentivisation for preserving nocturnal habitats and native vegetation. The absence of such guidelines in the Urban development norms make native vegetation an easy prey to development and loss of habitat for birds.

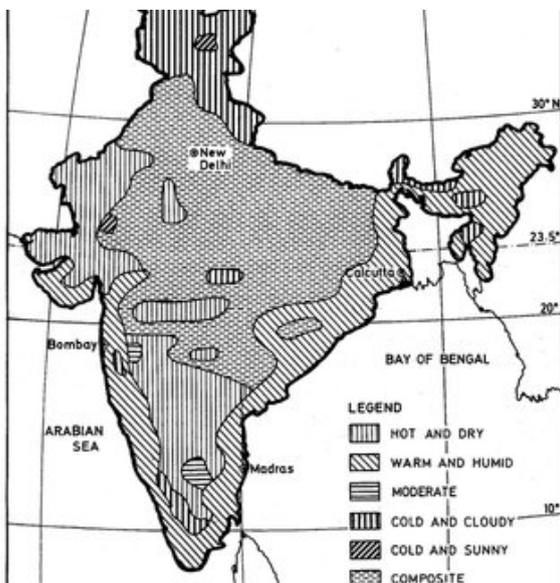


Figure 5 Climate Map of India (Padmanabhamurthy, 1990)

1.1. The Global Flyways

India falls within three of the nine global flyways- Central Asian Flyway (CAF), East Asian Australasian Flyway (EAAF) and Asian East African Flyway (AEAF). (Figure 2) (Pardikar, 2020) Out of approximately 1230 species of avifauna in India, the CAF is a stopover for approximately 370 species of migratory birds on the way to their destination, which is a combination of both landbirds using terrestrial environments such as bar-tailed godwicks and waterbirds dependant on wetlands, such as northern shovelers. (Forests, 2005) Through the flyways, the birds find the necessary nutrition and settlement in warmer countries like India until further movement towards the equator.

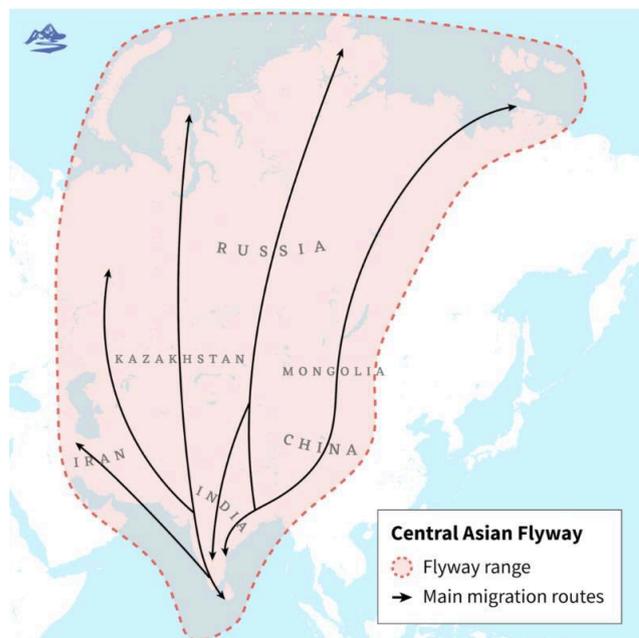


Figure 6 Central Asian Flyway (Pardikar, 2020)

Migrator Avian Species in India

1.1.1. Introduction

Due to different terrain and climate throughout the country, India has both grassland and wetland environments which support the nesting, roosting and feeding habits of migratory birds. If broken into biomes, central India consists of the grasslands for the landbirds, while notable wetlands in the north western region (Rajasthan, Haryana), eastern region (Bengal, Odisha) and the Southern region (Tamil Nadu) attract the waterbirds. In the urban scenario, landcover can be further broken into grassland, wetland, agricultural land and human habitation. (Figure 3) The distribution of avifauna, according to habitat in urban settlements is as given in Figure 4. (Forests, 2005; Panda, et al., 2020)



Figure 7 Land cover distribution in India (Forests, 2005)

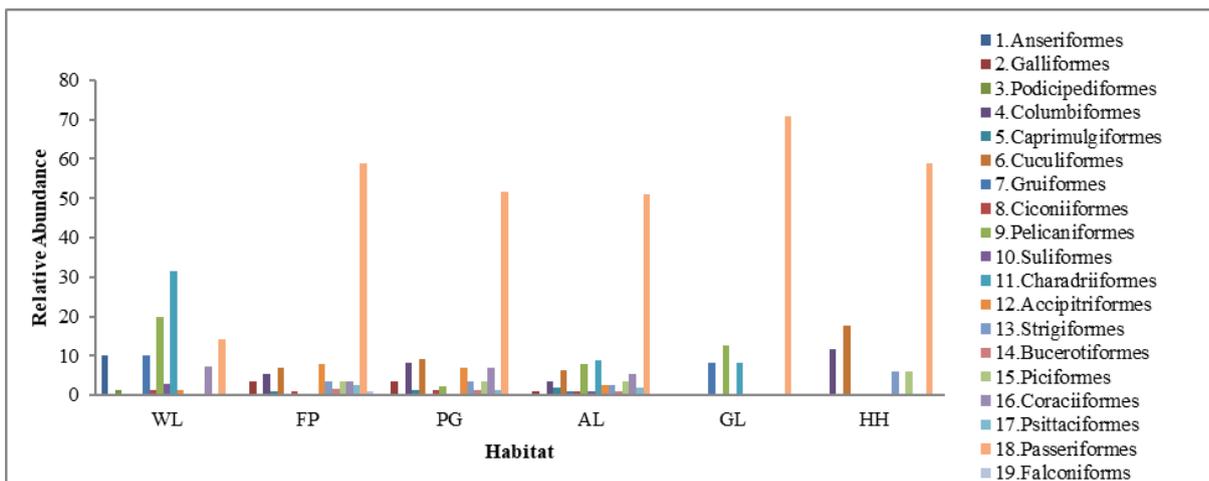


Figure 8 Relative abundances of bird species belong to different Orders across various urban habitats in Bhubaneswar, Odisha, India: Grassland (GL), Wetland (WL), Forest Patches (FP), Park and Garden (PG), Agricultural Land (AL), Human Habitation (HH) (Panda, et al., 2020)

1.2. Adaptation of local birds to human settlements

Of all local and migratory birds, the taxa most observed in urban settlements are passers viz. sparrows and rock pigeons and raptors viz. crows and hawks. The reasons for the proliferation of these species over others is abundance of food and adaptability of nesting habits to human settlement fabric. In the case of sparrows, availability of grain due to homes and shops is high in cities. Similarly, for raptors, the garbage dumps, landfills, rodents and traditional burial systems such as the Parsi cemetery provide a constant supply of food in cities. (Isaksson, 2018) Interestingly, while the number of *Corvus* species and hawks have been observed to increase while selective carrion eaters like vultures are on a steady decline. This may be attributed to nesting habits and human conflict as well. Vultures prefer nesting at higher altitudes, which is a challenge in urban settlements in India, known predominantly for mid-rise and low-rise settlements. The flat roofs of India are not preferable to the birds for nesting. Moreover, traditionally, vultures are perceived as ominous and unclean, leading to humans shunning them. The downside of discouraging vultures was

noticed when the number of stray dogs increased with the decline of vultures, leading to an outbreak of rabies throughout the country. Birds such as owls prefer nesting in holes, mainly trees. With the incessant felling of trees in Indian cities, owl numbers are dwindling. The mythological element is contradictory, as some cultures see the owl as holy while the others perceive them to be ominous. (Aggarwal, 2020)

Some species of birds have become comfortable in human habitat, such as rock pigeons. With high rise building societies proliferating the settlements, the plumbing shafts and decorative waterbodies are enticing the cavity nesting birds to roost and breed. (Reynolds, et al., 2019) This is leading to an opposite human-bird conflict as rock pigeons, through their feathers and droppings, are the cause of many respiratory diseases in humans. This leads to humans discouraging proximity to the birds.

2. Research Questions

While a variety of local birds have adapted to towns and cities, there is a necessity to assimilate migratory birds into the human settlement as well. In order to achieve this, modification and improvement is required in urban planning norms of the country to preserve pockets of avian habitat with minimal human disturbance, devise alternative ways to enhance nesting and feeding habits of birds and increase awareness among citizens towards avian preservation. Hence, this research begets the two questions:

- 2.1. In terms of migratory bird habitat, are there equivalent solutions in urban settlements to preserve their nesting, roosting and feeding habits?
- 2.2. What are the necessary modifications required in urban and design guidelines of India to conserve avifauna habitats?

3. Characteristics of migratory birds in India

Migratory birds, both land and water birds have distinct nesting, roosting and mating habits. Along with sustaining their species, they have an important role in the global ecological balance, from maintaining the insect population during monsoons to propagation of vegetation.

3.1. Habitat and taxonomic characteristics of migratory birds in India

Names	Habitat	Food	Nesting/breeding
Order: Anseriformes Ducks, Geese and swans	- Generally found in ready fresh water marshes, shallow pools, lakes with developing vegetation and submerged tree in plains. - Found in small groups and sometimes large flocks.	- Mainly Vegetarian comprising aquatic plants, arable crop. - In some instances insects, fish and frogs are also consumed.	- Breeding period is from June to October. - In and around vegetation, preferably old tree or naturally hollow trunks.
Order: Galliformes Peafowls (Peacock), Jungle Fowls, Chicken, Turkey	- They are adaptive in almost all environments except for core desert and uninterrupted ice.	- These birds are herbivorous to slightly omnivorous which feeds	- Most Galliformes are very prolific regularly exceeding

	<ul style="list-style-type: none"> - Very few tend to migrate over considerable distance. Others tend to stay in and around nesting place. 	<ul style="list-style-type: none"> on ground for rootlet or other plant materials. - Young birds tend to consume insects too. 	<ul style="list-style-type: none"> 10 eggs in many species. - Galliformes young ones are very precocious and roam with their mother or both parents.
Order: Columbiformes Pigeons and Doves	<ul style="list-style-type: none"> - The family has adapted to most of the habitable space in the planet. - The species have also adapted to the human activities and resides mostly in the majority of cities. 	<ul style="list-style-type: none"> - Seeds and fruits form the major component of the diet for pigeons and doves. - Ground doves and quail doves also consume a large number of prey items such as insects and worms. - Urban birds depend on human activities to obtain food, causing them to forage for spoiled food or food provided by humans. 	<ul style="list-style-type: none"> - The nesting and breeding is peculiar in the family. The male chooses a site in view of the female. - The nests can be found along building ledges, rafters, beams, under bridges. - The nest is saucer like shape and made of stems and leaves.
Order: Accipitriformes Hawks, Eagles, Kites	<ul style="list-style-type: none"> -Generally found near water body, perches on trees o rocks overlooking water stream, ponds, lakes or costal sides. 	<ul style="list-style-type: none"> - Hunt and eat large fish, also ducks, mammals and young birds. 	<ul style="list-style-type: none"> -Eagles build their best in a branched crotch towards the top of the tree. - The bird stack and interweave sticks and branches. - Generally one to three eggs are laid during breeding.
Order: Passeriformes Crow, Sparrow, Sunbirds	<ul style="list-style-type: none"> - Sparrows are generally birds of open habitats, including grasslands, deserts and scrublands. - Crows can also adapt to a number of different environments as well. 	<ul style="list-style-type: none"> -Sparrows are primarily seed eaters but increases their protein intake a lot by eating insects during breeding season. - Crows are scavengers as well as predators and will eat anything they can find. 	<ul style="list-style-type: none"> - Different species of crows have variation in breeding but the nesting habit remains the same. The nest are generally 2ft wide and 60ft above ground. - Sparrow mainly nest in holes and cracks of man-made structure. They use different types of material for building nest.
Order: Phoenicopteriformes Flamingoes	<ul style="list-style-type: none"> -Highly gregarious, found in small number of groups but thousand in flock. - Prefer lagoons, water lakes, and blackish water lakes. 	<ul style="list-style-type: none"> -Largely drink fresh water with small insects, seed of aquatic plants, larvae, and small molluscs. 	<ul style="list-style-type: none"> - Breed in colonies from July to April, nest conical mounds of mud with shallow pan

			like depression at top.
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Table 4 Characteristics of migratory birds in India (Forests, 2005)

3.2. Role of migratory birds in the ecological balance

3.2.1. Pollination and seeding

The seasonal migration of birds, or flyways, is closely related to the monsoons in India and the vegetation. Due to the long distances covered by the birds, their droppings are rich in seeds which germinate in the monsoon. Also, the activity of birds during the retreating monsoons and the springtime assists pollination. (Forests, 2005)

3.2.2. Manure

Bird droppings are rich in phosphorus. Identifying this, certain indigenous tribes encourage migratory birds to visit their lands and ponds, in order to enrich the soil and decrease the number of insects which would otherwise damage the crops. (Aggarwal, 2020)

3.2.3. Ecological Balance

Migratory birds are highly essential in maintaining the food chain and ecological balance. In wetlands, it is observed that the waders eat the highest proliferating insects and amphibians, thus curbing their spread. Similarly, the algae and plankton the ducks and geese feed on ensure that the algae do not multiply and block the aeration of the wetlands. (Forests, 2005)

4. Impact of Urbanisation on migratory birds in India

4.1. Encroachment of non-Ramsar wetland habitat

India has approximately 750,000 wetlands, out of which only 49 are Ramsar wetlands. Ramsar wetlands are protected under international policies. The arbitrary guidelines in the case of the other wetlands do not provide protection, leaving the rest of the wetlands open to destruction due to urbanisation. In the case of the Najafgarh and Bisai wetlands near Delhi, urban habitat is gradually encroaching into the wetland. Parts of the land has been drained and structures built on it. Out of the two, Bisai is notified as an Important Bird Area (IBA), which brings it under urban development safeguards. Due to low to no monitoring, industrial and residential sewage is drained into the wetland, polluting the water and the organisms living in it. This in turn is affecting birds, leading to high mortality, weak shelled eggs, low progeny. Both Najafgarh and Bisai are important bioreserves as threatened species include Egyptian vulture, Sarus Crane, Steppe Eagle, Greater Spotted Eagle, Indian Spotted Eagle and Imperial Eagle. White-tailed Lapwings from Russia come to Delhi using CAF, raptors like Steppe Eagles from the steppes in Kyrgyzstan and Kazakhstan visit during winter in Delhi. (Chandramouli, 2022)

4.2. Loss of Native Tree Species

In the course of urban development, both public and private, ornamental vegetation is preferred over native tree species. Thus, the genetic imprint of the birds, which adapts them to nest in specific native vegetation, is disturbed,

discouraging the birds to nest. Moreover, the ornamental vegetation usually consists of shrubbery and palm trees, both of which are unsafe for nesting. These plants and trees lack any edible fruit, impacting the essential nourishment of the birds which enables to fly long distances towards their destination. This had led to many birds perishing on their way. Along with the phyla of the vegetation, the density and canopy of the trees, the thickness of the trunk with holes, which mature deciduous trees have, are important, especially for nesting birds like owls. With rampant cutting of these trees, the loss of habitat is affecting roosting and nesting habits, leading to a steady decline in owl population. (Isaksson, 2018)

4.3. Anthropogenic impact on migratory birds in Urban settlements

Anthropogenic activities, in this case, refers to all human activity which is positively and adversely impacting the habits of migratory birds in India. Four stress factors of urbanization which affect migratory avian species are noise, human proximity, chemical pollution and artificial light at night (ALAN). (Cabrera-Cruz, et al., 2018) While pollution, excessive use of chemical fertilizers and habitat loss are adverse impacts, the phenomenon of global warming is a unique predicament in relation to migratory birds and their nesting habits, which will be explained below.

4.3.1. Pollution

In case of urban settlements in close proximity or enveloping a migratory bird habitat, the lack of public ownership of these locations make them easy targets for dumping garbage, sewage and industrial effluents. These are consumed by the smaller organisms, in turn by the birds, which poison them, affect their metabolism and egg laying abilities. India is the highest consumer of chemical fertilizers and pesticides for agriculture globally. In agricultural land in and around urban settlements, the exorbitant use of pesticides is affecting the birds, similarly, leading to a concerning spike in the mortality of the birds. (Aggarwal, 2020)

4.3.2. Light pollution

Light plays an integral role in flyways. Some birds prefer to fly during the daytime while other birds like lapwings prefer nocturnal environments. Therefore, while the nocturnal birds use the darkness and calls to keep the flock together, other birds use the night to rest. The bright lights of the city disturb both, affecting the migration cycle. The distance travelled by the birds is affected as the lights confuse them, while other birds are stressed and fatigued due to lack of rest during the night. (Cabrera-Cruz, et al., 2018)

4.3.3. Sound pollution

In many studies, it has been observed that birds living in a city are more stressed than birds living in habitats undisturbed by human activity. One important factor for this is sounds in the city. Low decibel sounds like peak hour traffic impacts the mating calls of birds, leading to a reduction in mating activity, in turn, progeny. High decibel sounds disturb birds, leading them to keep flying instead of roosting and nesting. Hence, the small migratory songbirds like wagtails are declining in population, or else, are turning nocturnal when their mating calls will be heard more clearly. (Menon, 2021)

4.3.4. Built environment

In traditional Indian houses, there were vernacular elements which would encourage nesting habits. The low to mid rise houses with high ceilings, roof shingles and lofts provided undisturbed roosting spots for local and migratory birds. Moreover, with traditional practices such as scattering grain in front of the house would ensure food for the birds as well. In present times, the extroverted houses have given way to introverted high rise buildings, with glass facades, flat roofs and introverted doorways. The roosting and nesting spots for birds are gradually disappearing. Moreover, with birds like the rock pigeon being perceived as pests, people put spikes on the exposed architectural elements, leaving no space for birds in the settlements. (Kale, et al., 2012)

4.3.5. *Global Warming*

Detrimental effects of global warming and desertification are shrinking of wetlands, decreasing vegetation and increasing storms and forest fires. At the same time, rising temperatures globally has led to birds reducing the distance covered during seasonal migration. This in turn, has encouraged birds to adapt to nearer areas, other vegetation and reliance on lesser food and fat conserves. Food preferences of water birds has been observed to change, adapting to food easily available. (Tryjanowski, et al., 2013)

5. Economic Potential of Migratory birds in India

For ages, nature has played an important role in the rituals, beliefs and festivals of India. Every season calls for different festivals in every part of the country. For many festivals, certain birds are said to be the heralds of the season. The monsoon is depicted by the local pheasant and national bird of India, the peacock. In the north eastern state of Nagaland, the Great Indian Hornbill is said to be the harbinger of good tidings. In a festival named after the bird, awareness of other migratory birds of the region, such as the Amur Falcon has been raised.

5.1. Eco Tourism

In states like Nagaland, grand festivals are held in the name of the Great Indian Hornbill, whom the local tribes revere and consciously protect, to increase its dwindling numbers (due to habitat loss and hunting). In other states, urban wetlands and protected sanctuaries bring heavy footfall during the retreating monsoons and springtime by avid birdwatchers.

5.2. Income generation

Indigenous knowledge helps farmers in parts of the country to appreciate migratory birds for their role in the food chain and use it to their advantage. In the case of Garapadu and Uppalapadu lakes in Andhra Pradesh, migratory birds from Siberia and Australia such as the white ibis, painted stork and open billed stork were observed to flock at Garapadu lake initially. This caused a hindrance to local business interests who depended on the lake for commercial fishery, and the birds were poached or driven away by loud sounds. The birds gradually settled in the nearby Uppalapadu wetland area where the citizens welcomed them. Encouraged by the citizens' interest, the local forest department helped create a healthy habitat for the birds, which increased their population, approximately 20,000 birds in peak season. Gradually, this led to eco-tourism in the area for bird watchers and opened up allied employment opportunities – such as lake management, commercial

ventures for tourists etc. The bird droppings collected from the lake could be converted to manure for local agriculture. (Prasad, et al., 2012)

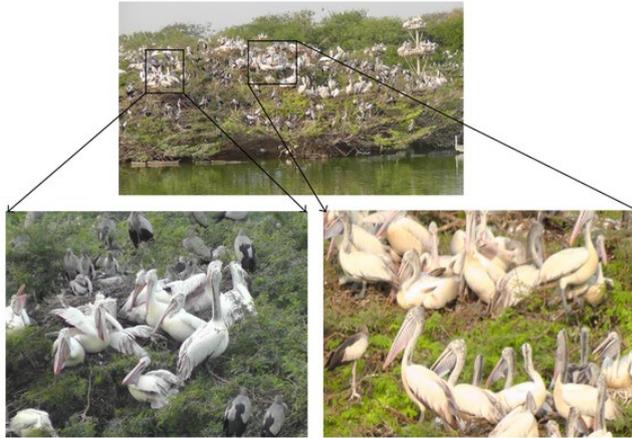


Figure 9 Avian Species at Uppalapadu Lake (Prasad, et al., 2012)

6. Present biodiversity norms in India

Wildlife biodiversity norms in India presently focus on eco sensitive regions demarcated by international agreements such as Ramsar wetlands and national delineations such as Important Bird Areas (IBAs) or wildlife sanctuaries. With historical focus on threatened animals such as the tiger and the elephant, authorities are gradually directing their attention towards the importance of local and migratory birds and their role in maintaining ecosystems. With this, enhancement on migratory avian conservation has been captured in the following initiatives:

- Wetland Protection rules, 2017
- Visionary Perspective Plan (2020-2030) for the conservation of avian diversity, their ecosystems, habitats and landscapes in the country” –Ministry of Environment, Forest and Climate Change
- National Wildlife Action Plan – 2017 to 2031
- India’s National Action Plan for Conservation of Migratory Birds and their Habitats along the Central Asian Flyway (2018-2023)

A major concern observed in these initiatives is the lack of notification or identification of bio reserves within urban settlements. The ambiguity raised by this encourages wetland pollution, draining, grassland encroachment and bird poaching. In the case of a black necked stork rescued in Bisai wetland in the NCR urban settlement, it was released back into Sultanpur National Park instead, due to Sultanpur being a documented and protected eco reserve as compared to Bisai. (Pardikar, 2020)

6.1. Overview of national urban planning norms in India

Urban and Regional Development Plans Formulation and Implementation Guidelines 2015 – While the document gives a complete breakdown of city planning, with optimum land use demarcation, amenities and health, there is no clause for urban biodiversity. All environmental and wildlife articles are dealt with in a separate volume Vol.IIA, which identifies bio reserves away from the urban settlement or agglomeration. This leaves the fate of grasslands and wetlands to the course and interpretation of development. While land use is earmarked for parks and green zones, in practice, the parks are first to be eradicated in case of public projects such as road widening, no requirement of preserving native vegetation is mentioned and ornamental low height shrubbery is planted under a beautification interpretation.

6.2. Overview of State level urban planning norms in India

State level planning norms focus on land development, infrastructure allotment and amenities planning. While the plans aim for a high quality of life, there is a myopic understanding as biodiversity is unacknowledged in the documents. In the case of UDCPR 2020, a document enumerating the urban planning and development norms of urban settlements in the state of Maharashtra, there are clear demarcations for land use in order to safeguard the green and agricultural zones from encroachment. But, in the same document, there are multiple caveats which aid people who wish to convert green zones into residential and/or commercial zones.

6.3. Green building norms in India

Since the last decade, sustainability through green buildings are gradually gaining momentum in the country, under organisational ratings such as IGBC, GRIHA and LEED. While certain clauses and incentives are tabulated in order to preserve biodiversity, the lack of a legal binding or enforcement of these guidelines make them optional and often sacrificed in the name of budgetary concerns and unnecessary responsibility with very less financial incentive. For example, in IGBC rating, under the title of site selection, 50 percent of native vegetation is to be preserved in order to win a point. Additionally, downward illuminating LED fixtures are essential for external lighting, in order to decrease ALAN at night, as well as all water bodies are to be preserved on the site to win another point. Another alternative which could be explored is making these points mandatory for rating award, instead of incentivisation.

6.4. Urban avian conservation efforts in India

Active conservation efforts have been taken by birdwatchers and the local authorities in many towns and cities of India. Through awareness campaigns in educational institutions and bird-watching camps, the younger generation is gradually being sensitized regarding local and migratory avifauna species. Through this, a severe lack of information in seasonal bird-watching data and trends is gradually being improved. With developments in technology, tracking birds through bird ringing as well as remote working and collaboration apps have amplified the efforts. These efforts are encouraged by the local forest and development authorities who use the data effectively to gain funds to maintain the bio reserves and increase the seasonal bird population. In the case of the Uppalapadu lake, the residents took up the responsibility of educating themselves and the students in the locality regarding the importance of the migratory bird species - spot-billed pelican, painted stork and night heron. The original lake, Garapadu, which the birds visited was designated as a commercial fishery. As the birds ate the fish and hampered local livelihoods, they were driven away. Through the efforts of the residents, ornithologists and the local forest department, not only was Uppalapadu lake notified as a protected area, but additions such as installation of artificial trees and native vegetation (*prosopis julifera*) encouraged more birds to flock and breed here. Through this initiative, an increase in the breeding population of the pelican was observed (400 individuals in October 2007 to 1,500 in February 2008), as compared to other wetlands in

the country. The tourism generated by the seasonal birds encouraged local awareness and safeguarding of the habitat. (Prasad, et al., 2012)



Figure 10 Artificial trees at Uppalapadu Lake (Prasad, et al., 2012)

An urban initiative by Yashodhara Foundation, Nagpur focused on the nesting habits of local and migratory passer and warbler species. As these birds are cavity nesters, the organization created artificial nests with provision for food and water. In 2016, the organization distributed and installed 1600 bird houses to interested residents, which encouraged an increase in the bird population that season. (Vijaykumar, 2016)

7. Observations

7.1. Legal interpretation of urban biodiversity

In India, the urban land use types are broadly classified as residential, commercial, transportation, institutional, industrial, amenities, green zones and wasteland. Green zones are interpreted as parks and recreation, instead of forests. To protect wetlands and grasslands which are migratory bird habitats, a specific delineation of the same needs to be inserted into the local planning norms. In order to reduce anthropogenic disturbances like activity, light and sound, native tree cover needs to be planned and planted to encourage the birds to visit. All effluents and pollutants should be diverted away from the reserves and legal action taken against wrongdoers. Terms such as micro-bio-reserves can be proposed to encourage bird watchers and tourist footfall in these areas. Management of these reserves will help generate local employment, cultural pride and a sense of empathy for the birds. Recently, the National Green Tribunal, recognising the importance of birds in our ecosystem, has asked all states to populate the national bird register to record the seasonal trends of avifauna. This will help to identify reserves throughout the country, especially in disputed land in cities, where land is a scarce resource. A similar successful story can be observed in Singapore and Kuala Lumpur where pockets of native vegetation, terrain and water bodies have been preserved. Apart from acting as refuge for migratory birds, these areas provide respite to people from the din of the city. Visitors are made aware

of the birds presence and certain strict rules such as no bright lights, loud noises, speech or parties are enforced. At night, soft indirect artificial lighting is provided.

7.2. Native tree species

In terms of nesting habits, native tree species need to be identified and propagated in close proximity of micro-bio-reserves and along roadways. As observed in the case of heronries, there is a preference for large canopy trees such as rain trees *amanea saman*, copper pod *Peltophorum terocarpum*, banyan tree *Ficus bengalensis*, mango tree *Mangifera indica* and jackfruit *Artocarpus heterophyllus*. These trees are also preferred by smaller raptors as the girth of the trunk has cavities for nests and boughs for nests. The dense canopy acts as light and sound barriers for healthy fledgling growth as well. (Roshnath & Sinu, 2017)

7.3. Avifauna awareness initiatives

In order to identify migratory bird species and their characteristics, record their seasonal behaviour and safeguard their habitat, a level of awareness and empathy is necessary. Collaborations between interested residents, NGOs, local development and forest authorities and law enforcement agencies can help create citizen charters to preserve identified bird habitats locally. Students can be sensitized at school towards bird conservation. Local population can be provided employment in maintaining the micro-bio-reserves. These actions will lead to more migratory bird habitats to be notified as IBAs and become tourism nodes in the city.

7.4. Adaptation of birds to human habitation

Globally, many birds are adapting to human habitation in urban areas. The birds seen in an urban settlement can be broadly divided into generalists and specialists. Through annual trends, generalist species are on the rise while specialist populations are on the decline. For generalists such as the common house sparrow, common crow, parrots and pigeons, the interpretation of human house nooks and cavities as potential nesting zones, abundance of food for omnivorous species and change in mating behaviours has led to an improvement in their numbers. Species like the cuckoo bird and red vented bulbul have shifted their mating call to night-time or dawn when low decibel noises like traffic and high decibel noises like horns and sirens are minimum. Generalists have also been observed to use artificial artefacts for nesting such as lint, cigarette butts and wire. While elements such as plastic rings and cigarette butts are dangerous for birds, due to choking hazards and toxic elements, the adaptability of the birds is encouraging to conservationists to look for or create alternative habitats. (Menon, 2021) For specialists such as herons, vultures and pelicans, reliance on specific trees for nesting and specific fish and habitat has discouraged their roosting behaviour, in turn, their propagation. An interesting phenomenon seen globally is also the impact of global warming. In the case of the Siberian crane, in order to preserve a healthy body temperature, it would need to fly from Siberia, via India, towards the Southern tropics. With rising temperatures, the temperate zones are more favourable for the birds to stop at, leading to lesser dependence on habitat, food and adverse weather, thus increasing their lifespan and progeny.

7.5. Artificial avifauna conservation measures in urban settlements

While generalists are adapting to urban anthropogenic settlements as surrogate habitats, the decline in specialist species is concerning, which requires preservation of their natural habitat and exploration of artificial habitat. In the case of Uppalapadu lake, the construction of artificial trees encouraged the birds to roost and nest there. Similar initiatives have been taken in Nagpur and Bidar, where artificial nests and feeders are placed at regular intervals for birds. (Vijaykumar, 2016) Playing recorded bird sounds close to the feeders reduce the stress in the birds and make them comfortable to eat in human proximity. Additional initiatives in reducing ALAN by using downward illumination at night and planting trees with dense canopies along transportation corridors will bring the light and noise pollution down, encouraging migratory birds to gradually acclimatise to human environments.

7.6. Traditional knowledge

Many tribes in India consider revere local and migratory fauna as guardian deities and holy creatures, therefore protecting them, their habitat and progeny. Similar to the case of the hornbill in Arunachal Pradesh, the Greater Adjutant Stork is a migratory bird which visits Sensowa and Khutikotiya villages in Assam. (Vijaykumar, 2016) As the bird only prefers the silk cotton tree for nesting, rampant deforestation brought its numbers down to 1800. With awareness drives among the tribes, a reminder of the cultural importance of the bird and compensation for their efforts, the tribals consider the bird their identity and protect the trees where they nest. In the case of the hornbill, bird lovers from Pune, a city in West India, created a donation drive to remunerate the people who conserve hornbill habitat, thus giving them a livelihood and encouraging them to reverse deforestation, thereby protecting the hornbill habitat.

8. Framework proposal for avifauna preservation

Document	Present Status	Proposed Amendment
URDPFI	No special provision for bio-reserves within urban settlements	Addition of separate clause for micro-bio-reserves. Identification of reserves to be based on a weighted overlay method with heavy weightage given to migratory bird population, wetland area, grassland area, number of nests and fledglings. No amenities or services to be allowed within the zone and the feeder system of the wetland to be free of industrial and chemical pollutants.
URDPFI	Buffer area around bioreserves missing	While land is a premium resource in urban settlements, a minimum buffer based on survey data to be proposed around the micro-bio-reserve. The native vegetation species for food and nesting to be within the inner ring of the buffer to limit the bird movement outwards.
Urban Construction Bye Laws	No compulsory clause for vegetation within property boundary	Native vegetation species, preferably fruit-bearing, which will not damage the built structure,

		should be made mandatory at every site. Necessary front setbacks, based on region and vegetation species to be clearly tabulated.
Urban Construction Bye Laws	No mention of external lighting norms	Clause to be inserted that all external illumination to be downward, so as to bring down the ALAN.
Urban Construction Bye Laws	Architectural elements to enhance avian nesting behaviour absent	For every urban settlement, a preliminary study can be carried out with avian experts, traditional wisdom givers and bird lovers to identify architectural elements such as roof shingles or ornamental cavities and water requirements such that human and bird can coexist without conflict. Certain elements can be made mandatory
Green Building norms	Downward lighting norms are an incentive	To be made mandatory. Clause for the same to be inserted in urban planning and local construction guidelines.
	Preserving native vegetation and waterbodies are partially incentivized	To be made mandatory.

Table 5 Framework Proposal for avifauna preservation

9. Conclusion

Urbanisation in India is occurring at a very fast pace. It is estimated that –percent of the country’s population will be living in cities. This, coupled with high levels of poverty and general apathy is leading to large tracts of green zones and water bodies being encroached upon by vested parties and squatters. While the National Action Plan and the National Bird Register will aid in observing the trends in migratory bird population, actual conservation requires to be enforced at the local level. Apart from awareness and ornithologist intervention, legal provisions have to be maintained with minimum ambiguity and maximum culpability to establish the necessity of avifauna preservation. Moreover, significant architectural elements could be proposed in the local construction bye laws to weave avifauna habitat within the urban settlement fabric and increase the adaptability of seasonal birds to the urban scenario. The proposed legal framework has been devised to help bridge the gap between provision and implementation of local and national urban planning norms followed in India towards avifauna conservation. A holistic quality of life is achievable when the nature and development are allowed to coexist and avifauna is an integral element to this ecology. Preservation of avifauna should be a matter of identity, pride and above all, respecting nature which sustains all life.

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HOW CAN NEIGHBOURHOOD SUSTAINABILITY ASSESSMENT TOOLS IMPROVE URBAN WELLBEING?

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Introduction

In the contemporary world we are facing four megatrends: population growth, population ageing, international migration and urbanization. All these trends interest both developed countries and developing ones, even if there are some differences and disparities among them. Moreover, they directly affect the sustainable development of nations and consequently have influence on people health and wellbeing.

Paying attention on developed countries, and in particular on European (and Italian) cities, urbanization and population ageing are the two main issues to be considered. In fact, here the number of over 65 years old people is growing exponentially and in 2018 it has overpassed the number of under 5 children. In addition, elderly cohort will exceed the 15-24 one by 2050 (UN, 2019a).

The number of people living in urban contexts will increase, reaching about 68% of the world population (UN, 2019b). This estimation means that cities and their public spaces have to be the core of the sustainable development to guarantee equity, health and wellbeing to the citizens. In fact, rapid urbanization exacerbates environmental problems, inadequate basic services, urban sprawl, differences in opportunities for people.

For this reason, it is necessary to recognize the centrality of people in urban transforming processes by providing equal opportunities for all looking at *2030 Agenda for Sustainable Development* and specifically to the 11th goal *Making cities and human settlements inclusive, safe, resilient and sustainable* (UN, 2015). The purpose of this goal is to ensure access to housing and good public spaces and improve a more inclusive urban planning through adequate public transport and social cohesion.

According to Fusco Girard (2006, p. 48) «the city that promotes sustainable human development is a city in which the human person, in the relational-community dimension is at the centre with its inalienable rights (health, quality environment, work, culture). It promotes integration from its neighbourhoods which reproduce a network of many micro-communities». Neighbourhood is the “ideal urban dimension” where innovation and public investments are possible.

Therefore, this paper focuses on neighbourhood scale to look at health and wellbeing for people in urban contexts. Specifically, it aims to analyse some of the main Neighbourhood Sustainability Assessment (NSA) tools to underline whether and how the use of them can improve urban wellbeing recognising in social sustainability the key to do that.

Urban health and wellbeing

In 1948, in its Constitution, World Health Organization (WHO) defines health «a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity». According to this definition, human health in urban contexts means to be in a good physical and physiological state sharing spaces and activities with other people.

In particular, in *Encyclopedia of quality of life and well-being research* (Michalos, 2014) the term “urban health” is associated with the outcomes of the physical and social environment that have an impact on the community quality of life within an urban setting. In this sense health may be affected by directly “physical issues”, as pollution, infrastructure, services, open spaces and so on, but also indirectly by “social determinants”, as housing, food, inclusion or exclusion processes.

In exceptional cases, even other factors affect health like in the case of the COVID-19 pandemic. In fact, it has been more than health crisis. The pandemic has stressed economic and social systems, exacerbated inequalities, denied the sense of the city and accentuated its problems. However, climate change is another “exceptional” case that affects urban health.

Because of the increasing trend of urbanization, which means a greater number of people who will live in urban contexts, cities play a key role to respond to the human and urban health challenges. This phenomenon contributes to spatial misery improving the growth of poor areas and then of people living in poor conditions.

In fact, in the *New Urban Agenda* health is considered one of the sustainability challenges that cities and human settlements are facing (UN-Habitat, 2017). According to the author, to do this is necessary to define a limited area of the city where to address the different issues about health.

The neighbourhood-scale

The neighbourhood-scale is the ideal scale to propose regeneration interventions which seek to encourage quality of life and wellbeing. It is the “optimal scale” to receive and implement experimentation for the sustainable development of the cities (Sharifi et al., 2021).

It is not easy to find an unambiguous definition of neighbourhood. After an in-depth literature review, Galster (2001, p. 2112) states that it «is the bundle of spatially based attributes associated with clusters of residences, sometimes in conjunction with other land uses».

The neighbourhood is “a territorial portion of the city” having its own specificities in which it is possible to strengthen sense of place and sense of community. According to Lynch, in his masterpiece *The image of the city* (1960), neighbourhood is an element of the city with defined boundaries where people can recognise its identifying features.

It is a physical place but it has also an high social value: here people can support each other, that is particularly important for the elderlies, for example, in order to improve their possibility to *age in place* avoiding institutionalisation. Neighbourhood term itself means both «the area of a town that surrounds someone’s home» and «the people who live in this area»¹.

Therefore, neighbourhood-scale becomes the place where it is possible to evaluate how physical and social environments affect people health and wellbeing. This study pays particular attention on social issues, seen as an accelerator for these issues².

¹ Definition from Cambridge online dictionary: <https://dictionary.cambridge.org/it/dizionario/inglese/neighbourhood> (last accessed: 24/05/2022).

² Even economic and environmental dimension of sustainability could have an impact on urban health and wellbeing and even, but they will not be not an objective of this study.

Social sustainability as an accelerator for urban wellbeing

The morphological characteristics of the urban environment have a direct impact on the interactions between people and between people and the space itself. In fact, the quality of public spaces is essential to ensure inclusion and wellbeing having influence on people behaviour and perception. «It is clear that if a city offers spaces which provide freedom, permitting dialogue, allowing coming and going, affecting the sense of belonging to a community, then that city can be defined as healthy and sustainable» (Arengi, 2020, p. 129).

The relationship between sustainability and neighbourhoods – more in general public spaces – is quite complex and includes environmental, economic, social, cultural, political issues. However, talking about sustainability implies the promotion of economic growth while minimising environmental impacts and ensuring social inclusion. As a matter of fact, this statement explains the “3 P” – people, planet and profit – introduced by Elkington in 1994.

Sustainability is achieved when there is a balance between these three dimensions – economical, environmental, social –, since they are mutually dependent (Colantonio, 2009). Only in this way people, planet and profit could have the same value in rethinking urban spaces. Nevertheless, the social dimension seems often less relevant than the other two, due to its “immaterial” nature.

For Polese and Stern (2000, p. 15-16) social sustainability is the «development (and/or growth) that is compatible with harmonious evolution of civil society, fostering an environment conducive to compatible cohabitation of culturally and socially diverse groups, while at the same time encouraging social integration, with improvements in the quality of life for all segments of the population». This is one of the most interesting definitions of social sustainability, since it is not possible to have a unique one.

Social sustainability is characterized by different components, which could be distinguished in “hard” or tangible and “soft” or intangible ones (Colantonio, 2009). In particular, the main aspects to be considered are: social equity, social cohesion and participation, social exclusion, environmental justice, security, urban liveability and quality of life (Colantonio, 2009; Shirazi et Keivani, 2019).

As stated, social sustainability and physical characteristics of the urban public spaces influence each other. In detail, urban social sustainability represents the continuous ability of a city to function as a vital environment for cultural development, human interaction and communication (Bramley et al., 2006). Social sustainability in urban areas, precisely urban social sustainability, is therefore based on the design of consciously built and “good quality” places so as to be able to feed sociality, while remaining connected to the issues of social cohesion and social capital (Goosen and Cilliers, 2020).

In this direction, the *New Urban Agenda* (UN-Habitat, 2017) includes even actions aimed at inclusive cities and human settlements which promote social and civic involvement by addressing the issues of urban social sustainability.

Because of this strong connection between the social dimension of sustainability, the quality of the built space and urban health, this study aims to analyse some of the main neighbourhood sustainability assessment tools in order to understand how public spaces at neighbourhood-scale can help to increase the level of urban wellbeing and thus social sustainability.

Social sustainability in the Neighbourhood Sustainability Assessment tools

Neighbourhood sustainability assessment tools, also known as NSA tools, are voluntary systems edited by no-profit organizations to certify specific performances about economic, environmental and social sustainability at neighbourhood-scale. The first examples were born in the 90s at building-scale with the aim of controlling and limiting buildings energy

consumptions. About a decade later the focus was moved also on urban public spaces, taking into account neighbourhoods as places that can play a key role in sustainable development processes.

In fact neighbourhoods represents the “ideal” scale of the city to implement sustainable actions thanks to its confined dimension, its own characteristics and because it is the privileged place of collective activities, social exchange, people interaction and everyday life (Sharifi et al., 2021).

NSA tools are used both in the case of new construction and in regeneration process. They are based on a set of indicators, categories and benchmarks to assess specific performances. These tools aim to objectify the planned intervention assigning a final score which identifies the overall performance of the district in term of sustainability (Boyle et al., 2018). To do this, it is necessary the payment of a fee and the work of third parties which can operationally do the assessment. The fact that the use of NSA tools – and in general all sustainability assessment tools – has a cost constitute a limit in their dissemination, with a greater diffusion in developed countries rather than in developing ones.

Among the most used NSA tools (such as BREEAM Communities, LEED Neighbourhood Development and its Italian version GBC Italia Quartieri, ITACA Scala Urbana, DGNB Districts, Living Community Challenge, CASBEE for Urban Development, Green Star Communities, EcoDistricts, HQE2R) it possible to identify two typologies. According to Sharifi and Murayama (2012) most NSA tools directly derive from their respecting building-scale systems (which are called “spin-off” tools). Instead, a minor part of them (it is the case of EcoDistricts and HQE2R) has been specifically created for neighbourhood-scale interventions and so works differently from previous ones.

Another characteristic of these tools is that each of them is generally used in the country where it has been developed because it is based on the national regulations and it is not always easy to adapt them to other contexts.

NSA tools are generally composed by environmental, economic and social criteria in order to assess the “degree” of sustainability of the selected district. Nevertheless, environmental and economic criteria predominate over the social ones confirming «the fundamental misunderstanding according to which sustainability is mainly intended in environmental terms, despite its strongly anthropocentric nature» (Acierno and Attaianesi, 2018, p. 267).

In this study five NSA tools have been selected on the basis of most diffused in European and Italian contexts and the free availability of their respective manuals. These are: BREEAM Communities (UK), DGNB Districts (Germany), Living Community Challenge (USA), GBC Italia Quartieri (Italy), and EcoDistricts (USA)³. In the table 1 the most relevant characteristics of each of them are shown.

Table 1. Summary table of the selected NSA tools

NSA tool	Main country	1 st publication / current version	Main characteristics of the current version			
			Structure	Total number of criteria	Minimum score	Is there a specific social category?
BREEAM Community	UK	2008 / 2012	3 steps 6 categories	40 individual issues	30%	Yes, it has <i>Social wellbeing</i> subcategory
EcoDistricts	USA	first decade 2000s / 2018	3 key elements 6 priorities	n.d.	n.d.	It could be <i>Place and Health and wellbeing</i> priorities

³ For EcoDistricts it was not possible to have the full manual, so the presented indicators will have no corresponding weighting.

			3 implementation phases			
DGNB Districts	Germany	2012 / 2020	5 thematic areas	31 criteria	50%	Yes, it has <i>Sociocultural and functional quality</i>
Living Community Challenge	USA	2014 / 2019	7 categories	20 imperatives	n.d.	It could be found in the categories <i>Health and happiness, Equity and Beauty</i>
GBC Italia Quartieri	Italy	2015 / 2015	3 main categories 2 optional categories	12 prerequisites 42 credits	40/110 points	It could be related to some credits about the “spatial quality”

For each of them the “social criteria” have been selected and compared to understand how they are used and to what end in relation to the whole tool. As it is possible to see in table 1, not all the NSA tools have a specific social category. This is only the case of BREEAM Community and DGNB Districts in which the social theme is expressly stated. Instead, in the other tools social category is linked with criteria or indicators that could have impacts on social issues. These criteria are related to both “hard” components of social sustainability and “soft” ones.

In the table 2 there is a comparison between the identified social categories of each NSA tool, with their respective aims and weighting.

Table 2. Summary table of social categories for each NSA tool

NSA tool	Main category	Criterion	Aim in brief	Weighting
BREEAM Community	Social wellbeing (which is a subcategory of Social and economic wellbeing)	SE02 - Demographic needs and priorities	To ensure that design is based upon the local demographic trends and priorities.	2.7%
		SE 05 - Housing provision	To ensure appropriate housing provision for all within the development.	2.7%
		SE06 - Delivery of services, facilities and amenities	To ensure essential facilities are provided and that they are located within a reasonable and safe walking distance.	2.7%
		SE07 - Public realm	To encourage social interaction by creating comfortable and vibrant spaces in the public realm.	2.7%
		SE09 - Utilities	To provide easy access to site service and communications infrastructure.	0.9%
		SE11 - Green infrastructure	To ensure access to high quality space in the natural environment or urban green infrastructure for all.	1.8%
		SE15 - Inclusive design	To create an inclusive community by enhancing accessibility for as many current and future residents as possible.	1.8%
EcoDistricts	Place	Engagement and inclusion	Civic engagement is strong and processes are inclusive and representative. Sharing programs are robust.	n.d.
		Culture and identity	Historic and culturally significant places are preserved and celebrated. Participation in cultural events is high.	n.d.

	Health and wellbeing	Public spaces	Public spaces are accessible to all. They are high quality, engaging, and active.	n.d.
		Active living	Access to recreation facilities and services is improved. Walkability is enhanced.	n.d.
		Health	Health outcomes and life expectancy are more equitable. Affordable, high-quality health care is accessible. Toxic environments are remediated and regenerated.	n.d.
		Safety	Public safety is enhanced. The built environment is designed for public safety.	n.d.
		Food systems	Healthy and affordable fresh food is accessible. Food production in the district is encouraged.	n.d.
DGNB Districts	Sociocultural and functional quality	SOC 1.6 - Open space	To satisfy the need for recreation and interaction by providing high-quality open spaces within walking distance.	3.5%
		SOC 2.1 - Barrier free design	To make the entire environment accessible to everyone and without restrictions on its use.	2.6%
		SOC 3.1 - Urban design	The objective is to contribute cultural identity by establishing and maintaining consistent urban structure as part of the city as a whole.	2.6%
		SOC 3.2 - Social and functional mix	To make the district adaptable to social change and ensure a socio-functional mix.	3.5%
		SOC 3.3 - Social and commercial infrastructure	To ensure close, easily accessible and commercial infrastructure, creating social acceptance of the district.	2.6%
	Process quality	PRO 1.7 - Participation	To involve all those affected by the planning at an early stage.	3.3%
Living Community Challenge	Health and happiness	08 - Healthy neighbourhood design	To promote and optimize the health and well-being of its residents.	1/20
	Equity	14 - Human scale and human places	To create human-scaled rather than automobile-scaled places.	1/20
		15 - Universal access to nature and place	All primary transportation, roads and non-building infrastructure must be equally accessible to all people.	1/20
		16 - Universal access to community services	To have basic community services and amenities that support the health, dignity and rights of all people.	1/20
	Beauty	19 - Beauty and spirit	To have public art and design features in urban spaces intended solely for human delight.	1/20
		20 - Inspiration and education	To ensure participation through education of the community.	1/20
GBC Italia Quartieri	Organization and Planning of the Neighbourhood	OPQ3 - Mixed use neighbourhoods	To group and make accessible different uses in central areas of the neighbourhood.	4/110
		OPQ6 - Connected and open communities	To promote projects that have high levels of internal connection and are well connected to the city.	2/110
		OPQ9 - Access to public spaces	To improve citizens social life by offering them a variety of open spaces.	1/110

		OPQ10 - Access to recreational activities	To improve citizens social life by offering them a variety of recreational activities.	1/110
		OPQ11 - Universal accessibility	To allow all citizens to participate more easily in community life.	1/110
		OPQ12 - Involvement and openness to the community	To promote awareness of community needs by activating participation.	2/110

Discussion and conclusion

The carried-out analysis has highlighted the presence of a greater number of environmental and economic criteria regarding social ones, as it is possible to see from their weighting. In particular, as shown in table 2, the social criteria are mainly related to the “hard” components of social sustainability, thus to the physical characteristics of the neighbourhood (i.e., accessibility, mixité, urban design, and so on). While the ones concerning social activities and sense of community are less in number (i.e., participation, involvement, equity) and generally difficult to evaluate quantitatively.

In addition it is difficult compare the criteria of each tool, since they have a different weight and meaning compared to the whole system. For example, in the case of “public space” criterion (BREEAM - S07 Public realm; EcoDistricts - Public spaces; DGNB Districts – SOC 1.6 Open space; LCC – 10 Human scale and human places; GBC Italia Quartieri – OPQ9 Access to public spaces) the aims are similar but the weighting differs from a tool to the other. Moreover, some tools have specific criteria that others do not mention, as in the case of EcoDistricts where there is a criterion named “health” that does not exist in the other tools.

Starting from these considerations it is clear that each tool contributes differently to the improvement of urban health and wellbeing. In EcoDistricts and Living Community Challenge there is a focus on the issues concerning social sustainability compared to the other tools. Nevertheless, they do not provide for an objective measurement through benchmarks and this is a limitation in their application.

It seems necessary improving social categories importance in all the NSA tools and focusing on social sustainability as an accelerator to improve urban health and wellbeing. Therefore, trying to answer to the title question, NSA tools are contributing to people health respect to environmental issues and less to economical and social ones. However, a greater deepening of these dimensions of sustainability would ensure a more adequate vision of urban health and wellbeing, through interventions aimed at both economic and social inclusion and equality.

Further studies on these tools are also needed to think about the possibility of making them usable in countries where they can really promote actions for inclusive cities and human rights.

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TRACK 4: HOUSING

AFFORDABLE OVERNIGHT LODGING IN HIGH-COST, HIGH-NEED COASTAL ENVIRONMENTS

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INTRODUCTION

Over the past 40 years, one of the strongest dialogues in the West has been the call to protect environmental resources, particularly access to the coastal environment. For example, in the mid-1970s the State of California created the Coastal Commission / Conservancy to protect, restore, and provide public access to California's world-renowned coastal environment and marine resources. The California Coastal Commission ("CCC") oversees all coastal development, manages habitat restoration and protection, and governs natural resource use.

Coastal areas Section 30213 of the California Coastal Act (Division 20 of the California Public Resources Code) requires the CCC to protect, encourage, and, where feasible, provide for lower cost overnight visitor accommodations ("LCOVA") along the State's coast. As a mitigation measure per Section 30213, the CCC typically requires hotel and other development projects to include LCOVA facilities on-site, off-site, or pay an in-lieu fee. Despite such measures, the market has produced few LCOVA facilities along the California coastline. The supply of LCOVA facilities has not kept pace with demand, and as a result, coastal lodging facilities remain unaffordable to many Californians.

Section 31104.1, Division 21 of the California Public Resources Code maintains the California State Coastal Conservancy ("SCC") may,

accept dedication of fee title, easements, development rights, or other interests in lands, including interests required to provide public access to recreation and resources areas in the coastal zone.

Over the years, the SCC has funded overnight accommodation projects that include a Coastal Development Permit for the Port San Luis Harbor Terrace project, restoration of the Crystal Cove Cottages at Crystal Cove State Park in Orange County, and campground facilities at the Piedras Blancas Motel site within Hearst San Simeon State Park, among others.

Increasing the inventory of LCOVA also has important consequences for cities' entire housing markets. More available LCOVA units keeps long-term rental units from slipping into the vacation rental inventory (i.e. Airbnb, VRBO, Homestay, etc). Cities with high-cost, high-need housing inventories can utilize LCOVA as a lever to balance long-term and short-term markets and make housing on the whole more affordable. Moreover the preservation of low-cost overnight units can allow for more equitable access to coastal environments and natural resources to broader populations that cannot afford to live in coastal areas.

In this context it is important to understand the mechanism for monitoring and judging supply of LCOVA facilities in high-cost coastal areas, and also to understand affordability within the coastal areas the need-for or surplus-of affordable supply to match demand. This paper develops and pilots a methodology of assembling LCOVA supply data, and explores daily rate and hotel distribution metrics to illustrate supply and demand in the context of the need for LCOVA. Furthermore, it provides ideas of possible synergistic solutions that address coastal access while at the same time helping to address affordable housing and transportation crises in many high-cost, high-need markets.

LITERATURE REVIEW

For background, there has been very little work on assessing LCOVA in the coastal zone. While work has evaluated the distributional equity aspects of the planning process as they relate to housing, it has not ventured much in to overnight accommodations. For example, in classic work Bobo and Shulman (1977) suggest more stringent development controls that require the use of inclusionary zoning ordinances to assure that the coast will service the housing needs of all economic segments of the community. They conclude that the housing sections of the plan lacked the necessary definition to implement the stated policies.

Recent literature has primarily focused on sustainable management and fisheries. This includes work by those such as Richmond, Riggs and Pontarelli arguing for a sustainable land use in the coastal zone (Richmond et al., 2019; Riggs & Pontarelli, 2014) as well as other works that highlights the connection of fishing industries to land-side infrastructure and resources (Sethi, Reimer, & Knapp, 2014; Sethi, Riggs, & Knapp, 2014).

Lester and Matella examine alternative statewide sea level rise adaptation policies that are consistent and compliant with the Coastal Act (Lester & Matella, 2016). They demonstrate six development contexts that illustrate planning challenges related to issues like redevelopment rules. The authors argue that the rise in sea level threatens residential development since emergency measures, such as seawalls, could lead to an incremental loss of recreational beach area, and provide a useful systematic classification of types that have similar attributes to describe residential development and hazard conditions along California's coastline.

Yet these have not focused on the coupled human and natural systems which are inherently complex yet essential to community resilience (Gunderson, 2010; Liu et al., 2007; Magis, 2010). None have focused on LCOVA specifically. Some work has looked at access—for example the spatial distribution of public access to the coastline in California relative to the distribution at the states diverse residents has been evaluated (Reineman, Wedding, Hartge, McEnery, & Reiblich, 2016). This is evaluated from shared benefit perspective in the context of decision-making, however, as opposed to a quantification, approach.

In one of the most relevant pieces of literature researchers looked at the coastal act and the housing dynamics associated with the introduction of the CCC (Kahn, Vaughn, & Zasloff, 2010). They compared housing market outcomes in select cities and argued that California's Coastal Act promoted housing for some lower income people (mainly seniors). Yet at the same time, they made no provisions for either average or median prices, and did not provide statewide methodologies.

Additional work from Pierucci, explored LCOVA specifically using a highly granular approach and highlighting the need for more research (Pierucci, 2015). The analysis explored the practice and legality of the California Coastal Commission's application of the \$30,000/25% fee as a LCOVA mitigation measure. Based on a legal and policy analysis of the fee, Pierucci argues that the fee will likely fail the applicable legal standards—suggesting recommendations for developers.

This suggestive work comes at a time when housing affordability is acute yet development has become harder. Take for example the August 2015 report from the *San Diego Tribune* of the CCC's rejection of plans to develop up to three Harbor Island Hotels that would be located on public tidelands overseeing the port of San Diego (Weisberg, 2015). The commission was reported to have rejected the proposal in recognition of the fact that undeveloped waterfront tidelands are shrinking, and that the San Diego Port District would not make a stronger commitment to guaranteeing affordable lodging on or near Harbor Island. The report also stated that approximately \$19 million in affordable lodging fees have been collected over the years, but close to \$10 million remained unspent.

METHODOLOGY

Given this practical and theoretical need and to address the gaps in the literature and develop methods to better understand affordability needs, this paper develops and pilots a methodology of assembling LCOVA supply data, and explores daily rate and hotel distribution metrics to illustrate supply and demand in the context of the need for LCOVA. To do this we focused on analyzing average daily rate (ADR) data from hotel inventories for City of Long Beach, Orange County, Los Angeles County, the California Coastal Zone, and the Five-Miles-from-Shoreline Zone, and in calculating low-, moderate- and high-cost rates for these areas. We developed a preliminary database of motel, hotel, campsite and RV establishments by acquiring data from Smith Travel Research (STR) and Oddity Software to identify over 6,000 lodging establishments in California. We then narrowed the data to include only establishments within Coastal Counties. At the same time we assembled statewide lists of RV and campsites from a variety of sources

including California State Parks, AAA, HipCamp.com, TripAdvisor and Expedia. These data sets were combined into one mega-database for GIS analysis.

Determining Affordability

The process for arriving at the daily rate benchmarks involved working with SCC and benchmarking off of the Average Daily Hotel Rate (ADR) for California in 2015. The ADR figure was derived from all hotels in California that are included in the Smith Travel Research (STR) database, approximately 6,700 establishments, and was \$150.03 as shown Table 1 which shows season variation of rates. For our purposes, Summer was considered the months of July and August. The maximum daily rate considered for “lower-cost accommodations” was calculated from the higher of two data points: \$100 per night, and 75% of the 2015 California ADR.

2015 California ADR Time Period	ADR (1)	75% * ADR	Maximum Daily Rate for Lower-Cost Accommodations (2)
All Year	\$150.03	\$112.52	\$112.52
July	\$164.25	\$123.19	\$123.19
August	\$163.76	\$122.82	\$122.82

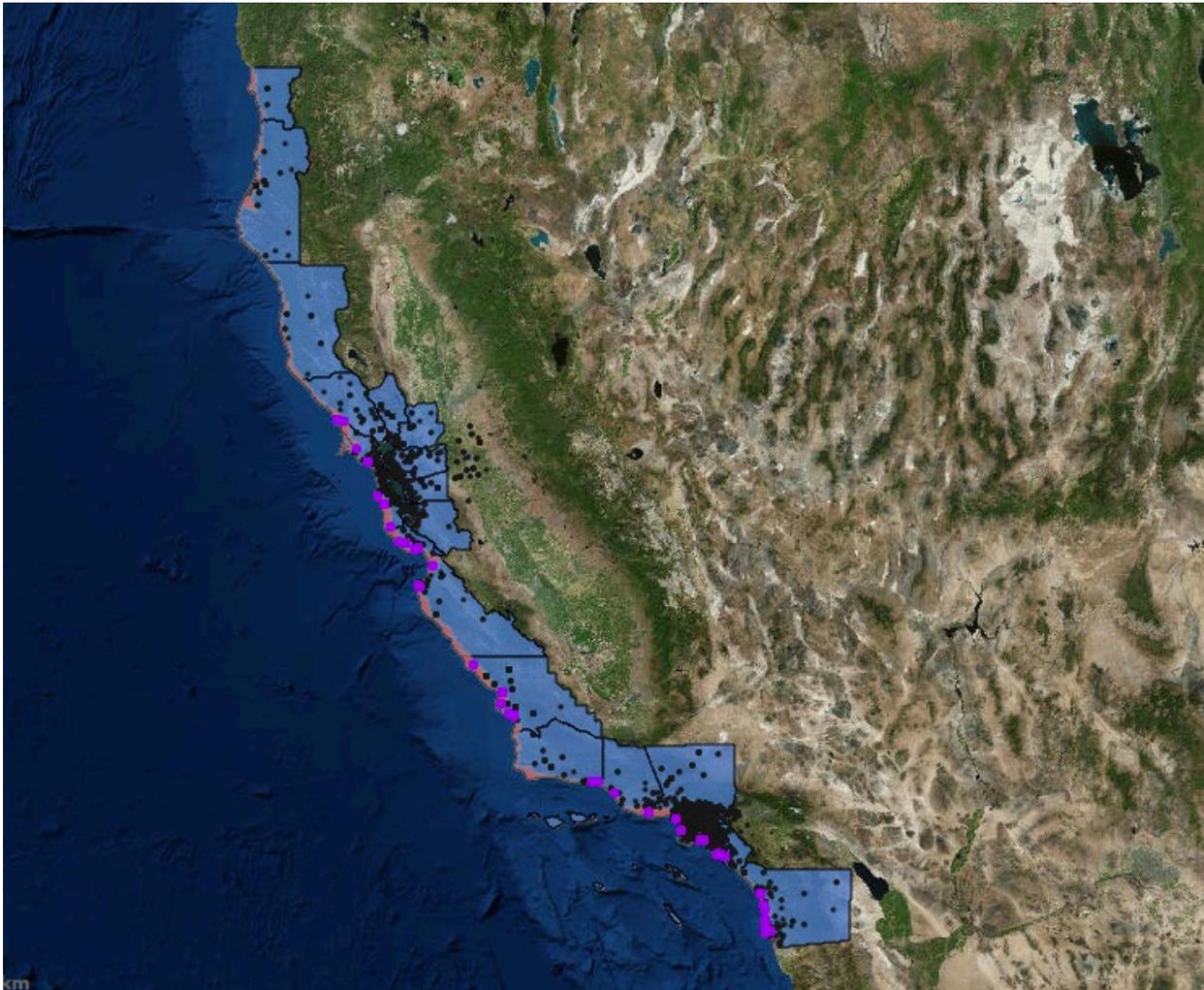
Notes:

- (1) Data from STR 2015 California Trend Report
- (2) The higher of \$100 per night or 75% of the 2015 California ADR

Preliminary GIS Assessment

Following the preliminary data assembly process, we used GIS technology to geo-code the exact location of each establishment to determine which were located in the Coastal Zone or within one mile of the shoreline. This was done using a method of analysis called spatial selection. A representation of this is shown in Figure 1 below. The California State Coastal Conservancy (SCC) provided an initial GIS layer representing a 1-mile buffer beyond the coastal zone. To comply with the scope of work Author developed a new GIS layer that instead identified the geographic area located within 1-mile of the California shoreline.

Figure 11. Spatial Selection of Coastal California Overnight Accommodation Establishments



Source: Author

It is worth noting that there were two key challenges in geocoding data for project sites that led to a visual overlap in the online GIS and many duplicate entries in the data when it was converted from a Excel / comma separated value (CSV) file to a GIS shapefile.

1. Google data scraping issue: available XY coordinates were the same for a number of properties. These coordinates appeared to be accurate only within 1/4 to 1/2 mile causing sites located within close proximity (e.g. across the street from each other) to be assigned the same location coordinates in the Google database.
2. ArcGIS bug: a geocoding bug related to the number of characters in an Excel field caused duplicate entries to be created. When the CSV file was read in ArcGIS Online, if there were fields that contained long entries, the record was split, and new rows (or field entries) were created. This error is related to an ArcGIS 'inspection' issue in which imported field entries are defined by looking only at the first 10 rows. More discussion on this is found here: <https://geonet.esri.com/thread/179295>.

While we originally thought that each property in the database would need to be manually separated (a task that would have taken an ~15 minutes per location) after further evaluation a more efficient, two-pronged approach was devised to resolve each of the identified issues.

1. Google data scraping issue: XY coordinate data was sorted by length. Any site with less than 4 decimal degrees in the XY coordinate was ruled to be too spatially aggregate and flagged for correction. For these sites (numbering roughly 300) a new XY coordinate was gathered; geocoding using the available postal address. Following this data was scrubbed for errors, including missing negative signs and inadvertently included punctuation that would prevent proper mapping.
2. ArcGIS bug: a workaround was devised that involved two strategies. First, before uploading, the excel function =len() was used to determine the number of characters in each cell in the spreadsheet. Following this, spreadsheet data was sorted so that records with fields containing the longest entries appeared within the top 10 records. Doing this ensured that ArcGIS would not 'split' those down the line for subsequent field entries. For any sites not corrected using this method, an offsite geocoding service hosted by Texas A&M was used (<https://geoservices.tamu.edu/Services/Geocode/>).

County-by-County Validation

Following the GIS assessment Author validated and cleaned the data. We eliminated rental agencies, restaurants and other facilities miss-coded as hotels, and undertook a county-by-county assessment to evaluate and include hotels that were not a part of the initial list. This effort was required to incorporate smaller, boutique establishments that were not included in the STR and Oddity Software data sets, yielding a total data set of 942 unique accommodations, each with related geo-spatial information. As a sample size this number of sites is statistically significant at the 95% confidence interval with a margin of error of +/-2.9%

Finalization with Data

Following the County-by-County validation, our team gathered data for each establishment in the Coastal Zone or 1-mile-from-shoreline buffer, as shown in Table 1. AAA and Trip Advisor rating categories were added to the dataset, where appropriate—beyond Task 2 language in the scope of work yet consistent with conversations with SCC staff. Longitude and Latitude (X,Y) spatial coordinates were scrubbed from our GIS files using Google Earth.

In gathering cost data, we captured the daily room rate at each overnight accommodation facility. To determine a low, average, and high cost for a 2-queen bed motel or hotel room in the summer and winter, we used direct sampling methods (calling lodging establishments and surveying on-line hotel reservation systems) to obtain data. To capture the number of rooms per establishment, we documented the actual number of rooms. However, for a small number of establishments, where no reliable information existed, we assumed 10 rooms as a proxy for the size of standard small inn. Our analysis assumes that one family would occupy one 2-queen bed motel/hotel room. Therefore, larger group accommodations usually did not match the low-cost criteria, even though the per person rate could be considered relatively inexpensive. We made no adjustments for sharing economy supply from sites like Airbnb or VRBO rooms

/ units on the market. STR reports at the time indicated that peer-to-peer based lodging tools currently make up 5.4% of the accommodations in many markets, offering an opportunity for future evaluation.¹

Table 6. Data Categories for Task 2 Database

Variable Name	Description	Source
X	Geographic Coordinates: Longitude	Author (?)
Y	Geographic Coordinates: Latitude	Author
Facility_Name	Name of Lodging	STR / Author
Type	Facility Type (RV / Campsite / Hotel & Motel)	Author
Campsite_RV	Campsite / RV Filter	Author
Public	Public or Private site	Author
AAA	1-5 AAA Diamond Rating (if any)	AAA.com
TripAdvisorRating	TripAdvisor.com User Rating (if any)	TripAdvisor.com
Address	Street Address	STR / Author
City	City	STR / Author
State	State	STR / Author
Zip	Zip Code	STR / Author
County	County	STR / Author
Phone	Phone	STR / Author
Email	Email	STR / Author
Website	Website	STR / Author
Number_Sites_Rooms	Total Number of Rooms	STR / Author
Cost_Per_Night	Average Room Cost per Night for Summer	STR / Author
Number_of_People	Average Number of Individuals per Room	STR / Author
Max_Occupancy	Max Individuals Accommodated	STR / Author
Occupancy_Rate	Annual Occupancy	STR / Author
Below Max	Below the Maximum ADR	Author
1Mile Coast	Filter for Sites 1-Mile from the Coast	Author

Population Assessment

Once the coastal lodging establishments dataset was complete our team compared overnight accommodation data to population and economic (median income) data compiled from US Census Bureau, 2014 American Community Survey (ACS) 5-year estimates. ACS estimates provide the most up-to-date population and economic data available. They are available in 1, 3 and 5-year increments, in which statistical sample becomes increasingly more accurate. We use the 5-year estimates, since they are the only data sets available at small geographies and represent the highest degree of accuracy. We combined this inventory prepared with U.S. Census data of family income and population by County to analyze LCOVA supply relative to geographic, population, and income profiles. We gathered this population and median income data for all counties within 150 miles from the coast. To visualize and analyze this we established a comparison using the simple-share or ratio method of economic analysis for each location (e.g. comparing the number of rooms in each county to the number of people in each 150-mile buffer). Although this approach was limited in that it allowed for a degree of overlap and limited ability to compare county to county statewide, it was distinctly easier to explain to a larger audience (e.g. number of units per person or every X number of people within 150 mile) and more disaggregate than other approaches considered.

¹ "Airbnb Accounts for 5.4% of NYC Demand." Hotel News Now. <http://www.hotelnewsnow.com/articles/24578/Airbnb-accounts-for-54-of-NYC-demand>.

RESULTS

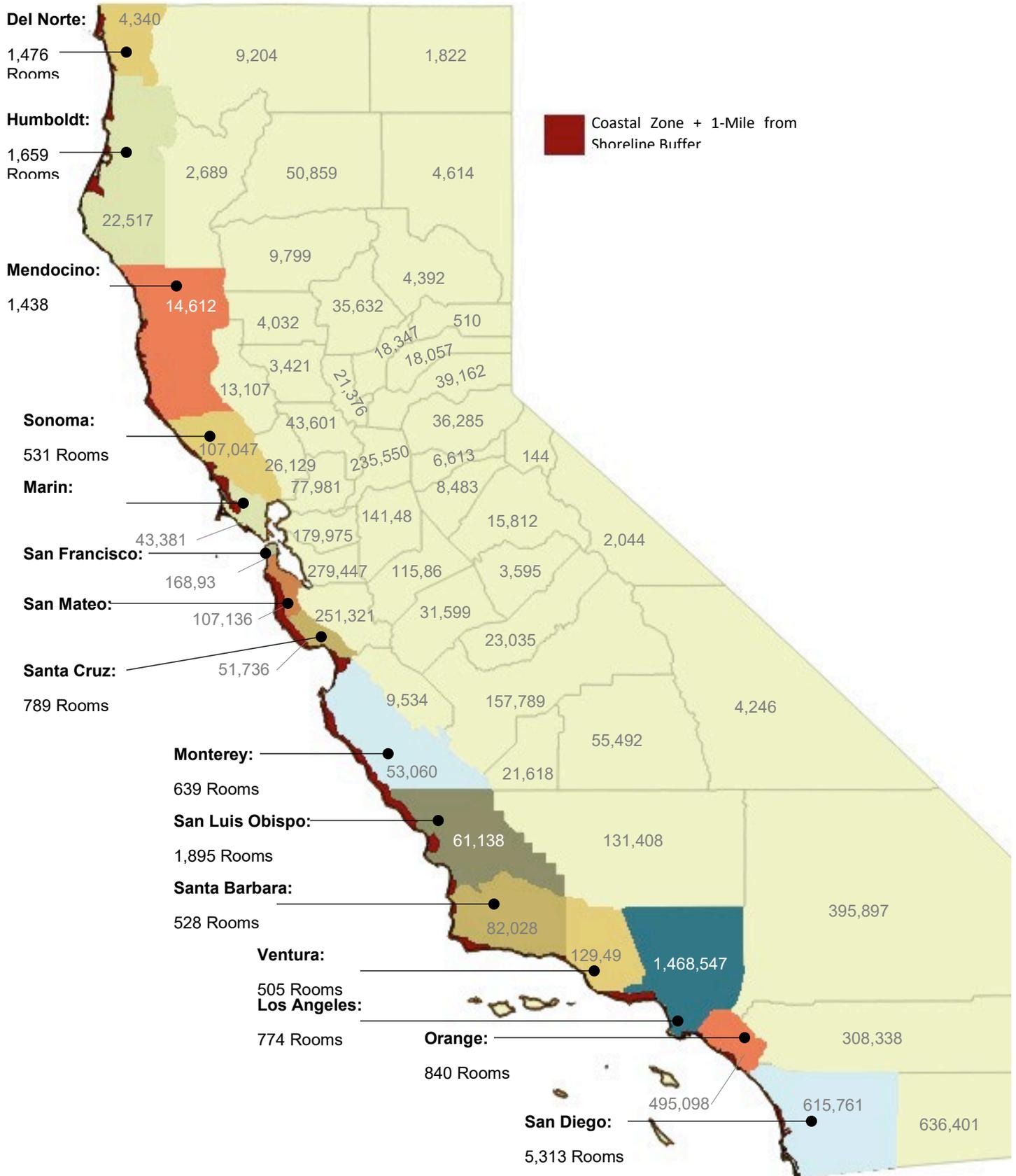
There are approximately 64,611 rooms in the combined Coastal Zone and 1-mile from shoreline buffer, of which 17,094 rooms, or approximately 26 percent, fall below the \$112 maximum daily rate for lower-cost accommodations. Table 2 illustrates the distribution of coastal rooms in each California county. Figure 2 and Figure 3 illustrate the supply of coastal rooms in each California county in comparison to total county populations and the number of households in each county that earn below 80% of area median income (AMI).

Figure 2. Number of Low Cost Accommodations (Rooms) in the Coastal Zone + 1-Mile from Shoreline Buffer (by County) and Total Households in California Counties



Source: Authors, American Community Survey 2014 5-Year Estimates

Figure 7. Number of Low Cost Accommodations (Rooms) in the Coastal Zone + 1-Mile from Shoreline Buffer (by County) and Number of *Households* Per County Below 80% Area Median Income within 150 Miles from the Coastal Zone Boundary



Source: Authors, American Community Survey 2014 5-Year Estimates

Table 7. Number of Rooms Below Annual Maximum Daily Rate for Lower-Cost Accommodations (\$112)

County	Total Coastal Rooms	Number of Lower Cost Coastal Rooms	Percent of Total by County
Del Norte	1,927	1,476	77%
Humboldt	2,421	1,659	69%
Los Angeles	2,494	774	31%
Marin	413	387	94%
Mendocino	2,291	1,438	63%
Monterey	2,996	639	21%
Orange	7,727	840	11%
San Diego	30,452	5,313	17%
San Francisco	10	0	0%
San Luis Obispo	4,724	1,895	40%
San Mateo	987	320	32%
Santa Barbara	3,184	528	17%
Santa Cruz	2,176	789	36%
Sonoma	814	531	65%
Ventura	1,995	505	25%
Total	64,611	17,094	26%

Furthermore, when comparing the population breakdown for households with income levels below 80% AMI, we find that there are substantial variations in the distribution of lower cost accommodations throughout the State. As is shown in Table 3, individuals living in households 150 miles inland from various coastal counties have different levels of spatial access⁵⁷ to low-cost accommodations. For example, in the North there are roughly 20 affordable rooms for every 1,000 potential households within 150 miles inland, while in the Bay Area and Southern California the proportion narrows to 1:1000 and 2:1000 respectively.

This statewide breakdown is illustrated in the figures found in the appendices as well as the population to accommodation ratio density map shown in Figure 5. This figure shows a heat map of population (households <80% AMI) in relationship to accommodations, with increasingly warmer colors indicating 'hot spots' where demand might exceed supply. Both of these graphics consistently suggest that there are needs for increased affordable accommodations in both the San Francisco Bay Region and in Southern California, opportunity for future investment and development.

Table 8. Number of Households Compared to Lower-Cost Accommodations (Rooms)

	Total Households	Ave. HH Income	Population <80% AMI	Low Cost Rooms (LCR)	LCR per 1000
North (<i>Del Norte, Humboldt, Mendocino</i>)	1,217,092	\$44,044	239,330	4,573	20
Bay Area (<i>Sonoma, Marin, San Francisco, San Mateo, Santa Cruz</i>)	11,186,585	\$67,584	1,965,068	2,027	1
Central (<i>Monterey, San Luis Obispo, Santa Barbara</i>)	4,061,265	\$52,296	636,586	3,062	5

⁵⁷ Calculated using linear vs. network distance that would factor in transportation routes.

South (<i>Ventura, Los Angeles, Orange, San Diego</i>)	21,601,978	\$60,809	3,433,774	7,432	2
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Figure 4. Lower Cost Accommodations (Rooms) per 1,000 Households Regionally in California

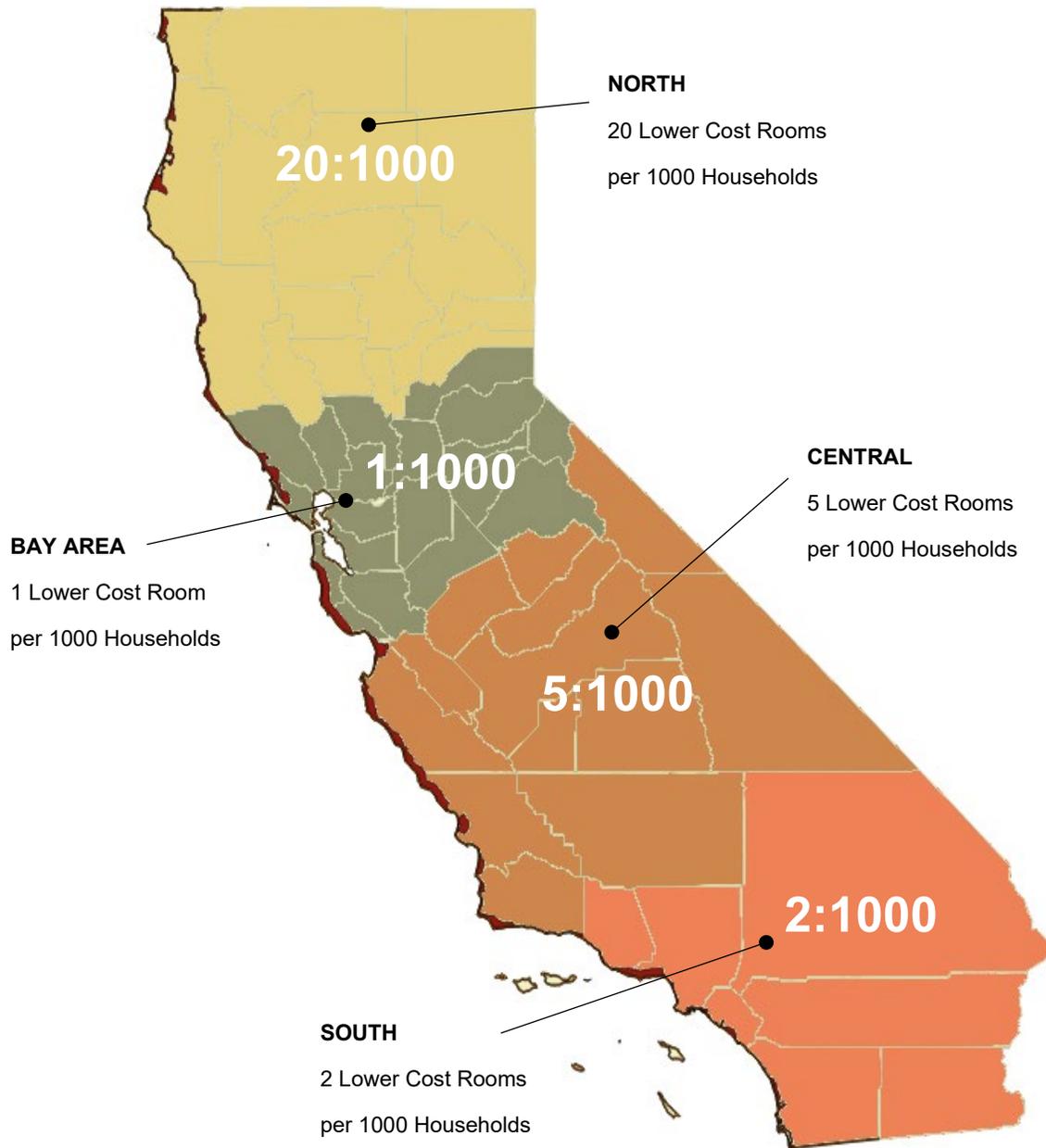
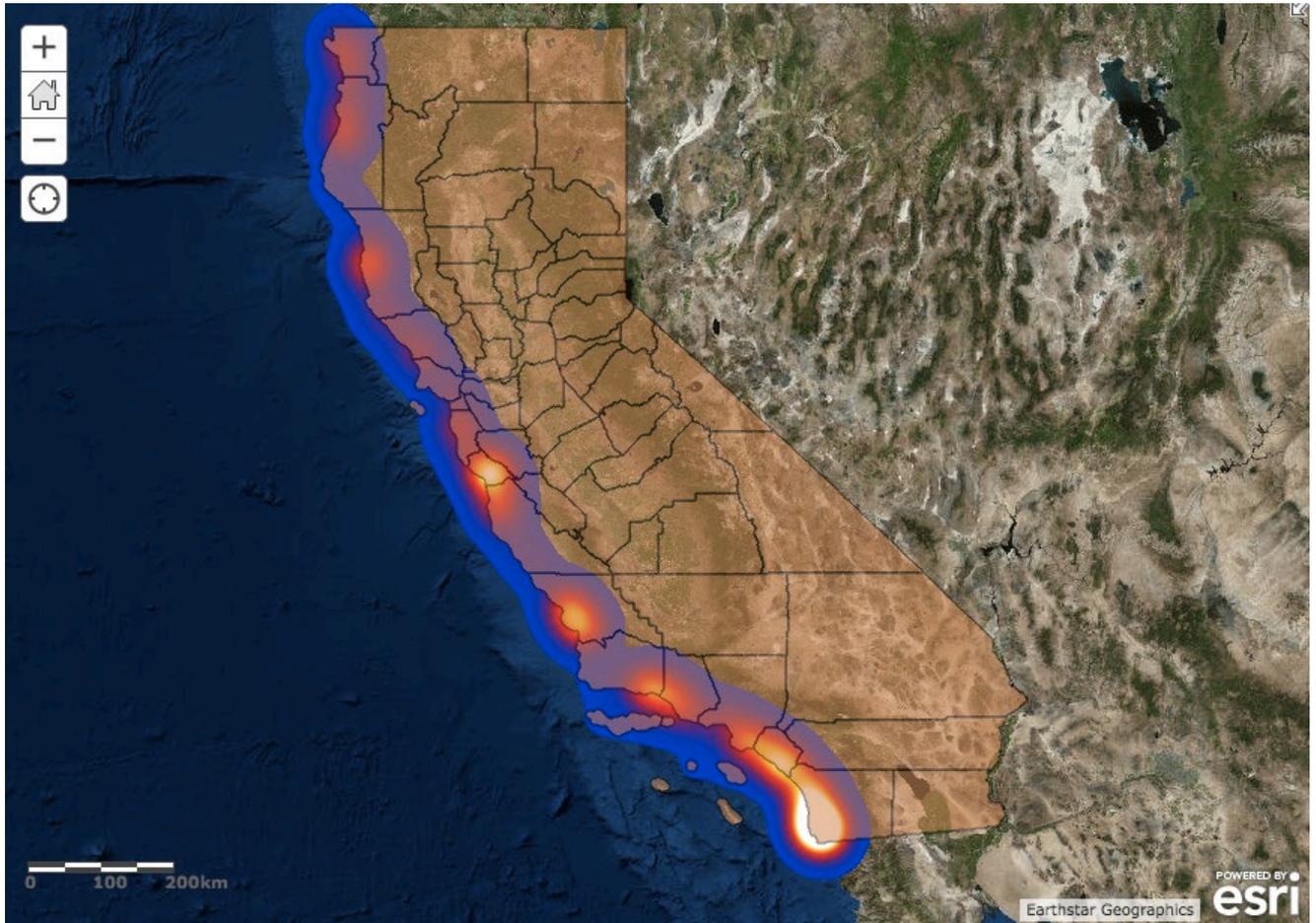


Figure 5. Spatial Hot Spot Analysis of the Number of Households <80% AMI compared to the number of Lower Cost Accommodations. More intense warm shades indicated increased population demand (e.g. greater population to fewer or fixed accommodations).



Source: American Community Survey 2014 5-Year Estimates.

In looking at affordability, there is vast variation in the data across both summer and winter as is show by the a minimum, maximum, and average costs illustrated in Table 4 and Table 5. This indicates an opportunity for policy and supply intervention.

Table 4. Range of California Room Rates by County within 1-Mile-of-the-Shoreline Zone (Summer)

County	Average	Low	High
Del Norte	\$135	\$72	\$200
Humboldt	\$153	\$80	\$300
Los Angeles	\$254	\$69	\$904
Marin	\$180	\$37	\$325
Mendocino	\$193	\$87	\$425
Monterey	\$274	\$133	\$665

Orange	\$287	\$89	\$799
San Diego	\$211	\$39	\$822
San Francisco	\$182	\$182	\$182
San Luis Obispo	\$248	\$69	\$500
San Mateo	\$302	\$140	\$1,000
Santa Barbara	\$343	\$146	\$1,470
Santa Cruz	\$245	\$52	\$1,037
Sonoma	\$223	\$99	\$300
Ventura	\$194	\$90	\$407

Table 5. Range of California Room Rates by County within 1-Mile-of-the-Shoreline Zone (Winter)⁵⁸

County	Average	Low	High
Del Norte	\$104	\$56	\$167
Humboldt	\$107	\$61	\$176
Los Angeles	\$202	\$65	\$469
Marin	\$79	\$79	\$79
Mendocino	\$156	\$74	\$374
Monterey	\$207	\$69	\$499
Orange	\$256	\$90	\$795
San Diego	\$194	\$56	\$682
San Francisco	\$162	\$162	\$162
San Luis Obispo	\$171	\$56	\$420
San Mateo	\$291	\$119	\$609
Santa Barbara	\$289	\$66	\$995
Santa Cruz	\$178	\$52	\$418
Sonoma	\$228	\$134	\$300
Ventura	\$144	\$61	\$240

DISCUSSION

This analysis indicates that LCOVA are an acute need, particularly in high-cost coastal regions, and this presents distinct policy and management ideas worth discussion. Perhaps there is a need to rethink the

⁵⁸ Winter rates were obtained for 660 of the total lodging establishments documented in the coastal zone (N=1,064). It should be noted that the average season discount rate statewide was 16%, while literature suggests a rate of 45-50% during Winter.^{58, 58}

affordability of access to coastal areas and begin to subsidize coastal lodging in certain ways. This analysis suggests a program that might promote more camping or RV sites, or the acquisition of existing motels by non-profits or public agencies, might help preserve lower cost rooms in perpetuity and is therefore viable and be worthy of further consideration. Investments in accessibility to coastal resources also include the preservation of existing lower-cost rooms that should otherwise be considered at-risk (e.g. lower cost rooms that are anticipated to be subject of rate increases that are in-line with market rate increases).

If this potential access management strategy were to be explored key considerations should evaluate when considering the purchase of an existing motel for the purposes of implementing and maintaining lower cost rates in perpetuity are:

- **Upfront Capital Expenditures.** Properties may require retrofit to achieve compliance with current ADA or seismic requirements and to remediate lead paint, asbestos, or other hazardous materials.
- **Low Profit Margins.** Lower cost rates produce profit margins that may be sufficient to attract non-profit partners (operating and/or ownership), but may not be sufficient to attract for-profit partners.
- **Low Cost Rate May Exceed Market Rate.** It is possible that a statewide low cost rate could exceed the market-rate of limited-service motels in certain areas.
- **Financing.** The exact amount of financing required will vary for individual property, but generally, a large up-front investment would be needed for a lower cost motel acquisition. A key constraint in attaining a loan for the property would be the amount of income the property must produce above and beyond debt service (the loan payment). Current underwriting criteria suggest lenders would require property income that is 20% more than the loan payment (debt service coverage ratio of 1.2 or higher). Underwriting criteria is subject to change, and should be monitored. Mission-oriented and /or social impact lenders may be willing to issue loans with more flexible underwriting criteria.

Successful LCOVA Development Projects

Recent coastal development projects have successfully preserved low-cost accommodations. These case-studies can serve as a model on how public and private organizations collaborated to both conserve historic state park areas and create funding networks to support restoration. Many new accommodations are advertised as “alternative accommodations” by the state parks website and are great options for people that do not want to camp in tents. Perhaps the best example are the newly remodeled Crystal Cove Cottages. The Crystal Cove Conservancy collaborated with California State Park System to prevent the historic state park area from becoming a luxury resort in 1999 (Crystalcove.org). The Crystal Cove Conservancy has been able to remodel 29 out of 46 cottages using diverse funding sources including private donors, state and local government support, and low-interest loans (Crystalcove.org). The individual cottages start at \$39 per night and can house 2 – 9 people. Additionally, dorm-style accommodations provide the opportunity for underserved high school students to participate in overnight educational programming in partnership with UC Irvine.

Re-purposing lighthouses is another creative option for coastal accommodation. Another alternative accommodation through the California State Parks system is the Pigeon Point Lighthouse Hostel. This

hostel can offer accommodations to 50 travelers in houses originally constructed by the U.S. Coast Guard in the 1960s (https://www.parks.ca.gov/?page_id=21997). Similarly, visitors can stay in the Point Montara Lighthouse hostel (<https://www.hiusa.org/blog/miscellaneous/history-point-montara-lighthouse>). Point Cabrillo Lighthouse is another option for families or individuals that do not want dorm-style hostel accommodation. In 2002, the CCC worked with California State Parks to restore the buildings (<https://pointcabrillo.org/learn/history/restoration-2002-to-today/>). Two lightkeeper's houses and other property cottages are available for rent (<https://pointcabrillo.org/rentals/>).

Interestingly, other State Park alternative accommodations do not meet the criteria for low-cost accommodation. For example, San Clemente State Parks leased four of their campsites to local entrepreneurs who installed retro Shasta trailers ([Dwell.com](https://www.dwell.com)). These trailers are \$209.00 per night, showing that this model is perpetuating the high-cost market. However, as previously mentioned in methodology, our analysis assumes one family per campsite. These vintage trailers offer space for four adults and one child, with four additional campers welcome to set up tents outside (<https://www.theholidaysca.com/san-clemente-rentals>). In this case, the per person overnight cost may be affordable to larger families or groups.

East Palo, Alto Mountain View, and Oakland are another case study for increasing affordable housing within the Coastal Zone. Located within Silicon Valley, long-time residents are faced with evictions from rising rents. Resident's solution has become living in RVs; however, they face a variety of obstacles. Right now, it is illegal in many locations to have an RV parked on the street overnight. In East Palo Alto, an RV Safe Parking Pilot Program has been implemented to provide for legal overnight parking to residents. The hope is to create an RV co-op in a safe, secure lot with bathroom and shower facilities with reasonable monthly fees. One major limitation of the program is the requirement for RV owners to move during the day; this requires maintenance on the RV so that it is mobile and increases spending on gas. While more permanent solutions must be implemented this temporary program allows for low-income residents to continue living within a Coastal Zone.

Opportunities for New Construction

In addition to preserving existing low-cost rooms and acquiring low-cost motels, there is also an opportunity to construct new low-cost housing and campgrounds. Recent technological advances in prefabricated modular construction and new composite materials, as well as the commercialization of these technologies, provide a good opportunity to build lower cost housing. These have been backed by a market demand for modular, affordable homes, as a result of the growing popularity of the "tiny house movement," accessory dwelling unit (ADU) regulations throughout California, as well as the demand for vacation homes and rentals outside of cities during COVID-19. Many developers today cater to this sector and provide various financing options. For instance, several design-build companies put up all of the capital for construction and then share in the rental revenue. Options like this would reduce the upfront capital by the Coastal Commission to site expenditures only, without any housing cost.

However, sea level rise as a result of global warming will threaten California's coastal regions. Currently, sea levels are rising 3.2 millimeters (0.13 in) per year (although it varies from place to place),ⁱ but this number is expected to rapidly increase as average temperatures rise, with roughly seven and a half feet of sea level rise expected per degree Celsius of warming. Even the conservative 2 degrees Celsius of temperature increase, the goal of the Paris Agreement, would likely cause sea levels to rise an average

4.6 meters (15 ft), putting coastal areas. This will diminish access to coastal areas and may flood existing lodging facilities such as camp sites. Therefore, new construction needs to take resilience in mind.

The most resilient strategies for new construction is to move away from the risk, by building higher upland. However, this could be counter to the objective to increase visitor access to the waterfront. To counter this, another opportunity for resilient housing is floating structures. Floating structures rise and fall with floodwaters. They could also be amphibious, with modular homes built on raft structures that provide buoyancy to float the entire weight of the house. These structures double as a foundation on land and will float in case of a flood. There are several examples of low-cost homes like this, including in New Orleans and Amsterdam.

In the following, five specific new construction typologies will be evaluated.

1. Portable Cabin Communities

COVID-19 further fueled the already growing demand for tiny houses and cabins, catering to predominantly millennials looking for weekend getaway options near large metropolitan cities. Many of these are built on wheels, circumventing zoning regulations that may put limits on the use of land. This makes them ideal for temporary housing on sites. They are also ideal for sites with limited utilities. They would require septic fields to handle sewage, photovoltaics to provide power, and a daily delivery of water. Given their small environmental footprint, these would be appropriate for areas where a minimal intrusion into the landscape is desirable.

2. Modular Housing Communities

Many companies are stepping into the market for ADU's, by providing affordable, prefabricated modular housing. These could be used for affordable coastal lodging and could be installed quickly on site. Like the portable cabin communities, these would be relevant in areas where lower density is more desirable

3. Container Housing Communities

There are many examples around the world of converted container housing projects. These are ideal for temporary housing, given that they are easy to move. And since shipping containers can be stacked, they could achieve higher densities. Therefore, these would be most appropriate for temporary sites that require higher capacity. Upcycled shipping containers provides environmental benefits, since there is less embodied energy wasted on new construction.

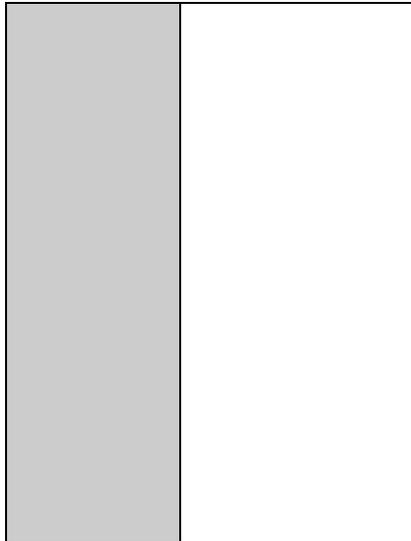
4. Floating Housing

Within the context of a limited supply of land and a lack of affordable housing, several cities in Europe are building floating communities, such as Amsterdam, Rotterdam and Copenhagen. These homes could be made from upcycled shipping containers, reducing the environmental footprint of these projects even more. Projects like this would be more appropriate in sheltered bay areas with limited wave action. They provide guests with unique experiential qualities, giving them the opportunity to stay on water.

5. Floating Campgrounds

Floating campgrounds provide an even lower cost option. Several of these have been built on barges. In some cases, they include a one-story platform to be able to double capacity. Even more so than floating housing, floating campgrounds require very sheltered bay areas with little wave action. Alternatively, they could be docked to the shore.

Type	Attributes + Site	Case Study
Portable Cabins	<ul style="list-style-type: none"> - Temporary - Minimal intrusion - Limited site utilities required - Low density 	 <p>Getaway House, Shenandoah Valley. Source: Nicolás Boulosa, Flickr.</p>
Modular Housing	<ul style="list-style-type: none"> - Low density 	 <p>Weehouse prefab, California. Source: Nicolás Boulosa, Flickr.</p>
Container Housing	<ul style="list-style-type: none"> - Temporary - Low embodied energy - Medium density 	



Container student homes “Space Boxes”, Delft. Source: Christopher Parkes, Flickr.

Floating Housing

- Temporary
- Limited site utilities required
- Low density
- Bays with limited wave action



Floating container student homes “Urban Rigger” by the Bjarke Ingels Group, Copenhagen. Source: Jimmy Baikovicus, Flickr.

Floating Campgrounds

- Temporary
- Limited site utilities required
- Medium density
- Bays with very limited wave action



Floating campground, Lake Oroville. Source: Tom Owen, Flickr.

Transportation considerations

Transportation costs and accessibility are significant obstacles to public coastal access. Expensive parking rates, limited parking space, and insufficient public transit are important barriers keeping individuals from going to the beach (UCLA IoES, 2016). In Southern California, only 3% of beach visitors use public transportation while 90% drive (UCLA IoES, 2017). Individuals who do not have access to a car are much less likely to be able to visit the beach.

Therefore, transportation considerations are critical for future LCOVA development projects. Projects should be planned near public transit. For example, in Los Angeles the addition of the 15-mile Expo Line connects downtown Los Angeles to coastal city of Santa Monica (UCLA IoES, 2017). However, the end of the line is still over ¼ mile from the sand, which may be too long of a distance for elderly or disabled populations (UCLA IoES, 2017).

City and Community Benefits

Increased LCOVA availability would allow for a greater proportion of California residents to benefit from coastal areas. There is a considerable amount of research showing that outdoor recreation is excellent for mental and physical health (<https://doi.org/10.3390/ijerph18052506>; <https://doi.org/10.1177/030802260606900406>; will fill in more references). In fact, simply viewing the ocean was associated with reduced “psychological distress” in one New Zealand-based study (<https://doi.org/10.1016/j.healthplace.2016.03.002>). Other benefits of outdoor recreation include crime reduction, educational opportunities, and increased community engagement (i.e. volunteering) ([10.3390/ijerph16060937](https://doi.org/10.3390/ijerph16060937)).

Investing in LCOVA development projects is an important way for cities to increase equitable access to the outdoors. Research shows that ‘populous minority groups’ have the lowest access to the beach and thus would likely benefit most from coastal accommodations (Reineman et al., 2016). Additionally, according to a UCLA study, people with household incomes greater than \$60K are more likely to visit the beach. Lower-income communities are disproportionately less likely to visit the beach and receive the mental and physical health benefits of outdoor recreation. A lack of affordable accommodations is a self-reported barrier from visiting the beach, particularly for Latinos and families with young children (UCLA IoES, 2017).

CONCLUSIONS

This key question drives this work, exploring data and modeling policy solutions that can help increase the ability for individuals of all races and social classes to access coastal environs and habitat in a sustainable and equitable manner. Further, it is possible that there may be synergistic solutions that address coastal access while at the same time helping to address housing and transportation crises in many high-cost markets. We show LCOVA is limiting, demonstrating a model that employs a comprehensive database of lower-cost overnight accommodations in coastal California as a template that can be used in other coastal high-cost, high-need environments. This offers a method of determining a distribution analysis of households at 80% of the median income level within 150 miles of the coast that can yield specific strategies to provide affordable transportation access to these important environmental resources.

This work offers a platform for future work that can help unravel how these trends are tied-to and perhaps correlated-with different types of local land use regulations or transportation patterns. We speculate that access to coastal areas will continue be limited both from an overnight standpoint and that demand far exceeds supply on local housing / transportation networks, particularly in high-cost markets. The expectation is that broader housing, transportation and equity policies will need to be cultivated in these areas with critical environmental habitat but also a need to provide both short and long-term housing. In this light there are opportunities to explore new construction typologies in the planning and architecture communities, including but not limited to: portable cabin; modular and container housing; and floating communities. All of these strategies will help broaden the dialogue on providing lower-cost accommodations in coastal areas in parallel with preserving local environments.

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APPENDICES

Figure A1. Total Households for California Counties



Source: Authors, American Community Survey 2014 5-Year Estimates

Figure A2. County 80% Area Median Household Income within 150 Miles from the Coastal Zone Boundary (Figures Shown in Dollars)



Source: Authors, American Community Survey 2014 5-Year Estimates

Figure A3. Number of Households Per County Below 80% Area Median Income within 150 Miles from the Coastal Zone Boundary



Source: Authors, American Community Survey 2014 5-Year Estimates

Table A1. County Population and Households Below 80% Area Median Income within 150 Miles from the Coastal Zone Boundary

County	Total Households by County	Median Household Income (\$)	80% Median Household Income (\$)	Number Household < 80% Median Household Income
Alameda	1,559,308	\$73,775	\$59,020	279,447
Alpine	1,202	\$61,343	\$49,074	144
Amador	37,159	\$52,964	\$42,371	6,613
Butte	221,578	\$43,165	\$34,532	35,632
Calaveras	44,921	\$54,936	\$43,949	8,483
Colusa	21,424	\$50,503	\$40,402	3,421
Contra Costa	1,081,232	\$79,799	\$63,839	179,975
Del Norte	28,066	\$39,302	\$31,442	4,340
El Dorado	181,465	\$68,507	\$54,806	36,285
Fresno	948,844	\$45,201	\$36,161	157,789
Glenn	28,019	\$40,106	\$32,085	4,032
Humboldt	134,876	\$42,153	\$33,722	22,517
Imperial	177,026	\$41,772	\$33,418	20,640
Inyo	18,439	\$45,625	\$36,500	4,246
Kern	857,730	\$48,574	\$38,859	131,408
Kings	151,390	\$47,341	\$37,873	21,618
Lake	64,209	\$35,997	\$28,798	13,107
Lassen	33,356	\$53,351	\$42,681	4,614
Los Angeles	9,974,203	\$55,870	\$44,696	1,468,547
Madera	152,452	\$45,490	\$36,392	23,035
Marin	256,802	\$91,529	\$73,223	43,381
Mariposa	17,946	\$50,560	\$40,448	3,595
Mendocino	87,612	\$43,290	\$34,632	14,612
Merced	261,609	\$43,066	\$34,453	31,599
Modoc	9,335	\$38,560	\$30,848	1,822
Mono	14,193	\$61,814	\$49,451	2,044
Monterey	424,927	\$58,582	\$46,866	53,060
Napa	139,253	\$70,925	\$56,740	26,129
Nevada	98,606	\$56,949	\$45,559	18,057
Orange	3,086,331	\$75,998	\$60,798	495,098
Placer	361,518	\$73,747	\$58,998	68,143
Plumas	19,286	\$48,032	\$38,426	4,392
Riverside	2,266,899	\$56,592	\$45,274	308,338
Sacramento	1,450,277	\$55,615	\$44,492	235,550
San Benito	56,888	\$67,874	\$54,299	9,534
San Bernardino	2,078,586	\$54,100	\$43,280	395,897
San Diego	3,183,143	\$63,996	\$51,197	615,761
San Francisco	829,072	\$78,378	\$62,702	168,934
San Joaquin	701,050	\$53,253	\$42,602	141,485
San Luis Obispo	274,184	\$59,454	\$47,563	61,138
San Mateo	739,837	\$91,421	\$73,137	107,136
Santa Barbara	431,555	\$63,409	\$50,727	82,028
Santa Clara	1,841,569	\$93,854	\$75,083	251,321
Santa Cruz	267,203	\$66,923	\$53,538	51,736
Shasta	178,520	\$44,556	\$35,645	50,859
Sierra	3,019	\$43,107	\$34,486	510
Siskiyou	44,261	\$37,495	\$29,996	9,204
Solano	421,624	\$67,341	\$53,873	77,981
Sonoma	491,790	\$63,799	\$51,039	107,047
Stanislaus	522,794	\$49,573	\$39,658	115,865
Sutter	95,067	\$51,527	\$41,222	21,376
Tehama	63,284	\$42,369	\$33,895	9,799
Trinity	13,515	\$36,862	\$29,490	2,689
Tulare	451,108	\$42,863	\$34,290	55,492
Tuolumne	54,347	\$48,493	\$38,794	15,812

Ventura	835,790	\$77,335	\$61,868	129,493
Yolo	204,162	\$55,508	\$44,406	43,601
Yuba	73,059	\$45,470	\$36,376	18,347

Source: Authors, American Community Survey 2014 5-Year Estimates

Table A2. Clustered Population and Households Below 80% Area Median Income within 150 Miles from the Coastal Zone Boundary

	<i>County</i>	<i>Households</i>	<i>HH Income</i>	<i>80% HH Income</i>	<i>Num HH < 80%</i>
NORTH	Del Norte County, California	28,066	\$39,302	\$31,442	4,340
	Siskiyou County, California	44,261	\$37,495	\$29,996	9,204
	Modoc County, California	9,335	\$38,560	\$30,848	1,822
					15,366
	Humboldt County, California	134,876	\$42,153	\$33,722	22,517
	Trinity County, California	13,515	\$36,862	\$29,490	2,689
	Shasta County, California	178,520	\$44,556	\$35,645	50,859
	Lassen County, California	33,356	\$53,351	\$42,681	4,614
	Tehama County, California	63,284	\$42,369	\$33,895	9,799
					90,478
	Mendocino County, California	87,612	\$43,290	\$34,632	14,612
	Lake County, California	64,209	\$35,997	\$28,798	13,107
	Glenn County, California	28,019	\$40,106	\$32,085	4,032
	Colusa County, California	21,424	\$50,503	\$40,402	3,421
	Butte County, California	221,578	\$43,165	\$34,532	35,632
	Sutter County, California	95,067	\$51,527	\$41,222	21,376
	Yuba County, California	73,059	\$45,470	\$36,376	18,347
	Nevada County, California	98,606	\$56,949	\$45,559	18,057
	Plumas County, California	19,286	\$48,032	\$38,426	4,392
	Sierra County, California	3,019	\$43,107	\$34,486	510
				133,486	
				239,330	
BAY AREA	Sonoma County, California	491,790	\$63,799	\$51,039	107,047
	Napa County, California	139,253	\$70,925	\$56,740	26,129
	Yolo County, California	204,162	\$55,508	\$44,406	43,601
	Solano County, California	421,624	\$67,341	\$53,873	77,981
	Sacramento County, California	1,450,277	\$55,615	\$44,492	235,550
	Placer County, California	361,518	\$73,747	\$58,998	68,143
	El Dorado County, California	181,465	\$68,507	\$54,806	36,285
	Amador County, California	37,159	\$52,964	\$42,371	6,613
					601,349
	Marin County, California	256,802	\$91,529	\$73,223	43,381
	San Francisco County, California	829,072	\$78,378	\$62,702	168,934
	San Mateo County, California	739,837	\$91,421	\$73,137	107,136
	Santa Cruz County, California	267,203	\$66,923	\$53,538	51,736

Contra Costa County, California	1,081,232	\$79,799	\$63,839	179,975
Alameda County, California	1,559,308	\$73,775	\$59,020	279,447
Santa Clara County, California	1,841,569	\$93,854	\$75,083	251,321
San Joaquin County, California	701,050	\$53,253	\$42,602	141,485
Stanislaus County, California	522,794	\$49,573	\$39,658	115,865
Calaveras County, California	44,921	\$54,936	\$43,949	8,483
Tuolumne County, California	54,347	\$48,493	\$38,794	15,812
Alpine County, California	1,202	\$61,343	\$49,074	144
				1,363,719
				1,965,068

CENTRAL	Monterey County, California	424,927	\$58,582	\$46,866	53,060
	San Benito County, California	56,888	\$67,874	\$54,299	9,534
	Merced County, California	261,609	\$43,066	\$34,453	31,599
	Fresno County, California	948,844	\$45,201	\$36,161	157,789
	Mariposa County, California	17,946	\$50,560	\$40,448	3,595
	Madera County, California	152,452	\$45,490	\$36,392	23,035
	Mono County, California	14,193	\$61,814	\$49,451	2,044
					280,656
	San Luis Obispo County, California	274,184	\$59,454	\$47,563	61,138
	Santa Barbara County, California	431,555	\$63,409	\$50,727	82,028
	Kings County, California	151,390	\$47,341	\$37,873	21,618
	Kern County, California	857,730	\$48,574	\$38,859	131,408
	Tulare County, California	451,108	\$42,863	\$34,290	55,492
	Inyo County, California	18,439	\$45,625	\$36,500	4,246
				355,930	
				636,586	

LA / SOUTH	Ventura County, California	835,790	\$77,335	\$61,868	129,493
	Los Angeles County, California	9,974,203	\$55,870	\$44,696	1,468,547
	Orange County, California	3,086,331	\$75,998	\$60,798	495,098
	San Bernardino County, California	2,078,586	\$54,100	\$43,280	395,897
	Riverside County, California	2,266,899	\$56,592	\$45,274	308,338
					2,797,373
	San Diego County, California	3,183,143	\$63,996	\$51,197	615,761
	Imperial County, California	177,026	\$41,772	\$33,418	20,640
					636,401
					3,433,774

THE IDENTIFICATION OF URBAN VITALITY CENTER AND ITS SPATIAL RELATIONSHIP BASED ON MULTI-SOURCE BIG DATA IN JINAN CITY, CHINA

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1. Introduction

With the acceleration of urbanisation in China, most urban spatial structures have changed from "single center" to "multi center"; urban centers are also gradually showing the characteristics of functional compounding. Scholars' research on urban centers has experienced a transformation from geographical centers to functional places providing trade, finance, administration and other services (Christaller, 1933). Since then, the connotation of urban center is no longer limited to the central location of urban geographical structure, but more from the perspective of the functions undertaken by the center itself. In recent years, with the continuous enrichment of the perspective of urban space research, scholars' research on urban space is no longer limited to the dominant elements such as space and function, and begin to emphasise the non-material space in urban research. Sociological content is added to the connotation of urban center, and it is considered that urban center is not only the functional core of the city, but also a material spatial form that condenses the sense of identity of citizens (Shi, Yang, 2013, p.86). Taking the temporal and spatial characteristics of residents' behavior as an aspect of describing the urban center, it is believed that the urban center should have a certain use intensity (Zhang, Zhang&Zhou, 2017, p.183). For the research on the spatial relationship of urban centers, many scholars took several large cities as examples to analyze the current situation of their urban center system and the influencing factors behind it, and gave the connotation and research framework of the urban center system. However, most of these studies focus on the hierarchical structure or spatial distribution, and use the individual attribute of the center as the research basis for the urban center system (Shi, Yang, 2011, p.29; Zhang, 2012,; Wei, Xiu&Wang, 2014, p.83). In fact, with the continuous development of information technology, the relationship between the centers is often generated through traffic flow, information flow, capital flow, technology flow, there are also obvious element links between urban centers.

The application and development of big data technology provides a better platform for studying the development status and spatial relationship of urban central areas. Many scholars try to visualize different types of big data, and use the address data representing different functions of the city to describe the spatial distribution of urban functions (Wang, Zhen, 2014, p.58; Zhao, Liang&Guo, 2018, p.72). Analyze the flow status of urban residents in urban space according to the track data left by urban residents on the data platform (Liu, Biderman&Ratti, 2012, p.72; Ding, Niu, 2015, p.16, Niu, Ding, 2015, p.100). However, the city is a complex life body. Using a certain kind of data from one aspect alone cannot accurately describe the urban spatial form.

Therefore, based on the existing research of urban center and the dual attributes of urban space material and behavior, this paper combines urban construction space with human space-time behavior, and puts forward the concept of urban vitality center, elect the POI data of AutoNavi which can represent the urban function and the thermal map data of Baidu map which can represent the spatial agglomeration characteristics of urban population as the basic data to identify

the spatial distribution of urban vitality centers, and analyze the spatial relationship of urban vitality centers from two aspects , grade and spatial connection.

2. Research Foundation Of Urban Vitality Center

The concept of urban vitality center appeared in the study of spatial syntax theory in the early stage. At the end of the 20th century, Bill Hillier(1999) pointed out that "Life Center refers to a series of functional clusters that are usually supported by people flow and suitable for the lives of ordinary residents, such as retail, catering and entertainment", it is clear that "urban vitality center" is a dual concept used to determine urban land use and residential activity density(Anon,2017).

By integrating the concepts of urban vitality center and urban vitality, we believe that urban vitality center can be defined as a combination space that is central within a certain region and can provide urban residents with a variety of service functions. At the same time, the center needs to be dynamic, reach a certain use intensity, be able to maintain a stable and sustainable crowd flow. Different from the previous definition of urban center, urban vitality center not only emphasizes the diversity of functions, making it serve different consumer groups, but also takes the population density as an important measure to describe the "vitality" state of urban vitality center, which is different from the "pseudo urban center" with complete functions but unable to attract people.

Therefore, when identifying urban vitality centers, it is necessary to grasp the two directions of human behavior and functional space, select representative index data for comprehensive analysis, and finally realize the accurate identification of urban vitality centers.

3. Data Selection And Processing

The data used in this study are mainly from the data open platform databases of the two websites ,POI data of AutoNavi and thermal map data of Baidu Maps (Fig.1). Among them, the POI data of AutoNavi contains two attributes: function and location, which can describe the functional diversity and spatial correlation of the urban vitality center to a certain extent.



Figure 1. Thermal map interface of Jinan Baidu map

Source: Baidu Maps

The POI data used in this study is from the AutoNav in June 2018. The four sub categories of shopping service, catering service, life service and leisure entertainment in this POI data are extracted for analysis. After correction, spatial matching and de duplication of the data, a total of 49590 valid POI data in the central city of Jinan were obtained (Fig. 2).

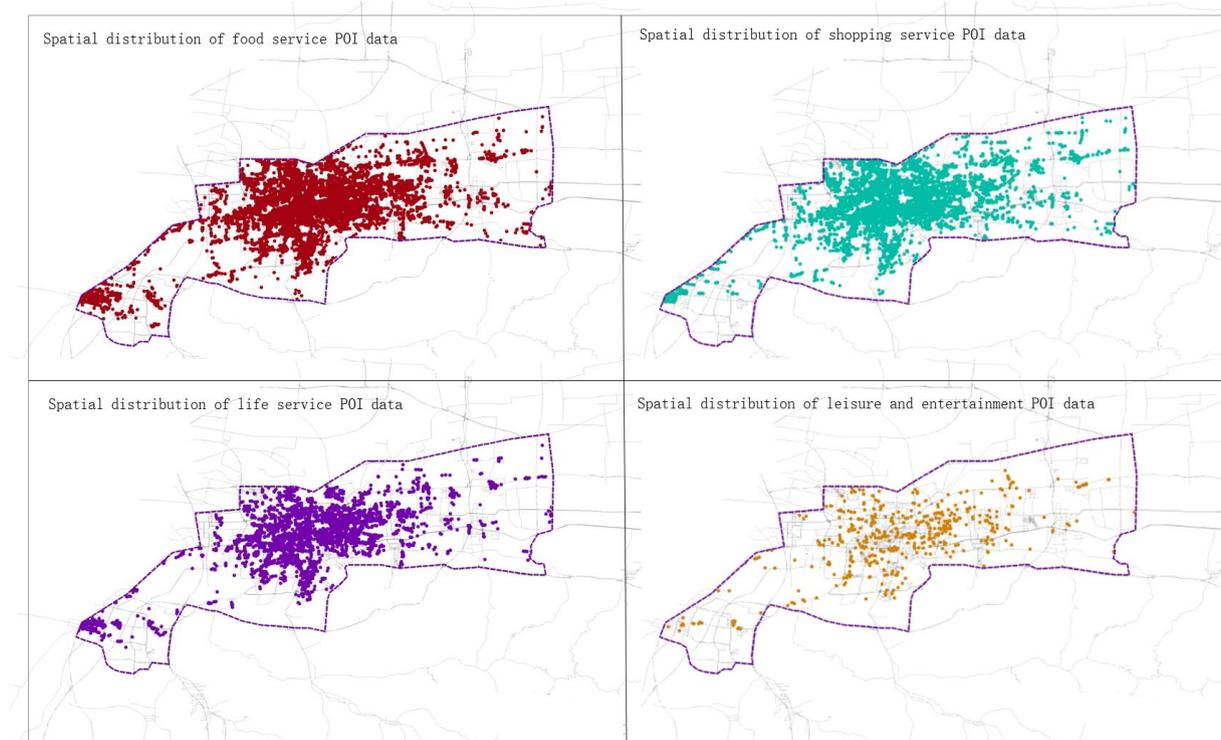


Figure 2. Spatial distribution of POI points of Jinan functional vitality Center

4. Identification Of Jinan Urban Vitality Center

4.1 Identification Of Urban Functional Vitality Centers Based On Poi Data Of Autonavi

We include four steps in identifying the activity center based on the POI data of AutoNavi map: ①Reclassify the POI data based on the conceptual characteristics of the urban activity center and the classification method of AutoNavi map, and obtain the point data types and attributes used in the study.②Use the spatial Global Moran's I tool in ArcGIS and SPSS correlation analysis to verify whether the POI data of various functional types have spatial agglomeration and correlation.③Identify the density center of each functional spatial element distribution within the research scope through ArcGIS kernel density estimation and hotspot analysis tools, and select the high-value area of its density as the candidate functional center. ④The threshold value of nuclear density is determined by using the triple standard deviation method to identify the significant hot spots within the threshold range; using the method of extracting classification isoline to determine the vitality center boundary (Fig. 3).

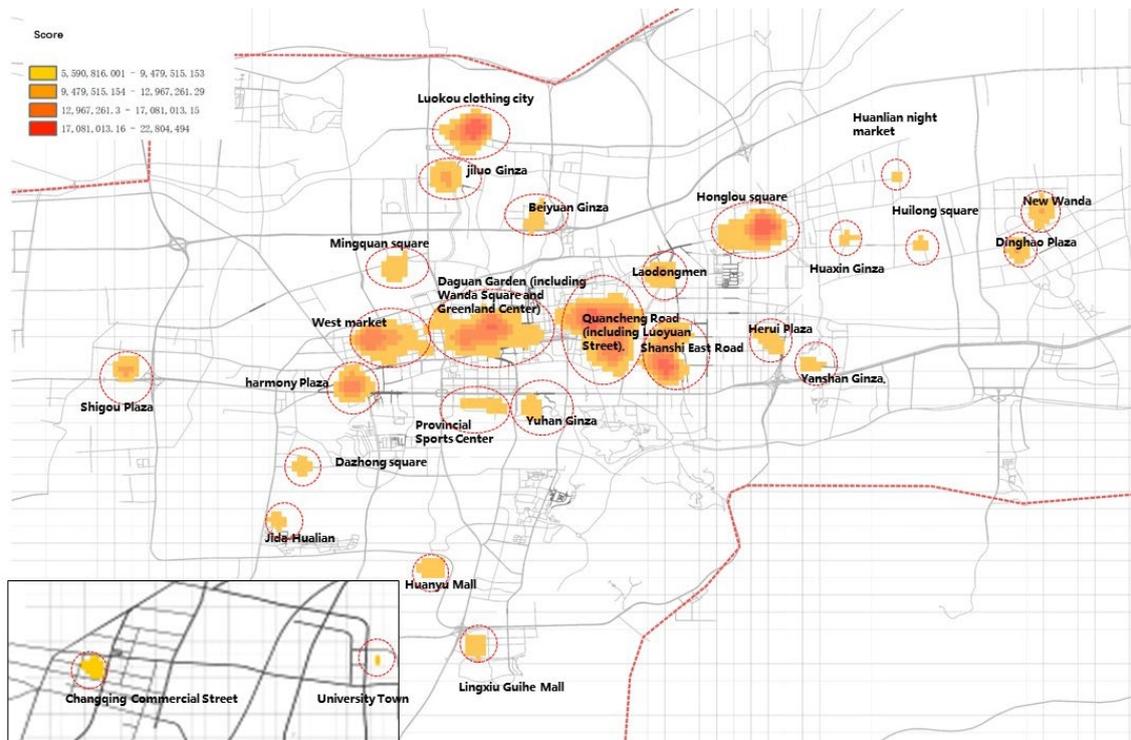


Figure 3. Identification results of Jinan urban function vitality

A total of 27 functional vitality centers in Jinan were identified, belonging to different district (table 1).

Table 1. Identification results of Jinan urban function vitality

	Urban Function Vitality
Lixia District	Herui Plaza, Yanshan Ginza, Laodongmen, Shanshi East Road, Quancheng Road (Including Luoyuan Street), Yuhan Ginza, New Wanda, Dinghao Plaza
Licheng District	Huanlian Night Market, Huilong Square, Huaxin Ginza, Hongjialou
Shizhong District	Daguan Garden (Including Wanda Square And Greenland Center), Provincial Sports Center, Huanyu Mall, Dazhong Square, Jida Hualian, Lingxiu Guihe Mall
Tianqiao District	Luokou Clothing City, Jiluo Ginza, Beiyuan Ginza, Mingquan Square
Huaiyin District	West Market, Harmony Plaza, Shigou Plaza
Chanqing District	University Town, Changqing Commercial Street

4.2 Identification Of Urban Population Vitality Centers Based On Baidu Population Heat Map

We takes the following steps to identify the urban population vitality center based on the thermal map of Baidu map: ① Intercept the thermal map image of Baidu map in different time periods in the central urban area of Jinan Based on the program. ② Use ArcGIS to project and register the geographic coordinates of the collected thermodynamic map images. ③ Use ArcGIS re-classification tool to re classify the thermal map image, and use the thermal degree grade to measure the density reflected by the thermal map. ④ Select the period with better population concentration as the research object, and extract the area with high density value as the population vitality center.

After comparing the heat maps of different time, we find that the daily life of urban people follows certain objective laws, which are generally cyclic changes in weeks. Within a week, there is a difference between the activity status of workday and weekday, which is reflected in the fact that regular activities (commuting) are mainly carried out on workday, and free activities (leisure activities) are more carried out on weekday. Because the definition of urban vitality center in this paper is based on the aggregation of service functions, the weekday is selected as the research time. The data of 13:00 and 14:00 on September 8 were reclassified by using the ArcGIS. The population concentration density was divided into 7 categories by using the natural discontinuity classification method. The 6th and 7th grades were defined as the high heat area of urban population concentration, which was identified as the core area of the urban population vitality center, and then vectorised by ArcGIS, delimit the scope of population vitality Center (Fig. 4).

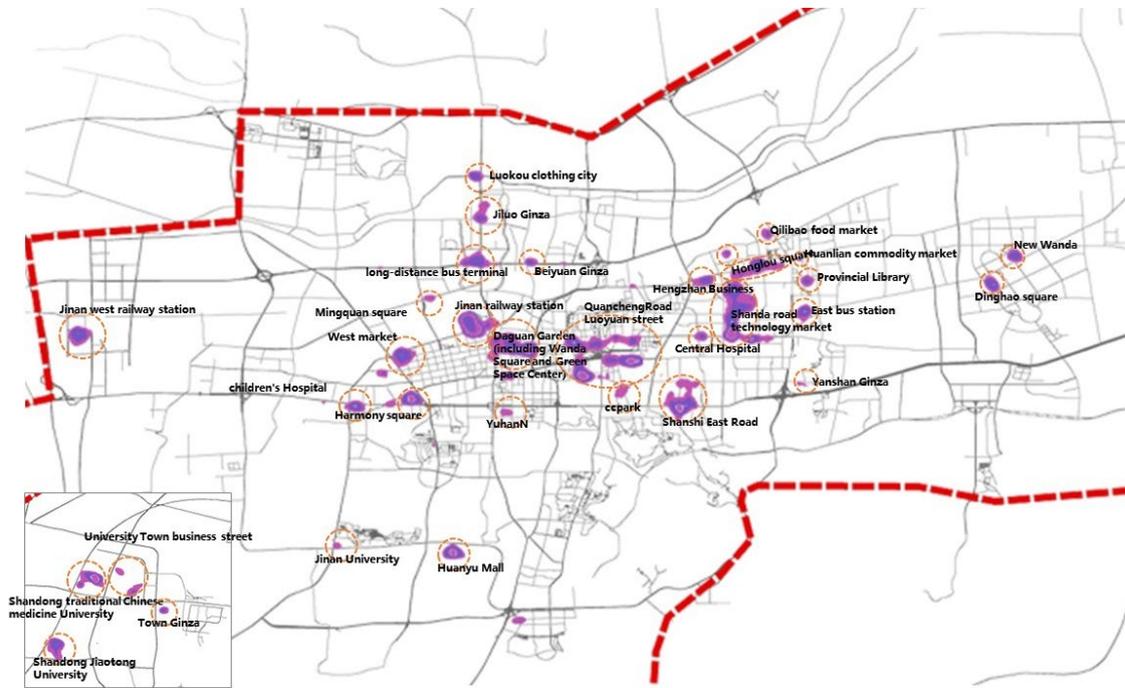


Figure 4. Identification results of Jinan population vitality Center

A total of 33 population vitality centers were identified in the central city of Jinan, belonging to different district (table 2).

Table 2 Identification results of Jinan population vitality center

	Population Vitality Center
Lixia district	Central Hospital, Shanda Road Technology Market, Hengzhan Business, Quancheng Road, Luoyuan Street, Yanshan Ginza, New Wanda, Dinghao Square,
Shizhong Distric	Daguang Garden (Including Wanda Square And Green Space Center), Jinan University, Huanyu Mall
Licheng District	Provincial Library, Huanlian Commodity Market, Qilibao Food Market, Honglou Square
Tianqiao District	Luokou Clothing City, Jiluo Ginza, Belyuan Ginza, Long-Distance Bus Terminal, Jinan Railway Station, Mingquan Square,
Huaiyin District	West Market, Children's Hospital, Harmony Square, Jinan West Railway Station,

Changqing District	University Town Business Street, Shandong Traditional Chinese Medicine University ,Town Ginza, Shandong Jiaotong University
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4.3 Comprehensive Identification Of Jinan Urban Vitality Center

The grid stacking tool in ArcGIS is used to stack the functional vitality center and population vitality center of Jinan without weight, and the results are obtained (Fig. 5).

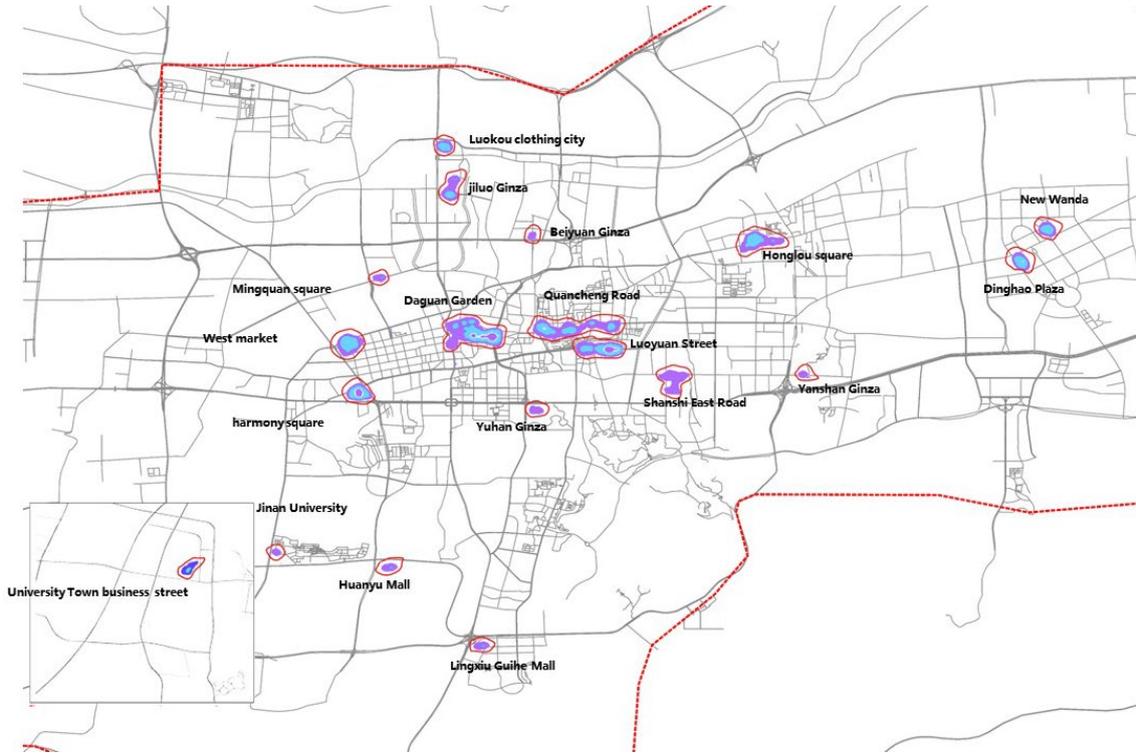


Figure 5. Spatial distribution of Jinan urban vitality Center

After rectifying and correcting the superimposed layers, combined with field investigation and data collection, 19 vitality centers were finally identified, belonging to different district of Jinan (table 3).

Table 3. Identification results of Jinan vitality Center

	Vitality Center
Lixia District	Yanshan Ginza, Shanshi East Road, Quancheng Road, Yuhang Ginza, Luoyuan Street, New Wanda, Dinghao Plaza
Licheng District	Honglou Square
Shizhong District	Daguang Garden, Huanyu Mall, Jinan University, Lingxiu Guihe Mall
Tianqiao District	Luokou Clothing City, Jiluo Ginza, Beiyuan Ginza, Mingquan Square

Huaiyin District	West Market, Harmony Square
Changqing District	University Town Business Street

5. Research On The Spatial Relationship Of Jinan Urban Vitality Center

5.1 Scale Grade Analysis Of Jinan Urban Vitality Center

Area is one of the commonly used indicators to measure the size of urban space. In this paper, it represents the physical space attribute of urban vitality center. The larger the area, the larger the scale of the vitality center, the stronger the spatial agglomeration ability, and vice versa. In the previous, we have defined the scope of urban vitality centers. then the spatial area of each vitality center will be calculated on this basis to compare and analyze the scale differences between vitality centers. The specific calculation steps are as follows: ①Vectorize the scope of 19 urban vitality centers on the ArcGIS.②Use the area field calculator in ArcGIS to calculate the area size of each vitality center, and divided into three grades (table 4).

Table 4. Grade distribution of Jinan urban vitality Center

Level_1 (2)	Quancheng Road, Dagan Garden
Level_2 (4)	Luoyuan Street, Hongjialou, Shanshi East Road, West Market
Level_3 (13)	Jiluo Ginza, Yanshan Ginza, Yuhan Ginza, Jinan University, Dinghao Square, Lingxiu Guihe Mall, University Town Business Street, Mingquan Square, Huanyu Mall, Harmony Square, Beiyuan Ginza, New Wanda, Luokou Clothing City

In terms of the grading results, the number of vitality centers included in the three grades is quite different.

The Level_1 includes Quancheng road and Dagan Garden. It is a municipal commercial center that developed earlier in Jinan. It has superior location conditions, rich service functions and a large space area; at the same time, they are also important destinations for cultural tourism in Jinan. They have a strong ability to attract population agglomeration and a wide range of services. Level_2, Luoyuan street, radiated by Quancheng Road, gathers a certain number of service functions. Hongjialou is the administrative center of Licheng District, with relatively perfect shopping, catering and other industries. Shanshi East Road and west market are two business circles with Jinan characteristics. The former is a shopping paradise for young people, and the latter mainly serves people with low consumption level. The Level_3 vitality centers are mainly divided into two types, one is the traditional area center based on Ginza supermarket, and the other is the large shopping center in the construction of the new city.

5.2 Spatial Hierarchical Analysis Of Urban Vitality Center

Using ArcGIS taking the spatial center of gravity of the vitality center as the center of circle, a multi ring buffer zone with a distance of 5km is established. The research scope is divided into 5 circles, which are spatially connected with 19 vitality centers. Taking the circle center as the intersection point, the circle is divided into four quadrants(Fig.6.)

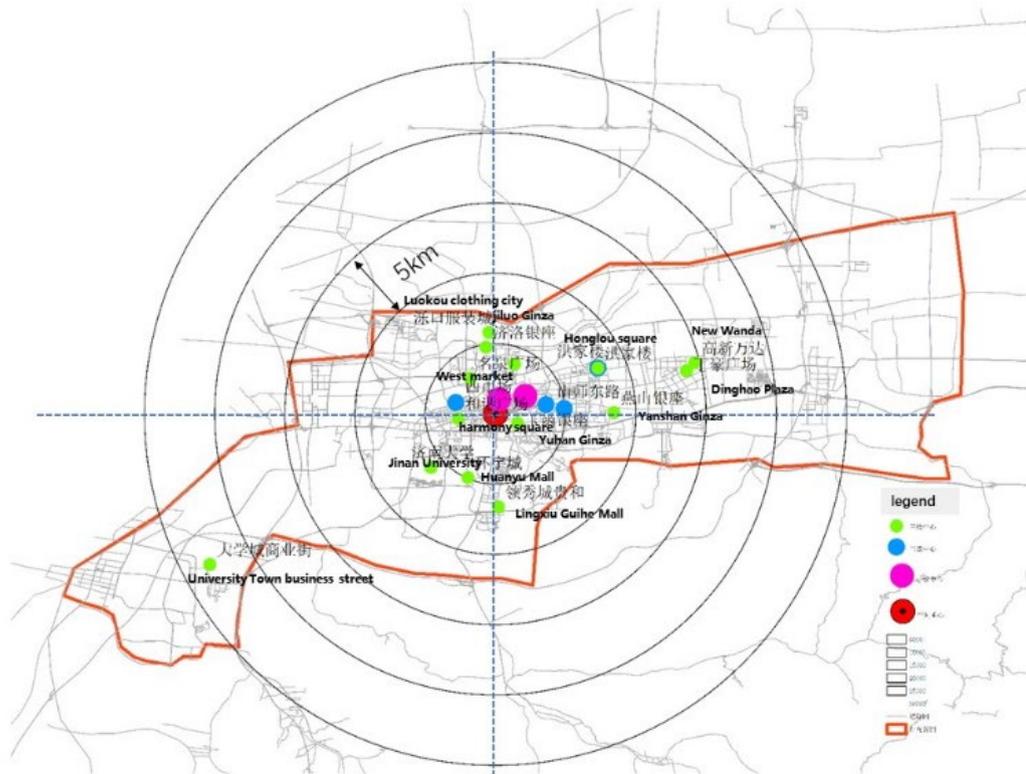


Figure 6. Distribution pattern of urban vitality Center

Results shows that there is a hierarchical ring system with multiple centers in the spatial distribution of Jinan vitality center. In terms of quantity, 0-5km is the largest, including 10 activity centers, accounting for more than half of the total. There are 6 activity centers within 5-10km, and the number of activity centers within 15-20km is zero; in the most marginal circle, there is a vitality center in the commercial street of Changqing University Town. Therefore, it can be concluded that the overall characteristic of the spatial distribution of Jinan urban vitality center is the combination of ring structure mode and core agglomeration mode. Among them, the circle structure mode means that the distribution of urban vitality centers decreases outward along the circle, which is manifested in the reduction of the number and scale of vitality centers. The urban vitality center in the inner circle has obvious scale advantages, showing the characteristics of continuous distribution. The vitality center of the surrounding circle is small. On the other hand, the activity centers of each circle show the characteristics of cluster agglomeration. For example, within the range of 0-5km, 80% of the activity centers are distributed in the north of the center of gravity, and the two activity centers within the range of 10-15km form a cluster. According to this feature, we summarise the spatial layout mode of Jinan urban vitality Center (Fig. 7).

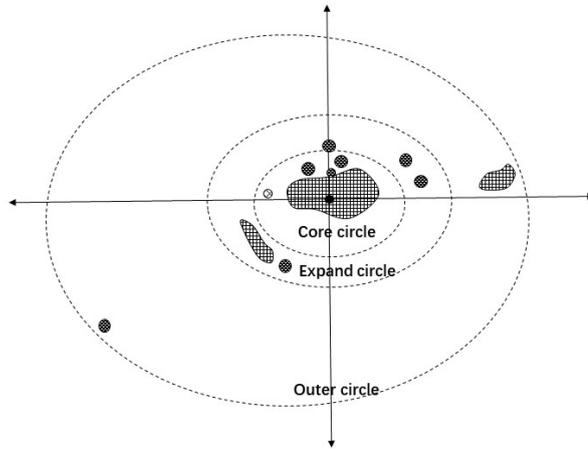


Figure 7 distribution mode of Jinan urban vitality Center

5.3 Spatial Connection Analysis Of Jinan Urban Vitality Center

because urban vitality center is based on the agglomeration of consumer places. Therefore, this paper chooses to study the spatial relationship of the vitality center based on the internal relationship of chain brands. In order to maintain the accuracy and objectivity of the data, the following principles are followed when screening the data of chain enterprises: ① The selected chain enterprises appear at least in two dynamic centers at the same time. ② When screening the enterprises, franchise chain enterprises are not considered, and only direct chain enterprises are retained. ③ The more chain enterprises screened out, the better. Based on the above principles, we selected 33 chain brand enterprises including shopping service, entertainment and leisure, catering service and life service as the basic data of this study (table 5).

Table 5 .Chain Enterprise Selection Results

Catering Services	Dexter, Pizza Hut, Love Gift, 85°C, Zhizhen Dumplings, Zhang Liang Malatang, Yuanliang Porridge, Yuku, Starbucks, Xijiade, Subway, Lao Paifang, KFC, Kelling Cake, Holland
Shopping Service	Amoy, Belle, Swarovski, Jackjones, Jinlilai, Anlifang, Chow Tai Fook, Zhisolang, Slade, Watsons, Jinmuyu, Hailan Home, Chaohongji
Life Service	Gymboree, Child King, Shuang&Yue
Entertainment And Leisure	K-One KTV、 Wanda Cinema

In order to more intuitively reflect the spatial relationship between the vitality centers, we use ArcGIS for visualisation, takes the number of chain enterprises as a hierarchical field, represents the connection strength between the two points, and distinguishes them by color depth and line width. As can be seen from the figure 8, the network pattern between the urban vitality centers of Jinan has initially taken shape. In addition to Luokou clothing city, other vitality centers also participated in the formation of the network. On the whole, the network structure conforms to the characteristics of the Belt and Road city in Jinan, showing the characteristics of long east-west and short north-south.

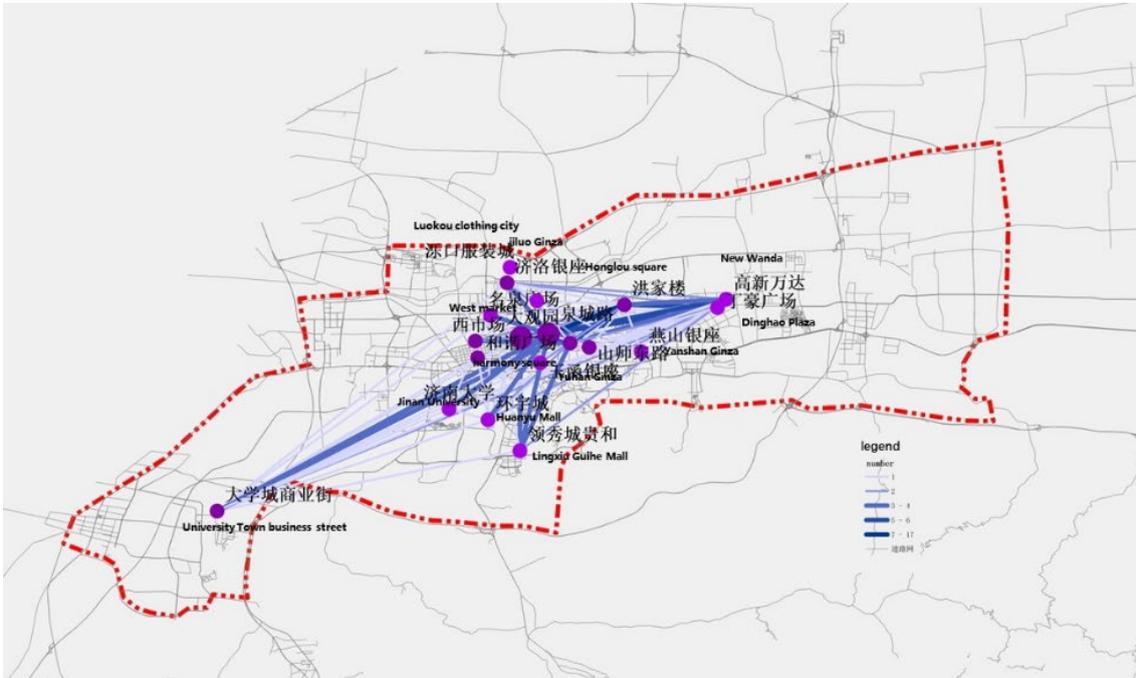


Figure 8. Network structure of Jinan City vitality Center

In order to further explore the relative relationship between nodes in the network structure of vitality center, the paper introduces the degree centrality calculation method in social network analysis to quantify the importance of nodes in the network. UCINET is used to analyze the network of the enterprise contact matrix of Jinan urban vitality center, and calculate the centrality of each node. The relative size of network nodes is used for visualisation. The larger the node, the greater the centrality of the center in the network. Figure 9 is obtained. It can be concluded that in the network structure, there are still obvious differences in the centrality between nodes, and traditional business centers such as Quancheng road and Dagan Garden still have advantages in the centrality, making a great contribution to the formation of the network structure. However, compared with the traditional department stores such as Yuhan Ginza and Yanshan Ginza, the three-level vitality centers such as Dinghao Plaza, New Wanda and the university town business street also show a higher degree of centrality, and the relative relationship with the first and second level vitality centers is gradually weakening.

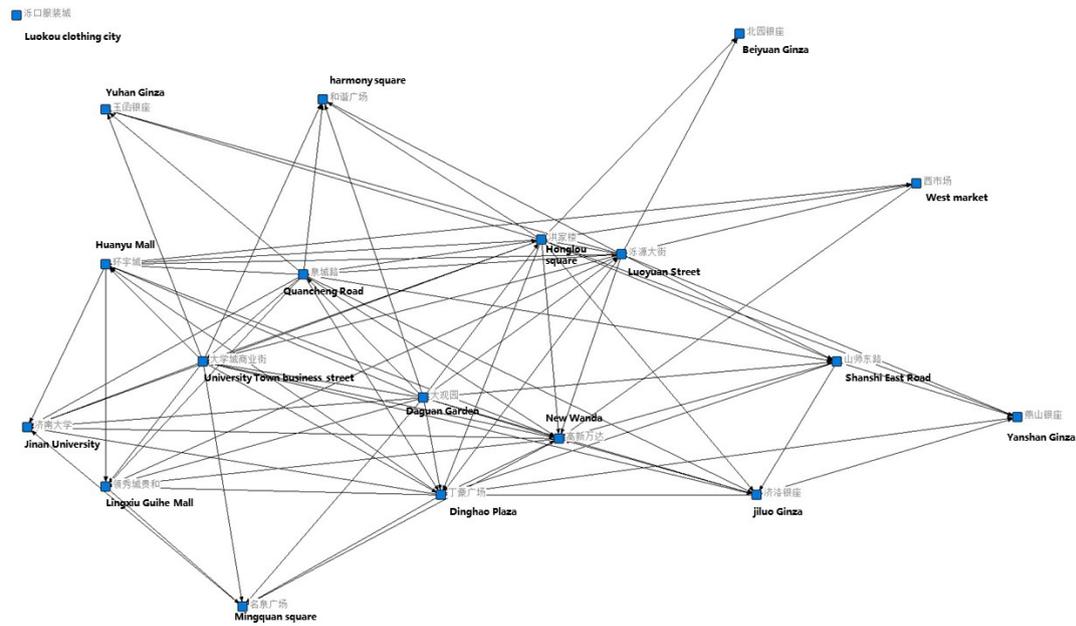


Figure 9. Network structure of Jinan urban vitality Center

We believe that the main reason for this change is the change of business model. As a new generation of business model, Dinghao Plaza and Wanda Plaza have the characteristics of standardisation and branding, and have formed a mature brand enterprise system. In the network system built by enterprise "flow", they have a strong relationship with other dynamic centers. However, the dynamic centers of the older generation, such as west market and East Shanshi Road, lack chain enterprises, so their contribution to the network system is degraded. Similarly, as the benchmark of Jinan's business model development, Quancheng road has many new generation shopping malls, such as Henglong square and Shimao square. Therefore, compared with Grand View Park, there are more chain enterprises, and there is a strong relationship with other dynamic centers. The polarisation phenomenon is significant in the network system.

6. Summary

This paper puts forward the concept of urban vitality center from the perspective of human behavior and material space in view of the current research status of the separation of physical space and social space in urban space research. It also carries out basic research on the connotation and characteristics of the urban vitality center to enrich the research framework of the vitality center. Then, combined with big data processing and analysis technology, Taking Jinan as an example, this paper uses two kinds of big data comprehensive analysis to accurately identify the vitality center of Jinan, and analyzes the multi center network pattern of Jinan from the perspective of hierarchical structure and spatial connection. The main conclusions are as follows: urban vitality center is a dual concept of physical space and behavioral space, and multivariate data combination analysis can more accurately identify urban vitality center. Taking Jinan as the research object, it is concluded that the urban vitality center in Jinan presents a spatial pattern of "grade + network" as a whole, and there are significant differences in the scale of different vitality centers, showing the characteristics of decreasing circles and core agglomeration in space. The network structure of the vitality center has also taken shape, and compared with the scale grade of the vitality center, the hierarchical structure of vitality center has changed under the action of network.

The main deficiency of this paper is lacking of field research data as a supplement. We hope to make up for this deficiency in the next research.

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NECESSITY OF ECO-HOUSING IN DEVELOPING COUNTRIES FOR PROMOTING SUSTAINABLE DEVELOPMENT

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1 INTRODUCTION

With its present growth rate (about 150 persons/ min. [1]), as per UN projections, the world population will be crossing 11.25 billion by the end of the year 2100 [13]. As per the projections made, 57% of this population will be urban, out of which 95% contribution will be due to the developing countries. As a result, the population of 24 cities in developing countries will cross the figure of 20 million by the year 2025. Based on the List1 prepared by the UN, 50% of the 34-mega cities are already in developing countries.

LIST 1 - Existing Mega cities with descending Order of population (2020)

S.No.	Mega City	Population
1.	Tokyo	37.39 million
2.	Delhi	30.29 million
3.	Shanghai	27.05 million
4.	São Paulo	22.04 million
5.	Mexico City	21.78 million
6.	Dhaka	21 million
7.	Cairo	20.9 million
8.	Beijing	20.46 million
9.	Mumbai	20.41 million
10.	Osaka	19.16 million
11.	New York-Newark	18.8 million
12.	Karachi	16.09 million
13.	Chongqing	15.87 million
14.	Istanbul	15.19 million
15.	Buenos Aires	15.15 million
16.	Kolkata	14.85 million
17.	Lagos	14.36 million
18.	Kinshasa	14.34 million
19.	Manila	13.92 million
20.	Tianjin	13.58 million
21.	Rio de Janeiro	13.45 million
22.	Guangzhou, Guangdong	13.3 million
23.	Lahore	12.64 million
24.	Moscow	12.53 million
25.	Los Angeles-Long Beach-Santa Ana	12.44 million
26.	Shenzhen	12.35 million
27.	Bangalore	12.32 million
28.	Paris	11.01 million
29.	Bogotá	10.97 million
30.	Chennai	10.97 million
31.	Jakarta	10.77 million

32.	Lima	10.71 million
33.	Bangkok	10.53 million
34.	Hyderabad	10 million
<small>(Ref. UN Department of Economic and Social Affairs, Population Dynamics, World Urbanization Prospects 2018, Population of Urban Agglomerations with 300,000 Inhabitants or More in 2018, by country, 1950-2035 (thousands). https://population.un.org/wup/)</small>		

As per the above projections, it is quite easy to predict future housing needs. Already there is a global shortage of housing for 2 billion people. This shortage will be becoming more and more acute if no immediate actions/measures are taken. This advocates the need for the development of mass housing projects. This shortage will further increase by the advancing years. But what about the tremendous impact on the field of energy usage of these future developmental projects of mass housing? As per International Energy Agency report 2008, Urban areas account for approximately 70%–80% of global energy demands and greenhouse gas emissions, and thus they are a major contributor to global warming [15].

A study of present processes of development with associated energy usage will help architects in designing mass housing with less energy consumption, leading ultimately to the conservation of natural resources and a less polluted urban environment.

2 THE PRESSURE

It is necessary here, to identify various major pressures, which are generally put on the urban areas by building more mass housing units:

2.1 Land:

As of today the land in the urban metro cities has become very dear & costly; also it is difficult to find new land suitable for mass housing. The alternative of housing in high-rise apartments is leading these urban areas towards chaotic development. They also pose greater pressure on parking and transportation system networks [12].

2.2 Energy:

This is a burning problem of the present era. The present unplanned and uncontrolled growth of housing cares little about energy conservation aspects. Sometimes even providing minimum energy to all households is not becoming possible for the local authorities. Studies reveal that around 18% of the total energy consumption of mankind is in the housing sector. It is necessary to consider energy conservation techniques before, during, and after construction; as energy can be saved considerably in each stage. Over 80% of the embodied energy in mass housing is the energy required to manufacture the materials [7]. Most of this energy usage is for manufacturing only a small number of the (high-energy) materials used in the construction of housing units, principally steel products, cement, concrete products, bricks, and ceramic materials. This embodied energy amounts to several times the annual energy consumption of that same housing in use. Energy is used wastefully in heat recovery processes, insulation techniques, and simple orientation concerns. Architectural lighting & space heating/ cooling are also two of the largest and most visible consumers of energy. A properly designed energy-efficient housing will have a lower initial cost than one planned disregarding energy consequences. This cost advantage derives mainly from smaller building volume & lower energy demands. The conventional centralized energy distribution network accounts for high transmission losses (ranging from 9% to 20% at times). In the Indian context grid loss sometimes reach up to 35%. The energy consumption in residential structures accounts for considerably high than in other buildings, also it is a recurring ever cost increasing phenomenon. It is very difficult to remain in the city and save energy beyond a certain limit without compromising the present-day materialistic lifestyle of the city dweller households.

2.3 Utilities:

The present-day big cities are growing at a faster speed; the utilities & the city of basic amenities for an urban population are becoming increasingly difficult day by day. It is a very complex situation and a major multifaceted problem to cope with such a huge demand. Lack of finance/ civic sense resources is further adding to this precarious condition.

2.4 Environment:

The present-day pollution & lack of basic amenities are proving detrimental to the future growth of residential nature in metro city areas. The polluted air and water, the toxic wastes, and the dangerous fuel emissions from vehicles are further aggravating this situation. The decreasing green areas are bringing changes in the microclimate in these cities, making it more and more uncomfortable for living.

2.5 Transportation:

The public transport systems of almost all these urban conglomerations are running at a loss and it has become increasingly difficult to maintain their effectiveness cleanliness and punctuality, because of overcrowding and the pressure of the daily commuting population.

3 ENERGY EFFICIENCY TO SUFFICIENCY

It had already been established in 1970 that there is no inexhaustible supply of cheap conventional energy sources, available in the world & therefore serious efforts should be aimed at identifying energy conservation methods and a lot of research is being done to effectively use the available non-conventional & renewable energy sources. The future of housing design should rely on not only energy efficiency but towards energy sufficiency. For effectively using these concepts, simultaneous use of various non-conventional energy sources is necessary, which will cover the lean period of generation of energy by one source and will provide a designed uninterrupted quantity of energy all the time. UNCHS recommends, "Housing should be designed with the application of bio-climatic design principle & employment of energy conservation measures will reduce 60% energy consumption in heating/ cooling of buildings."

4 THE NEW CONCEPT

The concept of 'self-sufficient housing' is to minimize the pressures on cities in terms of space, energy, traffic, population, etc. This housing will be in a self-contained commune with a building unit designed to cater to the needs of approximately 15 to 20 families. They will produce their energy for domestic use; grow their own agricultural produces for food, thereby limiting their visits to urban areas for such tasks and products, which are not feasible in this commune. They will be sited in economical rural spaces / natural surroundings [2]. A self-sufficient home is a structure that is designed, built, renovated, operated, or reused in an ecological and resource-efficient manner. These homes are designed to meet certain objectives such as protecting health; using energy, water, and other resources more efficiently; and reducing the overall impact on the environment.

5 The Advantage

5.1 Location & Siting:

These units will be located in rural / country areas & they will be well connected with the possible work centres. The rural natural fresh & unpolluted environment and low cost of land will be the first positive aspect of siting such dwelling units. Protect and retain existing landscaping and natural features. Select plants that have low water and pesticide needs, and generate minimum plant trimmings. Use compost and mulches. This will save water and time. Recycled content paving materials, furnishings, and mulches help close the recycling loop.

5.2 Energy Sufficiency:

The building will be planned in such a way that it will use non-conventional & renewal energy sources totally and will not use any form of external energy source like an electrical grid network or fossil fuels, etc. Here reference can be made to Nottinghamshire's Hockerton Housing Project (HHP), which is the UK's earth-sheltered, self-sufficient ecological housing development [8]. Architectural strategies for energy conservation can be:-

- Develop strategies to provide natural lighting. Studies have shown that it has a positive impact well being.
- Task lighting reduces general overhead light levels.

- Use a properly sized and energy-efficient heat/cooling system in conjunction with thermally efficient walls, roofs, and floors.
- Maximize light colours for roofing and wall finish materials; install high R-value wall and ceiling insulation, and use minimal glass on undesired sun exposures.
- Consider alternative and renewable energy sources.
- Passive design strategies can dramatically affect a home's energy performance. These measures include home shape and orientation, passive solar design, and the use of natural lighting.

5.3 Materials Efficiency:

Select sustainable construction materials and products by evaluating several characteristics such as reused and recycled content, zero or low off gassing of harmful air emissions, zero or low toxicity, sustainably harvested materials, high recyclables, durability, longevity, and local production. Such products promote resource conservation and efficiency. Reuse and recycle construction and demolition materials.

5.4 Recycling:

The concept of recycling waste/ water/ garbage will be applied in such a way that it fulfills the need of dwellers without tapping any external services or utility networks. The garbage will be recycled to produce energy through non-conventional methods & end product will become manure for crops. One example of recycling can be using wastewater from washing in fishponds and from there it can be used in fields/ vegetable farms [3]. Some other measures which will improve water efficiency can be:-

- Design for dual plumbing to use recycled water for toilet flushing or a gray water system that recovers rainwater or other nonpotable water for site irrigation.
- Minimize wastewater by using ultra-flush toilets, low-flow showerheads, and other water-conserving fixtures.
- Use recirculating systems for centralized hot water distribution.
- Install point-of-use tank less hot water heating systems.
- Use micro-irrigation (which excludes sprinklers and high-pressure sprayers) to supply water in non-turf areas.
- Use state-of-the-art irrigation controllers and self-closing nozzles on hoses.

5.5 Space Economy:

This building will be providing minimum adequate living space for 15 to 20 families in an economical rural/ countryside site. This number of dwellers will depend upon local conditions, the extent of the problem, and energy sufficiency parameters along with other factors.

5.6 Environment Friendly:

The main aim of these self-sufficient housing units is to develop such a housing system in which there will be no generation of pollution by any means. Besides being situated in a rural environment these houses will be using recycling of water and all the waste materials. Thus a nature-friendly & ecologically balanced surrounding will be created by these dwellers through these housing systems.

5.7 Employment Generating:

The commune development activities and maintenance of various energy generation equipment will also generate employment for the dwellers & only a handful (one person per family) may have to go to city areas for sophisticated jobs etc. As this concept provides partial food growing facility / zero energy bill along with Other economical advantages; there will be less necessity for a job, and dwellers can engage themselves in an occupation/ vocation of their own choice for better income, while living in the commune.

5.8 Minimizing Transportation:

The dwellers require minimum transportation. As only periodical shopping of merchandise & some other works may require traveling to other areas which are not possible within this commune. Though the scientific application of knowledge of farming will reduce this need to travel. This in turn will decrease the overall stress on existing transportation systems.

6 The Process of Implementation

Here, planning steps are suggested with taking India, as an example of developing country:-

6.1 Selection of a target group representing the largest portion of such migratory population: This selection must be made at the local level considering the nearness of urban areas. This group should necessarily contains people having major skills/vocation (like carpenter, plumber, mason, electrician etc.) needed for running day-to-day activities & proper maintenance of commune.

6.2 Determination of a feasible size of the commune by considering local problems of Siting: Though preliminary studies suggest about 250 families can be a manageable size for Indian conditions, having a maximum of 5 persons per family.

6.3 Proposing living space: For 15 to 20 families in one building, by undertaking anthropometrical studies and deciding space standards, taking along with the study of economical feasibility of the target group [5]. The minimum proposed enclosed spaces required for a family should be consisting of:

- Habitable space: bedroom / living room; utilities: kitchen / toilet / bathroom / store, etc.

In addition to these some common spaces are necessary for community living, which may be:

- Services/electric room/garbage collection room, Kitchen garden / open garden / terrace garden, farming, fishpond, poultry etc. These spaces can be created in common spaces left between the units.

6.4 Estimating space requirements: For energy production by renewable or non-conventional energy sources: - Biogas/biomass plant, wind energy, solar energy. Where feasible tidal energy can be also used.

6.5 Deciding Building fabric and enclosure spaces (including structural considerations): Here due attention must be paid to achieving a structurally safe & maintenance-free construction.

6.6 Earmarking Spaces for recycling plants: For water/garbage/sewerage for energy and manure production. These spaces should be designed with an optimum space utilization concept, though the importance of these cannot be ignored due to their necessity in keeping the pollution level low. Care must be taken to adapt foolproof recycling systems.

6.7 Providing community spaces & common spaces for recreation and other utilities:

Park / school / primary health center / recreation center, roads / pathways, etc.

6.8 Calculating the energy demands: of individual unit and proposing energy sufficiency by tapping non-conventional energy sources. Some of such energy sources under consideration are:

Solar (photovoltaic), Biomass, Wind, Tidal, etc. It may be necessary to install a combination of these energy sources to get the desired result all year round.

6.9 Estimating the necessity of other resources: like water, etc., & proposing their procurement from locally available natural sources. Rainwater must be compulsorily collected & underground water levels must be allowed to charge through natural means.

6.10 Deciding the size of one building unit: cross-checking each of the above-mentioned spaces as per their feasibility and sustainability concerning the number of dwellers and self-sufficiency parameters [4].

6.11 Arriving at a suitable size: as per local conditions/resources availability / willing population.

6.12 Determining the social acceptability: of these relatively new housing systems, through a preliminary survey of various shelter less people, or people suffering from overcrowding in conventional housing [5].

6.13 Replicating the commune: Once, a prototype commune is successful, they can be replicated according to local site/climate conditions.

7 ARCHITECTURAL DESIGN OF HOUSING

The housing design should incorporate energy saving techniques by reducing the energy demands & some major recommendations are:-

7.1 Proper site selection & orientation.

7.2 Use of shady trees to control radiation reaching unwanted places of building envelope.

7.3 Maximum window placement on the side of least sun exposure.

7.4 Minimize exposed surface area for reducing heat transmission.

8 THE CHOICE OF LOW ENERGY BUILDING MATERIALS

Architects of these housing have the opportunity to make a major contribution to the reduction of total energy use in the built environment through some of the strategies enlisted here:

- **Maximum use of low-energy materials.**
- **Selection of lower-energy structural systems**, such as load bearing masonry in place of RCC/ steel frames.
- **Selection of waste/recycled materials**, or manufactured materials, which incorporate these.
- **Use local materials**, involving less transportation.

- **Use more functional windows** (designed as passive solar collectors). Optionally smart windows can be also used, which use anti reflection layers, low emission coatings and switchable films.

9 THE CONSTRUCTION

During the construction process, materials are combined in composite building components such as walls, floors, and roofs. Based on the energy intensity of the materials and the quantities used, it is possible to calculate the energy insensitivity of various types of building materials and construction methods.

Tab. 1: Energy Requirements for Typical Housing Components

Components	Energy (MJ/Sq.m.)
Floors:	

Suspended Timber	733
Concrete slab on ground	1014
Walls:	
Timber frame, weatherboard cladding	198
Timber frame, brick-veneer cladding	1284
Concrete block	755
Roofs:	
Galvanized Steel	508
Concrete Tile	176

Similarly, the energy intensity of various house designs can be calculated and compared. Notably, structures can vary up to 60% in **capital** energy requirement, as a result of the architect's choice of materials [6].

10 ECONOMICAL CONSIDERATIONS

A Self Sufficient home may cost more up front but saves through lower operating costs over the life of the home. These homes require fewer trips to the doctor's office. This approach applies a life cycle cost analysis for determining the appropriate up-front cost. This analytical method calculates costs over the useful life of the home. These cost savings can only be fully realized when they are incorporated at the project's conceptual design phase with the assistance of an integrated team of professionals. The integrated systems approach ensures that the home is designed as one system rather than a collection of stand-alone systems. Some benefits, such as improving health and comfort, reducing pollution, and landfill waste are not easily quantified. Consequently, they are not adequately considered in a cost analysis. For this reason, consider setting aside a small portion of the building budget to cover differential costs associated with less tangible benefits or to cover the cost of researching and analyzing Self Sufficient housing options. This development may lead to a school of thought in the inhabitants and they will thrive to become self-sufficient.

11 SELECTED EXAMPLES

Though full implementation of these concepts is rare, some good examples exist in Europe, which partially uses self-sufficient concepts are enlisted herewith:

- The Crophorne Autonomous Home in the UK which is using renewable energy and as a result, it is carbon-negative [9].
 - Climate Neutral Passive House Estate in Hannover Kronsberg, which is using passive solar techniques along with super insulation technologies [10].
 - Findhorn Ecovillage in the UK is notable for its low carbon and oldest community-based agricultural system [11].

12 ECO-CITY DEVELOPMENT

If the other urban buildings/ infrastructure constructions follow a similar approach, the development of eco-city will become more and more feasible. Further, it is necessary to give importance to these concepts as housing nearly covers 40% to 42% (as per Town and Country Planning norms in India), of serviced urban land areas in developing countries. Many researchers feel the need of a holistic sustainability approach beyond developing only energy efficient housing [14]. So developing Eco-housing based on sustainability principles are definitely the path to future planning strategies.

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INCORPORATING SMART TECHNOLOGIES FOR ENERGY SUFFICIENCY IN BUILT ENVIRONMENT OF DEVELOPING COUNTRIES: AN ARCHITECT'S PERSPECTIVE

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1 Introduction

This is a burning problem of present era. The present unplanned and uncontrolled growth of housing cares little about energy conservation aspects. Sometimes even providing minimum energy to all households is not becoming possible by the local authorities. Studies reveal that around 18% of total energy consumption of mankind is in housing sector. It is necessary to consider energy conservation techniques before, during and after construction; as energy can be saved considerably in each stage. Over 80% of the embodied energy in mass housing is the energy required to manufacture the materials. Most of this energy usage is for manufacturing only a small number of the (high-energy) materials used in construction of housing units, principally steel products, cement, concrete products, bricks and ceramic materials.

This embodied energy amounts to several times the annual energy consumption of that same housing in use. Energy is used wastefully in heat recovery processes, insulation techniques, and simple orientation concerns. Architectural lighting & space heating/ cooling are also two of the largest and most visible consumers of energy. A properly designed energy efficient housing will have a lower initial cost than one planned disregarding energy consequences. This cost advantage derives mainly from smaller building volume & lower energy demands. . The conventional centralized energy distribution network accounts for high transmission losses (ranging from 9 to 20% at times). In Indian context grid loss sometimes reach upto 35%. The energy consumption in residential structures accounts considerably high than other buildings, also it is a recurring ever cost increasing phenomena. It is very difficult to remain in the city and save energy beyond a certain limit without compromising the present day materialistic lifestyle by the city dweller households.

2 The Definition

But after all what are these intelligent buildings? The Intelligent or the "Smart" buildings are characterized by the following major properties :

1. Smart buildings should KNOW what is happening inside and outside the building fabric, by way of various sensors and microprocessors along with weather monitoring instruments and technologies.
2. Smart buildings should DECIDE the most convenient way of providing comfortable and productive environment, by the use of automated control systems and air handling units.

3. Smart buildings should CATER the exigencies of security and safety (from fire, weather hazards etc.), by simultaneous sensing, control, and monitoring of different factors.
4. Smart buildings should CALCULATE the minimum energy requirement levels and maintain the same with the help of dimmers or sometimes even by switching off the extra energy sources.
5. Smart buildings must RESPOND to occupants requests, with the provisions of different electronic and mechanical means.

3 Addition of Smart BMS

The field of Smart Buildings, Smart Homes and Building Management Systems (BMS) encompasses an enormous variety of technologies, suitable for domestic buildings, including energy management systems and building controls. The function of Building Management Systems is central to 'Smart Buildings' concepts; its purpose is to control, monitor and optimize building services, e.g., lighting; heating; security, CCTV and alarm systems; access control; audio-visual and entertainment systems; ventilation, filtration and climate control, etc.; even time & attendance control and reporting (notably staff movement and availability).

The potential within these concepts and the surrounding technology is vast, and our lives are changing from the effects of Smart Buildings developments on our living and working environments. The impact on facilities planning and facilities management is also potentially immense. Any facilities managers considering premises development or site relocation should also consider the opportunities presented by Smart Building technologies and concepts. Until recent years, energy efficiency has been a relatively low priority and low perceived opportunity to building owners and investors.

However, with the dramatic increase and awareness of energy use concerns, and the advances in cost-effective technologies, energy efficiency is fast becoming part of real estate management, facilities management and operations strategy. The concepts are also now making significant inroads into the domestic residential house building sectors. Since many of the problems of tall buildings can be solved by smart building features, it's high time BMS should be considered in design of tall buildings.

The addition of "intelligence" to the concept of mass housing in tall buildings is also necessary because this will further enhance their habitability by eliminating some of the major disadvantages and by incorporating comfortable living atmosphere [Sanyal, 1997].

4 Energy Conservation :

Smart buildings effectively use energy conservation methods and maintain the optimum energy usage level all the time. The energy production cost is higher in developing countries; the reduction of unnecessary wastage of household energy will be very advantageous in the long run. Reduction in energy consumption derives from strategies, in the form of intelligence, for manipulating the HVAC and electrical systems. These strategies are complex, because energy optimization schemes have an impact on many different functional aspects simultaneously; consequently, they can be effectively followed by smart system only. It has been already experienced that using energy management software that reacts to the electrical demand approaching a new monthly peak value can reduce electrical power costs, and then recommends shedding, of certain building electrical loads in accordance with a priority schedule. Smart buildings can offer the most comfortable and productive living environment. They can even change the inside environment as per changes of likings of occupants by voice actuation system (already in use in developed countries). Thus the psychological satisfaction of the habitants can be obtained to a greater extent by smart buildings.

A critical factor of smart is to develop an effective and flexible control for lighting systems. In mass housing units lighting represents a major portion of the energy costs. Traditionally, lighting controls are being enforced for: -

- Providing an effective/acceptable level of illumination,
- Reducing energy consumption in peak periods,
- Providing flexible scheduling & overriding capabilities,
- Saving of energy.

Studies reveal that out of 40% in buildings, around 18% of total energy consumption is in housing sector, where energy is used wastefully. Moreover, though people are aware of energy shortages as they are reminded by load shedding and power cuts time-to-time; still they have not yet developed a psychology to conserve energy whatever and whenever they can. As per UNCHS, approximately 60% of reduction in energy consumption is possible through employment of energy conscious design principles and it is the responsibility of architects/ designers to encourage such measures. The energy consumed by a housing unit depends upon the structure's energy needs and the efficiency with which those needs are satisfied. Energy conservation aims at both reducing basic demand by cutting a housing unit's appetite and improving the efficiency of energy supply system by eliminating wastage. Many of the dwellings are being designed to aggressive standards for illumination levels, which leads to over-illumination. Smart buildings can use dynamic area illumination techniques to effectively control and maintain optimum illumination.

An **Energy Management System (EMS)** is a system of computer-aided tools used by operators of electric utility grids to monitor, control, and optimize the performance of the generation and/or transmission system.

The computer technology is also referred to as SCADA/EMS or EMS/SCADA. In these respects, the terminology EMS then excludes the monitoring and control functions, but more specifically refers to the collective suite of power network applications and to the generation control and scheduling applications.

Manufacturers of EMS also commonly supply a corresponding dispatcher training simulator (DTS). This related technology makes use of components of SCADA and EMS as a training tool for control centre operators. It is also possible to acquire an independent DTS from a non-EMS source such as [EPRI](#).

Energy management systems are also often commonly used by individual commercial entities to monitor, measure, and control their electrical building loads. Energy management systems can be used to centrally control devices like HVAC units and lighting systems across multiple locations, such as retail, grocery and restaurant sites. Energy management systems can also provide metering, sub metering, and monitoring functions that allow facility and building managers to gather data and insight that allows them to make more informed decisions about energy activities across their sites.

5 Other Energy conservation strategies:

The major actionable aspects to reduce energy consumption are:-

- Use energy management system to reduce the peak energy demands and cut on the energy wastage. Use energy efficient lighting fixtures, like L.E.D.
- Use passive architectural techniques like wind tunnel system, etc. to reduce air-conditioning load. Energy recovery wheels can also be used.

- Use of renewable sources of energy should be promoted. Solar energy can be tapped by adding solar panels to the external facades of tall housing or from Building Integrated Photo Voltaic. Energy can be also generated by using bio-mass technologies utilizing biological (kitchen/restaurant) wastes from tall buildings. Develop strategies to provide natural lighting. Studies have shown that it has a positive impact well being.

Further strategies can be:-

- Use of Task lighting reduces general overhead light levels.
- Use a properly sized and energy-efficient heat/cooling system in conjunction with thermally efficient walls, roofs and floors.
- Maximize light colours for roofing and wall finish materials; install high R-value wall and ceiling insulation; and use minimal glass on undesired sun exposures.
- Passive design strategies can dramatically affect energy performance. These measures include home shape and orientation, passive solar design, and the use of natural lighting. Over 80% of the embodied energy in housing is the energy required to manufacture the building materials. It has been established that most of this energy is used in only a small number of materials, principally, iron/steel products, cement/concrete products, bricks/ceramic materials. The embodied energy in a housing unit amounts to several times the annual energy consumption of that same housing in use [UNCHS, 1991b]. So, architects of super tall housing have the opportunity to make a major contribution to the reduction of total energy use in built environment through some of the strategies enlisted here:
- Maximum use of low energy materials.
- Selection of lower-energy structural systems.
- Selection of waste/recycled materials, or manufactured materials, which incorporate these.
- Use local materials, involving less transportation.
- Use more functional windows (designed as passive solar collectors). Optionally smart windows can be also used, which use anti reflection layers, low emission coatings and switch able films.
- During construction process, materials are combined in composite building components such as walls, floors and roofs. Based on the energy intensity of the materials and the quantities used, it is possible to calculate the energy insensitivity of various types of building materials and construction methods. It is notable that structures can vary up to 60% in **capital** energy requirement, as a result of architect's choice of materials [UNCHS, 1991a].

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TRACK 2: CULTURE

CULTURE, PRODUCTIVE HERITAGE AND SPATIAL DEVELOPMENT

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1.0 Introduction

Culture is an important driver of innovation for heritage management and spatial development. In recent years, many scholars have analysed this phenomenon to understand the effects on the territory (Dodd, 2020). Culture indeed has a transformative ability to create new flows and growth in the urban space. It positively affects the enhancement of local resources, and promotes social interaction and community spaces (Clark & Wise, 2018). In recent years, much attention has been given to the creative regeneration of marginalised heritage, such as productive heritage (Areces, 2005; Scaffidi, 2021). In Europe there are many cases that have recycled disused heritage through art and culture. At the heart of the debate are innovative communities, where cultural initiatives, art exhibitions, alternative forms of education and cooperation keep heritage alive. These are places often managed by social enterprises that involve citizens and local governments.

These innovative social enterprises indeed promote the creative reactivation of neglected assets through cultural activities, services, and community involvement. Numerous studies have shown that these centres are able to create open and inclusive urban spaces (Scaffidi 2021; Schröder, 2018). They foster moments of debate and social interaction (Walker et al. 2004). These cultural enterprises aim to innovate in the art sector with new management models that promote culture, through social innovation practices. Many policies have been developed to support these enterprises to enhance local assets (Cerreta et Al., 2021). They promote a more open governance that includes stakeholders in decision-making processes, which innovates the development of assets culturally, socially, economically and environmentally.

The research aims to discuss the importance of innovative cultural centres for the development of cities and the reactivation of underused heritage. Considering this purpose, the research examines specific examples where socio-cultural actions have been the driving force behind the creative regeneration of productive assets and spatial innovation. Today, creativity is an important factor in urban transformation. Culture enhances the innovative capacities of a society and plays a relevant role in spatial reactivation. The socio-cultural dimension is explicitly expressed in some examples of heritage reactivation.

1.1. Recycling productive heritage

Contemporary society is strongly influenced by the presence of abandoned heritage such as, neglected mining areas and disused industrial sites.

The reactivation of these sites fosters a progressive process of urban and spatial development. Neglected assets are considered as territorial capital and generator of new life cycles (Marini, 2014). Recycling is not limited to the conservation and reuse of the asset, but stimulates the reactivation of local resources by creating new life cycles (Bocchi, 2013, Marini 2013, Ippolito, 2014; Simone, 2014;). Recycling represents the transition from a linear economy to a circular economy that makes sustainability and creativity the core of change in cities and territories. As Bocchi and Marini (2015: 16) state: "[...] an idea of recycling taken not as a mere technical operation of reusing or re-purposing discarded or abandoned materials, but more lustroously as a reinvention of vital meanings, as a reactivation of new life cycles"¹. The systemic and cyclical approach of recycling leads it to be a strategical process aiming at activating new cultural activities and innovative economies able to self-sustaining its own development (Marini, 2014). This process generates a flow of knowledge and actions through an open source and socially inclusive process (Andriani, Corradi, Massacesi, 2014). Contemporary literature widely shows the importance of recycling local resources including the community and the third sector (Mangialardo and Micelli, 2016). It opens up a new scenario that sees assets as places that are shared and accessible to all, as common goods (Iaione, 2015; Mattei, 2011). According to Christian Iaione, is (2015: 112) "[...] that element that puts people in a position to collaborate, to gather around a table and to start designing the forms of their joint and collective action"². Community participation plays an important role in urban regeneration in terms of cultural heritage revival and innovative social interventions. What is needed, however, are new tools and models that facilitate a system of governance, a collaboration between different stakeholders, in the name of enhancement of the commons. Social enterprises are working in this direction. The latter, in fact, has a social purpose, fosters cooperation between the different actors involved (Andreottola, 2017; Tricarico, 2014; Tricarico et. Al, 2018; Borzaga, Tortia, 2009). This type of enterprise does not act for profit, but for the development of benefits for the local community and the asset, developing cultural outcomes, new economy and local development (Iaione, 2016; Doherty, Haugh, Lyon, 2014). Today, creativity is an important factor in urban transformation. Cultural capital is developed to innovate the place; culture enhances the innovative capacities of a society and plays a relevant role in spatial reactivation. The socio-cultural development of places is explicitly visible in many European examples of heritage reactivation. According to the literature review, some examples of the recycling of neglected productive heritage have been analysed.

2.0 Methodology: materials, data and methods

The research aims to discuss the importance of innovative cultural centres for the development of cities and the reactivation of underused heritage. Considering this purpose, the research examines specific examples where socio-cultural actions have been the driving force behind the creative regeneration of productive assets and spatial innovation. An analysis of contemporary literature on social and cultural development of heritage was carried out. The information on literature and examples was collected through bibliographic research, website surveys, exploratory and dialogic surveys, and semi-structured qualitative interviews with local actors and experts. Empirical examples of social and cultural recycling of neglected heritage selected and studied. Through a qualitative research methodology, the research showcases examples

¹ Original text: un'idea di ri-ciclo assunta non in quanto mera operazione tecnica di reimpiego o riuso di materiali scartati o abbandonati ma più latamente come re-invenzione di significati vitali, come riattivazione di cicli di vita nuovi.

² Original text: [...] quell'elemento che mette le persone in condizione di collaborare, di ritrovarsi intorno ad un tavolo e di cominciare a disegnare le forme della loro azione congiunta, collettiva

of regeneration of productive heritage in Europe and replies to the following question: What are the effects of productive heritage recycling?

The selected examples are the following: the Kulturzentrum Schlachthof in Bremen (Germany), the Faust in Hannover (Germany), Real Fábrica de Cristales in La Granja (Spain) and WUK Werkstätten – Und Kulturhaus in Wien (Austria), Periferica in Mazara del Vallo (Italy), Cantieri Culturali alla Zisa in Palermo (Italy), Spazio Punch in Giudecca (Italy), Dolomiti Hub in Artèn, Fonzasco (Italy), Valle Salado in Salinas de Añana (Spain), Mina de Arnao in Avilés (Spain), Matadero of Madrid (Spain), Zeche Zollverein of Essen (Germany), Baumwollspinnerei of Leipzig (Germany), Kulturzentrum Faust of Hannover (Germany) and Ufa Fabrik of Berlin (Germany).

This research analyses the cultural innovation in the enhancement of these sites. The selected cases are former production sites, such as slaughterhouses (Schlachthof, Ufafabrik), manufacturing plants (Real Fábrica de Cristales, Ex Fadda, Cascina Cuccagna), former factories where cotton and celluloid were produced. They are in urban and rural-urban areas, as they are generally in peripheral locations due to their industrial and productive past. This research focuses on the analysis of the recycling of disused productive assets through processes of creative recycling.

3.0 Results and Discussion

The findings show that these cultural communities transform a marginalised heritage into an alive and vibrant ecosystem that promotes social and cultural services for the city. In conclusion, this research wants to contribute to the existing body of knowledge and create new insights for the European context. It is clear from the analysis that all these cases promote a better use of local resources resulting in a structural impact capable of innovating the place over time. Each of these examples has a positive impact on the territory in which they are located through co-design activities, social inclusion, community participation, artistic and cultural events as a means of transformation (Scaffidi, 2019). They are places that drive innovation, where people live and cooperate and, as such, benefit from local activities, new services for the whole urban context. Considering local impacts, the results show four main impacts based on culture and education, social issues, economic creativity and spatial development. Nevertheless, it is clear that culture is one of the main effects of the reactivation of these places.

All these cases are considered as creative hubs that improve the urban context, creating new spaces, building networks, developing international projects and attracting new people, such as permanent or temporary inhabitants and tourists.

In this sense, there are several activities promoted by these social enterprises. The findings show that many of these centres organise festivals and international projects (e.g. Ufafabrik, Schlachthof, Periferica, Valle Salado, Verkatehdas, WUK Werkstätten – Und Kulturhaus), exhibitions (Caos, Spinnerei, Periferica, Verkatehdas, Knos manufactures, Kulturfabrik, Real Fábrica de Cristales) and the development of new offers, sport initiatives, dance and cooking courses, such as Spinnerei, Ufafabrik, ExFadda, Cascina Cuccagna and Schlachthof. All these centres pay great attention to different art forms, with many activities related to literature, music, theatre and film (e.g. Schlachthof, Kulturkampf, Kulturkampf and Schlachthof). Schlachthof, Kulturfabrik, Manifatture Knos, Verkatehdas, Spinnerei) and many of them also offer educational support to children, such as the summer camps organised by Caos in Terni, the educational activities of Kulturfabrik in Esch-Sur-Alzette, the non-formal education of Periferica in Mazara del Vallo and specific cultural courses for children to discover the salt mines of Añana (Valle Salado). These centres aim to build an active community that improves the quality of life, responding to social problems such as the lack of specific offers for the inhabitants of the area by municipalities, local administrations and institutions.

The results show an overall positive impact on the place that improves the local context, attracts new investments, new collaborations, artistic activities and economic creativity. These centres become places for cultural innovative initiatives,

but also locations for new businesses, such as shops, bars, restaurants, schools, etc. They are places for new forms of community, meeting places for artists, cultural entrepreneurs, associations, local inhabitants, supporting the socialisation of young people and offering social activities for seniors, children and families. These centres promote the participation of the local community in their activities, counteract the emigration of younger generations, bridge social distances, increase the quality of life, create new services for different generations. In this sense, the results illustrate the presence of collaborative spaces (e.g. Spinnerei, ExFadda, Schlachthof, Knos Manufactures), family networks (e.g. Ufabrik), social pedagogical services (e.g. Schlachthof).

These innovative and creative experiences define alternative ways for the future development of Europe. In addition, they encourage the recycling of neglected and underused spaces, such as productive sites, and promote the recovery and sustainable development of assets considered as local resources. Spatial development also stands out for its positive influence on the urban context and its surroundings. The experiences analysed are characterised by the presence of a social enterprise whose ambition is to the urban development of the place by creating cultural innovation, economic growth and social involvement. They play a relevant role in the recycling of disused assets by promoting new cultural spaces for collaboration and creativity and new networking opportunities between inhabitants, institutions and social enterprises.

4.0 Conclusions

Culture is an important driver of innovation in heritage management and spatial development. Neglected assets are considered as territorial capital and generator of new life cycles (Marini, 2014). Recycling represents the transition from a linear economy to a circular economy that makes sustainability and creativity the core of change in cities and territories. It is not limited to the protection and reuse of the asset, but stimulates the reactivation of local resources by creating new life cycles (Bocchi, 2013, Marini 2013, Ippolito, 2014; Simone, 2014). Contemporary literature widely shows the importance of recycling local resources including the community and the third sector (Mangialardo and Micelli, 2016). Today, creativity is an important factor in urban transformation. The socio-cultural development of places is explicitly visible in many European examples of heritage reactivation. Innovative management models have been promoted to reactivate this heritage and create socio-cultural benefits and new economic development (Scaffidi, 2019). Many scholars have analysed this phenomenon to understand the effects on the territory (Dodd, 2020), the resource (Areces, 2005; Scaffidi, 2021) and the community (Clark & Wise, 2018; Tricarico et Al., 2020).

The research aims to discuss the importance of innovative cultural centres for the development of cities and the reactivation of underused heritage. At the heart of the debate are innovative communities, where cultural initiatives, art exhibitions, alternative forms of education and cooperation keep heritage alive. The research examines specific examples where socio-cultural actions have been the driving force behind the creative regeneration of productive assets and spatial innovation. It is argued that these recycling processes have positive impacts on urban space and promote cultural, economic and social development of the asset and the city.

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PLACES, PANDEMIC AND MULTIPLE RISKS: NEW EMERGING URBAN CHALLENGES

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Introduction

The Covid-19 emergency, although in different manner and measure, is changing habits and use of places and cities at global level. In many cities, public spaces became completely empty for months and new urban landscapes have substituted the previous ones, transforming the private in public (Sepe, 2021). Children and young have interrupted the school in presence to start that by internet; adults started the smart working; elderly begun to meet their sons through the computer. Houses and balconies were used for work and study, allowing people to go inside the private life of everyone. The reopening of public spaces has happened after months of closing, allowing again “live” social interactions, although in respect of the physical distance, confirming the importance for all people of these places (Carmona, 2019; Crappsley, 2017; Gehl, 2010). The new challenges concern facing the presence of multiple risks (Sepe, 2022a), improving health, integration, and liveability of places for more flexible and adaptive uses. Accordingly, to provide a sustainable regeneration meant in its three-fold meaning, it needs to use new methodological approaches, including: the 15-minutes city (Moreno, 2020) that is a city able to offer all its inhabitants everything they need to live, work and have fun to be reached on foot in no more than 15 minutes; the flexible one (CRA, 2019) that is based on tools for architectural and urban planning and design, which are able to allow changes in the course of implementation of those projects; the Soft City (Sim, 2019) that is based on the idea that from the union of density and diversity a more liveable and healthier city can be obtained, as proximity of an environment can be translated into time; the Health-Liveable city (Sepe, 2022b) is a city in which public spaces are considered the main places to enhance and health and liveability issues the first factors to improve; and the smart city (Karvonen et Al., 2019) in which the whole range of technologies are at the service of the place both to improve its liveability and health and ensure its sustainability.

Starting from these premises, this study, carried in the framework of the Prin 2020 - Research Projects of National Relevance titled “Sustainable modelling of materials, structures and urban spaces including economic-legal implications” – ISMed-CNR Unit with the author’s responsibility, is aimed at illustrating: a new method of analysis and design of public spaces, the original Healthy Place Design – within the Health-Liveable city approach - (Sepe, 2022b) and an emblematic case study, characterized by both flexibility and accessibility at different level. Conclusion concerning both critical and positive issues of the case study will complete the paper.

The method

The Healthy Place Design method aims to identify urban healthy, liveability and happiness and the factors which make places healthy, happy and liveable from the user’s point of view. This method is of particular interest in the case in which many risks occur simultaneously, and health issues have to be particularly taken in account.

The part of analysis of the method – five phases - consists of different kinds of surveys, observations, and questionnaires. The part of design is composed by three phases and include the check of consistency with the 25 principles of the Charter of urban health, liveable and happy design.

Phase 1 of the method consists in the definition of the study area; it needs to go on the site in question and decide, through an inspection, whether to confirm the delimitation decided beforehand or modify it.

Phase 2 is characterized by the observation of the characteristics of the place through three surveys concerning the kinds of activities, the perceptions, and the elements which contribute to the perception of healthy, happiness and liveability.

In the survey 1, the types of people - locals, visitors, professionals - and activities - enjoyment, passing by, work – are observed. It needs to observe these activities from the quantitative point of view, in order to collect data concerning in what percentage the activities are present in that place and how influence its liveability and healthy. Then, it needs both measure and observe the presence of persons from the quantitative point of view. Accordingly, the frequency with which the activities are repeated or implemented and with what pace is measured: it is observed if that activity is carried out with a rapid, slow or moderate pace.

The survey 2 consists in identification of singular and mixed perceptions. The singular perceptions include the visual, auditory, tactile, olfactory, taste perceptions, while the mixed one include chaos, serenity, disorder, joy, harmony, disorientation, uncomfotability and so on, deriving from the sum of one or more perceptions. Their quantity is expressed as light, medium and high amount percentage; the quality is expressed as pleasant, non-influential and annoying perceived perception.

The survey 3 of this phase consists in the observation of the elements which contribute to the health and happiness sensation such as constructed and natural elements, suitable pedestrian areas, transportation modes, good quality equipment and services (furniture, pavement, wireless, etc).

Finally, from the intersection of these data, a first result on the degree of healthy, happiness and liveability is obtained, resulted from surveys on the place in object.

Phase 3 consists in a questionnaire to the people who use the sites aimed at identifying factors and elements which give them the sensation of healthy, happy and liveable place.

Questions may include the following and will be modified in accordance with the place characteristics: This place gives you a feeling of happiness or sadness/ liveability or discomfort/ health or unhealthy; What are the elements that give you the above sensations?; What are the main facilities that give quality to this place?; What are the activities that you act in this place and how often?; What do you think about the presence of many or few people here? Do you think that it is capable to improve the pleasantness or unpleasantness of the place?; According to the place healthy, liveability and happiness what could be done in order to improve this place?; What is a healthy/happy/liveable place that you remember in this city or elsewhere?; How the weather condition might influence the perception of liveability or happiness this place?

Phase 4 is that of the analysis of the traditional cartography in order to understand the elements that compose the place in terms of the type of the historical and architectural elements, urban fabric, the natural environment (green areas, sea, hills, etc ..), and other public spaces in the surrounding area. A collection of projects of urban design in development on these areas can complete this analysis.

Phase 5 involves the construction of the map of healthy, liveability and happiness with the identification of spaces and features that give to the people who use that place the perception of these factors. The map will be the result of the different survey operations, analysis and observation, which were collected on the sites in object.

In phase 6, the check of the degree of healthy, liveability and happiness is carried out. This is obtained through the study of both intrinsic and extrinsic factors contained in the map which are capable to determine urban healthy, liveability and

happiness. The intrinsic factors include the perceptions, tradition and culture. Extrinsic factors include the architecture, facility, and urban furniture. The aim is that of identifying a map of those areas where there is a minor presence of healthy, liveability and happiness, which are underused with respect to the place in general and where the project interventions have to be concentrated. These areas could be represented by both perceived empty spaces or physical empty spaces – such as a non-utilized square, an area destroyed following an environmental disaster. Furthermore, these areas can be marginal with respect to the place or central or can also be constituted by the whole study place. The check is carried out through the 25 principles of urban health, happy and liveable design concerning the aforementioned Charter.

1. A healthy, liveable and happy place is a space which can transmit feelings of healthy, liveability and happiness to everyone who uses it.

Accordingly, it is important:

2. To encourage the use of the place by people of different age groups, from children to the elderly
3. To eliminate architectural barriers which might discourage people from frequenting that space
4. To create a suitable balance between the elements of nature, landscape and equipment in the composition elements of the space
5. To have both in streets and public spaces natural lighting during the day and artificial at other times, avoiding artificial light in daily hours.
6. To retain an adequate state of cleanliness and maintenance
7. To create suitable spaces for dogs and domestic animals
8. To create a sense of security and safety to those who walk, cross, rest, and so on in the public spaces
9. To minimise or eliminate the noise generated by public transport
10. To improve suitable cycle lines
11. To fully perceive naturally occurring smells - e.g. wood, grass, sea
12. To have direct contact with natural materials, preferably local, used in the design of the space
13. To have the presence of water in different shapes (e.g. fountains) which promotes the vitality of the place.
14. To have the possibility of doing actions – such as walking, watching, etc.. - with a moderate or slow pace, promoting opportunities to take breaks in the space
15. To have the possibility of using the space in different weather conditions and seasons, contributing at the same time to its good state of maintenance
16. To preserve both the place identity and the intangible characteristics of the site and its surroundings
17. To both allow and promote different types of functions such as games, breaks, walking, etc..
18. To facilitate gymnastic activities – also slow - with the presence of small equipment or a designated space.
19. To have the possibility of doing actions that normally are not permitted – such as walking barefoot in the water or in designated public areas -, improving a feeling of freedom and joy.
20. To encourage the presence of art in its different forms.

21. To promote sculptures, games, or other elements and amenities which can bring a smile to a person's face promotes a state of liveability and happiness.
22. To promote participation, namely the feeling of being able to contribute to the life of that place increasing the sense of belonging.
23. The consideration of the place as symbolic of the neighbourhood improves the perception of its identity.
24. To promote the educational function which a place has – e.g. clearly displayed information about history of the place etc. or suitable ways to use it - increasing its intrinsic value.
25. To facilitate the use of new technology to increase the knowledge of its intangible values and history, offering a more profound experience of the place.

Phase 7 concerns the check of the emerged first design ideas - with the users of the place to obtain a mosaic of degree of pleasure on these. Two typologies of questionnaires are carried out: the questionnaire on site that must be administered to the different kinds of users and visitors of the place; the research on the websites with the user requests. In the first kind of questionnaire, the design hypothesis are verified with demands selected by who carried out the study, *ad hoc* with respect both to the place and the results of the phase 7.

The second kind of questionnaire is constituted by or the study of web reviews concerning booking of tourist services (e.g. booking or trip advisor) already on-line or *ad hoc* created tool, such as the realization of blogs or other social network tools to support this and other phases of the project.

Answers to the different questionnaires administered on site and online will be overlapped, constituting the participative part of the project, but also the possibility of comprehension of the place in a wider manner.

Following the check of consistency with the Charter of phase 6 and the results of the phase 7 questionnaire, the identification of project interventions for the realization of the principles is carried out. In phase 8 – the last one - the insertion of the project interventions in the areas in object is carried out through: the overlapping of the results of the previous phases; a check of consistence with spaces and urban furniture and equipment already present; the identification of the use of the traces – urban, cultural, etc., already present in the place.

By way of example the case of the riverfront of Dublin will be illustrated in the following section.

The case study

The case studies of the Healthy Place Design Method were carried out in Europe, USA and China, including Bordeaux, Hamburg, Newcastle, Nice, Dublin, Vancouver and Wuhan. In the following the emblematic case of Dublin in Ireland will be synthesized, illustrating the healthy factors of phase 5 and the project interventions of phase 8.

Dublin is bathed by the River Liffey, whose banks and related bridges characterize this city and whose regeneration - together with that of the Docklands - are elements of interest and subject of the case study.

The area that has been decided to be analysed is the Liffey waterfront between Grattan bridge and Samuel Beckett Bridge (first stretch) and the area between Samuel Beckett Bridge and Grand Canal Quai-Grand Canal Bridge (second stretch).

The spaces and activities which make the place liveable, healthy and happy from the users point of view include as follows.

The waterfront of the River Liffey is a liveable and healthy place that offers people the opportunity to do different types of activities. The river serves as a scene for walking, cycling, running, stopping for a break, having a hot drink at the café, gazing at the view, sitting, relaxing and take a sightseeing tour by boat. Seats, benches in wood and stone of different

shapes and oriented in different ways to allow both the view of the river and for conversation, trees, green flower beds, decorative flowerpots, bike parking racks. The stretch with the wooden walkway separates the walk from the noise of road vehicles giving people an even closer view of the river with the possibility of sitting on the benches. The bronze statues along the waterfront, as well as artistic bird tracks and footprints, embedded in the pavements at O'Connell Street, visual perceptions of historic buildings such as the Custom House, the bridges and the sailing ships contribute to the perception of liveability of the place, but also to the enhancement of its identity, as well as the outdoor exhibition panels that illustrate the history of the area constitute important factors for the liveability of this place.

The long river ends with the docklands, where the second stretch of the study area is located, between the Samuel Beckett Bridge and Grand Canal Quai-Grand Canal Bridge. This part is characterized by a pedestrian stretch in continuity with the long river, but wider, with seats, trees, bike parking racks. Here people walk, take a break, observe the river, run, and ride their bikes.

The walk reaches the Grand Canal Plaza with contemporary architecture and public spaces that offer a perception of surprise and almost discovery, heralded by the Samuel Beckett Bridge. The Grand Canal Plaza is made up of a contemporary design with seats, paths marked by pavement, and stylized red lamp posts. Here people walk, take a break, ride a bike and rent a bicycle, take pictures of the square, the theatre and the panorama. The perception is of liveability, healthiness, happiness.

The whole area is routinely frequented by locals and tourists of all ages, both for its beauty and liveability and for its centrality and proximity to areas of interest such as the historic Temple Bar district and the docklands.

From the information gathered in this phases and in the project phases including the consistence with the principles of the Charter mentioned in the method's section, the following project interventions were identified.

The first project intervention is to create a cycling and pedestrian dedicated line. The Liffey waterfront is a place used by many people and to create both a cycle and pedestrian line could make this place still more liveable. Where the street dimension is not suitable, this project intervention could be carried out with the enlargement of the current pavements and consequent reduction of the car line. The dedicated bike and pedestrian lanes could continue until the Grand Canal Square and along the docklands.

The second project intervention is to create new spaces, widen the game areas and inserting playgrounds and places for games for people of all age and with disabilities. Also in this case, these could be inserted in the wider parts of the area including the Liffey walkway and the Grand Canal Square. Playgrounds could also be of little dimensions and made by natural materials. This project intervention could further increase the liveability and healthy of this place.

The third project intervention is to insert artworks to improve the presence of art in this place. Art products could be of different kinds, including sculptures, video and murals that could be inserted in the whole site and could be permanent or temporary. These, together with those which are already present in the area could be engaging and further improve the liveability of the place.

The fourth project intervention is to add equipment for gymnastic exercises. This could be inserted in the part of the waterfront that is wider, including the Liffey walkway and in the Grand Canal Square. The equipment could allow people of different age and ability to make physical activities and further improve the perception of health of this place.

The fifth project intervention is to add an area for dogs. This means to insert an off-leash space in which dogs can run and play freely in a dedicated area of the waterfront and could be carried out with an enlargement of the pavements or the pedestrianization of the whole or parts of the Liffey River. Alternatively, an off-leash area could be inserted in the Grand Canal Square.

The sixth project intervention is to minimize the sound of vehicles. Along the Liffey riverfront the sound of the vehicles in some hours of the day are quite loud; the speed limit reduction of the means of transport, the pedestrianization of some parts or the whole waterfront, the introduction of green barriers are the project interventions which could minimize the impact of the vehicular traffic.

The seventh project intervention is to insert public light structures to use the place in all the seasons. The structures should be mobile, made with natural material and in continuity with the identity of the place. Furthermore, these could be used in both very warm and cold period, further improving the use of the place all over the year.

The eighth project intervention is to add information about the area, and it is strictly related with the idea to insert wireless information points. Although some information points are already present in the area adding some more information with the history, equipment and activities of this place could improve its liveability and happiness. These information could be inserted using totem, qr codes, dedicated app and so on.

The ninth project intervention is to identify suitable sites for participation. This is important to create major sense of belonging of the place and could be temporary, namely according with a general identification of the suitable sites, could change in relation to the kind of activities. These could include the wider part of the riverfront, the boardwalk and the Grand Canal Square.

The tenth project intervention is to insert or enhance the green. The Liffey riverfront and Grand Canal Square present trees and green in different forms. In some parts where the pavements are of little dimensions, there are not trees or green; the insertion of trees, green or flowerpots could further improve the health and happiness of this place.

Observation and Conclusions

The paper illustrated the original Healthy Place Design method and the emblematic case of the riverfront of Dublin. In the last years, many risks are occurring simultaneously, and health, integration and liveability issues are becoming more and more important. Accordingly, the proposed method is useful to identify project interventions that can regenerate places from the health point of view, making spaces more liveable, and, at the same time, more flexible to different uses.

The Dublin area that was analysed is a place of great interest because there are elements of tradition and elements of innovation. The chosen route starts from the Grattan Bridge and ends in the Grand Canal Square. In this path, the River Liffey constitutes the natural element that characterizes the place and determines its activities and the flow of people and means of transport on the two banks, on the bridges and along the docklands.

The good quality of the materials used for the streets, the good maintenance, the presence of trees and greenery, the sculptures contribute to this general perception.

The entire route is experienced by locals of all ages and by visitors from all over the world for walking, cycling, running, stopping for a break, having a hot drink at the café, gazing at the view, sitting, relaxing and take a sightseeing tour by boat.

The check of the degree of healthy, liveability and happiness is carried out through the 25 principles of urban health and liveable design concerning the Charter. By the check of the principles, those which could be improved include: 7. To create suitable spaces for dogs and domestic animals; 9. To minimise or eliminate the noise generated by public transport; 10. To improve suitable cycle lines; 15. To have the possibility of using the space in different weather conditions and seasons, contributing at the same time to its good state of maintenance; 17. To both allow and promote different types of functions such as games, breaks, walking; 18. To facilitate gymnastic activities – also slow - with the presence of small equipment or a designated space; 20. To encourage the presence of art in its different forms; 22. To promote participation, namely the feeling of being able to contribute to the life of that place increasing the sense of belonging; 24. To promote the educational function which a place has – e.g. clearly displayed information about history of the place etc. or suitable ways to use it -

increasing its intrinsic value; 25. To facilitate the use of new technology to increase the knowledge of its intangible values and history, offering a more profound experience of the place.

Accordingly, the project interventions which were identified include: to create a cycling and pedestrian dedicated line; to widen the game areas; to insert artwork to improve the presence of art in this place; to add equipment for gymnastic exercises; to add an area for dogs; to minimize the sound of vehicles; to insert public light structures; to add information about the place; to identify sites for participation events; and to insert or enhance the green.

These actions have as a final route to give more space for different activities for people of all age and less to cars, improving flexibility, accessibility, and adaptation, while maintaining place identity (Sepe, 2013).

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MAPPING THE WALK : A SCALABLE COMPUTER VISION APPROACH FOR GENERATING SIDEWALK NETWORK DATASETS FROM AERIAL IMAGERY

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1. Introduction

After a century of car-oriented urban growth ([Walker & Johnson, 2016](#)), cities around the world are implementing policies and plans that aim to make their neighborhoods and streets more walkable and transit oriented. Renewed attention to walkability is driven simultaneously by the impending climate crisis, public health concerns, and a strive for economic competitiveness. With more than a third of all CO₂ emissions attributable to the transport sector ([EPA, 2021](#)), it has become clear that climate goals will not be reached unless urban populations start driving less and relying more on walking and public transportation ([Cervero, 1998](#); [Speck, 2013](#)). From a health perspective, more walkable cities have been found to have lower obesity and inactivity-related conditions, respiratory diseases, and lower overall public health expenditures ([Frank & Engelke, 2001](#); [Grasser et al., 2013](#); [Zapata-Diomedes et al., 2019](#)). Economically, walkable and transit-served city environments have also become an important draw for a competitive workforce ([Moretti, 2012](#); [Glaeser, 2010](#)) and now command some of the highest-priced real estates in American cities ([Leinberger & Lynch, 2014](#)).

Despite the growing, multi-pronged importance of pedestrian-oriented city design, the necessary geospatial data for pedestrian infrastructure mapping and modeling remains far behind vehicular infrastructure data. Digital mapping of vehicular road networks expanded rapidly in the 1990s, led by Federal legislation (President Clinton 1994), municipal governments' investments, as well as private companies such as Navteq and TomTom that operationalized roadway mapping in cities across the world. Assembly and wide-scale dissemination of such data has been instrumental to numerous technologies that use road network data as a key input:

mapping and routing applications (e.g., Google Maps, TransitApp), transportation service technologies (e.g. Uber, Amazon Prime), urban transportation models and policies (e.g., metropolitan and urban Travel Demand Models, congestion charging systems in various of cities), as well as mobility data specification standards (e.g., Google’s General Transit Feed Specification, and the City of Los Angeles’ Mobility Data Specification).

Transportation debates are often skewed towards topics rich in data – vehicle throughput, for instance, which is monitored on individual streets in many cities, is a key parameter for new road design and investment. *Not only is comparable data describing pedestrian throughput on sidewalks typically unknown, the locations and types of sidewalks are also rarely mapped or updated, contributing to systemic underinvestment in the pedestrian realm.* When pedestrian accessibility is analyzed, it is often done using simplified road-centerline data, not the actual pedestrian infrastructure—sidewalks, footpaths, and road crossings ([Liu et al., 2021](#)). A number of studies have highlighted the inadequacy of using street-centerline networks for pedestrian routing ([Qin et al., 2018](#); [Cambra et al., 2019](#); [Sun et al., 2019a](#)), which can lead to inaccuracies (e.g., streets with no sidewalks), simplifications (e.g., assumptions that buildings can be directly accessed on both side of a street centerline, while in reality crossing a street is only allowed at certain locations), and misrepresentation (e.g., assuming pedestrian connections based on vehicular routes, where there are none) ([Chin et al., 2008](#); [Ellis et al., 2016](#)). Not only can road-network data be imprecise for pedestrian needs, it can also be hazardous for the more vulnerable street users, such as vision-, hearing- or mobility-challenged travelers, wheelchair-bound travelers, the elderly, and the young ([Saha et al., 2019](#); [Zhang & Zhang, 2019](#)).

To address these challenges, we introduce Tile2Net—an end-to-end framework for automated mapping of pedestrian infrastructure using aerial imagery. Tile2Net enables users to download orthorectified sub-meter resolution image tiles for a given region from public sources and generate topologically interconnected, georeferenced sidewalk and crosswalk centerlines as well as side-walk, road, and crosswalk polygons. Our goal is to map pedestrian networks “as they are” rather than trying to improve the network connectivity artificially. To achieve this, we use a semantic segmentation model that can detect sidewalk, footpath, and crosswalk polygons from orthorectified tiles. We then use the resulting polygons to create an interconnected network. We pilot tested the approach in Manhattan, NY, Washington, DC, Boston, and Cambridge, MA, and achieved high accuracy in each of these cities. The model can be finetuned based on the topological characteristics of different datasets and cities. Our key contributions are as follows:

1. We provide an end-to-end, open-source framework to create large-scale pedestrian networks from orthorectified imagery(link omitted to satisfy double-blind review requirements).
2. The framework also generates georeferenced polygons of roads, sidewalks (including footpaths) and crosswalks.
3. We offer techniques for the automated creation of annotation masks, using publicly available or user input

datasets to train the semantic segmentation models.

4. Our generalized pedestrian feature detection model—made publicly available—is trained on a selected number of cities with varying street network geometries, building shadow densities, and tree covers (Cambridge, Washington, DC, and New York City parks), making it applicable for other cities with similar environments without any need for additional training.
5. Our solution is adjustable to different city environments, offering various settings to finetune the model on the new dataset, based on the local characteristics of the data.

The paper is organized as follows: In Section [2](#), we review existing literature on sidewalk mapping. In Section [3](#), we describe our methodology, data sources, and implementation. In Section [4](#) we present our results. Section [5](#) presents a discussion of the challenges of automated sidewalk network detection and suggests directions for expanding the work in the future. Section [6](#) concludes the paper.

2. Literature Review

2.1. Map generation

At least five different frameworks for mapping sidewalk infrastructure can be disguised in existing literature and practice, with additional combinations thereof. The main differentiating point between these five categories lies in the method used to detect pedestrian infrastructures such as sidewalks, footpaths, and crosswalks. Figure [1](#) offers an illustrative summary of these methods.

First, physical site surveys and manual aerial imagery surveys have been used in a number of cities to develop datasets on pedestrian facilities (e.g., in Melbourne, Singapore, and Boston). This involves tracing observable sidewalks and crosswalks from georeferenced aerial imagery, combined with on-the-ground observation and validation ([Proulx et al., 2015](#)). Such mapping efforts can produce accurate and high-quality results, but it can also be prohibitively labor intensive and difficult to scale across large regions. In a recent study, 6,400 intersections in San Francisco were manually reviewed and classified based on the crosswalk presence and condition, which took 90 hours for a researcher to complete ([Moran, 2022](#)). Some cities have relied on crowd-sourcing sidewalk mapping to a community of online users ([Sachs, 2016](#)). Custom-built mapping platforms, such as OpenSidewalks ([TCAT, 2016](#)), WalkScope ([Placematters and WalkDenver, 2014](#)), or global open-access platforms like OpenStreetMap, enable users to view and edit available datasets collectively. How these open-sourced data is generated can vary, but can also include the methods described in this section.

Second, network buffering uses a geospatial road centerline network as a reference, which is offset on both sides to

generate

polygons whose boundaries approximate the right-of-way of the roadway. In this method, which is a widely used and a common approach in geo-information processing, the boundaries of the resulting polygons are considered as the approximate location of the sidewalks segments, assuming that (1) pedestrian path segments only exist along roads, (2) sidewalks exist along both sides of selected roads, and (3) crosswalks are located at every intersection. Buffer distances can include road right-of-way or road-width dimensions from the vehicular road centerline network dataset. After sidewalk segment geometries are generated, crosswalks can be added by linking the endpoints (i.e., intersections) of the assumed sidewalk intersections perpendicularly across road centerlines (Karimi & Kasemsuppakorn, 2013; Brezina et al., 2017). This approach has several shortcomings, first is the limited extent of the locations such a network can cover. A network constructed based on streets and roads does not include off-road footpaths, pedestrian bridges, skywalks, or underground tunnels. In other words, it is limited to only where roads can go and can generate arbitrary sidewalks and crosswalks, which can lead to inaccuracies (e.g., all streets will have sidewalks on both sides), simplifications (e.g., assumptions that buildings can be directly accessed on both sides of a street centerline, while in reality crossing a street is

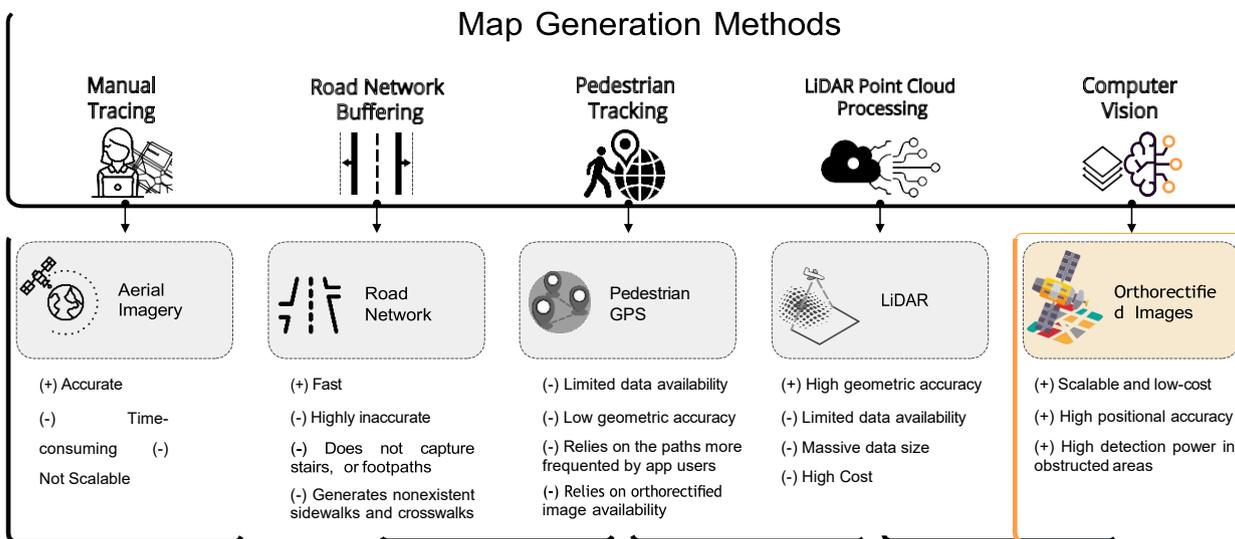


Fig. 1. Different methods of map generation. Each box presents the main data sources (shaded parts), as well as the strengths (+) and weaknesses (-) of each method. The last box highlighted in orange denotes the method used in this paper.

only allowed at specific locations), and misrepresentation (e.g., assuming pedestrian connections based on vehicular routes, where there are none) (Chin et al., 2008; Ellis et al., 2016), each of which can lead to potentially hazardous situations for pedestrians, specifically the more vulnerable population (Saha et al., 2019).

Third, pedestrian pathways have also been identified from Global Positioning System (GPS) trajectories of pedestrian movement. This can include data from designated GPS tracking devices that are handed out to consenting participants or collected from their smartphone tracking Apps (Cottrill et al., 2013). Third-party data aggregators, such as

StreetlightData and Cuebiq collect GPS trace data from hundreds of different Apps that track their users' location history. Once collected, GPS traces can be merged, simplified, and joined into contiguous network datasets ([Kasemsuppakorn & Karimi, 2013](#)). The results can effectively illustrate where people (or at least App users) actually walked, but they may ignore segments not frequented by smartphone or app users ([Yang et al., 2020](#)). Moreover, the accuracy of the final network relies heavily on the positional accuracy of the GPS trajectories, which can be noisy, specifically in locations such as the vicinity of high-rise buildings ([Karimi & Kasemsuppakorn, 2013](#)).

The fourth category is LiDAR point cloud processing, which utilizes airborne Light Detection and Ranging (LiDAR) point clouds data. LiDAR devices use active sensing and can be fixed or mounted on mobile objects such as planes and drones ([Cura et al., 2018](#)). In general, three main methods have been used for processing LiDAR point cloud data to extract road and sidewalk features. 1) Geometry-based methods, which uses prior knowledge of the unique geometrical shapes and measurements of urban ground elements. 2) Reflectance-based methods utilize the reflectance intensity of different classes of objects to classify the data. The classified points are then normalized based on the laser scanning model, and distance projection is used to create a saliency map. These two methods are often combined to more accurately extract the streetscape features. 3) Scan-based methods take advantage of the scanning pattern to connect the results from consecutive scans into a continuous boundary and refine the segmentation ([Ai & Tsai, 2016](#); [Baker & Hou, 2019](#); [Balado et al., 2018](#)). In clustering feature classes, pedestrian path segments are typically assumed to be made of concrete, and parking lots of asphalt ([Karimi & Kasemsuppakorn, 2013](#); [Hou & Ai, 2020](#); [Kasemsuppakorn & Karimi, 2013](#)), which as shown by [Hosseini et al. \(2022\)](#), is not the case in many cities. The resulting data represents sidewalks as vector lines or polygons that can be both accurate and scalable ([Horva'th et al., 2022](#); [Treccani et al., 2021](#)). Unlike aerial imagery, LiDAR data can be acquired during different hours (day and night), and the data is already georeferenced. However, the lack of spatially dense, universal LiDAR data has limited this approach to relatively few cities overall. Fifth, and in line with our work, different computer vision techniques have more recently been deployed in a limited number of studies to detect pedestrian infrastructure from aerial images ([Ning et al., 2022](#)). The detected features are then converted into georeferenced lines or polygons and go through topological corrections to produce the final network. Among computer vision techniques, semantic segmentation can result in highly accurate detection and localization of infrastructure elements. This method makes dense predictions inferring labels for each pixel of an image, hence, giving each one a semantic meaning ([Ess et al., 2009](#); [Geiger et al., 2012](#)). To construct a pedestrian network, a segmentation model is first trained to detect different features of the streetscape, such as roads, sidewalks, and crosswalks, from aerial images. Although semantic segmentation has been broadly used to detect roads and building footprints from aerial images ([Balali et al., 2015](#); [Igloukov et al., 2017](#); [Li et al., 2019](#)) and to create road networks ([Bastani et al., 2018](#); [Wei et al., 2019](#); [Etten, 2020](#)), it has not been widely implemented for sidewalk mapping so far,

possibly due to several technical challenges. First, in order to achieve satisfactory results, semantic segmentation algorithms need to be trained on densely annotated labels, which can be labor-intensive and costly to prepare. Consequently, in applying semantic segmentation models to urban context ([Zhang et al., 2018](#); [Wang et al., 2019](#); [Zhou et al., 2021](#); [Kim et al., 2021](#)), researchers often forego retraining or fine-tuning their models on their target datasets and rather rely only on publicly-available models pre-trained on datasets such as CityScapes ([Cordts et al., 2016](#)), Mapillary ([Neuhold et al., 2017](#)), and ADE20K ([Zhou et al., 2017](#)). This reliance on pre-trained models, not specific to the desired task, limits analysis to the pre-defined classes included in those datasets ([Ahn & Kwak, 2018](#)). Further, pre-trained models not fine-tuned on domain-specific data can yield sub-optimal performance ([Azizi et al., 2021](#)). Second, compared to roads and buildings, detecting sidewalks, footpaths and crosswalks is more challenging since they constitute a small portion of the visual information of aerial images, and their detection can be further inhibited by occlusion from shadow, vegetation, and structures such as bridges or tall buildings ([Hosseini et al., 2021](#)). Hence, choosing the right network architecture that can preserve the fine local details while taking the global image context into account is crucial.

2.2. Semantic segmentation

The rise of autonomous vehicles and self-driving cars created significant demand for fast and efficient algorithms that can extract both high and low-level information from urban scenes, leading to notable improvements in the field of scene parsing, specifically pixel-wise classification, commonly referred to as *semantic segmentation*. Early work incorporated multi-resolution processing into segmentation architectures to improve performance over a static resolution approach ([Zhao et al., 2017](#)). This has been followed by rapid developments in multi-scale pyramid-style networks ([He et al., 2019a](#); [Ding et al., 2018](#); [He et al., 2019b](#)). In particular, HRNet ([Sun et al., 2019c](#); [Wang et al., 2020](#)) connects high-to-low resolution convolutions via parallel and repeated multi-scale fusions to better preserve low-resolution representations alongside the high-resolution ones in comparison to previous works ([Newell et al., 2016](#); [Chen et al., 2018](#); [Yu et al., 2018](#)). A variant of HRNet, HRNet-W48, has shown superior performance across segmentation benchmarks such as Cityscapes ([Cordts et al., 2016](#)) and Mapillary Vista ([Sun et al., 2019b](#)), is used as a key component of this proposal’s segmentation framework.

Table 1. Datasets used for training the model and their sources.

City	Dataset	Features	Date	Source
Cambridge, MA	Sidewalks	Sidewalk polygons	2018	(Cambridge GIS, 2018a)
	Roads	Roads polygons	2018	(Cambridge GIS, 2018d)
	Pavement Markings	Crosswalk polygons	2018	(Cambridge GIS, 2018b)
	Public Footpaths	paved & unpaved	2018	(Cambridge GIS, 2018c)
	Ortho-imagery	Image tiles	2018	(MassGIS, 2018)
	Sidewalk Inventory	Off-road footpaths inside parks	2018	(NYC DoITT, 2018)

Manhattan and Brooklyn	Roads	Road polygons	2018	(NYC DoITT, 2018)
	Ortho-imagery	Image tiles	2018	(NYC GIS, 2018)
Washington, DC	Sidewalk Inventory	Sidewalk and crosswalk polygons	2019	(DC GIS, 2019b)
	Road	Road polygons	2019	(DC GIS, 2019a)
	Ortho-imagery	Orthophoto SID	2019	(DC GIS, 2020)

Attention-based mechanisms have been adopted in multiple semantic segmentation architectures ([Huang et al., 2017](#); [Fu et al., 2019](#); [Chen et al., 2016](#); [Li et al., 2018](#)). Instead of feeding multiple resized images into a shared network and merging the features to make the prediction, which can lead to sub-optimal results, the attention mechanism learns to assign different weights to multi-scale features at a pixel-level and uses the weighted sum of score-maps across all scales for the final prediction ([Chen et al., 2016](#)). [Huang et al. \(2017\)](#) proposed RAN, a reversed attention mechanism that trains the model on the features which are not associated with the target class. The network has three branches that simultaneously perform direct, reverse, and reversed-attention learning. Hierarchical multi-scale attention is a network architecture that learns to assign a relative weighting between adjacent scales ([Tao et al., 2020](#)). This method has shown to be four times more memory efficient and allows for larger crop sizes that can lead to more accurate results. We adopted this architecture in our network generation pipeline due to its superior performance in detecting both high and low-level features while benefiting from its memory-efficient design.

3. Materials and Methods

In this section, we detail the datasets used for training the model, describe our methodology, and discuss how we have addressed the previous challenges of preparing labor-intensive annotation labels for training the algorithm and generalized it to detect pedestrian infrastructure in different urban environments. We also illustrate how initially detected polygon geometries can be converted into sidewalk centerlines, bringing the outputs closer to a topologically interconnected network dataset that can be used for pedestrian routing and other network analysis procedures.

3.1. Data description

The semantic segmentation model requires pairs of aerial images and their corresponding annotation labels to be trained. We designed an automated method to create annotation labels from publicly available datasets to overcome the annotation bottleneck. Our goal has been to work with scalable, non-proprietary input data and methods that would allow sidewalk mapping to be extended to heterogeneous cities in the U.S. and potentially globally. Two main data sources were used to create our training set: 1) High-resolution orthorectified imagery that is available across numerous U.S. ([US Geological Survey, 2018](#)) and international cities, and

2) Planimetric data that is created from orthorectified images. Next, we provide more details about each one and describe

how they were used in creating the training data. Table [1](#) shows the datasets used to train the model and their delivery dates.

3.1.1. High-resolution orthorectified imagery

Raw aerial images inherently contain distortion caused by sensor orientation, systematic sensor and platform-related geometry errors, terrain relief, and curvature of the earth. Such distortions cause feature displacement and scaling errors, which can result in inaccurate direct measurement of distance, angles, areas, and positions, making raw images unsuitable for feature extraction and mapping purposes. Orthorectification removes these distortions and creates accurately georeferenced images with a uniform scale and consistent geometry ([Tucker et al., 2004](#); [Zhou et al., 2005](#)). The orthoimagery tile system also makes it possible to convert between positional coordinates of tiles in x/y/z (where z represents the zoom level) and geographical coordinates.

Aside from orthoimages provided by U.S. Geological Survey (USGS) ([US Geological Survey, 2018](#)), there are some state-wide programs dedicated to producing digital ortho-imagery on different zoom levels, which may offer more recent data. For the purposes of this study, we used orthorectified images provided by Massachusetts ([MassGIS, 2018](#)), Washington, DC ([DC GIS, 2020](#)), and New York ([NYC GIS, 2018](#)) to train the model and pilot test the approach. Tile2Net is designed with the capability of automating the data preparation process. It can take as input, the textual name or geographic coordinates of the bounding box of a given region and download the tiles that fall within the bounding box, for the cities where orthoimagery is available.

To create the training data, using Tile2Net, we obtained 11,000 tiles from Washington, DC, 28,000 tiles from Cambridge, and 8,000 tiles from inside NYC parks. Except for Washington, DC, where the tiles are 512x512 pixels, the rest of the tiles come in 256x256 pixels. We choose zoom level 20 for the 256x256 pixel tiles, which corresponds to the zoom level 19 for 512x512 pixels tiles, where each pixel of the image represents 0.19 meters on the surface of the earth. Our experiments training the model with both sizes showed that the model would perform better using 512x512 pixel input images (an increase of roughly 12% in mIoU). Hence, we used the tool to stitch every four neighboring 256x265 pixel tiles to get 512x512 pixel images, creating a total of 20,000 tiles.

3.1.2. Planimetric GIS data

Planimetric mapping involves extracting features from orthoimagery to create maps that only capture the horizontal distance between the features irrespective of elevation ([Quackenbush, 2004](#)). Since planimetric data are created using orthorectified images, they are suitable for creating annotation masks—a priori known and accurate raster polygons that describe the features we seek to automatically detect using semantic segmentation models. An annotation label is like a reference map that corresponds to a given tile, where each pixel color represents the class to which the

corresponding pixel in the image belongs (Figure 2(b,c,e,d)).

To prepare the annotation labels, Tile2Net primarily relies on available GIS data on sidewalk, crosswalk, and footpath locations in select city environments. In this study, we used the publicly available planimetric data on sidewalks, footpaths, and crosswalks in parts of Cambridge, Washington, DC, and selected sites from inside the parks of New York City. Reliance on existing GIS datasets allows us to prepare large-scale annotation labels using available data rather than manually annotating a huge number of images. Tile2Net takes the bounding box of each tile, finds the corresponding sidewalk, footpath, crosswalk, and road polygons from the available planimetric GIS data, rasterized the GIS polygons into pixel regions, and outputs annotated image tiles with four total classes: sidewalks (including footpaths), crosswalks, roads, and background, representing each class with a distinct color. These annotations are used as ground truth data for training the model.

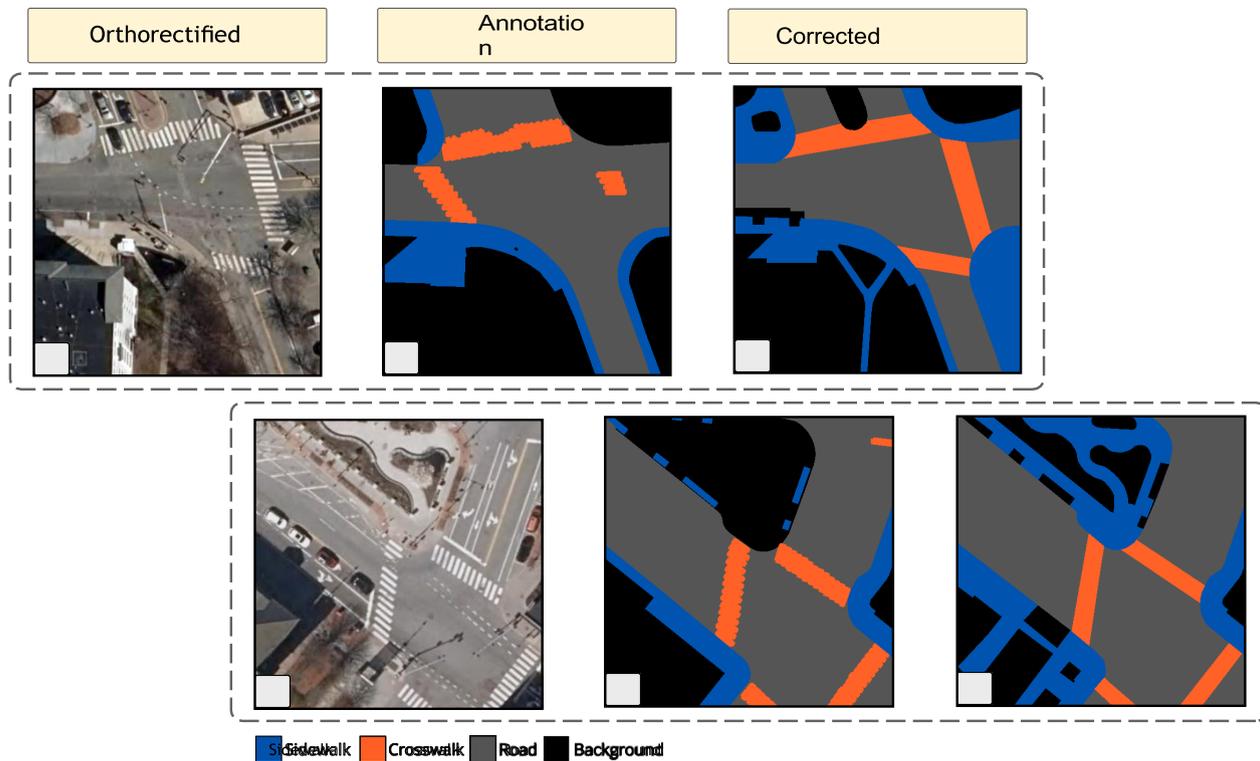


Fig. 2. Examples of the mismatches between the aerial image and the annotation label created from the official data. The manually corrected annotation labels are shown in the last column.

However, challenges remain in creating accurate and consistent training data. The first challenge arises from the lack of consistency between the mapping standards used by different municipalities. Moreover, since GIS data on pedestrian infrastructure does not necessarily reflect the exact conditions that are represented in aerial images, there can be a temporal difference between tiles and GIS data as the creation of GIS data may have relied on a different underlying data source. As illustrated in Figure 2, official GIS data can contain numerous errors. Human adjustment and correction may be necessary to bring ground truth annotation labels into alignment with the image data. To achieve that, our research

team manually corrected 2,500 tiles of the 12,000 training set, 1,620 image tiles out of 4,000 tiles that were used as our validation set, and 1,500 tiles out of 4,000 test set tiles.

3.2. Methods

Tile2Net adopts a multi-scale attention model for detecting pedestrian infrastructure from aerial imagery: sidewalks, cross-walks, stairs, and footpaths that may be separated from streets and roadways (e.g., in parks and open spaces). We combine a semantic segmentation approach with a raster-to-polygon conversion process to generate vector shapefiles of pedestrian infrastructure elements and, separately, a polygon-to-centerline conversion process to produce a topologically interconnected network of pedestrian centerlines. The pipeline has two main parts: 1) Detecting street elements from aerial imagery (Figure 3(a,b)), and 2) Network construction (Figure 3(c,d)). In the following, we describe our methods in detail.

3.2.1. Detecting street elements from aerial imagery

To detect street elements from aerial imagery, Tile2Net allows users to train a pedestrian feature recognition model on custom, locally-specific data. The trained model can then be used to make inference on unlabeled data. For our semantic segmentation task,

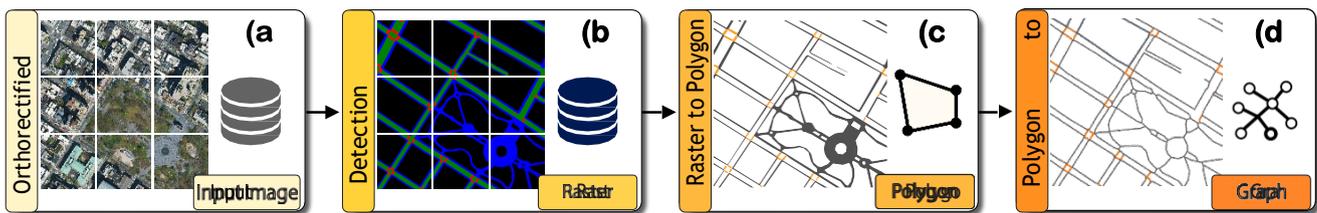


Fig. 3. The proposed network generation pipeline. a) Unlabeled orthorectified tiles are passed through the semantic segmentation model for prediction, b) The model detected sidewalks (blue), crosswalks (red), and roads (green) in the input tiles, c) The sidewalks and crosswalks of the prediction results (raster format) are converted into georeferenced polygons, d) The line representation of the pedestrian network generated from polygons.

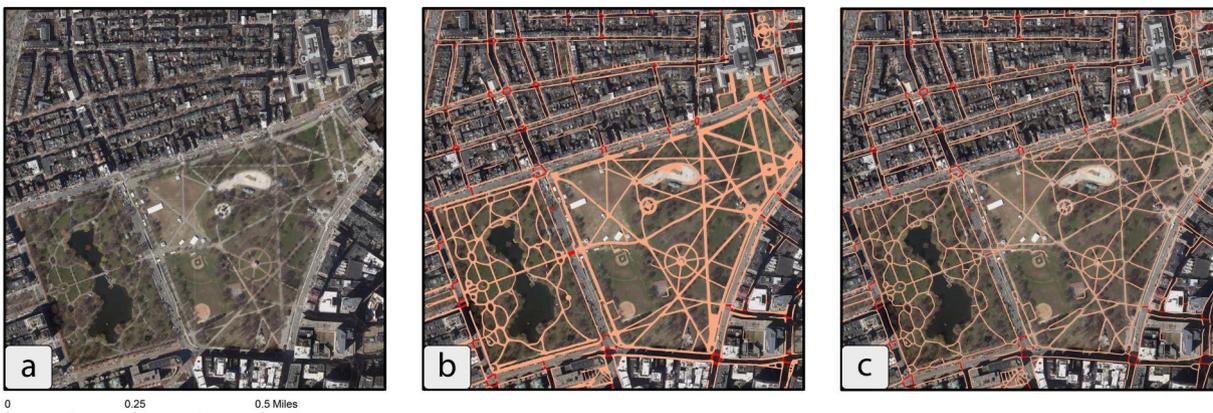


Fig. 4. Boston Commons: a) Aerial image, b) Detected sidewalk and footpath polygons (in orange) and detected crosswalks (in red), c) Fitted sidewalk, crosswalk, and footpath centerlines superimposed on the aerial image.

we adopted the Hierarchical Multi-Scale Attention model (Tao et al., 2020), and used HRNet-W48 (Sun et al., 2019c); Wang et al. (2020) with Object-Contextual Representations (Yuan et al., 2019) as the backbone. The computed representation from HRNet- W48 is fed the OCR module, which computes the weighted aggregation of all the object region representations to augment the representation of each pixel. The augmented representations are the input for the attention model. For the primary loss function, we used Region Mutual Information (RMI) loss (Zhao et al., 2019), which accounts for the relationship between pixels instead of only relying on single pixels to calculate the loss. The semantic segmentation model takes an input image, makes dense predictions inferring labels for each pixel, and outputs a feature map showing whether and where the objects of interest are recognized in the image tile. After the training phase is completed, the unlabeled orthorectified tiles are passed through the trained model, as shown in Figure 3(a), the prediction model outputs a raster image where each pixel has a value corresponding to one of our four classes: sidewalk, crosswalk, road, and background (Figure 3(b)).

3.2.2. Network creation

After the pedestrian features were detected from the input images, Tile2Net takes the model’s prediction in raster format and performs 1) raster to polygon conversion, which can save the output polygons in different formats such as GeoJSON and shapefiles, usable across multiple GIS tools; and 2) polygon to centerline conversion to create the final pedestrian network representation. Figure 4 shows the results of these two steps for Boston Commons, which was not part of the training data. Next, we will detail each of these steps.

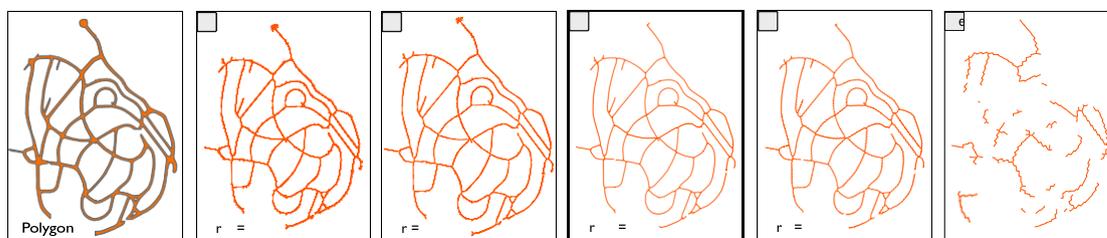


Fig. 5. Impact of different interpolation distances on the resulting centerline created from the input polygon. Small values create extra branches ($r=0.5$ and $r=1$) and large values create zigzaggy ($r=10$) or disjointed lines ($r=20$). The middle centerline, highlighted with a thicker border, is computed using the interpolation distance computed using our heuristic approach.

3.2.3. Raster to polygon conversion

To obtain the vectorized, georeferenced sidewalks, crosswalks, and roads, the detected regions should be converted into polygons. To achieve that, we employed connected-component mapping algorithm (Rosenfeld & Pfaltz, 1966; He et al., 2009), in which the connected cells of the same category in the raster image form regions or *raster polygons*. These regions are then georeferenced, using an affine transformation, which preserves lines and parallelism and maps the raster pixels into the geographic coordinates.

3.2.4. Polygon to centerline conversion

In the third and final step, Tile2Net calculates the centerlines for each polygon. Given that the initially detected regions are pixel-precise, we first simplify the polygons using the Douglas-Peucker algorithm (Douglas & Peucker, 1973). Next, a dense Voronoi diagram is computed to extract the centerlines of the sidewalk polygons (Brandt & Algazi, 1992). The centerline is constructed by linking the internal diagram edges not intersecting with the boundary of the object. The border density parameter, called interpolation distance, densifies the input geometry’s border by placing additional points at that given distance. If the interpolation distance is too small, the output will have many unwanted branches, while large values can lead to zigzaggy and disjointed centerlines (Lewandowicz & Flisek, 2020; Li et al., 2021) as illustrated in Figure 5.

Finding the optimal interpolation distance is beyond the scope of the current work. To approximate a suitable parameter for each polygon, we used a heuristic approach and selected a sample of 400 polygons of varying areas and perimeters. Next, for each polygon, we tested different interpolation distances ranging from 0.5 to 20, using a 0.5 step (i.e., total of 40 different parameters) and chose the line with the highest connectivity and the least number of extra branches which best represents our irregular shapes. For each polygon, we record the interpolation distance that results in the best centerline, as well as the polygon area, perimeter, average width, number of vertices, area to minimum bounding box area ratio, and area to perimeter ratio. We used a polynomial regression model and concluded that the area to perimeter ratio is a significant factor in choosing the interpolation distance. Using the derived coefficient, we compute the interpolation distance of each polygon for centerline creation. In Figure 5 the centerline highlighted with a thicker border is computed using the interpolation distance derived from our heuristic approach ($r=2.38$), having smooth lines which follow the form of the input polygons with very few extra branches compared to smaller values. The coefficient can be finetuned on new datasets. To clean and simplify the centerline, we trim branches shorter than an adjustable threshold, which is generally set to half of the average width of the polygon. Crosswalk centerlines were created by joining the centroids of the smaller edges of the minimum rotated rectangles for each polygon. The crosswalk centerlines are then connected to their nearest sidewalk lines. The resulting vector lines form the basis of our pedestrian network.

Table 2. Availability of the official data across different cities. Training: ◦, Evaluation: ●

City	Data type	Sidewalk	Crosswalk	Footpath
Boston	Polygon	◦	-	-
	Centerline	●	-	●
Cambridge	Polygon	◦	◦	◦
	Centerline	●	●	●
Washington DC	Polygon	◦	◦	◦
	Centerline	-	-	-
Manhattan	Polygon	●	-	◦
	Centerline	-	-	-

Following this step, the network goes through algorithmic post-processing operations to correct its topology: removing false nodes and removing the isolated lines. To close the small gaps, we used R-Tree (Guttman, 1984; Kamel & Faloutsos, 1993) and queried for gaps smaller than certain thresholds. Then we extrapolate both lines to meet in the center of the gap. These operations help refine the detected pedestrian centerlines into a topologically continuous network while avoiding undue corrections and additions where connections between sidewalk segments are lacking.

4. Implementation and Evaluation of Results

This section presents the implementation details and results of using Tile2Net to create city-scale pedestrian networks. We evaluate the performance of our proposed method in two parts. First, we evaluate the results of our semantic segmentation model based on ground truth masks (Section 4.2). Next, we evaluate the accuracy of the constructed maps, both polygons, and centerlines, using the available official data (Section 4.3). Table 2 presents an overview of the available ground truth data used in our evaluation. The polygon data was partly used in our training process, denoted by a plain circle, as explained in Section 3.1.

4.1. Implementation

The model was trained with a batch size of 16, SGD for the optimizer with polynomial learning rate (Liu et al., 2015), momentum 0.9, weight decay $5e^{-4}$, and an initial learning rate of 0.002. The multi-scale setting used 0.5, 1, 1.5, and 2, where a 0.5 scale denotes downsampling by a factor of two, and a scale of 2 denotes upsampling by a factor of 2 (Tao et al., 2020). We used color augmentation, random horizontal flip, random scaling (0.5x–2.0x), and Gaussian blur on the input tiles to augment the training data and improve the generalizability of the model. The crop size was set to 512x512. The image and annotation pairs were split into three parts: 60% of the tiles were used to train the model, 20% of the tiles to validate, and 20% were held-out to test the model in the final stage. To handle the class imbalance, we employed class uniform sampling in the data loader, which chooses equal samples for each class (Zhu et al., 2019) (classes like road and background are present in almost all images, whereas crosswalks can appear less frequently) and the class uniform percentage was set to 0.5. The segmentation model was trained for 310 epochs using 4 NVIDIA RTX8000 GPUs with 48 GB of RAM each.

The trained model is then used to make inference to create the city-scale networks; we obtained the tiles corresponding to the bounding box of Boston, Cambridge, Manhattan, and Washington, DC, on zoom level 20. Since smaller tiles result in more disjointed final shapes, we used 1024x1024 pixel tiles stitched using Tile2Net for the inference part. The hierarchical architecture

Table 3. Evaluation metrics on the test set.

Label	IoU	Precision	Recall
Sidewalk	82.67	0.9	0.92
Road	86.04	0.91	0.94
Crosswalk	75.42	0.86	0.86
Background	93.94	0.97	0.96
mIoU	84.51		

of our semantic segmentation network made it possible to choose different scales during the inference. In our experiments using 512x512, 1024x1024, and 2048x2048 pixel tiles during inference, the best results were achieved using 1024x1024 pixel tiles, where the model had enough context to distinguish between different classes.

Tile2Net uses the Geopandas (Jordahl, 2014) and PyGEOS(Wel, Casper van der, 2019) libraries for performing different spatial operations. The raster to polygon conversion was done using the Rasterio library (Gillies et al., 2013). To create the centerlines, we used the Centerline library (Todic, 2016). Momepy (Fleischmann, 2019) was used to handle network cleanups, such as removing the false nodes.

4.2. Evaluation of the semantic segmentation results

The trained model outputs four classes in total, two of which were directly used to create the pedestrian networks, i.e., sidewalks and crosswalks, one was used to draw local attributes for finetuning the network creation parameters, and the background, which contains all other elements not used in this study. To evaluate the performance of the model, we used the Jaccard index, commonly referred to as the Intersection over Union (IoU) approach, which is a scale-invariant standard evaluation metric for semantic segmentation tasks. Class-specific accuracy measures are also calculated to assess the model's performance in classifying objects of different classes. We did not rely on the more biased pixel-level accuracy since sidewalks and crosswalks comprise a small portion of each image, resulting in a significant class imbalance and an arbitrary high pixel-level accuracy. Table 3 presents the average IoU (mIoU), as well as the class-wise IoU, precision, and recall. The model achieved 84.5% mIoU over all four classes, with sidewalks having 82.7% IoU and crosswalks having 75.42% IoU. The lower accuracy of the crosswalks can be attributed to the more temporal nature of the crosswalks and the fact that they can get faded and, in some cases, not even visible to human eyes.

4.3. Evaluation of the constructed maps

Figure 6 presents the model outputs in Boston and Cambridge, Manhattan, parts of Brooklyn, and Washington, DC. All cities are shown at the same scale for comparison. To evaluate the quality of the output vis-a-vis existing official GIS datasets available in each city. We compared both the detected polygons to corresponding city GIS polygons and the detected network segments to a priori known GIS sidewalk networks in each city. Table 2 summarizes the availability of official data across the four cities, and how they were used for both training and evaluation.

For polygon comparisons, comprehensive and public data for sidewalks, crosswalks, and footpaths, was available in Cambridge, and Washington, DC. In Boston, only sidewalk GIS polygons were available, and Manhattan’s sidewalk data includes the footpath polygons. Table 4 presents class-level evaluation metrics for detected polygons, showing the total count and the percentage of ground-truth polygons (from the cities’ GIS data) that had a matching “detected” polygons spatially intersecting each element. In



Fig. 6. Model results showing detected sidewalk, crosswalk and footpath centerlines in a) Boston and Cambridge, b) Manhattan and parts of Brooklyn, c) Washington, DC. The maps are shown at the same scale for comparison.

Cambridge, 98.9% of all polygons in official GIS data had overlapped with polygons detected by Tile2Net. In Boston, that number was 98.7%, in Washington, DC, 84.4%, and in Manhattan, 98.2%. Since most of the unmatched polygons were small in size, we also report the area-weighted overlap percentages in Table 4.

The last row of Table 4 reports the mean aerial overlap percent between official GIS pedestrian infrastructure polygons and polygons detected by Tile2Net (also weighted by size). This illustrates what percent of the area featured in the official pedestrian polygons overlaps with detected polygons. In Cambridge, 85.9% of the area of official GIS polygons was also covered by detected polygons, 77.9% in Boston, 73.8% in Washington, DC, and 87.5% in Manhattan. Figure 4 illustrates an overlay of detected polygons and network segments in a part of Boston covering the Boston Commons and some blocks around it.

To evaluate the accuracy of the networks extracted from the imagery, we compared them against the publicly available sidewalk, crosswalk, and footpath centerline shapefiles of each city, where available (Table 2). All three types of pedestrian infrastructure centerlines were available in Cambridge. In Boston, the sidewalk centerline dataset includes crosswalks, and in Manhattan, only footpath centerlines were available for comparison. However, in Cambridge and Boston, centerline data dates back to 2011. To investigate the reliability of the centerline data for evaluation, we analyzed the Cambridge data, where more recent polygon data (2018) are available for both sidewalks and crosswalks. We compute the percentage change of the sidewalk and crosswalk centerlines by intersecting the centerlines of each

class with the more recent polygon data of that class. We manually examined all the mismatch cases and removed the false positives. Our analysis showed a 23% change from 2011 to 2018 in crosswalks, while sidewalks change was 9.2%, which shows the relative stability of the fixed features such as sidewalks over time. To perform the

Table 4. Comparison of polygon accuracy results in Cambridge, MA, Boston, MA, New York City, NY, and Washington, DC. The % detected indicates what proportion of polygons in the city dataset had a corresponding detected polygon that overlaps with it. Since many of the undetected polygons are small in area, we also report the % detected weighted by area. The mean area overlap % row reports how close in area (from 0-100%) the detected polygons are to the city dataset, on average (including those city polygons that remained undetected).

Measures	Cambridge, MA	Boston, MA	Washington, DC	New York City, NY
Official data polygon count	17,516	24,604	52,087	4,684
Match (overlaps with detected)	17,327	24,288	43,963	4,602
% Detected	98.92%	98.72%	84.40%	98.25%
% Detected (weighted by area)	99.62%	99.39%	97.48%	99.91%
Mean area overlap % (weighted by area)	85.9%	77.9%	73.8%	87.5%

Table 5. Comparison of network accuracy results in Cambridge, Boston, and Manhattan.

City	Measures	All	Sidewalk	Crosswalk	Footpath
Cambridge	Official element count	12,792	5,007	2,414	5,371
	Match (within 4m of centroid)	10,631	4,735	2,197	3,699
	% Match	83.1%	94.6%	91.0%	68.9%
Boston	Official element count	110,031	54,864	11,223	37,023
	Match (within 4m of centroid)	86,372	49,806	10,051	23,978
	% Match	78.5%	90.8%	89.6%	64.8%
Manhattan	Official element count	-	-	-	6,239
	Match (within 4m of centroid)	-	-	-	5,309
	% Match	-	-	-	85.1%

Table 6. Network accuracy evaluation in Washington, DC.

City	Measure	All
Washington, DC	OSM swlk element count	11,317
	Match (within 4m of centroid)	8,703
	% Match	76.9%

evaluation, we marked the centroid of each network segment from corresponding city datasets and buffered the centroid by four meters (corresponding to 95th percentile sidewalk width in Boston) to check how many ground-truth network segments have a detected segment within a 4-meter distance of their centroid. We relied on centroids rather than full segments or endpoints to avoid matching intersecting line segments around network nodes. The results are reported in Table 5.

In Cambridge, our model matched 83.1% of all segments, with notable heterogeneity among different types of elements. Among sidewalks, 94.6% of centerlines had a corresponding detected segment, among crosswalks, 91.0%, and among footpaths, 68.9%. The lower matching rates among footpaths were expected due to more frequent tree cover over footpaths in parks and green spaces. Network matching in Boston was fairly similar across the same network types (Table 5). 90.8% of all sidewalk segments in city GIS data and 89.6% of all crosswalks were matched by our results. Footpath

matching was again notably lower at 64.8%. In Manhattan, NY, we only had official footpath networks (in parks) available from the city's open data repository. Here, 85.1% of official footpath segments had a corresponding detected segment within a four-meter buffer of their centroid. In Washington, we did not find any official sidewalk centerlines.

For Washington, DC, the comparison could only be performed on more limited data. In Washington, DC, we did not find any official sidewalk centerlines and instead performed the comparison with the available OpenStreetMap sidewalk segments. The results are shown in Table 6. A somewhat lower matching rate with OSM networks was expected and confirmed by the 76.9% match across all categories since OSM sidewalk networks are not official data, following different standards than those prepared by city governments. Though our inspection of results confirmed that both sidewalks and crosswalks again matched more closely than footpaths in parks, no type attributes for such comparison were available in the OSM network.

5. Discussion

While the automated pedestrian infrastructure mapping methodology we explored was able to capture a 90% or higher share of sidewalks and crosswalks featured in city GIS datasets, and a notably lower share of footpaths in parks, green areas, and other public spaces, a few caveats need to be highlighted to interpret these results. First, the sidewalk, crosswalk, and footpath data available

for validation in Cambridge, Boston, Washington, DC, and New York City are not necessarily temporally concurrent with the aerial imagery we used for feature detection. This can lead to expected differences between ground truth and detected features. For instance, in Cambridge, the GIS data we used for validation was last updated to reflect the year 2010 flyover conditions according to the city's metadata, but the aerial image tiles we used as input for feature detection were captured in 2018. The Boston sidewalk and crosswalk centerline data were last updated to reflect 2011 conditions, while our Boston image tiles were captured in 2018. Some pedestrian elements in aerial views are therefore not featured in the cities' GIS data and vice versa, possibly because they were altered before or after the images were captured. As also explained in 4.3, the percentage change between the data created based on the 2010 flyovers and the 2018 polygon data was 9.2% for sidewalks and 23% for crosswalks.

Second, we also noted errors in the cities' GIS datasets, where pedestrian infrastructure elements were missing or different from the Google Street View conditions dated to the same year. Given that the city datasets were likely prepared with a combination of automated feature detection and human correction, some error is expected. While these were the only data available to construct a quasi-official comparison of our results, these caveats are also partially responsible for the differences between detected and official pedestrian network elements.

The model can be improved with training and validation data that are both temporally and geometrically identical to the conditions captured in the image tiles used for feature detection. If city GIS data is versioned by year, the ground

truth GIS data used for training the model could be dated back to an antecedent year that matches the image tiles and additionally humanly corrected to eliminate omissions and errors. This can ensure in future work that the detected polygons best match ground-truth polygons. The relatively lower detection accuracy of footpaths is attributable to several factors. On the one hand, feature detection from aerial imagery is hampered by significantly higher levels of tree cover and other vegetation obstructions over footpaths found in parks, courtyards, and campuses. Second, footpaths also tend to have more complex geometries with winding and non-gridiron layouts, resulting in a much higher and more detailed segment count than on sidewalks and crosswalks. A complex curving footpath in a park made up of several segments may have a matching detected segments on some but not all of its segmented parts.

The polygon to centerline fitting part could also benefit from further improvement. The network geometry improvements can be categorized into three separate areas. First, as also mentioned in Section 3.2.4, the Voronoi skeleton approach ([Brandt & Algazi, 1992](#)) we used for converting polygons to centerlines is very sensitive to the interpolation distance parameter and is not optimized for extracting the centerline of elongated polygons. Moreover, the algorithm fits centerlines into discrete polygons and is not optimized for fitting the centerlines such that the endpoints of one skeleton topologically connect to the skeleton of another polygon, resulting in discontinuities between polygons. We were partly able to adjust this with automated post-processing routines, but further refinements would be desirable to output continuous centerline networks. There is an extensive body of literature on various skeletonization algorithms ([Saha et al., 2016](#)), with some focusing solely on creating the centerlines of the elongated polygons ([Lewandowicz & Flisek, 2020](#); [Hauert & Sester, 2008](#)). However, finding the optimal interpolation distance value is beyond the scope of the current research, but as a future direction, we are planning to work on developing algorithms tailored for creating the centerlines of the pedestrian infrastructure.

Second, the resulting network segments are currently not optimized to form singular nodes or endpoints at intersections. Some detected line segments often converge near street corners, forming redundant intersections. This can be addressed in future work



Fig. 7. Mapping obstructed pedestrian facilities in different cities: a) Cambridge, MA. - sidewalks are mapped as continuous despite the heavy shadow, b) Manhattan - sidewalks and crosswalks obstructed by tree foliage and shadow are detected and mapped, c) Washington, DC. - crosswalks covered by vegetation are correctly detected and mapped.

by improving the algorithmic procedures to join endpoints into a single overlapping endpoint located at the geometric centroid of the multiple nodes found within a given distance. This threshold distance would ideally be determined contextually, depending on the street widths in each area.

Third, though most computer vision solutions are fundamentally unable to detect sidewalk spatial elements where visual obstructions exist, lower detection accuracy in tree-covered regions was expected. Nevertheless, since our model was trained on planimetric GIS data, where pedestrian infrastructure elements were present regardless of obstructions, our model performed surprisingly well in occluded areas. Figure 7 shows examples of the created network in sample areas of Cambridge, MA, Manhattan, and Washington, DC. In each case, the detection model correctly classified sidewalks and crosswalks, creating a continuous network despite the heavy shadow concentration on sidewalks (a), shadow and vegetation obstructing sidewalks, and crosswalks (b), and vegetation obstructing curbs and crosswalks (c).

Future work could further examine ways to fill in missing gaps in the resulting networks using probabilistic techniques. For instance, if additional detection classes, such as “tree” or “shadow,” are added to the semantic segmentation procedure, then these could be used in the network correction procedures to automatically connect gaps under trees and shadows. Yet, any automated correction for missing network links faces the hazard of erroneously creating pedestrian segments where they are not visible and hence may not exist. When networks are prepared for vulnerable street users (e.g., wheelchair users, mobility-impaired users, etc.), for whom network accuracy is critical, automated network correction procedures are likely futile, and improvements can only be made from ground surveys or Google Street View images.

Moreover, in the future, we plan to add additional classes such as driveways, curbs, stairs, and separating public and private footpaths to our detection model. The model is presently limited to detecting only sidewalk and crosswalk elements, which may not be appropriate in cities, where considerable parts of the pedestrian infrastructure are invisible from aerial imagery—overground foot-bridges, under-ground pedestrian crossings, covered pathways, and public pathways inside buildings. Additional efforts will be needed to combine aerial sidewalk and crosswalk detection with invisible indoor elements in the contexts where the latter are significant (e.g., Hong Kong, Singapore, Minneapolis, and Montreal, to name a few).

The lack of standardized training data across different cities also posed challenges in our work. For instance, different cities have captured and mapped sidewalks with varying levels of detail. In Washington, DC, unpaved planter areas were excluded from sidewalk polygons, whereas in Boston and NYC, they were treated as parts of sidewalks. The same

problem exists for curb extensions, medians, driveways, and curb-cuts. Moreover, the edges of the road and sidewalk polygons overlap and, in multiple instances, in GIS ground truth data. Crosswalk representation presented another source of variation among different cities. While they were mapped as part of sidewalk inventory data in Washington DC, in Boston, they were only presented in the sidewalk centerline dataset; hence, with no information available about their size and shape. In Cambridge, they were part of both the sidewalk centerline data and a separate dataset on road markings, where pedestrian zebras were represented as polygons.

Beyond heterogeneity in training data, the physical features, materials, and dimensions of sidewalks and crosswalks can also vary widely between cities. We observed multiple instances of faded crosswalks that made it challenging for semantic segmentation to detect. We also noted differences in both sidewalk materials and crosswalk materials across cities. Whereas very few crosswalks are paved in brick in NYC, they are common in Cambridge and Boston. Had we trained the algorithm on NYC, it could have resulted in systemic underdetection in Boston and Cambridge. Such differences are bound to be much bigger between international cities, where construction materials, crosswalk marking conventions, and infrastructure dimensions vary more considerably than between the three East Coast cities included in our study. When extending the model to new contexts, especially outside the U.S., it is crucial to train the model specifically for each region.

6. Conclusion

In this paper, we presented Tile2Net, a solution that is able to create accurate pedestrian networks from aerial imagery in an end-to-end fashion. We pilot tested the approach in New York City, Washington, DC, Boston, and Cambridge, with varying street network geometries, building shadow densities, and tree covers and reported on the quality and accuracy of the approach. The resulting networks are created using the most recent orthorectified images, hence, more closely reflect the current urban form and pedestrian infrastructure. While the results are promising, we emphasize the need for expanding the work to additional cities and regions globally, where locally specific training may be needed to achieve high detection accuracy. However, the retraining for new regions can be done at much lower cost since our pre-trained model can be used for transfer-learning and domain adaptations with significantly less data compared to the initial training.

The resulting sidewalk and crosswalk dataset can be further combined with attribute information that may be useful for various pedestrian analytics. For instance, as shown by [Hosseini et al. \(2021\)](#), the captured sidewalk and crosswalk polygons can be used to measure the width of each sidewalk segment. Furthermore, using results by [Hosseini et al. \(2022\)](#), who developed a method for detecting sidewalk surface materials from Google Street View imagery, our sidewalk segments can be joined with corresponding geotagged material information, instead of having to aggregate

the data from left and right sidewalks into road centerlines. Such measurable attributes can impact the quality and attractiveness of sidewalks, and have been shown to affect pedestrian route choice and perceived route length (Erath et al., 2015; Sevtsuk et al., 2021; Basu et al., 2022).

Having pedestrian paths represented as continuous, topologically connected network datasets could open up new (and overdue) efforts for pedestrian routing, flow analysis, and potential location-based or delivery services. Transit-first policies, walkable-streets

initiatives, step-free access for public transport, and vision zero goals represent but few planning and policy areas which could benefit from citywide sidewalk and crosswalk datasets.

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INFORMAL MIGRANT SETTLEMENTS BETWEEN IRREGULAR CONDITION AND RIGHT TO THE CITY. NEW CHALLENGES FOR PLANNING IN CROSS-BORDER EURO-MEDITERRANEAN CONTEXTS

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1. Introduction

The phenomenon of migratory flows, which has been growing exponentially in Europe for more than two decades and is recently reaching its peak also as an effect of the political and economic instability in North-Africa and the Middle-East, represents a major element of change in the European social framework.

Over the last fifty years, many European regions in the Mediterranean area, historically considered areas of origin of international migratory flows, have been transformed into places of reception. Underlying this mobility is the demand, by a variable and globalized economy, for 'easy' labour, mostly made up of new immigrants (Ambrosini and Abbatecola, 2004), instrumental to that particular economic system (Berlan, 2008; Keskinen, Norocel and Jorgensen, 2016).

Over the last ten years, the most significant percentage changes in Europe's resident foreign population have been recorded mainly in the Southern regions (especially in Italy, Greece and Spain), where (see Tab.1), despite the economic crisis, substantial increases in the number of resident foreign citizens have been recorded (Eurostat, 2021).

Nation	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Italy	3,648,128	3,879,224	4,052,081	4,387,721	4,922,085	5,014,437	5,026,153	5,047,028	5,144,440	4,996,158	5,039,637	5,171,894
Greece	931,424	934,395	921,447	886,450	854,998	821,969	798,357	810,034	816,059	831,692	906,345	921,485
Spain	5,402,575	5,312,439	5,236,030	5,072,680	6,477,059	4,454,354	4,417,517	4,419,621	4,562,962	4,840,207	5,226,906	5,360,271

Tab. 1/ Number of foreigners habitually resident. Source: Eurostat 2021 [online]: <https://ec.europa.eu/eurostat/databrowser/view/tps00157/default/table?lang=en>

2. Migration Flows in Italy and Scope of the Study

According to ISTAT (Census of Population and Housing, 2001, 2011, 2021), Italy has experienced a significant increase in the presence of migrants in the last 15 years, with the foreign resident population more than tripling (1,334,889 migrants in 2001, 5,171,894 in 2021). To these numbers are added those related to irregular presences, which are around 670,000 (ISPI, 2018). In particular, the regions of Northern Italy host 58.5% of resident foreigners, followed by the regions of the Centre with 26.5%, the South with 10.5%, and finally the islands with 4.5%. Despite these percentage values, the most significant increase in presences (+235% from 2001 to 2021) is precisely recorded in the Southern regions (Eurostat, 2021).

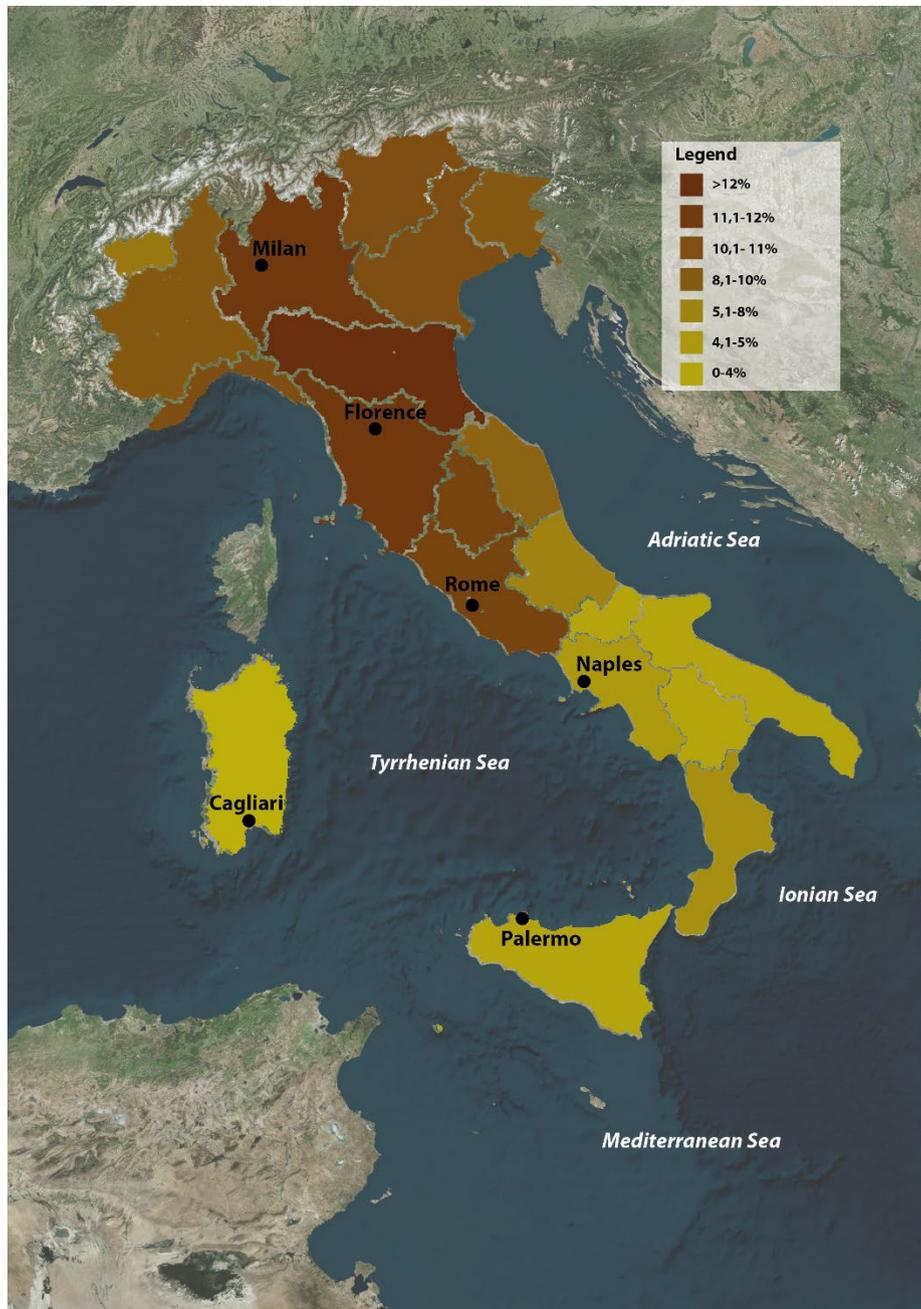


Figure 1/ Thematic map of the foreigners' incidence in the regions.
Source: Istat.

With respect to the management of migratory flows and that of actual presences, with particular reference to the issue of refugees, we have also witnessed in recent years the rise of a political climate that is openly hostile to migrants, through increasingly restrictive entry and flow management policies; among these: the 2018 'Security Decrees' ('Decreti Sicurezza') that abolished 'humanitarian protection' and expelled over 100,000 people; the drastic reduction in recognition of protection applications submitted in Italy, from 32.2% in 2018 to just 19.7% in 2019 (Aversa, 2021).

Analyzing the spatial dimension of the phenomenon, which shows the inadequacy and insufficiency of the reception system, the increase in eviction phenomena, as well as the effects of post-Covid exclusion and marginalization whose territorial scope does not yet appear entirely clear (Prencipe and Sanfilippo, 2021), the constant growth of migration flows has in fact generated a significant increase in the phenomenon of informal migrant settlements outside cities.

In this sense, the recent results of investigations conducted in Italy in the planning's field on the territorial distribution of the foreign population in extra-urban contexts show how the traditional focus on urban contexts has left a relevant field of enquiry uncovered (Ponzo, 2017). With reference to the international literature, contributions that focus on the extra-urban field of investigation include those by Kofman (1995), Osti (2010), Kasimis et al. (2010).

The issue of informality on the Italian national territory has been extensively studied especially in the contexts of Northern Italy and the Centre (Cancellieri and Ostanel, 2015; Chiodelli et al., 2020; Esposito and Chiodelli, 2020). Moreover, a number of studies have been conducted, which have addressed the same issues by linking them to the right to housing with particular reference to rural contexts (Todaro, 2016; 2017, 2020; Lo Piccolo and Todaro, 2019, 2022; MediciSenzaFrontiere, 2018; Cesareo, 2021).

In recent years, again with reference to the Italian context, in conjunction with the growth of migration flows, there has been a significant settlement distribution of migrant presences with evident phenomena of territorial dispersion (Balbo, 2015).

With respect to the described investigation's field, suburban contexts therefore generally remain scarcely analyzed with respect to migratory phenomena. In these cases, the territorial diffusion of foreign presences appears mainly connected to the seasonal dimension of agricultural production, particularly in the regions of Southern Italy, where this presence increasingly tends to convert from temporary into a permanent and stable condition.

In fact, INPS (National Social Security Institute, 2018) data show that the regions with the highest number of migrant agricultural workers are mostly Apulia (16.8%), Sicily (14.1%) and Calabria (9.9%) (Macri, 2019).

The issue does not only concern the housing's dimension, but increasingly also access to services and health care and, more generally, the recognition of the most basic civil and citizenship rights (Netto, 2011). It is therefore clear that the extra-urban dimension of the migration phenomenon is not adequately investigated in relation to the different socio-spatial issues that it raises compared to the urban one. And equally clear is the need to reformulate the interpretative frameworks of the phenomenon in a context that is not urban.

In relation to these aspects, this line of research intends to demonstrate how the presence of migrants is not exclusively an urban fact, but increasingly takes on an extra-urban territorial dimension, generally less known and, therefore, scarcely investigated (Balbo, 2015).

Of course, the physical conditions of suburban settlements present different characteristics to those of urban contexts: deterioration of the character of the 'urban' (with the loss of the rights it brings with it), physical and relational distance from local communities with the aggravating increase in the phenomena of labour exploitation of migrants; permanence of the informal settlement model that tends to persist over time, albeit with some variations, regardless of the replacement of immigrant groups.

3. Sicily: a case study

The shift from the urban to the extra-urban dimension of the migration phenomenon thus seems to evoke a transition from a situation of 'hypervisibility' (Cancellieri and Ostanel, 2015) to one of 'invisibility'.

Assuming the Sicilian regional context (a cross-border region that intercepts intercontinental migratory flows) as a case study, as of 1 January 2021 there were 186,195 foreign citizens resident in Sicily (98,211 males and 87,984 females), representing 3% of the total foreign population resident in Italy, placing Sicily in 8th place in the ranking of Italian regions (ISTAT, 2021).

The presence of foreign population in Sicily shows that among the first nationalities are Romanian (24,78%), Tunisian (11,49%) and Moroccan (8,47%), followed by Sri Lanka (6,88%) Albania (5,56%) and Bangladesh (5,14%).

Province	Romania	Tunisia	Marocco	Sri Lanka	Albania	Bangladesh
Agrigento	6,356	932	1,795	17	269	259
Caltanissetta	3,058	331	1,127	8	92	116
Catania	8,732	1,063	1,489	3,832	2,114	1,486
Enna	1,380	156	392	7	38	47
Messina	5,789	794	3,421	4,154	1,398	586

Palermo	5,787	1,593	1,976	3,261	657	5,928
Ragusa	7,359	8,720	1,678	19	5,227	270
Syracuse	2,855	1,304	2,285	1,495	421	273
Trapani	4,588	6,579	1,607	16	137	607
Total	46,141	21,402	15,770	12,809	10,353	9,572

Tab.2 / Foreign population resident in the Sicilian provinces as of 1 January 2021 - first citizenships. Source: ISTAT, resident foreigners as of 1 January 2021.

From an initial observation it is evident how, from the point of view of territorial distribution, the phenomenon of informal settlements is the result of the overlap between the routes of the main migratory flows along the international South-North axis and the areas of high agricultural production.

In Sicily migrant labour appears, in fact, to be mainly engaged in agricultural production (with over 16%), followed by the services and industry sector (with about 10%), and trade (with about 8%) (Ministry of Labour, 2020).

In areas with a strong agricultural vocation, the most commonly practised 'informal housing solutions' are those represented by the squatting of abandoned ruins in the countryside or improvised encampments. To these are added the reception structures in tent-camps organized by institutions or voluntary associations in correspondence with the areas affected by the main seasonal productions.

Getting to the heart of the matter, it is evident that the presence of migrants is mainly concentrated in areas classified as 'intensive agriculture' by the Sixth Census of Agriculture (2010). In the regional territory, agricultural areas (Utilised Agricultural Area, UAA) are mainly dedicated to the cultivation of durum wheat (20.5%), olives for oil (9.9%) and vines (8.2%). While vine cultivation prevails in Western Sicily (Trapani with 45%), in Eastern Sicily citrus fruit cultivation prevails (with Syracuse with 19.1% and Catania with 17.9%). Durum wheat then emerges, reaching around 25% of the SUA in Palermo, Agrigento, Enna, Catania and Caltanissetta, where it stands at 40%. With respect to the agricultural sector, it is noted that in Ragusa and Syracuse migrant labour is mainly employed in the greenhouse sector, while in Trapani, it is mainly concentrated in wine production (ISTAT, 2010; Three-year plan to combat labour exploitation in agriculture and caporalato 2020 - 2022).

The logic behind these locational choices of the main migrant settlements also takes into account their proximity to those urban nuclei (often of small-medium size) that allow migrants, with a certain ease in terms of distances to be covered (essentially on foot or by bicycle), to access the main urban services.

Therefore, from an initial survey it is possible to consider how the key indicators for studying the location choices of informal migrant settlements in Sicily are: the main routes of supra-local migratory flows, areas of intensive agricultural production and proximity to medium-sized urban nuclei.

3.1. The Castelvetro's 'ghetto'

The so-called Castelvetro's 'ghetto' is actually an informal settlement that, although it is located in the municipal territory of Castelvetro (a municipality of about 23,000 inhabitants in the province of Trapani), is about 4 km from the town of Campobello di Mazara (another municipality of about 10,000 inhabitants). The territorial context, extremely marginal with respect to the main economic-commercial flows of the Island, is characterized by extensive monoculture agricultural production of olives, with a high fragmentation of holdings (about 5,000), 90% of which have a surface area of about 2 hectares. (ISTAT, 2010). The area is also located along one of the main routes that intercepts international migratory flows and moves from the Southern coast of Sicily towards Palermo, the Island's capital.

The main local economies are concentrated in the hands of processing companies and large-scale commercial distribution, with a downward effect on production costs, including the economic recognition of migrant labour (Lo Cascio, 2019), until 2000 Tunisian, then mainly Senegalese. Large-scale production therefore periodically attracts significant flows of migrant workers who are nevertheless exploited and underpaid.

The proximity to the towns of Campobello di Mazara (1 km) and Castelvetro (3 km) allows migrants to take advantage of the main services available in the nearby towns.

The Castelvetro's 'ghetto' originated in Erbe Bianche's zone as a spontaneous camp, probably between 2008 and 2009 (Lo Cascio, 2019) in which around 700 seasonal migrant workers would gather every year from the beginning of October for the olive harvest. Due to protests from local residents and inadequate sanitary conditions, in 2018 the settlement was abandoned by the migrants (to avoid being reported), before it was cleared by order of the Prefecture of Trapani. The migrants moved to the former 'Calcestruzzi Selinunte' factory, not far from the previous settlement, where around 400 migrants were concentrated (becoming around 700 in the following years) in inhuman housing conditions.



Figure 2 | View of the 'Ghetto' at Ex 'Cementificio Selinunte', Castelvetrano (Trapani province).

Source: <https://www.castelvetranoselinunte.it/video-dentro-il-ghetto-di-migranti-a-castelvetrano/103767/>.

In October 2021, a fire, which broke out accidentally, destroyed the camp, also causing the death of a man of sub-Saharan origin. The episode generated strong protests by the migrants, who were tired of living in desperate conditions, which were followed by the response of the Prefecture of Trapani through a 'relocation' plan for the displaced migrants, who were housed in mobile structures and in a tensile structure provided by the Sicilian Red Cross, located in the former oil mill 'Fontane d'oro', a property confiscated from the mafia.



Figure 3 | View of the 'Ghetto' at Ex 'Cementificio Selinunte' Castelvetro (Trapani province) after the fire. Source: <https://www.tp24.it/2021/10/13/inchieste/reportage-campobello-nbsp/169426>.

In particular, a SPRAR (Protection System for Asylum Seekers and Refugees), which has now become SIPROIMI (Protection System for Persons with International Protection and Unaccompanied Foreign Minors), was set up in what used to be the factory offices¹. In the large car park of the former factory, on one side are housing modules provided by the Sicilian Region that can accommodate a little more than 100 migrants; on the other side is a shantytown, housing those who cannot fit inside the housing modules.

¹ SIPROIMI consists of the network of local authorities that use the National Fund for Asylum Policies and Services to implement integrated reception projects. The change from SPRAR to SIPROIMI was introduced by the 'Security Decree' which, by remodeling SPRAR, excludes that SIPROIMI can also benefit asylum seekers waiting for their application for international protection to be decided. The SPRAR/SIPROIMI currently accommodates about ten refugees.



Figure 4 | Satellite image former Oleificio 'Fontane d'Oro' to which migrants were moved after the fire which occurred in October 202. Source: Google earth.

The outcome of this story is an ambiguous and opaque institutional policy that, on the one hand, moves in the direction of restoring the conditions of legality (through squatters removing, construction of camps, etc.), according to the strict rules of 'reception' (residency permit and employment contract), while on the other hand this policy turns a blind eye to the conditions of illegality (probably incentivizing them at certain times), if they are maintained in full invisibility. The spatial result is the multiplication of camps (institutional and informal) that alternate or coexist, depending on the institutional balances achieved and the migrants' conditions of regularity/irregularity. Within the institutional and political debate migrants have no voice, remaining in the widest invisibility.

4. Conclusions

Informal settlements are configured as insurgent forms of claiming certain rights, first and foremost that to housing, while at the same time highlighting the limits of the institutional reception system. As demands for 'normal life' by subjects who are institutionally excluded from it, these informal housing forms take the shape of implicit forms of citizenship even beyond the awareness of their protagonists themselves.

On the other hand, the mismatch between collective identity, privileges of political belonging, rights and social claims, is also the result of precise political choices made by institutional actors; these concern both the norms defining the status of refugee and/or asylum seeker and, more generally, those attributable to the condition of 'migrant' (Benhabib, 2006). According to this interpretative vision, migrants' informal settlements are configured as realities hovering between the legal and the illegal, between inclusion and exclusion, whose 'extraordinary' management is removed from the ordinary institutions and handed over to those in charge of public security (Tarsi and Vecchiarelli, 2020).

Investigating what are the localization logics of informal migrant settlements is therefore the first step towards a more general understanding of the forms of housing discomfort/emergency of the foreign population in the Southern Italian countryside, also in relation to the way in which the absence of the 'public' is manifested in the different settlement experiences. In this sense, the emergency (or rather 'exceptional') dimension of public intervention paradoxically appears to move in the direction of choices that clearly show the character of differentiation and exclusion, rather than that of integration and inclusion. On the socio-spatial level, such policies trigger phenomena of 'institutional production of housing marginality' (Lo Cascio and Piro, 2018) that move in the opposite direction to practices of inclusion. Paraphrasing in an inverse sense what we have argued elsewhere (Lo Piccolo and Todaro, 2022), it is necessary for the 'exception' to become

the 'rule' once again and for the extraordinary dimension of public intervention (of the State) to nourish a common local policy of real reception that cannot take on the character of the 'field'.

Finally, the informal settlement phenomena of migrants represent practices of socio-spatial innovation and dynamism (coming from the informal sphere, such as self-construction) that are configured as 'acts of citizenship' in claiming the right to housing and the right to the city in contexts that traditionally tend to deny them (Tarsi and Vecchiarelli, 2020; Vecchiarelli, 2021).

With respect to this scenario, the role of planning becomes crucial in defining intervention strategies that recognize (and then understand whether it is also possible to legitimize) some of these conditions with the twofold aim of giving dignity to the housing and working dimension of migrants and at the same time to act on the territory through interventions of recovery and redevelopment of abandoned building heritage, reused for social purposes, redefining the central role of the public subject.

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PLACE IDENTITIES OF JAPANESE SOCIAL HOUSING (*DANCHI*):

THE ROLE OF URBAN DESIGN IN CREATING A “PLACE”

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1. Introduction

1.1. Background

In the backdrop of post-war economic growth and rapid urbanisation in Japan (late 1950s to early 1970s), many large-scale developments took place in suburban areas to counteract the critical situation of housing shortages. These social housings, referred to as “*danchi*,” which were suburban residential community with multi-family apartment blocks became a defining characteristic of the period. For its efficiency, *danchi* were generally developed into uniform homogenised forms. In reference to Relph's (1976) concept, lacking authentic and individual sense of identities, a typical *danchi* is more likely to represent *placelessness* than *place*.

Despite once perceived as an iconic lifestyle of the middle-class, welcoming working-age families, today its context is commonly associated with social issues (Nordin & Nakamura, 2018). Nearly half a century after the peak of developments, many *danchi* communities are faced with issues of weakened social structure such as, ageing population, depopulation, weakened neighbourhood relationships (Gouda & Okamoto, 2012), and deteriorating or dated physical issues such as, absence of elevators, dated or degraded basic infrastructure (Yoshikawa, 2010).

1.2. Theoretical Review

1.2.1. Place and Placelessness

Central to the entire discipline of *place*, a concept discussed extensively in various fields, is discussed in Relph's (1976) influential book “Place and Placelessness.” While there is no one universal definition, it is widely accepted that a *place* is a significant aspect of human experience (Tuan, 1979; Relph, 1976; Cresswell, 2015; Dovey, 2016). As Relph states, the identities of place are composed of three interconnected elements: (1) physical features or appearance; (2) observable activities and functions; (3) meanings or symbols (Fig. 1).

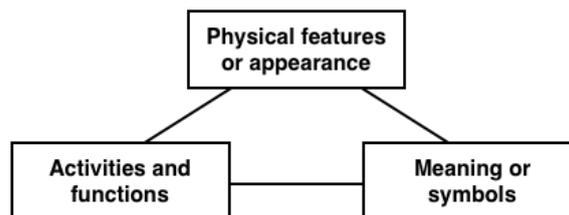


Fig. 1: Identities of place

Source: Author

1.2.2. Placemaking, Sense of Place and Place Attachment

Relph (1976) also writes about placemaking as the process of how places with distinctive character forms. As Sepe & Pitt (2014) summarises Relph’s statement, authentic places are “generated unselfconsciously and without theoretical pretence by individuals working alone or in small community groups over long spans of time” (p. 222).

As Relph (1976) describes, “‘sense of place’ is the ability to recognise different places and different identities of a place” (p.63). Also, an “authentic sense of place is above all that of being inside and belonging to your place both as an individual and as a member of a community” (p. 65), which one knows instinctively. This is an important basis of the individuals’ or community’s identity.

Similar discussions on emotional tie to a place often uses the term *place attachment*. Place attachment has been a widely discussed topic and there are a variety of definitions suggested (e.g., Altman & Low, 1992; Hidalgo & Hernández, 2001). This paper will adopt the definition provided by Low (1992) who states, “*Place attachment* is the symbolic relationship formed by people giving culturally shared emotional/affective meanings to a particular space or piece of land that provides the basis for the individual’s and group’s understanding of and relation to the environment” (p. 165).

1.2.3. Hyoushutsu and Afuredashi

*Hyoushutsu*¹ (=expression) and *afuredashi*² (=overflow) are activities that could be interpreted as a mark indicating a territory. This idea has been especially popular in architectural planning research, as although *territory* can often be more of a psychological recognition of space, activities such as *hyoushutsu* and *afuredashi* allow this recognition to become visible and tangible feature of space. One representative definition adopted for this study can be traced back to studies by Suzuki & Sugiyama (1978) and Kobayashi & Suzuki (1981), later summarised by Suzuki (1984) (Table 1).

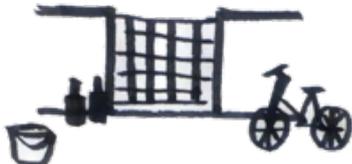
Concept	<i>afuredashi</i> [あふれ出し]	<i>hyoushutsu</i> [表出]
Meaning	overflow	expression
Definition	Natural, involuntary expansion of self to the exterior due to reasons such as lack of storage space	Deliberate expression of self to the exterior, where the resident intends to show their originality and decorate
Diagram		
Examples	Parked bikes Garbage bins Bundled cardboard boxes	Flowerpots on doorsteps Decorative doorplates Seasonal ornaments

Table 1: Concept definitions
Source: Author

1.3. Aim of Study

The central question in this research asks what factors create a thriving *danchi* and the role of urban design in mass-produced housing developments that encourage a *place* to evolve. Mass-produced housing developments are a common

¹ Japanese: 表出

² Japanese: あふれ出し

and important, yet there remains a multitude of aspects undiscovered to fully understand how to create an environment that can respond to the diverse needs of people.

This study has focused on *danchi*, as one of the major types of mass-produced housing developments in Japan along with its typical *placeless* representation. Analysing the relationship between physical form and social structure, this study aims to understand what factors create successful *danchi* environments and how we can further approach solutions to the issues evolving them.

1.4. Approach and Methodology

1.4.1. Research Approach

While a typical *danchi* will more likely associate its uniform and homogenic features as *placelessness*, Kanazawa Seaside Town (Kanazawa SST) differentiates itself from the *placeless* nature. Its unconventional design approaches and evidence of strong place attachment by residents, even after several decades since its development, exhibits *placeness*. For these reasons, Kanazawa SST was selected. Key research questions are as follows:

- 1) What creates this *danchi* to be a *place*?
- 2) What physical and social aspects enable this *danchi* to thrive after 40 years?
- 3) What is the role of urban design in a mass-produced housing development?

1.4.2. Conducted Studies

A combination of qualitative approaches, including a questionnaire survey to residents, interviews to residents, community leaders, architect and observations of residents' activities were adopted for the case study to analyse the identities of place (see also Section 1.2.1) and its interrelation. The studies were carried out in three phases. All interviews were semi-structured and in-depth interviews (1-2h), conducted in the *danchi* in person (except two: one interview with the architect conducted elsewhere and one with a resident online using video-chatting software, Zoom).

Firstly, in addition to review of precedent studies, preliminary research was conducted through field observations and interviews to current and former residents. Following initial investigations, further area-specific fieldwork (observations, interviews, questionnaire survey) was organised (Table 2). The questionnaire has referred to a previous survey conducted by Tomioka Namiki Investigation Team (*Ton-nan-tai*) (2003) to make comparisons. Finally, study on physical aspects (development process and design visions/concepts) was done through review of literature and an interview with Ben Nakamura, who was one of the main architects involved in the planning phases. Table 3 shows an overview of conducted interviews.

Note	Medium	Responses
Distributed		110
Collected response		58
	Online form submission	9
	Paper submission	49
Response rate		53%

Table 2: Overview of conducted survey
Source: Author

Interviewee	Number of people
Residents Total	15
A: Long-term residents (20+ years, same residence)	12

B: Long-term resident (20+ years, changed residence)	1
C: Short-term resident (5 years or less)	1
D: Former resident	1
Architect	1
Total	16

Table 3: Overview of interviews
Source: Author

2. Kanazawa SST: Development and Urban Design Concepts

Kanazawa SST is located in the southwest area of Yokohama, the second-largest city in Japan after Tokyo. It was developed as one of Yokohama City's urban development projects in late 1960s (Six Flagship Urban Development Project), which aimed to provide necessary infrastructure, housing and services to promote post-war reconstruction, as well as to combat additional difficulties faced in the economic growth period (City of Yokohama, 2012). This development on the reclaimed land is said to be one of the first housing development in Japan which explicitly stated its focus on "urban design" (Tamura, 1981).

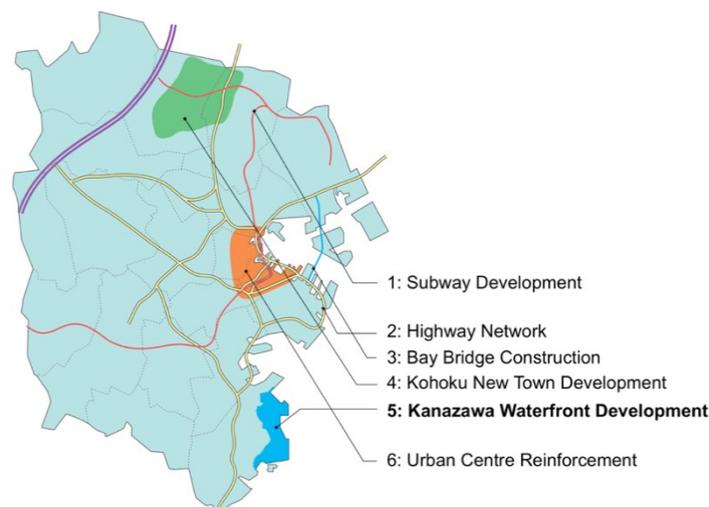


Fig. 2: Yokohama city and Six Flagship Urban Development Projects
Source: City of Yokohama (2012), labels modified by author

2.1. Key Design Concepts

Architect Fumihiko Maki (of Maki and Associates) was appointed master architect and proposed the masterplan, stating that the core philosophy behind the design concepts was to establish an atmosphere of town where collective memory of *territory* and *scene* was shared amongst residents (Maki & Hayashi, 1981).

Territory does not simply imply jurisdiction but more instinctive, of one's psychological recognition of knowing where their *home* started, coming back from outside, or where they could feel *home* (Maki & Hayashi, 1981). *Scene* is also key to creating the collective memory of a town. Realising some elements of Japanese cities, where greenery and wooded area were woven into environment, was deemed important especially on the reclaimed land that would otherwise remain a bleak and desolate environment (Maki & Hayashi, 1981). *Hyouso*³ (=surface, outer layer) is another key element in

³ Japanese: 表層

extension scene (Maki & Hayashi, 1981). On planning terms, *hyousou* was regarded as the semi-public space where the public and private life of residents meet.

Planning strategies to realise these design concepts focused on creating a residential area rich in nature, structure of town by adopting grid pattern and outlining street hierarchy, and most importantly, *kouji*⁴ community, where the designers intended for street spaces to become the core of the community⁵ (Nagashima 1981). While utilising modern planning methods and building technology, there was continuous emphasis on embedding Japanese-ness (both visually and of community structure) in the *danchi*.

3. Kanazawa Seaside Town: Transformation and Current Situation

Residents, generally with similar socio-economic backgrounds but from all over Japan, moved in with high hopes for their dream suburban lifestyle. Soon after the completion, *jichikai* (self-governing association, smallest and most fundamental community group for residents) worked to establish their community structure. Community activities (e.g, sports matches, festivals, cultural education programs) have been organised by *jichikai* members, which have now become rooted in Kanazawa SST.

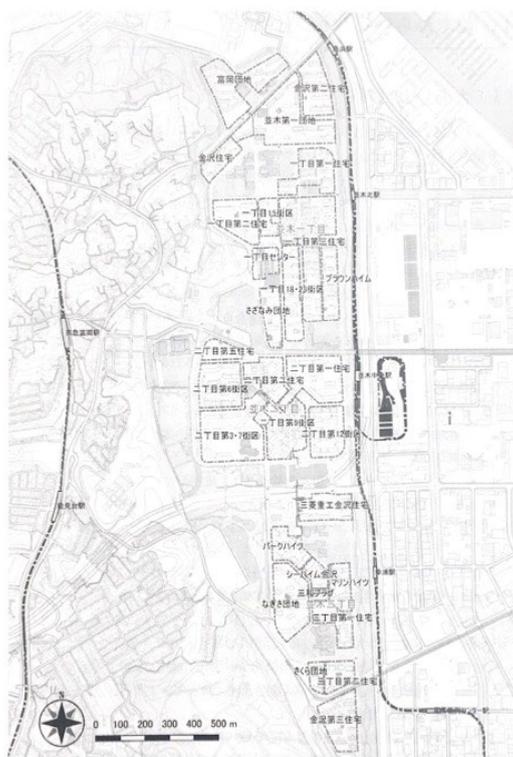


Fig. 3: Map of Kanazawa SST and *jichikai* jurisdictions
Source: Korekara no Namiki wo tsukuru kai⁶ (2018)

⁴ Japanese: 小路

⁵ Noted from interview with Ben Nakamura (November 6th, 2021)

⁶ Japanese: これからの並木を創る会

Like most *danchi* in Japan, ageing population and depopulation is critical in Kanazawa SST today. However, contrary to common beliefs of declining *danchi* communities, previous studies have found Kanazawa SST to represent strong sense of place, many residents expressing high evaluation of their living environment (Ton-nan-tai, 2003).

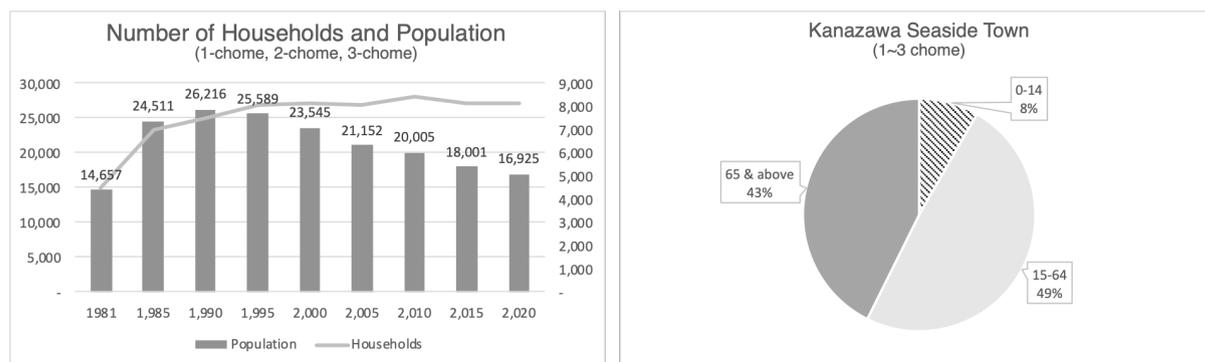


Fig. 4a: Changes in number of households and population
 Fig. 4b: Population percentage by age group
 Source: Author, based on data of City of Yokohama (2021)^{7,8}

4. Private-Use of Semi-Public Spaces

Preliminary observations of Kanazawa SST found resident activity extended to outdoor spaces to be a significant feature. One of the low-rise housing blocks, composed of 2-story and 3-story housing, was selected to further study this aspect.

Physical Features and Appearance

The block follows the street hierarchy, street spaces becoming more intimate and private further inside (Table 4). Residents have direct access from their dwellings to either *kouji* or *roji* space.

Name	<i>O-dori</i>	<i>Tori</i>	<i>Kouji</i>	<i>Roji</i>	<i>Uraoji</i>
Users	Car (Pavement: pedestrian)	Pedestrian, emergency vehicles	Pedestrian	Pedestrian	(Pedestrian)
Image					

Table 4: Street types, users, and images
 Source: Author

Activities and Functions

Dynamic behaviour of *hyoushutsu* and *afuredashi* is observed in the neighbourhood. Some common types of *hyoushutsu* are placement of flowerpots around their housing, outside on their doorstep or spread out into *roji* space or private usage of pre-existing flowerbeds, adding their own flowers or decorations (Fig. 5a, 5b).

⁷ Retrieved from: <https://www.city.yokohama.lg.jp/city-info/yokohamashi/tokei-chosa/portal/jinko/choki.html>

⁸ Retrieved from: <https://www.city.yokohama.lg.jp/city-info/yokohamashi/tokei-chosa/portal/jinko/chocho/nenrei/r3cho-nen.html>



Fig. 5a, 5b: Sketch of residents' activities
Source: Author

Rules provided by *kanri-kumiai* (management association, more focused on the hardware of buildings and infrastructure as opposed to *jichikai* focusing on software of community activities), prohibit private usage of public property. However, residents as well as *kanri-kumiai* seem to accept the activities. As one resident says, "There's no point saying. If they did, it will become dirty without people taking care of flowers and things. The empty spaces will become full of weeds not taken care of. If the empty spaces can be used for planting flowers, the resident there will take care of the place."⁹ Although the specific location of activities differed between housing types, the majority (72%) of residents were found to be enjoying some kind of gardening activity (Fig. 6, 7a, 7b).

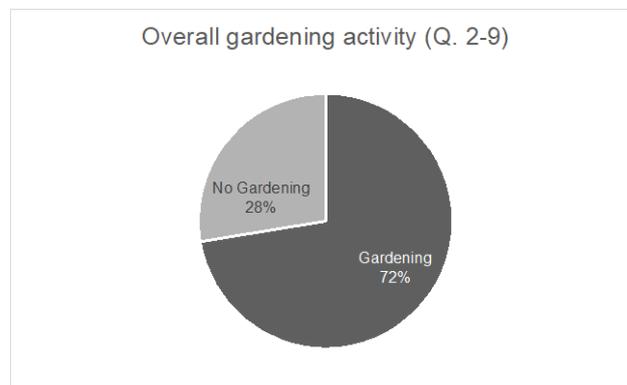


Fig. 6: Overall gardening activity of residents (Survey Q. 2-9)
Source: Author

⁹ Quoted from interview with Resident A-5 (July 8th, 2021)

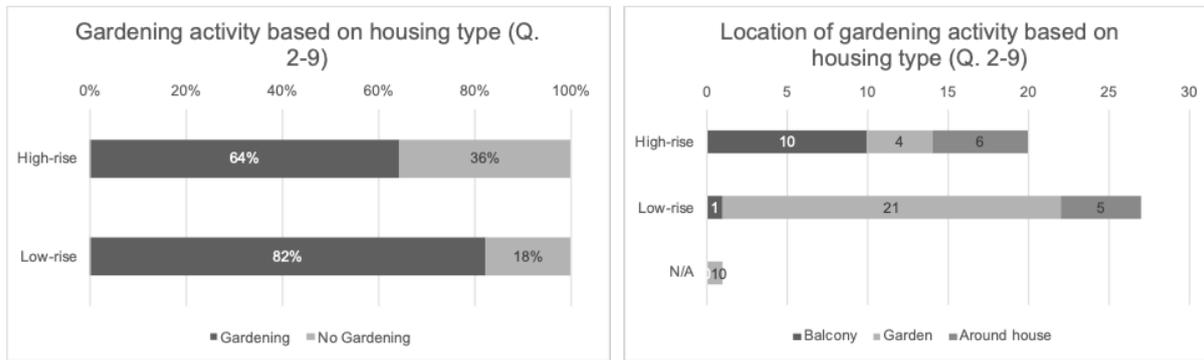


Fig. 7a: Gardening activity based on housing type
 Fig. 7b: Location of gardening activity based on housing type
 Source: Author

Meanings and Symbols

Activities of *hyoushutsu* were not just an enjoyable hobby or visually pleasing to observers but were found to have significant meanings to residents and their neighbourhood relationships. Sometimes planted flowers could become triggers for communication between neighbours, positively impacting their community relationships, or encourage a sense of place to evolve for residents.

A resident with a colourful and well-maintained front garden mentions,

“People that pass by here, they see the flowers and enjoy. Sometimes, people stop here (to see the flowers). Recently, when there was a rare type of flower blooming, someone casually spoke to me. You see, we can have this small communication. It’s also that people enjoying the flowers as they walk by.”¹⁰

Sometimes these communications between residents are not done explicitly, but through unspoken interactions. One resident reflects,

“When I’m walking through the roji and I see the flowers in bloom I think, ‘Oh, they must be working very hard on it, it’s blooming beautifully,” and from time to time I get to see all kinds of flowers. Small things like that make it fun for me to walk around. Knowing there’s a place like this close from my home, it gives me a sense of relief, I guess.”¹¹

As found from residents’ activities and its impact on neighbourhood relationships, it can be inferred that the chain of these residents’ activities has come to form a loosely defined community network (Fig. 8). *Hyoushutsu* and *afuredashi*, although not an organised activity and solely reliant on voluntary motivations, were found to have significant meanings to the community, unlike social groups (e.g., Origami group, Pet club) which are independently managed.

¹⁰ Quoted from interview with Resident A-9 (July 11th, 2021)

¹¹ Quoted from interview with Resident A-7 (July 29th, 2021)

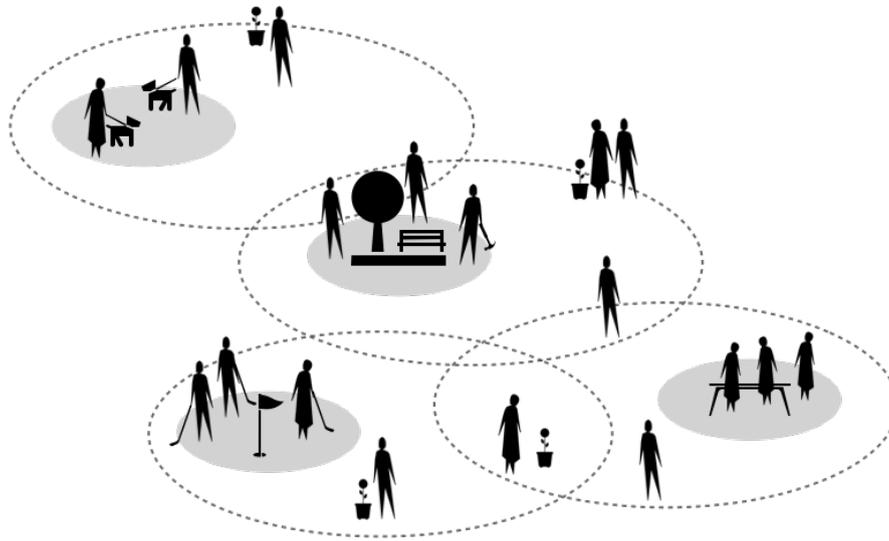


Fig. 8: Image of community network
Source: Author

5. Pond & Grapevine Association

A more intense and collective behaviour of *hyoushutsu* and *afuredashi* can be observed in the placemaking activity done by voluntary residents' group of "Ike-to-Budoudana-no-ka" (Pond and Grapevine Association, PGA).

Physical Features and Appearance

The activity takes place in an open space located in the centre of the block in between low-rise housing blocks (Fig. 9). The open space has two access points, a wider access point from *kouji* on the northern side and a narrower one on the south, leading to a *roji* with two intersections lead to *uraroji*.



Fig. 9:
Source: Google Earth (2021), modified by author

Activities and Functions

The placemaking activity by PGA started a few years ago, led by elderly residents who have retired from their jobs. Furniture (e.g., benches, tables, stools, decoration) and tools (e.g., night lights, protective shades, fishnets over the pond) have been added by residents (Fig. 10).

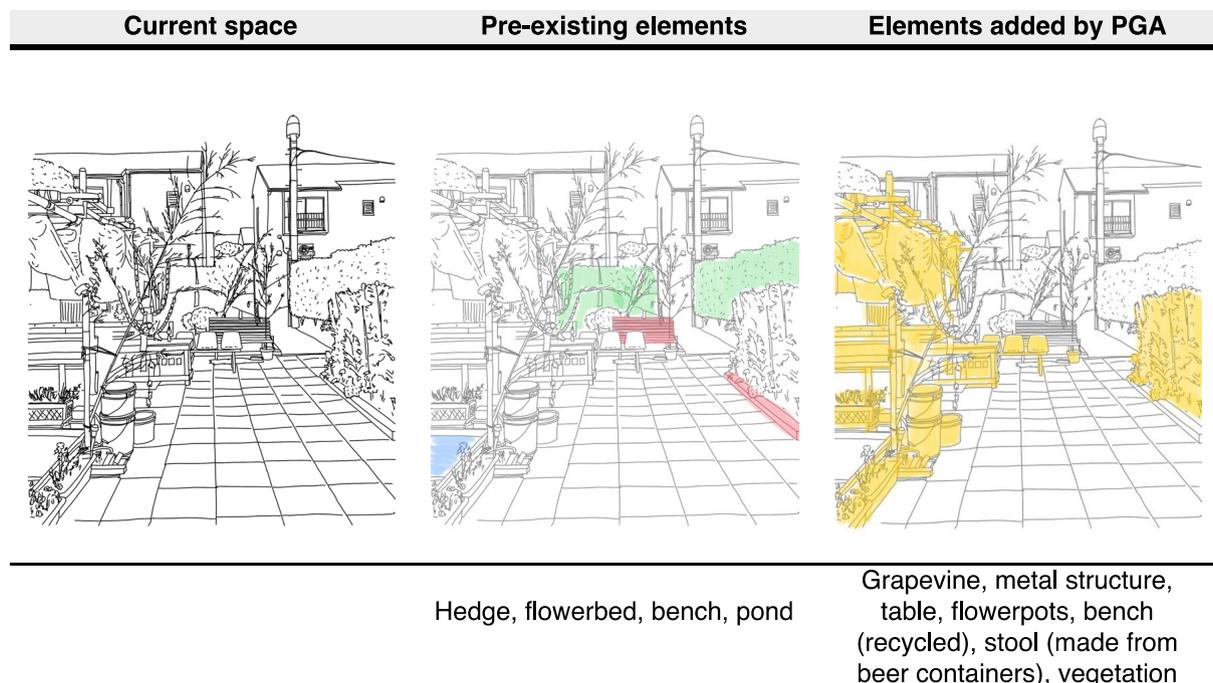


Fig. 10: Spatial features

Source: Author

It has now become a community space for residents, to use daily and for community events. Until this open space became actively used by members of PGA, people only gathered to clean the pond, which were assigned tasks for neighbouring residents. As one resident mentions, “There was a pond here but there was just a tree planted. We’d clean (the pond) five or six times a year, and that was it. There was no enjoyment in that”.¹²

¹² Quoted from interview with Resident A-6 (August 7th, 2021)

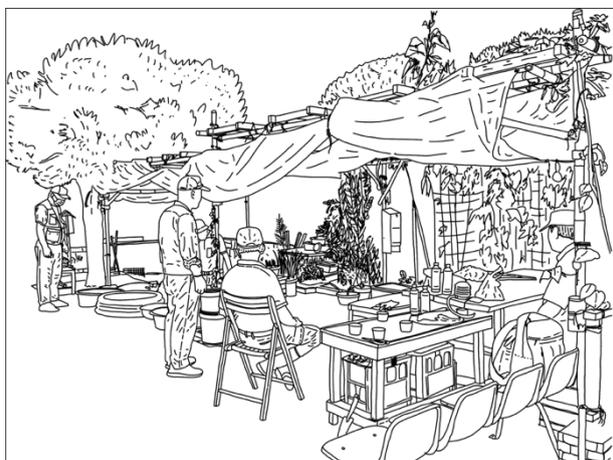


Fig. 11: Sketch of residents' gathering
Source: Author

Meanings and Symbols

While PGA is well known amongst residents, active participants remain the minority (Fig. 12a); however, some are occasional visitors for events (Fig. 12b).

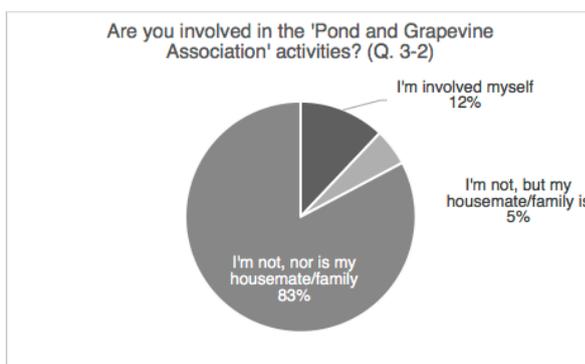
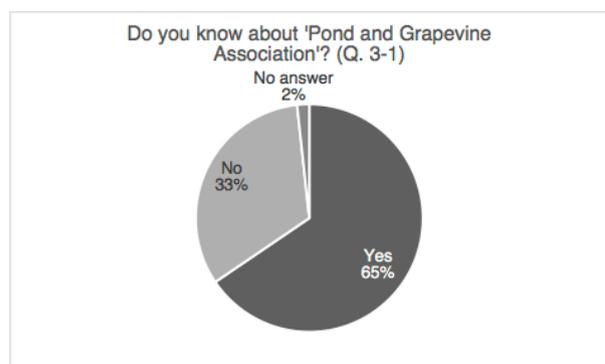


Fig. 12a: Results of survey, Q. 3-1

Fig. 12b: Results of survey, Q. 3-2

Source: Author

The main demographic of daily users was found to be the 70s and 80s group (Fig. 13a). Mainly who are retired, spend more time in the neighbourhood. Interestingly, some who are not usually active participants of other organised community activities were found to be daily users or occasional users of PGA's space (Fig. 13b), which indicate the flexibility in usage and participation.

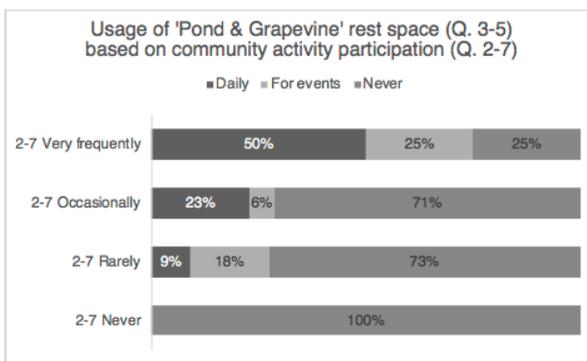
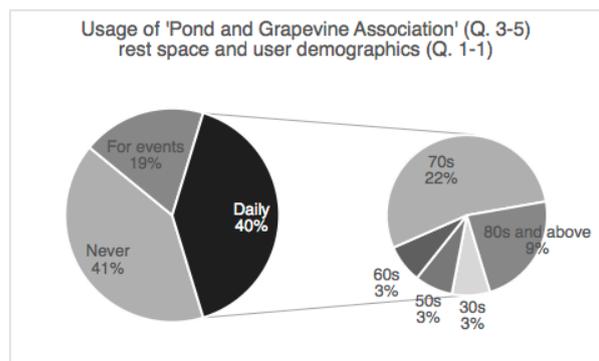


Fig. 13a: Cross-analysis of survey results (Q. 1-1 & 3-5)
Fig. 13b: Cross-analysis of survey results (Q. 2-7 & 3-5)
Source: Author

As found, a multi-layered social structure has evolved around the placemaking activity of PGA: core members actively engage in the space, creating and maintaining the rest space; occasional participants recognise the space and activities, visiting irregularly when there are events held; community members who do not participate but are aware of the space (Fig. 14).

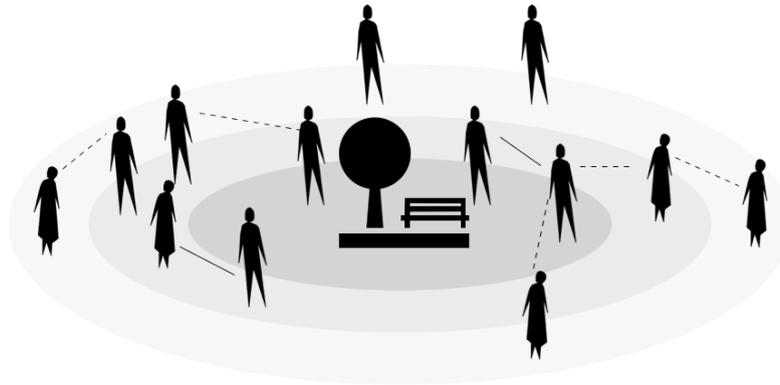


Fig. 14: Social structure around PGA
Source: Author

6. Identities of Place

The study set out with the aim of assessing the identities of place in further uncovering the factors that creates and maintains a *danchi* where residents have strong place attachment. The current study found that the physical space, with intended meanings or symbols by the designers, has been further developed by the activities or functions added by residents and the community. While some of the activities and functions aligned with initial intentions, some were unexpected. Together, these residents' and community's activities and functions have transformed the *danchi* environment over the years, extending or altering its meanings and symbols.

6.1. Placemaking

From the observations in Sections 4 and 5, we see both the intimate act of collective placemaking of a specific location and the more unselfconscious placemaking of the wider residential area. Both placemaking behaviour is seen to be associated with an individual's attachment to place as well as the shared recognition of sense of place. Moreover, these observed activities and meanings are found to be important elements of the identities of place.

6.2. Variability in Conditions of Place

Returning to the framework of the identities of place, findings from this study has not only revealed the intimate and complex interrelation between the three elements observed but has also discovered the interesting inter-relationship that results in a *place* to evolve.

For instance, *hyoushutsu* and *afuredashi* (Section 4) has evolved in a space where the designers had initially planned certain physical features and appearances with meaning, envisioning certain activities to occur. With a focus on street spaces to be central to the community, designers provided spaces (e.g., flowerbeds at the entrance) to encourage residents' private usage outside their home. The current situation shows how these activities intensified and further defined the initially intended meanings or symbols. This transition can be broken down into four phases (Fig. 15a): (1) the physical features or appearance and the meanings or symbols had a strong tie at the stage of development, with activities and functions as

anticipated elements; (2) as residents move in, the activities and functions act towards the pre-defined physical features or appearance and its meanings or symbols; (3) the activities and functions have further strengthened the initially intended meanings or symbols and the three elements have a strong tie as identities of place; (4) as a result, its current state can be seen as a “place.”

The case of PGA shows a different transition. While there were intentions behind creating open spaces for each block, the tie between certain physical features and its meanings or the anticipated activities were not as clearly defined by the designers. When residents started to act towards the space, refining spatial features, the open space became to mean more than just an open space. We can see its four phases of transformation (Fig. 15b): (1) relationship of the elements was not strictly defined; (2) the activities and functions further alternate the physical features or appearances of space; (3) new meanings or symbol for the actors (those who initiated the activity) as well as for the community has emerged; (4) as a result, its current space features an authentic sense of identity, seen as a “place.”

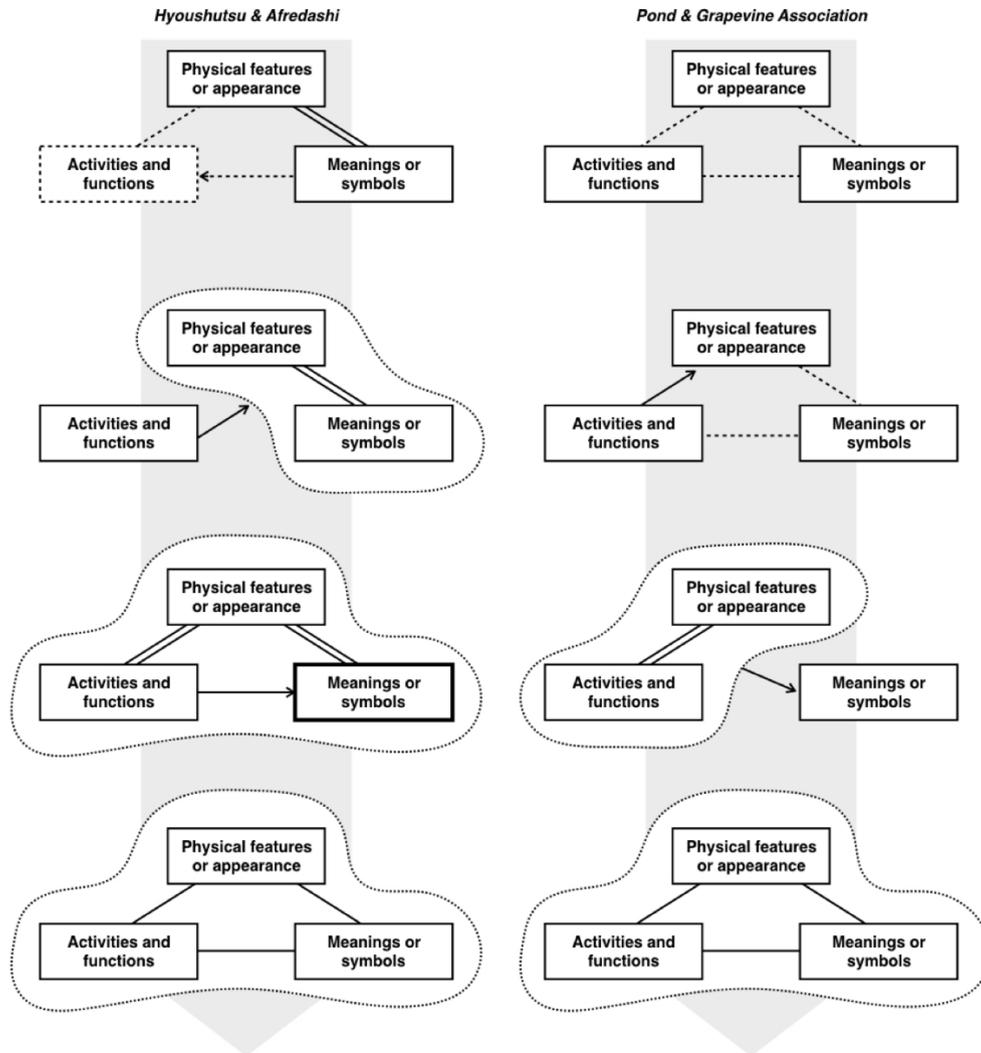


Fig. 15a: Transition of place identities – *Hyoushutsu & Afuredashi*
 Fig. 15b: Transitions of place identities – *Pond & Grapevine Association*
 Source: Author

6.3. Spaces Open to Interpretation

In both of these cases (reviewed in Section 6.2), the designers provided mere guidelines for intended usage but it was not to restrict from unpredicted activities to occur. Due to the availability in developing certain activities (like creating a self-made flower bed in the street space or creating a communal rest space) a community network has formed and/or has made one feel stronger about their home. It must be noted, however, that it was not merely the availability of semi-public spaces but the relatively tolerant management and shared awareness that developed over the years that enabled such modifications. Semi-public spaces that were less strictly defined, spatially and literally, and open to interpretation allowed residents to develop their own activities and redefine the “place.”

7. Conclusion

The study was designed to determine the role of urban design in mass-housing developments, through a case study of understanding the identities of place and uncovering the physical and social aspects that enable a *danchi* to thrive. As discussed in Section 6, variability in conditions of place as well as the importance of spaces open to interpretations was found. Interestingly, while the critical situation of ageing and decreasing of population remains a concerning matter, it was also found that the community that had matured together over the years was also a key factor in enabling the activities that encouraged “placeness” to evolve.

7.1. The Role of Urban Design in a Mass-produced Housing Development

The following conclusions on the role of urban design in a mass-produced housing development can be drawn from the current study: establishing inclusivity in design and orchestrating the intensity of definitions of space.

Housing complexes inhabit a diverse group of people and lifestyles, and spaces open to interpretation can allow each to find their own uses and meanings of space. As this study found, having some of the semi-public spaces open to interpretation allows the diverse group of people to each find their own meanings of the space. The open-endedness provides potential for change, elaborations, and developments, enabling a more inclusive housing environment.

Secondly, urban design as the orchestration of various elements composing an environment can control the intensity of definitions given to a space. While the loose and ambiguous definition of space is useful in establishing the inclusivity as stated above, it is not to encourage excessive freedom or to provide strict rules and indications. Definitions given to a space should be controlled in a way that allows certain interpretations to be made by the users to some extent yet manage the smooth cohabiting of residents.

Despite the exploratory nature, this study offers some insights into the role of urban design in housing complexes, particularly of important elements that will allow such environment to incorporate the diverse needs and respond to the changing lifestyles.

7.2. Research Limitations and Further Research

The generalisability of these results is subject to certain limitations. First, the current study is based on a small sample of participants. Secondly, the context of *danchi* is unique to Japan and findings need to be interpreted cautiously without its contextuality.

While the study found the importance of spaces open to users’ interpretation and the importance to control the intensity of definitions accompanying space, further study is needed to derive specific methods on how to include these spatial features into housing developments. For instance, inquiries into what physical qualities can convey its availability of interpretation and encourage users to develop their activities remains unclear. It would be interesting to assess such spatial features, such as size, shapes, materials, surrounding setup, or location in relation to the level of users’ interaction with space to further deepen understandings on such spaces.

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(3995 words)

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AIR TEMPERATURE CFD SIMULATION OF OUTDOOR SPACE ACCORDING TO HEIGHT CHANGE OF MAIN BUILDING OF APARTMENT COMPLEX

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1. Introduction

1.1. Background and purpose of the study

The fact that abnormal temperatures and urban heat island phenomena are occurring all over the world has been revealed based on many existing studies. One of the causes of these abnormal temperatures and urban heat islands is human-induced urbanization. (Park Sang-wook, 2019) Nowadays, most cities in the world usually have temperatures between 1°C and 4°C higher than those in the surrounding rural areas, and the temperature increase in Korea is more than twice as fast as the average temperature in the world. In the past 100 years, global temperatures have risen by 0.74°C, the average temperature in the six major cities of the Republic of Korea has risen by 1.8°C, the precipitation has risen by 11.6mm in the last 10 years, and the sea level by 10cm in 40 years. Due to the recent realization of climate change, abnormal climates such as heatwaves, droughts, and cold waves are frequent and the damage is intensifying. The damage from the abnormal climate in Korea is concentrated in urban areas where more than 90% of the people live. (Ministry of Environment 2011)

The reality is that apartment complexes, which account for a high proportion of residential buildings in urban areas today, are designed and built with quantitative development as priority, so the design to respond to climate change is insufficient. To this end, the thermal environment of the outdoor space of the apartment complex was analyzed by applying various types of design element types to the CFD simulation.

Therefore, in this study, by simulating the microclimate environment of an apartment complex, the effect of temperature reduction in the complex according to the change in the height of the main building, a design element of the apartment complex, is to be analyzed in detail by using the CFD simulation program Envi-met.

1.2. Scope and method of study

In this study, a simulation scenario was established by setting the weather conditions on August 25, 2020 (the date of occurrence of a heatwave warning) targeting the Han Riverside apartment complex in Seocho-gu, Seoul, Korea. For the spatial range, the Banpo Acro River Park apartment complex located in the Banpo district of the Han River waterside in Seoul, Seocho-gu, South Korea, located in Asia, was selected. As for the content range, the atmospheric temperature of the outdoor space was analyzed according to the change in the height of the building of the apartment complex using Envi-met, a CFD simulation program. The air temperature of the space was analyzed. For the time range, statistical data from the Korea Meteorological Administration on August 25, 2020, when a heatwaves warning was issued, was used. The research method is as follows. First, Envi-met's definition, of a CFD simulation program and outdoor space within an

apartment complex, is summarized through a literature review. Second, publicly measured data from the data portal (Seoul Meteorological Administration) is used. Third, based on the results of running the simulation using the CFD simulation program Envi-met, we find the appropriate height for reducing the atmospheric temperature of the outdoor space and suggest a pleasant outdoor space creation direction.

2. A Study on the Thermal Environment of Outdoor Space in Apartment Complex

2.1. Outdoor Space and Thermal Environment in Apartment Complex

1) Outdoor Space in Apartment Complex

An outdoor space generally refers to a space corresponding to the exterior of a house or building. The outdoor space of the multi-unit housing complex can be classified into an open space shared by all residents of the complex and a community space in the form of a building according to its function (Limited, 2011). As a building that directly affects the residential environment, it includes living convenience facilities such as medical facilities and social welfare facilities (Han Jeong et al., 2012).

The outdoor space can create a unique identity for the complex according to the landscape plan. visually Places can be connected, providing a walking and resting space for residents, and blocking from the outside. Moreover, as most of the complexes have recently removed ground parking as much as possible and converted them to underground, the importance of outdoor space is further emphasized and is emerging as a factor determining the value of complexes (Choi et al., 2009).

2) Walking Comfort and Thermal Environment

Comfort refers to the degree to which pedestrians can walk comfortably without being disturbed by pedestrian traffic in the pedestrian space. It is formed by topographical factors such as buildings. As such, comfort, which is a combination of thermal environment and microclimate factors, is an important factor that directly determines how long and pleasantly people can stay in a certain space.

In general, comfort in a thermal environment refers to the overall attractiveness of the environment, such as aesthetic value, comfort, convenience, and pleasure. Comfort is a very important characteristic that determines the quality of walking, but it is difficult to establish a universal standard because several factors act in a complex way. Also, depending on the recipient, contradictory reactions such as pleasantness and unpleasantness, preference, and dislike may appear (Seong-Hoon Oh et al., 2011).

3) CFD Simulation and Envi-met Program

CFD is an abbreviation of 'Computational Fluid Dynamic', which means computational fluid dynamics. It refers to discretizing using methods such as the surface/incompressible fluid analysis method (MPS), converting it into an algebraic equation, and analyzing the fluid flow problem using a numerical algorithm. (Sanghyun Kim et al., 2020)

Envi-met, which is most commonly used in the urban environment field, was developed by Michael Bruse (1998) of Bochum University in Germany. The advantage of the Envi-met model is that it is a microscale model of the interaction of the ground, vegetation, buildings, and atmosphere in an urban area, and it can create distinct microscale weather patterns and soft models such as forests as well as rigid building walls that can also be created. In addition, it has the feature of numerically analyzing detailed microclimate changes, so it is possible to calculate microclimate changes (fluid flow field, airflow, temperature, and humidity distribution) in the surrounding area due to high-rise buildings in urban areas. It also has the advantage of being able to select various conditions such as buildings and vegetation, so that it is possible to analyze on a micro-scale considering the design topography according to the user's design plan (Eunah Ko, 2010).

2.2. Review of previous studies and differentiation

By analyzing the atmospheric temperature of the outdoor space according to the height of the main building of the apartment complex, the preceding research was divided into three keywords: the outdoor space of the apartment complex, the improvement of the thermal environment, and the building arrangement using Envi-met.

In a study related to the outdoor space of the apartment complex, Jeong Gwang-bae (2015) suggested a subdivision of the outdoor space of the apartment building by analyzing the preference survey for the outdoor space of the apartment building, analysis of the space, etc. Accordingly, a plan for activating each detailed space of an apartment house was suggested. Kim Young-hoon (2018) investigated the planning characteristics of the outer space of an apartment complex located in Seoul and analyzed the spatial planning and design characteristics of residents as a community facility. Yoo Soomyung (2014) aimed to survey and analyze the facilities preferred by residents and experts in planning outdoor facilities based on some revisions to the Regulations on Housing Construction Standards, etc. and propose future plans for outdoor facilities based on the results.

Looking at research related to thermal environment improvement, Kim Hwan-Seong and two others (2020) compared the effects of three physical arrangements on thermal comfort in the Apgujeong Hyundai Apartment Complex in Seoul. suggested Park Sang-wook (2019) quantitatively verified the temperature reduction before and after landscaping construction and the improvement of the thermal environment felt by users of the external space for the external space of the apartment complex by using ECOTECT ANALYSIS and the micro-weather model Envi-met. Kim Myeong-seon and others (2017) simulated the thermal environment for each region in Songdo International City using the Envi-met model. The met model was presented and the improvement effect was comparatively analyzed.

Looking at the research related to building layout using Envi-met, Byung-ro Yoo et al. (2010) used the micro-weather program Envi-met to understand the thermal environment characteristics of each apartment complex by layout type of the apartment building, and the temperature by apartment layout type Changes and wind flow changes were examined, and the optimal arrangement of apartment complexes to reduce the thermal environment was suggested. Kim Jeong-ho et al. (2012) tried to predict changes in the external thermal environment and microclimate due to the new construction and green space arrangement of the building, and predicted that the construction of the building increased by 2.5°C on average, The composition of the green area was analyzed to have a temperature reduction effect of about 1.8°C.

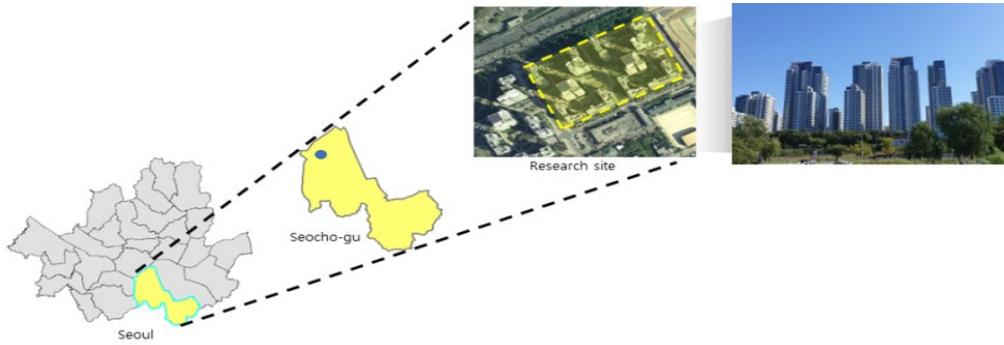
This study is differentiated from previous studies by using the CFD simulation program Envi-met to analyze the microclimate of the outdoor space formed according to the height change method for the outdoor space of the apartment complex in detail.

3. Set frameworks and simulation boundary conditions for analysis

3.1. Selection criteria and selection of target sites

High-rise apartment complexes, which occupy a high frequency among the housing types supplied in the recent Seoul area, were selected. The complexes that are easy to apply CFD simulation and are standardized have been selected, and the waterfront area (Han Riverside) has a clear airflow and has the greatest impact on the urban microclimate, and that can be checked on-site, will be selected as the research subject. According to these criteria, the 'Banpo Acro River Park' apartment complex was selected in the vicinity of the Han River as a type 3 general residential area, with a standardized main building layout, and excellent site accessibility in the area of Banpo 2-dong, Seocho-gu. Seoul, Republic of Korea

Figure 1. Site Location



Sources: Write it by referring to NAVER's picture

3.2.A framework for analysis

This study was jointly conducted by referring to the type of water space 1-plan(Located in water space where wind speed is high in the complex), which was most effective in terms of temperature reduction in Kang Jeon-hoon and Bae Woong-gyu (2022), 'CFD simulation analysis study of temperature change according to green space and piloti arrangement in an apartment complex during a heat wave'. It is to simulate the effect of temperature reduction according to the change in the height of the main building in the housing complex.

First, it goes through the 'basic status analysis of the site ⇒ modeling of the site ⇒ establishment of simulation conditions ⇒ setting of simulation scenarios ⇒ analysis of simulation results by scenario type ⇒ presentation of implications for the creation of pleasant apartment complexes'.

3.3.Establishment of the basic status and simulation boundary conditions of the target site

Seocho-gu, to which the target site belongs, is an autonomous district located in the southeastern part of the Han River in Seoul, South Korea, and has been using high-density land centered on complex functions since 1975. The area of the target site is about 28,975 m², and it is designated as three types of residential areas. The building consists of 15 buildings with 3 basement floors and 38 floors, with the highest height of 134 m and the lowest height of 45 m. The total number of households consists of 1,612 households, and the complex is arranged in a cluster of 2 districts with 5 main buildings combined. In addition, there are 2 central squares and 4 courtyards at the center of the complex, and the lower floors of the site were mostly made up of rest and leisure facilities, and community facilities were constructed inside through piloti arrangement.

The simulation boundary conditions of this study were set based on the data collected by the Seoul Meteorological Administration (<http://data.kma.go.kr>), and the boundary conditions were established based on the data on August 25, 2020, when the heat wave warning was issued to maximize the temperature reduction effect in the apartment complex. The single average wind speed was set at 1.69m/s, and the wind direction was set at 234.2°, the main wind direction on August 25. <Table 1>

Table1.Study Site Modeling and Boundary Conditions

Category	input value	Aerial photography of the target site	Targeted Site Modeling(Sketch-up)
Time	2020.08.25		
The speed of the wind	1.69 m/s		
wind direction	234.2° (a southwestern wind)		
temperature	Min 31.9°C(at: 18:00), Max 36°C(at: 14:00)		
relative humidity	Min 48% (at: 14:00), Max 62% (at: 18:00)		
Surface roughness	0.1		

Sources: Kang, (2021), "A Study on the Simulation Analysis of CFD for Temperature Mitigation in Apartment Complex by Water Space and Piloti Arrangement and Using Naver Map as a Reference to Naver Map

3.4. Temperature Mitigation Scenario Setting by Change in Main Height and Piloti Placement

In this study, Jeon-Hoon Kang and Woong-Gyu Bae (2022), 'CFD simulation analysis study of temperature change according to green space and piloti arrangement of multi-unit housing complex during heat wave' The scenario was set up with a type A with the best temperature reduction effect and Type B with the lowest average temperature in the complex

To analyze the temperature relief of the outdoor space of an apartment complex according to the height of the main building and the arrangement of the piloties, the height of the main building and the arrangement of the piloties were divided as shown in <Table 2> below. As for the piloti type, it was divided into Area A, where all piloti were built in the north main building, and Type B, which was created by alternating one piloti per cluster. Roof greening was created on the roof part. Greenery was installed in each of the 8 places with a size of 27m³ (the thickness of the songak is 0.3m). In the case of water space, the water space 1 plan, which had the best temperature reduction effect in the CFD simulation analysis (Kang Jeon-hoon, 2021), was set as the standard for the temperature relief of the external space of the apartment complex according to the water space and piloti arrangement, and the water space 1 plan was the area of one place. was set to 292.5m³ and placed in a total of 4 places. In the case of main pillar height, it was divided into 4 floors (3rd floor, 7th floor, 14th floor, 20th floor) for each A and B piloti arrangement type. <Table 3>

Table2.Setting up a simulation scenario

Filtertypes	North East Piloti. all created/ wall recording(A)				Create two pilotis by crossing over/ Rooftop greening(B)			
layout drawing								
main cylinder height	3rd floor(a)	7th floor(b)	14th floor(c)	20th floor(d)	3rd floor(a)	7th floor(b)	14th floor(c)	20th floor(d)

Table3. Model Type A, B Destination(Envi-met)

main cylinder height	3rd floor(a)	7th floor(b)	14th floor(c)	20th floor(d)
Modeling (A)				
Modeling (B)				

4. Analysis of Temperature Changes according to Height Changes in Apartment Housing Complex

4.1. Mean Temperature Variation according to the Change of Main Drive Height

In order to extract the temperature of the part of the target area reflecting the simulation results of the Banpo 2-dong Acro River Park area in Seocho-gu, Seoul, the average temperature of 14 o'clock was extracted from the pedestrian level of 1.5 m for 8 scenarios bordering the study site Judong to 72 m, which is higher than the maximum height of the North Side. (1.5m, 7.6m, 14.6m, 32.33m, 56.4m, 72m)

Through the results of the extracted data values, the temperature increased as the height increased in all types, and it was confirmed that the temperature was different according to the piloti arrangement and the change in the height of the main body, and the temperature change was shown as a bar graph.

In addition, the atmospheric temperature of the outdoor space of the target site was analyzed by

cutting type A and type B into cross section and longitudinal section based on the part where the temperature change of the outdoor space of the target site was good. First, the highest temperature among Type A was the highest at 31.61229 °C when cut in cross section with 14 stories high and had the lowest temperature at 31.6006 °C when cut in cross section with height of 20 stories. Type B was three stories high and had the highest temperature at 31.6113°C when cut in cross section and had the lowest temperature at 31.60134°C when cut in longitudinal section.
<Table6>,<Table7>,<Table8>

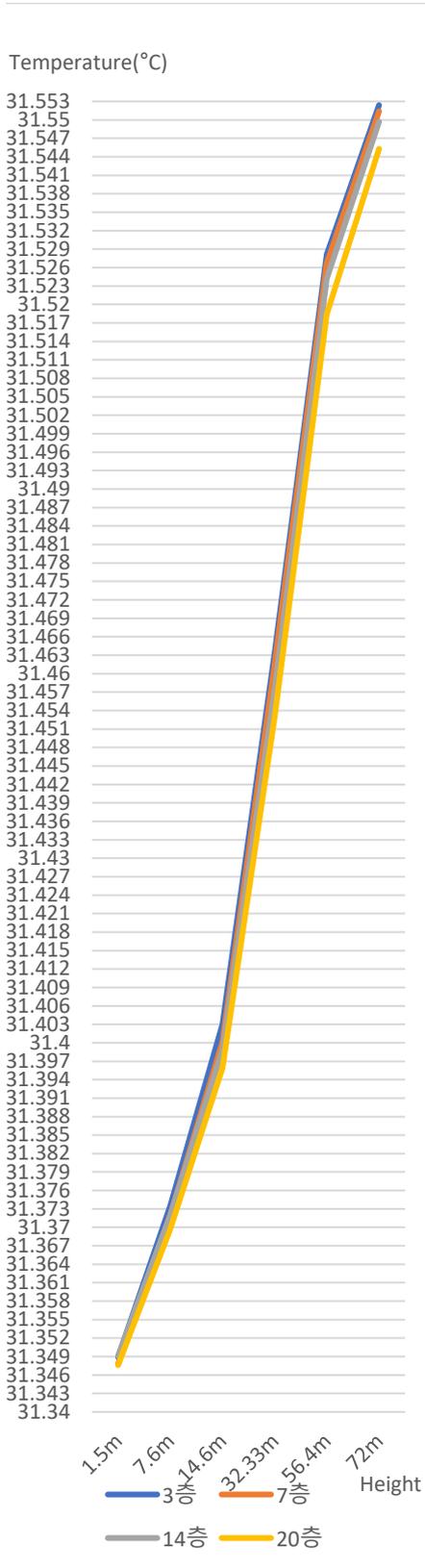


Figure2.
Type A Temperature change simulation results

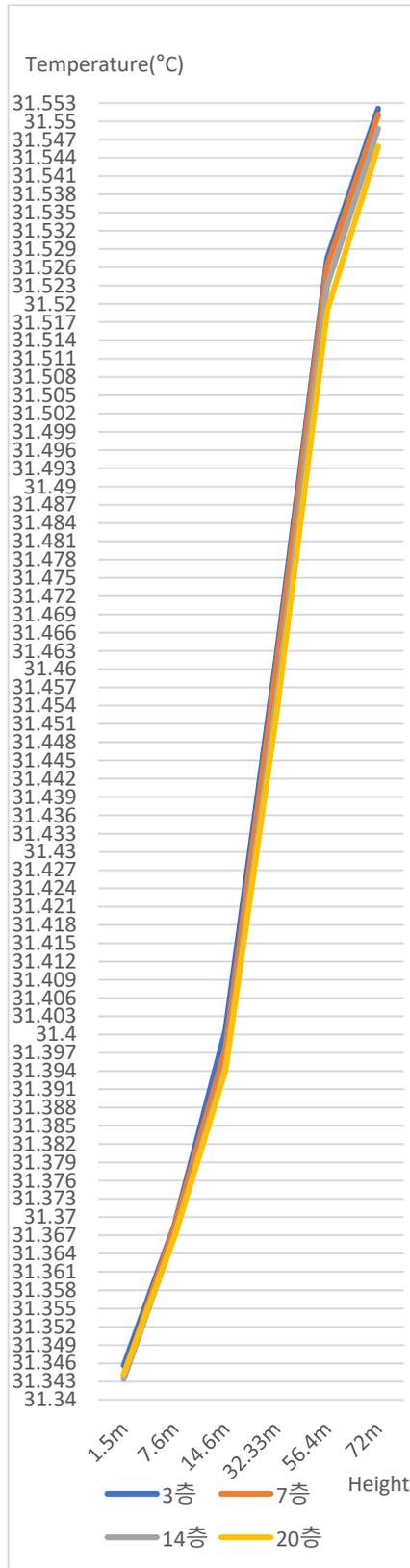
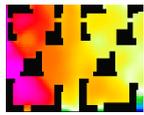
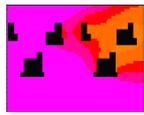
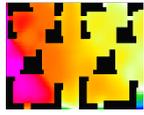
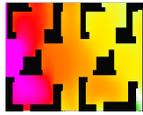
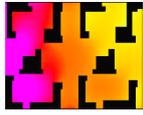
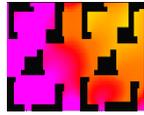


Figure3.
Type B Temperature change simulation results

Table4. Temperature Variation of Type A Outdoor Space

Type	1.5m	7.6m	14.6m	32.33m	56.4m	72m
3rd floor (9.9m)						
	31.3489(°C)	31.3735(°C)	31.4030(°C)	31.4635(°C)	31.5281(°C)	31.5524(°C)
7th floor (23m)						
	31.3478(°C)	31.3720(°C)	31.4002(°C)	31.4616(°C)	31.5267(°C)	31.5514(°C)
14th floor (46m)						
	31.3491(°C)	31.3720(°C)	31.3989(°C)	31.4575(°C)	31.5242(°C)	31.5497(°C)
20th floor (66m)						
	31.3476(°C)	31.3697(°C)	31.3959(°C)	31.4531(°C)	31.5184(°C)	31.5453(°C)

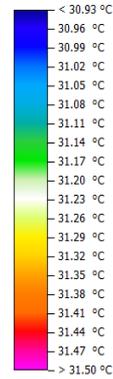
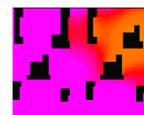
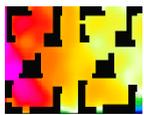
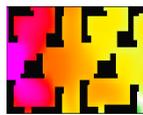
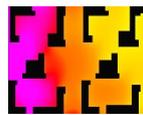
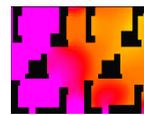
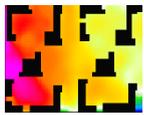
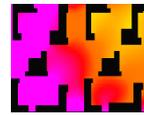
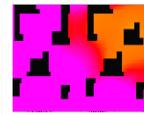
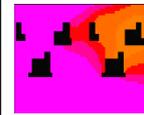


Table5. Temperature Variation of Type B Outdoor Space

Type	1.5m	7.6m	14.6m	32.33m	56.4m	72m
3rd floor (9.9m)						
	31.3456(°C)	31.3688(°C)	31.4007(°C)	31.4621(°C)	31.5275(°C)	31.5521(°C)
7th floor (23m)						
	31.344(°C)	31.3686(°C)	31.3976(°C)	31.4603(°C)	31.526(°C)	31.5511(°C)
14th floor (46m)						
	31.3434(°C)	31.3671(°C)	31.395(°C)	31.4551(°C)	31.523(°C)	31.5488(°C)
20th floor (66m)						
	31.3442(°C)	31.3669(°C)	31.3941(°C)	31.4527(°C)	31.5189(°C)	31.5459(°C)

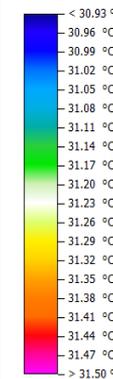


Table6. cross section & longitudinal section

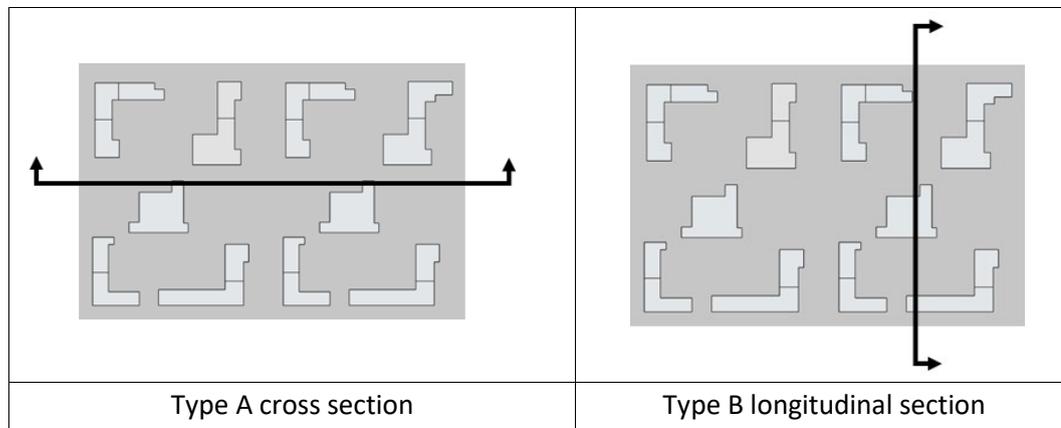


Table7. TypeA average temperature

	3rd floor (9.9m)	7th floor (23m)	14th floor (46m)	20th floor (66m)
CROSS SECTION				
Temperature (°C)	31.6119	31.6117	31.61229	31.61034
Longitudinal section				
Temperature (°C)	31.60153	31.60163	31.60283	31.6006

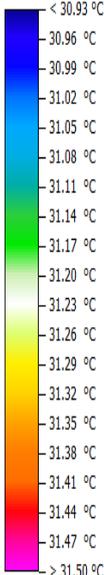
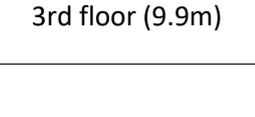
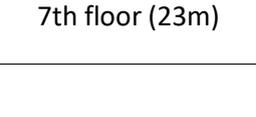
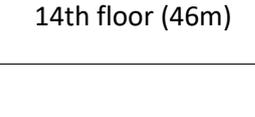
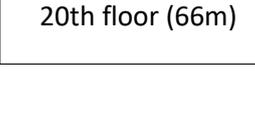
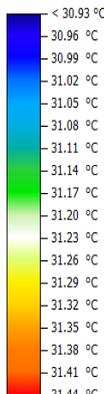




Table8. TypeB average temperature

	3rd floor (9.9m)	7th floor (23m)	14th floor (46m)	20th floor (66m)
				



CROSS SECTION				
Temperature (°C)	31.61173	31.61139	31.61103	31.61074
Longitudinal section				
Temperature (°C)	31.60134	31.60148	31.60157	31.60156



Table 9. Cross-section temperature comparison

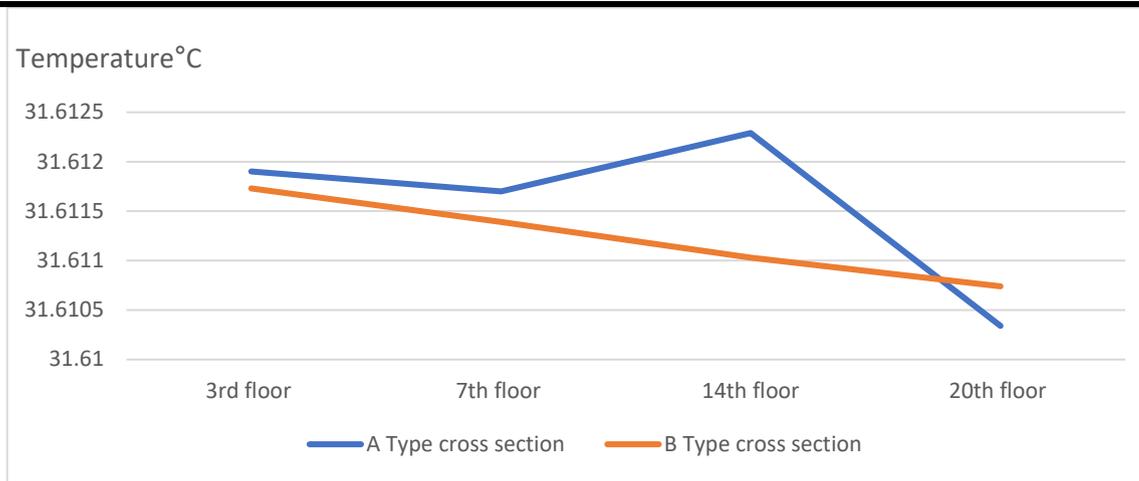
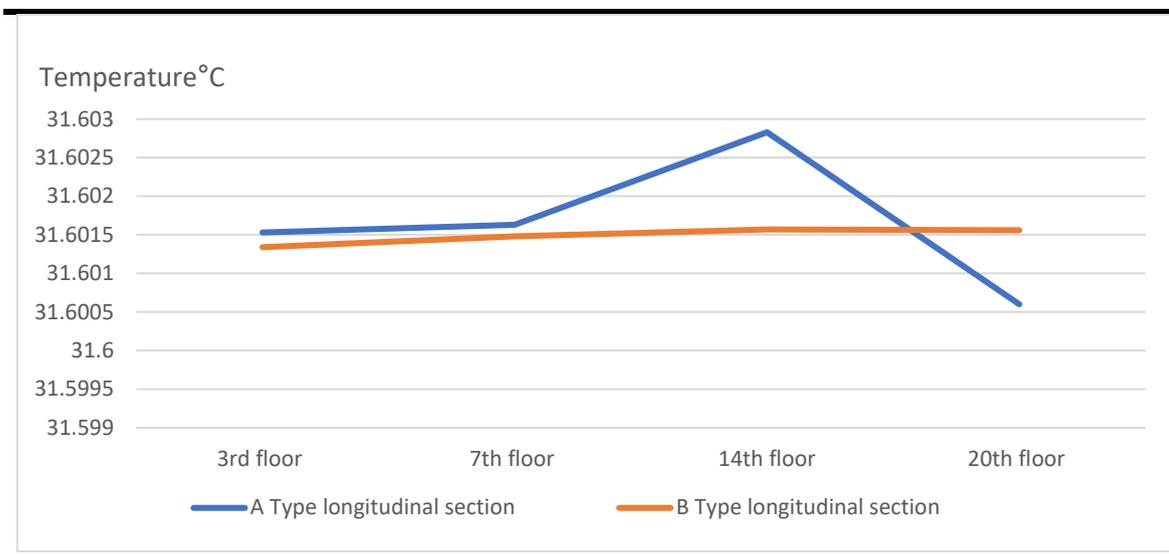


Table 10. Longitudinal-section temperature comparison



4.3.Sintering

In this study, the temperature change of the outdoor space of the apartment complex was analyzed through Envi-met simulation by classifying it into 8 types according to the change in the height of the apartment complex and the piloti arrangement. First, both types A and B showed that the temperature increased as the height increased, and it was confirmed that the temperature increased as the wind speed decreased.

According to the A-type analysis, the number of main floors in the north was 20 floors and the lowest was 31.34376°C from 1.5m height of pedestrian standard height, and the B-type analysis showed that the number of main floors in the north was 14 floors and the lowest temperature was 31.34°C from 1.5m height of pedestrian standard height. Conversely, as for the type with the highest temperature, the highest was 31.5524°C when the number of floors in the northern main building was 3 stories and the height was 72m in type A, As a result of Type B analysis, the temperature of outdoor space in the apartment complex was the highest at 31.5521°C when the number of floors in the north main building was three stories and the height was 72m. In the case of type A, on average, it was 0.003°C higher than that of type B. In addition, looking at the temperature difference between the two types when cut in cross-section, type A was 0.0003°C higher on average, and type A was 0.0002°C higher when cut in longitudinal section.

5. Conclusion

In this study, in order to find out the atmospheric temperature of the outdoor space according to the change in the height of the main building of the apartment complex along the Han River in Seocho-gu, Seoul, the weather conditions were set on August 25, 2020 (the date of the heatwave warning), and a simulation scenario was conducted. was set. The results of this study are as follows.

First of all, the temperature of the outdoor space was different for both Type A and Type B, and the higher the height of the northern main building, the higher the temperature of the outdoor space. This seems to be the result of the inflow of hot air from outside the site, and the higher the height in the north, the stronger the hot air could escape. Second, The temperature change according to the height of the main building of the apartment housing complex was different not

only depending on the height of the main building but also the location of the piloti in the complex. Third, as a result of identifying the effect of temperature change in the complex as piloti, green type, and floor height of the main building, it was confirmed that there was a difference according to wind speed.

In view of these results, it is meaningful that the degree of temperature change according to the piloti arrangement and the change in the height of the main building could be confirmed and the temperature change for the outdoor space of the apartment complex could be simulated. As a limitation of this study, there was a limitation in reflecting the weather conditions of various types of apartment complexes and weather conditions as it reflected the weather conditions on a specific day on August 25, 2020, when a heatwave warning was issued for specific apartment complexes.

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TRACK 2: CULTURE

CINEMATIC OPEN SPACES OF FLANDERS : SPATIAL PLANNING AND THE IMAGINATION OF FLEMISH OPEN SPACE IN THE FICTION FILMS *BULLHEAD* AND *KID*

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THE QUEST FOR A NARRATIVE ON OPEN SPACE

Who does not know *An Inconvenient Truth* (Guggenheim & Gore, 2006)? Most people remember this as the title of a documentary film about global warming. Even people who did not see one image of it, know the film raised international public awareness on the subject. In fact, according to various studies (Butts, 2007; Jacobsen, 2011), awareness of climate change translates into behavioral change and in carbon offsets after watching the documentary. In any case, the film and its narrative concerning climate change and its consequences set things in motion.

When coping with the effects of climate change in Flanders (northern region of Belgium), open space is considered to be primordial. In a densely populated and highly urbanized region such as Flanders, open spaces are crucial to retain water in the event of drought or sudden rains, to provide biodiversity and natural resources, raw materials, food production, and more. Although open space is of vital importance, it lacks a strong narrative.

The concept or definition of open space remains often as diffuse and fragmented as its appearance in this so-called 'rurban' area, the blurred zone of urban and rural. Morphological differentiation with open spaces as the opposite of the city determined traditional planning discourses of the last 45 years (Leinfelder, 2007). However, this dichotomous planning model, urban development versus conservation of open space, has lost its relevance as the Flemish countryside is also characterized by urban sprawl. The building pattern takes 33% of the total land cover and is scattered over the area without concentration in big metropolises, leaving the remaining open spaces fragmented between the built-up plots. For a long time, open space was considered as the unbuilt area or residual space, which remained after all other developments and served as potential ground for agriculture or residential expansion.

Similarly, comprehension of open space based on functional frameworks in terms of land use and land cover is equally incomplete and does not fully grasp the complex spatial mix of functions. The basic principle for open space is then the unsealed or non-built condition of land units by any unnatural cover. Consequently and according to this interpretation, open space coincides almost exclusively with nature and/or agriculture, the two major conventional land use categories. The increase of newcomers in land use and the transformation into hybrid 'rurban' spaces with mixed and multifunctional uses as urban agriculture, private gardens, horse meadows, etc., abolishes this categorization. (Brandt & Vejre, 2004; Dewaelheyns, Vanempten, Bomans, Verhoeve, & Gulinck, 2014; Wilson, 2007)

Moreover, these transformations consolidate the inefficient spatial organization which is accompanied with economic and ecological problems. Prices for farmlands rise as the non-agricultural functions increase in agricultural areas, the cost for construction and maintenance of road and utility infrastructure is seven times more in a dispersed settlement pattern compared to concentrated city centers (VITO, (Vermeiren et al., 2019), traffic jams on these roads as a result of high frequency of daily commuting movements, are only a few examples of economical damage. Furthermore, this spatial organization, with amongst others this high amount of road infrastructure and traffic jams, also generates an ecological impact. Spaces for nature disappear as paved areas provide further development.

Even within open space, there is a historical conflict between agriculture and natural environment. Forests, moorland and wastelands disappeared during the nineteenth and twentieth century to make way for agricultural production. In the quest for land, agricultural and natural activities and objectives were strictly divided from each other and land was only used for its purpose (agriculture fields or natural landscapes). As a result of this tradition of land sparing, only 3% of the Flemish area is reserved for nature reserves and natural landscape conservation (Claeys & Windekens, 2021, p.21) , while professional agriculture and horticulture covers almost half of the land in Flanders (about 45%)¹. As major operator in and manager of open space, agriculture thus shaped open space.

However, structural evolutions in Flemish agriculture weaken this position of agriculture. First, the number of agricultural holdings shows a declining trend. Since 2001, an average of 936 Flemish farmers cease their activities each year. From the 39.276 holdings in agriculture and horticulture in 2001, only 23.361 were still active in 2019. (Claeys & Windekens, 2021, pp., p.22) This decrease of 40% is mainly due to an aging population of farmers that retire and stop their activities on predominantly small farms. Simultaneously, the remaining farms are getting bigger and scale up. Additionally, scaling up goes hand in hand with technological developments to increase production, which means further mechanization, industrialization and specialization. Eventually this evolution results in further urbanization of the countryside along with fewer farmers to defend their interests.

¹ <https://statbel.fgov.be/nl/themas/landbouw-visserij/land-en-tuinbouwbedrijven#figures>. 31.05.2022

Secondly, relatively recent public attention for climate raised the awareness of biodiversity loss by agricultural production and initiated a shift to land sharing. In a land sharing system agricultural land and natural elements are no longer regarded as opposites but function together in an integrated system. More organic and agroforestry land-sharing-based farms shift away from the use of chemicals (fertilizers, pesticides, etc.) with plots of land that are much higher in diversity. In terms of agricultural output, however, a bigger plot of land is required to obtain the level of productivity and profit of a land-sparing farm. Therefore, a transformation is needed to reconcile agriculture and food production within the boundaries of the environment.

Finally, crises such as foot-and-mouth disease, dioxin, swine fever, bird flu, droughts, etc. and recently the nitrogen issue expose the vulnerability of the sector and raise new questions on the future of agriculture.

Although open space often appears as a straightforward concept, often envisaged as the idyllic countryside to preserve, open space is also very much urbanized and differentiated. Moreover, there is no common narrative that comprehends this multifunctional mixture of housing, commercial activities, nature, large-scale and industrialized agriculture, woods, recreational areas, etc. As a consequence, knowledge of everyday dynamics and realities is hardly generated by the existing approach of open space. To be able to read, understand and conceptualize open space in Flanders, planners need to go beyond the commonplace of open space.

It is exactly in this regard that cinematic narratives can add different meanings, merits and valuations. Doreen Massey (1997, 2005) stressed that systematic narratives suppress the full impact of space as the sphere of multiplicities and pincushions of story lines. This paper explores if film, as an instrument, can provide a glimpse of these everyday multiplicities. Also Mark Tewdwr-Jones (Tewdwr-Jones, 2011, p.29) argued that the camera lens is well positioned to provide such a multiple, holistic interpretation of the built environment. For Tewdwr-Jones film often provides a unique sense of space, unavailable through other explorations of space. Consequently, film can assist to reinterpret places and understand emotional attachments to them.

The central aim of this paper is to contribute to a more comprehensive understanding of open space in the strongly urbanized context of Flanders and its perception by focusing on cinematic imagination. To get to know the opportunities and problems in open space, we assume that spatial representations in film provide a unique instrument. Film can assist to reinterpret places and understand emotional attachments. Therefore, the cinematic imagination can clarify meaning and value of open spaces in ways that traditional planning tools fall short. Hence, the research question of this paper: *is the moving image able to contribute to the meaning and knowledge of open space in the context of urbanization in general, and the Flemish urbanized landscape in particular?*

FILM AS A MEDIATOR

Cinema and urban landscapes are closely intertwined. Since the very beginning of cinema, cities and urban landscapes have been a subject of interest for amateur and professional cinematographers. Furthermore, many authors (for example AlSayyad, 2006; Barber, 2002; Clarke & McArthur, 1997; Koeck & Roberts, 2010; Mennel, 2008; Penz & Lu, 2011; Pratt, 2014; Shiel, 2001; Shiel & Fitzmaurice, 2003) have demonstrated different aspects of the relationship between cinema and urban space. They expose thematic as well as formal aspects related to social, cultural, economic, geographical and political aspects of spatial perceptions. These insights pronounce that our understanding of contemporary (urban) space cannot be viewed independently of cinematic experience. Consequently, this research assumes that cinematic perceptions, in particular the depiction of spatial environments in films, have the capacity to represent, reflect and interact with evolutions of spaces. This threefold quality of the cinematic image facilitates film to mediate between realities and theories on contemporary landscapes.

Cinematic representation: a reading device

Firstly, film distances itself as an adequate reading instrument. The moving image combines filmic characteristics – it is spatio-temporal, narrative, camera position, mise-en-scène, soundtrack, ... – with the attention for the everyday. Film can function as a mirror to the world, appropriate to represent the lifeworld, the everyday. Film thus can serve as a (cultural) lens to gain insight in the everyday experience of places.

Cinematic reflection: a social construct of imaginaries

Second, films are – just like plans – social constructs, they articulate a certain perspective on the ‘real’ world. These constructions, cultural concepts in the sphere of the everyday, are caught in narratives. These narratives, the stories that are told to us and by us, structure the practices of our everyday life and can give us insight in the lived space. As a part of the totality of space as a product, lived space is defined by Henri Lefebvre in *The production of space* (1974) as the spatial imaginary of time. Not only the environment (perceived space) and its representation and perception (conceived space), but also the experience of living in this environment mediated through the expectations of its representation (lived space) should be incorporated. While the conceived space, the space of scientists, urbanists and architects, is subjected to the process of rationalization, the lived space is out of the planners gaze. To discover the sense and meaning of a place implies that this investigation of spatial environments in the moving image cannot be limited to film as a representation.

Cinematic Interaction: a mediator

Thirdly, the visualizations in films can also contribute to the social debate on how to deal with space. AlSayyad describes how ‘movies influence the way we construct images of the world, and in many instances they influence how we operate within it.’ (AlSayyad, 2006, p.1) He argues that our understanding of the city cannot be viewed independently of cinematic

experience. Moreover, since film is a very common and easily accessible medium, public opinion and behavior can also be influenced by film.²

Film thus has the capacity to interact, to function as a 'language', between the professional experts, or 'the system' as defined by Habermas in his *Theory of Communicative Action* (1981), and the everyday, 'the lifeworld'. The cinematic image provides a certain message (normative action), esthetically packed in a visual presentation (dramaturgic action) by means of narratives (communicative action). The subjective expressions of films can thus provide a more comprehensive perspective on the lifeworld, or everyday reality and introduce knowledge in the systemworld of spatial professionals. By focusing on film, another way of thinking can be implemented and eventually the moving image can function as a medium to bridge the gap between system and lifeworld.

A CINEMATIC APPROACH FOR OPEN SPACE

Selection

In order to address the research question, we have selected two contemporary Flemish fiction films which provide, amongst others, a specific example of a cinematic perspective on the Flemish rural and agricultural context. Although Flanders has had a tradition in so-called 'peasant-films'³, historical country-side films, mainstream contemporary Flemish feature films are mostly set in city centers or villages. However, *Bullhead* (Michaël R. Roskam, 2011b) and *Kid* (Fien Troch, 2012) are very much embedded in an agricultural setting. Both films exhibit special attention for, and a fresh eye on open spaces in Flanders.

The crime film *Bullhead* tells the story of Jacky Vanmarsenille, a young cow farmer involved in growth hormones traffic. He injects his cattle with hormones but also himself to safeguard his masculinity after being castrated as a kid during a skirmish with youngsters. A chain of events is set into motion after Jacky is pressured to make a deal with a notorious beef trader. But Jacky is hesitant. Next to the recent murder of a cop investigating the hormone mafia, also the hormone trafficker's assistant, an estranged friend from childhood, makes him suspicious. On top of that, the re-encounter with the sister of his childhood enemy brings Jacky's every day struggle with his own past even more to the fore and will finally determine his destiny.

Kid portrays the emotional lifeworld of seven-year-old boy Kid, who lives with his single mother and brother Billy on a farm. The mother apparently has financial problems, although it is not clear what exactly is going on because the events are shown through the eyes of the brothers. A fixed frontal camera, placed at the children's eye-level, registers how animals

² Many authors from different disciplines have investigated the influence of movies on attitudes and behavior, for example the 'Payne Fund Studies' (1933), a series of monographs already published in 1933 by a number of sociologists and psychologists or, more recently, Michelle C. Pautz (2015), ...

³ Films like *The Conscript* (Roland Verhavert, 1974), *Pallietier* (Roland Verhavert, 1975), *De Witte Van Sichem* (Robbe De Hert, 1980), *Flaxfield* (Jan Gruyaert, 1983), *The Van Paemel Family* (Paul Cammermans, 1986), *Boerenpsalm* (Roland Verhavert, 1989), portrayed a rural community of hard-working, often oppressed people. This genre was based on famous literary works and consists of a nostalgic impression of the countryside in which nature was glorified and the contrast with the modernity of the city was stressed.

are deported, bits and pieces of telephone conversations with creditors, or other conversations just out of earshot. When the mother is shot dead by creditors, the brothers have to move to live with their aunt and uncle. The film shows the boys grief and pain, who each deal with the situation and new environment in their own way.

Methodology

The cinematic analysis focusses on discovering the meaning and experience value of open space. The analysis is structured according to the three filmic actions: representation, reflection and interaction. The first section thus embodies film as a representation and examines the filmic depiction and particular composition of defining spatial elements visualized in these films, such as farms, streets, open fields, forest, parking lots, squares, buildings and other specific areas. In a second phase the directors were interviewed to reveal the social construction and reflection. In the process of filmmaking, directors decide on a wide range of aspects that create impressions and subtexts that reflect the director's subjective experience. Finally, the third part describes a general cinematographic construction of Flemish open space in film, hence film as interaction. Based on the analysis of the spatial structures in combination with the choices of the director, thematic structural patterns will be distilled in order to trace the communication and interaction through spatial concepts.

PRELIMINARY CINEMATIC NARRATIVES ON OPEN SPACE

The general set-up of both *Bullhead* and *Kid* is that of a farmer family on the Flemish countryside. This setting, together with the atmosphere of each movie, is introduced by completely different opening sequences.

Bullhead starts with an ominous voiceover accompanying a misty long shot of a meadow fringed by dark woods. (figure 1) After that this image turns lighter and the warning about buried secrets is spoken, the protagonist and the central theme are introduced. Jacky threatens a farmer to keep doing business with him. After that, *Bullhead* unfolds in a non-linear storytelling with jumps between present day and the drastic event of Jacky's childhood. Images of open fields are used to mark the transitions between different sequences. These images draw attention by their low horizon and oppressive amount of clouded skies. (figure 2) Other transition images show Jacky driving his car over long roads cutting through the fields. The represented open space in *Bullhead* is in general characterized by the urban fringe. With impressive aesthetic camerawork of cinematographer Nicolas Karakatsanis, the film portrays shady car dealers, meadows facing brothels and a mob meeting at an empty horse race track.

Although similar in setting, the Flemish countryside, *Kid* depicts the environment with an overall subdued ambiance. The movie takes off with four consecutive static shots of objects in the farmhouse followed by a tractor riding towards the farm. (figure 3) The whole opening is supported by dramatic music. The point of view is that of the children, their world and experiences are recorded in a linear storyline. *Kid*, the boy as well as the movie, spends a lot of time in the open spaces. His territory consists of the farm and its fields, the football field, the parking lot of the supermarket and especially the forest. (figure 4) These are the places where *Kid* passes on his way from school, plays with friends, and hangs around

according to his own intuition and desire. The forest is also the place where he connects with his mother. Before the death of his mother, Kid spends a lot of time alone in the forest. However, after the fatal shootout, Kid seems to have lost not only his mother but also this freedom. From that occasion onwards, he is accompanied in the forest: by classmates during gym course, by his uncle or his brother and even his father turned up and spends an afternoon with the boys in and around the wood.

As a social construct of (rurban) imaginaries, the reflection of both directors in different interviews reveal their intentions and connotations to these open spaces. Michaël R. Roskam explained how he uses the landscape as a dramatic concept with inspiration from Flemish painters. He employs the landscape as a container of stories, of the numerous events that took place in it, that is able to communicate. Moreover, Roskam, educated as a painter himself, evokes in *Bullhead* also references to ancient mythology. Obviously, the protagonist *Bullhead* refers to a Minotaur, a classic character with literally the head of a bull and body of a man from Greek and Roman mythology. In a more subtle way, Roskam implemented this aspect of mythology also in the composition of the film's landscape-portrayal:

*'I tried to create a Flanders with a slight mythological layer. A mythology which emerges from a poetic, literary, artistic and pictorial tradition from our past (...) I've captured present-day Flanders with a traditional eye, an eye that is connected to my cultural past.'*⁴

Whereas Roskam indicates mythological inspiration, Fien Troch assigned symbolic value to the places linked with nature in her film:

*'That was the plan, I'm not saying that it's one hundred percent clear in the film, but the plan was to show that nature could create a kind of freedom, which he had less in those other places. I also wanted to treat nature a bit like uhm, ... almost like in fairy tales. Where the forest can be such a bright and lovely place but also a dark and sinister place. So that it blends a bit with that.'*⁵

Especially the forest is imagined as a place of big and intense emotions, as well harmony and happiness (in a quiet family moment or when Kid plays in the wood) as fear (when Kid is afraid he lost his mother). This contrasts with the insensitive, chilly atmosphere of urban places, as the supermarket, bank office, and even the living rooms in this movie. These places are clean and organized but devoid of warmth.

As a mediator, the investigation of spatial representation and reflection in *Bullhead* and *Kid* brings three thematic connotations to the fore which determine the cinematographic interaction. Firstly, open spaces always contain traces of urbanization. In morphological terms urbanization is visible in the background-buildings or roads cutting through the fields. Sociocultural aspects of urbanization are linked with urban issues and problems that appear on the countryside. For instance, illegal trafficking, mobs, prostitution and violence in *Bullhead* or debts an murder in *Kid*, which are considered as

⁴ Interview with Michaël R. Roskam (2011a)

⁵ Interview with Fien Troch (2021)

typically urban phenomena. Nevertheless, the forest in *Kid* takes a special place in this matter. Almost entirely portrayed as pure nature, the forest is initially not linked in any way to urbanization. However, the trodden path on which gym class runs through the trees betrays cultivation. (figure 5)

Secondly, both movies connect freedom with open space. Moreover, freedom is experienced by (innocent) children. These environments do not impose rules or obligations, there are no expectations like silence in the church, purchase in the supermarket or behave and obey at school and at home. The scene in *Bullhead* when young Jacky and his friend discuss girls, love and sex in front of a large meadow, illustrates the freedom of these kids. (figure 6) When Jacky asks his friend a favor, and thus imposes expectations, the camera shifts perspective and shows how the two boys were leering at prostitutes in the brothels on the other side of the road. (figure 7) In the case of *Kid*, one can say that together with Kid's mother, the boy's innocence dies. From that moment, he is no longer free in the wood, even on the parking lot bound he is now bound to stay in the car of his uncle and aunt.

Thirdly, open spaces are situated on the borderline. They literally mark transitions in the narrative of *Bullhead* while the activities in these spaces more figuratively balance on a border. The border of legal and illegal when it concerns the criminal activities, or the methodologic and symbolic borderline in the climax of the films. In the final scene of *Kid*, the forest is the place where the boy is re-united with his mother after both of them have died. (figure 8) They crossed the border of life and turned the wood into a symbolic transition between life and death.

DISCUSSION AND CONCLUSION

Throughout this paper cinematographic perceptions in two contemporary fiction films were investigated as a case study to discover, whether film is able to operationally contribute to the meaning and knowledge of open space in the context of the Flemish 'rurban' landscape. The results make clear that film unarguably has the potential to go beyond the commonplace of open space as the idyllic countryside.

First of all, cinematic representations in the selection of films reveal locations that are experienced as open spaces but cannot be categorized as such according the definition of unbuilt, non-sealed land. Places on the urban fringe, like the parking lot of the supermarket in *Kid* or the horse track in *Bullhead*, offer recreation and freedom that characterize open spaces. Moreover, urban elements have intruded all open spaces.

Secondly films might also add to the knowledge about the socio-cultural construction of place. The cinematic reflection of the films is not linked to the idyllic, as it used to be in the traditional Flemish 'peasant' movies. In contrast, the cinematic analysis highlights the dramatic and symbolic layer added to these places.

Finally, the possible mediating role of film helps to understand emotional attachments to places. Especially the impact on people became clear. Freedom is reserved for children in open spaces, of which the wood has a special symbolic place as predominant natural space. Adults are bound by illegal structures (hormone traffic, debts) and struggle to survive. They inhabit urbanized spaces.

This method of analyzing cinematic images through its three different acting roles definitely forms an addition to regular research on the matter. Filmic narratives succeed in adjusting a very selective perspective on open space (monofunctional, nature or agriculture) into an multiple layered image. Open spaces thus differ from their first appearance: what at first glance is a harmonious pastoral environment, happens to be dark and mysterious. In correspondence with international findings (Massey, 2005; Tewdwr-Jones, 2011), film has proven to be able to clarify these everyday multiplicities and provides insight in the lifeworld.

However, the implementation of film as an interdisciplinary tool for spatial planning requires future research. Incorporating cinematic narratives in problematization and analytical phases of planning processes, might give new insights and redirect the focus on what is at stake in the everyday experience. And although this first and modest selection of two contemporary fiction films, both set in an agricultural atmosphere, is very much restricted, a strong narrative on open space came to the fore: open space is urbanized, not as much on the morphological level, but socio-cultural urbanization of open space determines the everyday experience.

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FIGURES



Figure 1 : Bullhead : Opening scene (still 0:00:58)



Figure 2 : Bullhead : Transition image of field (still 0:07:31)



Figure 3 : Kid : Tractor riding towards the farm (still 0:02:38)



Figure 4 : Kid : Kid at the parking lot of the supermarket (still 0:48:02)



Figure 5 : Kid : the trodden path in the forest (still 1:08:42)



Figure 6 : Bullhead : Jacky and his friend before a meadow (still 0:33:15)



Figure 7 : Bullhead : Jacky and his friend leering at prostitutes (still 0:33:24)



Figure 8 : Kid : final scene (still 1:27:47)

REGIONAL PLANNING GAMIFICATION – A GAME-BASED APPROACH FOR ACTIVATING REGIONAL PLANNING STRATEGIES

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1. Introduction

While gamification has already been a topic of discussion for years (Scholles, 2005, p.326-333), the reality of planning does look different. In the presented work, issues of the formal regional planning in Germany are depicted in general and specific on the Stuttgart region. Well-known as the key economic region in Baden-Württemberg and southern Germany with global players such as Daimler, Porsche and Bosch in economically performing sectors like engineering, automotive industries and business services, even Stuttgart faces several challenges, which broadly can be subsumed as growth related pain. In the regions characterised by growth pains, actors in regional development, citizens and political decision-makers from various municipalities are confronted with one another in multiple constellations along with their positions and motivations. As an overall spatial planning concept, the regional plan has to take integrated account of the functional interrelations of the region and mediate between competing uses while it is often met with incomprehension, reluctance or even headwind, corresponding with negative consequences for the acceptance and appreciation of the plan. The current procedures, concepts and planning instruments of formal regional planning to ensure sustainable settlement development seem to have reached their limits. They need to be supplemented by persuasive instruments, among others, in order to convincingly convey the concepts in political decision-making processes (Stiewing, Mangels and Grotheer, 2020, p.1)

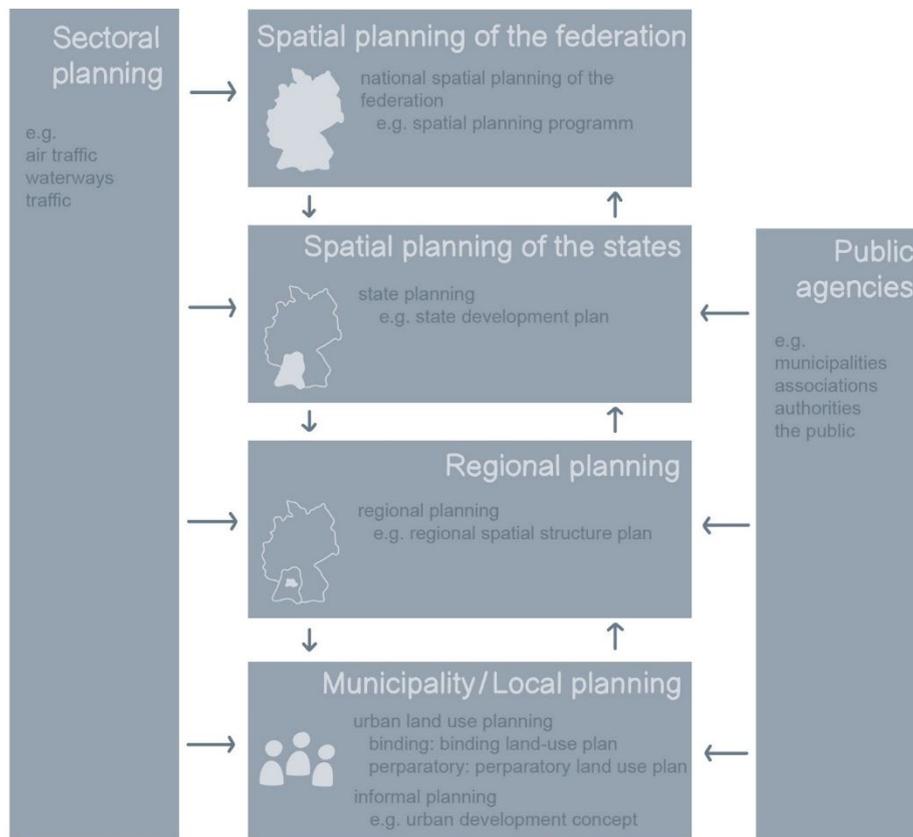
One persuasive, game-based approach for the above-mentioned issues with a focus on mediation, consultation and integration into political decision-making processes has been developed within the framework of a student project by students of the master's program in urban and regional development at the Technische Universität Kaiserslautern and will be presented in this paper. It addresses both citizens and political decision makers of the municipalities at the interface of regional planning and offers a possibility to present regionally relevant but locally rather intangible matters in a comprehensible way in order to stimulate an awareness-raising process. At the same time, this paper shows in which fields of practice the designed card-game can be used.

2. Regional planning in Germany and the Stuttgart region

2.1 The system of formal spatial planning in Germany

The political and administrative system in the Federal Republic of Germany is marked by the basic statutes of democratic principle, principle of the rule of law, social state principle and federalism principle. Characteristic for the system of spatial planning in Germany therefore is the federalist state order with the tiers of the federal government, the 16 states and local governments in 294 counties, about 10.700 county municipalities and 107 county-free cities. Considering that the latter are again spread over 22 administrative districts and 111 planning regions, spatial planning in Germany is accordingly decentralised and differentiated (Henckel and Pahl-Weber, 2008, p.13-39). The distribution of competencies and functions corresponds to a system of three planning levels of legal, organisational and substantive differentiation. The levels are at the same time interlinked by multilayered requirements of notification, participation, coordination and compliance as well as the mutual feedback principle (or: principle of countervailing influence), which applies to all levels and is characterised by mutual feedback and adjustment. In several rounds - partly mandatory, partly informal - also public agencies (e.g. municipalities, associations, authorities, the public) and sectoral planning (e.g. transport, nature and landscape, energy supply) are involved (Turowski, 2005, p.895-898).

Figure 1: The system of spatial planning in Germany (Henckel and Pahl-Weber, 2008, p.71)



While the role of federal spatial planning is mainly the development of guiding principles and action strategies for spatial development, state spatial planning develops state-wide spatial structure plans laying down principles and binding goals on the basis of spatially significant sectoral plans. The comprehensive, supralocal and intersectoral state instrument implements federal planning principles as well as the state spatial development goals and ideas, including specifications on the desired settlement and open space structure, securing locations and routes of infrastructure and the central-place system. Federal and state authorities are interlinked through the Conference of Ministers of Spatial Planning (Henckel and Pahl-Weber, 2008, p.69-73).

Regional planning, as dealt with in this paper, has to specify the state development plans for the individual sub-areas of the federal states by means of regional spatial development plans as an overall spatial planning concept of a region. Regional plans thereby 'coordinate land use matters of supra-local interest transcending municipal boundaries' (Henckel and Pahl-Weber, 2008, p. 73). More even, as medium-term concepts they are intended to illustrate the envisioned development of a region for a period of ten to fifteen years. Due to its sandwich position, regional planning not only mediates between state spatial planning and local spatial planning as well as sectoral planning (Priebes, 2018, p.2051-2052), 'it defends the general interests of a region against the particular interests of local authorities.' (Henckel and Pahl-Weber, 2008, p. 73). At the municipal level, the concretization through urban planning and urban land use planning takes place as an essential prerequisite for the realisation of projects.

The practice of regional planning varies from state to state, due to different shaped planning regions, various forms of organisation or the regularity of plan preparation and updating (Priebes, 2018, p.2051-2052).

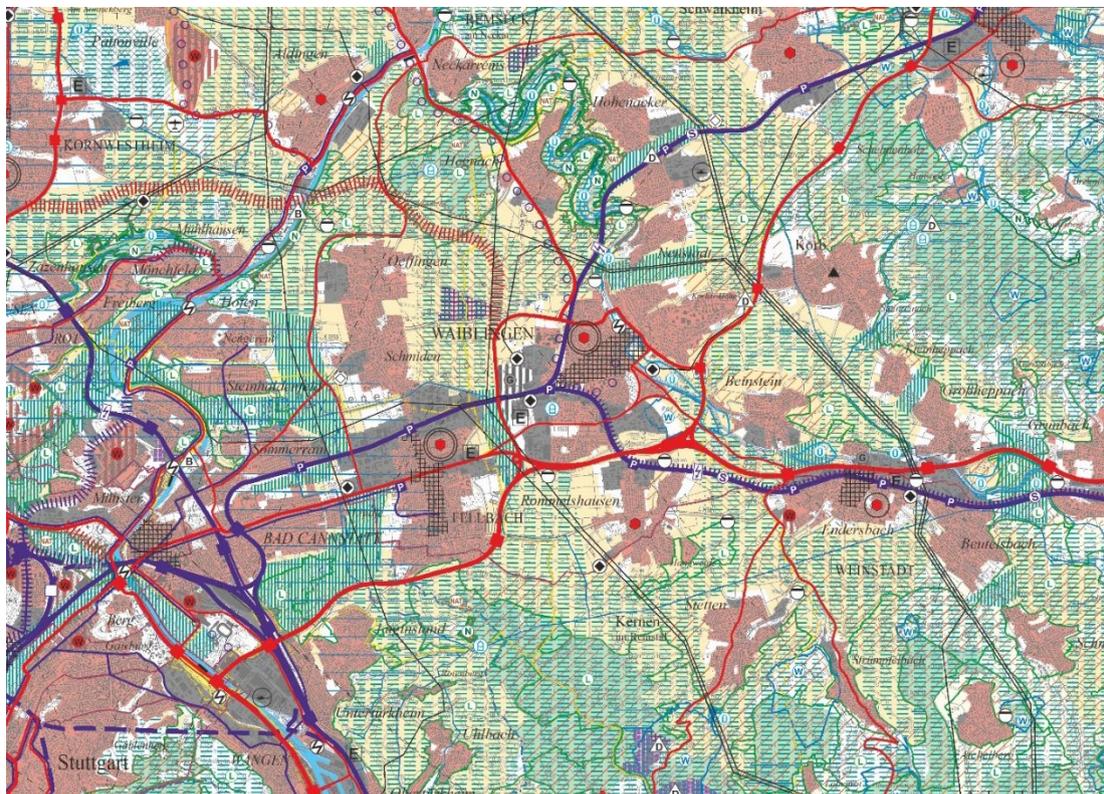
2.2 Regional planning in the Stuttgart region

In the Stuttgart region the regional planning authority is the regional association Verband Region Stuttgart (VRS) as one of twelve authorities in Baden-Württemberg. Representing the region on a political level since 1994, members of the regional

assembly, the parliament, are elected by the citizens every five years in regional elections. The association is headed by the honorary association chairman and the regular regional director. With the aim of ensuring the region's variety, high standard and quality of life, mobility and economic performance, the VRS works on a forward-looking and sustainable development of the region. As mandatory tasks, the VRS is therefore responsible for the regional planning along with landscape outline planning, concept and planning of the landscape park Stuttgart region, regional transport planning, public transport of regional importance, regional traffic management, regional economic development aid, waste disposal (partly) and regional tourism marketing.

The current regional plan for the Stuttgart region consists of three parts (text part, land use map and structural map), which were adopted as bylaws by the regional assembly in 2009. In the long term, the regional plan intends to ensure the region as a prospering economic area and attractive place to live by maintaining the infrastructure sustainable for the future, steering settlement development on the back of public transport and providing appropriate land in harmony with ecological and economic conditions. In terms of content, the regional plan is divided into the chapters 'goals and principles of the desired spatial development and order', 'regional settlement structure', 'regional open space structure' and 'regional infrastructure' (VRS, 2009a, pp.9-14).

Figure 2: Regional plan (excerpt) for the Stuttgart region (VRS, 2009b, p.1)



2.3 Challenges in regional planning and the Stuttgart region

General issues of formal regional planning in Germany arise from the structure of the regional plan as a comprehensive but due to periods of development and coordination inflexible instrument. As outlined, regional planning is based on legal requirements and specifications with a varying degree of coordination and integrated approach at local and supra-local levels. The implementation of the settlement development 'desired' by urban and regional planning varies at the municipal level and is reliant on the local self-governments (Stiewing, Mangels and Grotheer, 2020, p.1-2). While the conviction of the local level is essential for the implementation of regional planning strategies, corresponding to the differentiation of

regional planning, there is a broad heterogeneity of illustrations and plan symbols whereby differences occur even within the same state (Kistenmacher, Domhardt, Albert et al., 2001, p.79). The specifications of regional plans are not only therefore incomprehensible for non-experts such as citizens and political decision-makers (Tainz, 1992, p.369), but more even in general unsuitable for a comprehension of the sense or even the understanding of the complex planning specifications (Kegel, 2006, p.90-100). As a consequence, regional planning goals may not only become difficult to perceive but also the implementation of the plan's contents be hindered (Müller, 1999, p.244-245).

While goals of spatial planning lead to a restrictive character of the regional plan, the principles of spatial planning represent a declaration of intent, yet they do not have any binding effect on the local level. In the example of settlement development, the missing use of areas prepared and secured by regional planning as well as a lack of awareness of the housing shortage and an insufficient assumption of responsibility for the creation of housing are to be mentioned as obstacles. Thus, the influence of regional planning is limited. Municipalities cannot be forced to dedicate land, but rather can be prevented from dedicating land in suboptimal locations (Stiewing, Mangels and Grotheer, 2020, p.1-2). The formal instruments of regional planning prove to be effective when it comes to limiting the growth aspirations of individual municipalities to an acceptable level from a supra-local perspective. Nonetheless they are lacking more enforcing mechanisms in order to bring regional specifications to an implementation (Hemberger, Kiwitt, 2018, p. 33-35). The current configuration and standing of regional plans including a lack of understanding, doubts, reluctance and headwind by individual municipalities lead to the fact that many of the already integrated contents are not sufficiently activated and steering and guiding functions of regional planning determinations become ineffective.

With regard to the Stuttgart region, there are further challenges due to local conditions. On the one hand, there is a large administrative fragmentation with often insufficient cooperation within the city region, rather a widespread competitive thinking regarding residential, commercial and recreational spaces. An increased 'NIMBY' (not in my backyard) or 'BANANA' (build absolutely nothing around near anybody) phenomenon among citizens is also to be mentioned in this context. Regional needs for action may be recognised, but are not necessarily supported by citizens and decision-makers acting on their behalf. This is why decisions are thereby to an extent dependent on local political considerations and the goodwill of the electorate. Moreover, the narrow focus on the municipalities' own sphere of influence has an aggravating effect, whereby the local authorities' role in solving the housing shortage is often not perceived in a way that is adequate to the problem (Stiewing, Mangels and Grotheer, 2020, p.3). The strategic development of the region as a whole is thus hampered by intermunicipal competition, stagnation of saturated feel-good municipalities and plain unsolidary actions on the part of individual municipalities.

Yet regional approaches are particularly necessary in regard to the problems existing in the region and arise from the functioning as a labour market, passenger transport and service region around the centre of Stuttgart. Issues worth mentioning are the increasing traffic congestion caused by commuters, including side effects such as smog or traffic jams, the housing shortage with a strained real estate market in urban locations and the necessity of open space and climate protection in a largely densified settlement area. Further aspects are an inhibited economic development due to a lack of space for commercial and industrial expansion and restructuring, a brain drain due to housing shortage and missing 'residual space' for creative milieus and start-ups. In addition, the concentration on the automotive industry offers a vulnerability to structural transformation with regarding trends as sustainability and mobility change. Even though the regional plan serves as a strong inhibitor to maldevelopments and exploits the instrument's frame with restrictive regulations, it reaches its limits, lacking the ability to activate and enforce the relevant in order to keep the region's economic position. Likewise, regional planning, the influence of the VRS as a public authority and advocate of regional interests as well as its awareness among citizens is limited.

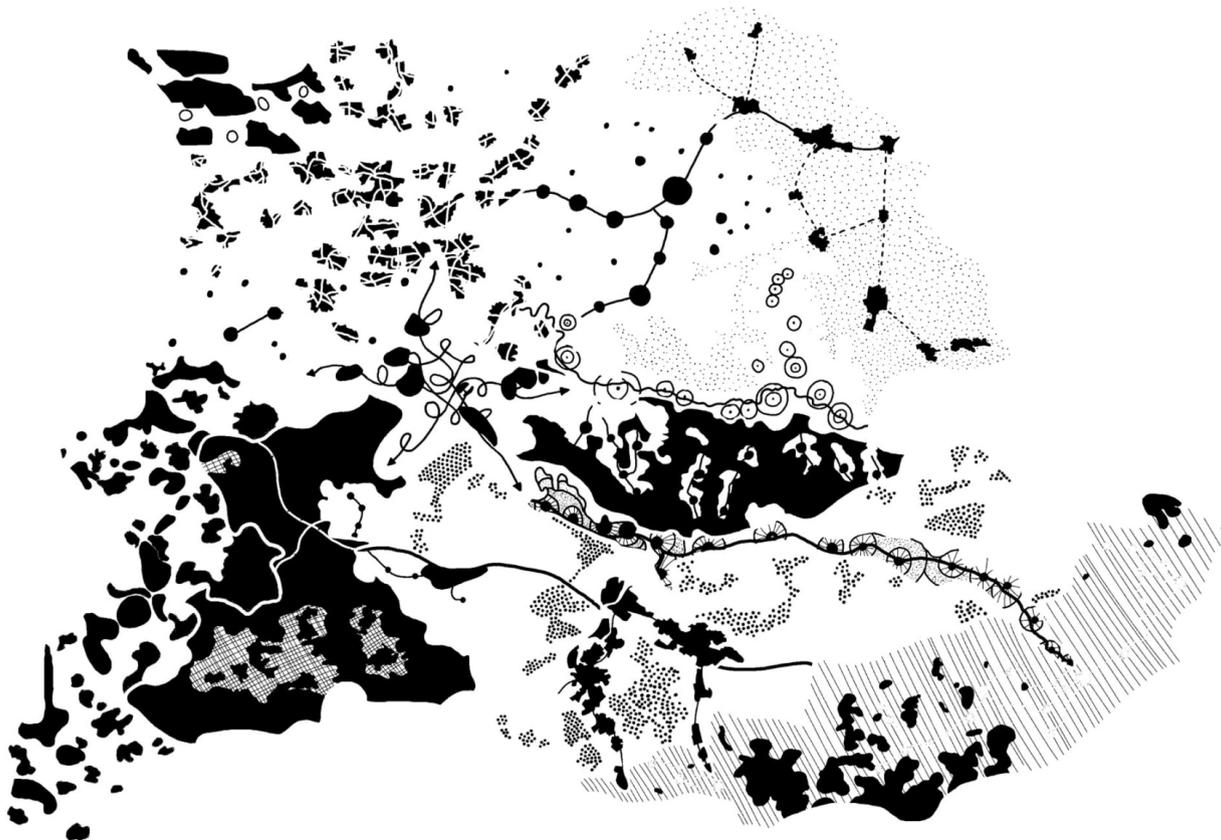
3. Methods and approach

3.1 Project-design and gamification as a strategy

Besides the rather restrictive specifications, regional planning has a legal development mandate as an opportunity to use formats of information, cooperation and awareness raising specifications to achieve a consensus on future developments. Strengthening inter-communal and regional cooperation, as well as building trust, is an essential aspect in this context and can complement the classic instruments of regional planning. Both the necessity and effectiveness of such persuasive instruments for consultation, persuasion and conflict moderation have already been discussed in the professional community for years (Stiewing, Mangels and Grotheer, 2020, p.3).

Thus, this paper presents a card game developed on the back of the Stuttgart region as an approach on tackling the outlined issues of regional planning strategies. The aforementioned challenges were identified in the course of a data-based quick scan of the Stuttgart region, an exploratory excursion and on-site expert discussions with representatives of the VRS. Following the further working process, four fields of action, future scenarios and potential maps as well as a spatial image and a map to point out spatial dynamics were designed for the region and its partial areas. In order to establish regionally responsible action among the municipalities, the problems and challenges must be known throughout the region and, above all, ideas, options and approaches to action must be supported by the respective decision-makers. Local politicians, administration authorities and citizens are therefore called upon to think regionally.

Figure 3: Heterogeneity of patterns in the spatial image of the Stuttgart region



The need for an easily understandable medium to reduce the acquired insights about the region and its mode of operation as well as formal instruments like the regional plan then led to the design of the presented game. The methodological approach is based on the idea of pictorial and playful elements instead of classical specifications of regional planning. The mutual communication of different municipal perspectives as well as the realisation that problems cannot be solved by individual municipalities alone is to be promoted. Ultimately, the development of a regional consciousness and mutual understanding is intended to contribute to the discarding of communal egoism. Even though conceived on the back of planning in Germany and the challenges of the Stuttgart region, the approach can be applied in general regarding the subject matter.

3.2 Regional card game as an informal approach

As a low-threshold medium, the developed game is suitable to break down planning principles and their underlying interrelationships as well as (local policy) options for both good and bad regional action for a broad target group. It represents a tool to symbolize regional principles and possibilities with regard to thematic focal points. While playing, citizens and political decision-makers slip into the role of municipalities in order to determine their future development being shown the caused consequences of different (non)actions and spatially effective trends on 60 different illustrated cards. In a playful way, principles of the activation strategies outlined above are clarified and communities are motivated to act while unsolidary actions and violations of regionally coordinated strategies are sanctioned. The factual to humorous cards include both success and regression as well as no-way, trading and action cards representing different local-regional mechanisms and implementing good practices in regard to the four fields of actions. The game concept then requires the distribution of seven cards per player and the turn-by-turn discarding until one player has no more cards left to win the round. The 60 playing cards of the game with the German interim title 'total regional' are divided into

- 24 trading cards in 4 categories corresponding to the key fields of action,
- 4 regular and 4 regional progress cards,
- 4 regular and 4 regional regression cards,
- 16 action cards of various meanings and
- 4 no-way cards.

3.2.1 Progress and regression - good and bad regional acting

Both regular and regional progress as well as the corresponding regression cards are representative for positive and negative developments affecting either one player as an individual municipality (regular) or all players as the entire region (regional). The principles illustrate the effects of certain developments influenced by the municipalities actions and raise awareness for different consequences of spatially effective decisions.

When a regular progress card is played, the player on the turn (representing a single municipality in the region) is rewarded by being allowed to discard any other card in addition and thus reaching the goal of getting rid of all cards more quickly. Examples are the establishment of an economically strong company as a cash cow as well as the distinction with an award for excellent open space design.

In contrast, when a regular regression card is played, the player on the turn is in the position to hinder a player of choice (representing a competing municipality in the region) by handing over the regular regression card. The card must then be discarded on the player's next turn, a card must be drawn from the deck and no further action may be performed instead. Examples are the award for the region's worst public transport or the loss of young professionals as a brain drain due to lack of affordable housing.

Regional progress cards have a stronger regional reference regarding the matter and reward not only the individual playing municipalities but all players and thus the region as a whole. Played by any player, all players may discard a card of their

choice without any effect. Examples are a region of short distances or Stuttgart as a pilot region for innovative traction systems and mobility.

Regional regression cards again have a stronger regional reference regarding the matter and sanction not only the individual playing municipalities but all players and thus the region as a whole. Played by any player, all players must draw a card from the deck. Examples are a regional traffic collapse with smog and particulate pollution or missing out on economic changes regarding the characterising focus on automotive industries.

Figure 3: Sample of progress and regression cards



3.2.2 Trading cards - good practice in housing, economics, mobility and open space

As outlined, issues emerge from various thematic areas. Considering currently discussed trends such as changes in mobility, the necessity of an economic transformation, housing shortage, demographic change and climate change, the topics housing, economics, mobility and open space can be named as key fields of action. Within six trading cards each, good practices are depicted on the local government level in order to match regional strategies and resolving issues by scale. In terms of content, the cards illustrate for instance

- the designation of new building land, compaction of existing housing stock or promotion of social housing construction as strategies in the field of housing,
- the development of intermunicipal business areas, participation in research clusters or the promotion of innovative start-ups in the field of economics,
- the expansion of bicycle, public and alternative transport infrastructures, the improvement of the modal split or the promotion of the principle of short distances as strategies in the field of mobility and
- the qualitative and quantitative design of open spaces, measures for climate adaptation or the unsealing of sealed surfaces in the field of open space.

Trading cards may only be discarded in pairs as a combination of two cards of one category. Alternatively, in the sense of cross-section-oriented action, four trading cards with one card of each category may be played to discard.

Figure 4: Sample of the 24 trading cards



3.2.3 Action cards - entertaining elements with a scientific background

In order to illustrate local and regional significant principles and tendencies as an institutional framework as well as loosening up the course of the game the set is supplemented by 16 action cards in nine categories, conveying an additional raise of awareness for regional interrelations and the linkage between region and municipality. Principles and options as described are voluntary municipal twinning, funding programs and resource exchange in order to emphasise positive aspects of municipal cooperation and regionally compatible strategies as well as parochial thinking, compulsory merger of municipalities, municipal supervision, suspension, vote of the regional assembly and joint territorial reform to illustrate intermunicipal competition and sanctions by state authorities. Examples for consequences are the joint discarding, the drawing of cards from the deck, suspension for one turn or the redistribution of all playing cards in the game.

Figure 5: Sample of the 16 action cards



3.2.4 No way! - NIMBY as the crux of spatial planning

Mirroring the reality in planning, (almost) all of the outlined game actions are underlying the veto option of the public, by playing one of the four no-way cards. As public opinions diverge among different municipalities, also the no-way card itself can be vetoed by another no-way card of any other player. As the only exception both regular and regional regression and progress cards are excluded from the veto, due to their inevitability in reality and their strong importance to the region as a whole.

In terms of content, no-way cards are linked to existing hindering mechanisms such as the NIMBY or BANANA phenomenon among citizens, referendums, demonstrations and a shortage of political backing within the regional assembly. Drawing attention to this crucial aspect of planning, no-way cards are thus suitable for achieving a corresponding gain in knowledge among the players.

Figure 6: Set of no-way cards



4. Conclusions and outlook

Spatial and especially regional planning Germany show to be highly formal, decentral and differentiated by regions and municipalities. The VRS as one of the interconnected, innovative regional associations hereby is to be mentioned as a strong political actor in the region, given the possibilities regional planning has by law. Nonetheless, regarding the issues and challenges that are either existing or currently arising, there are increasing fields where formal regional planning in general cannot act in a targeted manner due to a lack of implementing competencies. The consequent need for informal accompanying instruments of activating nature are therefore inevitable, addressing both citizens and local political decision-makers of different political orientation and motivation throughout the region.

As presented, a game-based approach offers a promising, low-threshold medium in the informal sector for especially non-experts or those stakeholders with a sceptical attitude towards regional planning. By dealing with regional issues in a simplified, game-like manner, stakeholders can benefit from an increase in experience, comprehension and trust with regard to political actions as well as formal regulations in planning. Further, they are encouraged to cooperate and act collectively. Trying out, getting to know and experiencing topic-specific options for action and regional steering principles

is intended to convey fun in dealing with regional topics on the one hand and to trigger a learning effect in the players, at least subconsciously, on the other.

Essential target groups can be identified by means of three key fields of use. First of all, the game can serve as a communication medium that is intended to enable a further exchange between the regional and municipal level beyond bringing the municipalities together. Besides the local regional planning authorities, the aforementioned political decision-makers in the municipalities, such as councillors, honorary and full-time mayors as often non-experts have to be named here as relevant stakeholders. Second, game-based media may be used in the field of planning and political education, regarding students and practising experts of spatial planning as well as local decision-makers in terms of council retreats or workshops. In the long-term, the approach is moreover conceivable within the framework of participation processes of different types, for instance as part of the elaboration process of regional spatial structure plans or regarding citizens and local initiatives.

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THE INFLUENCE OF MORAL KNOWLEDGE ON URBAN VILLAGES IN SHENZHEN, CHINA

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1. Introduction

Chinese moral knowledge, immensely informed by the primitive cosmology and the ethical philosophy of Confucianism, had deeply affected people's attitudes and way of life. It had been practiced throughout history by framing and ordering social practice on the land, becoming a part of the path of Chinese beauty (Li 1988). However, when China has gone into its fast urban development that is much influenced by the global economy and political movements, these traditional practices face extensive challenges from the dominant western paradigms. The understanding of the traditional knowledge as cultural forces shaping the distinct characteristics of Chinese spaces and urban life (Li 2004) is urgently needed.

Chinese urban village is one of the areas where the local traditions confront modernisation. It is a particular phenomenon where the traditional rural villages are gradually surrounded by built-up urban areas in the process of rapid urbanisation (Wang et al., 2009; Pan and Du, 2021). Shenzhen, a metropolitan city in southern China, has more than 1000 urban villages (Du, 2020). The urban village has its essential roles in cities: it offers social opportunities to migrants, including the facilitation of temporary practices that meet their aspirations and needs; it fits into the landscape and generates inclusive social interactions beyond the lineage origins; it also embraces the notion of urban heritage that recognises its existing cultures and accumulated experiences as related to diversity and identity (UNESCO 2019). As the city's land resources are quickly consumed driven by the market benefits, urban villages as such have become the main target for urban redevelopment. Huaide Village is no exception, and the process is demolished-oriented. Existing studies started to acknowledge the importance of urban villages, but they mainly focused on affordable housing, typologies, and other physical elements. What are the core values of urban villages that make the distinct characteristics of Chinese spaces? How should the values of urban villages be recognised in the transitional time towards sustainable development? This paper explores the concept of moral knowledge and analyses how it influenced the spatial configuration that bears the socio-ecological values in Huaide Village in Shenzhen. The lessons and insights from the tradition provide alternative ways for future urban renewal strategies that engender better citizen engagement.

2. Methods

2.1. The study site

Huaide Village is a 700 years old village in Bao'an district of Shenzhen, China (Figure 1). Located on the eastern bank of the Pearl River Estuary, the village has a hilly landscape which used to be characterised by crisscrossed rivers and streams. With the southern subtropical monsoon climate, Shenzhen has long summers with a seasonal average temperature of 32°C and frequent heavy rains (Shenzhen Meteorological Bureau, 2022). The city is among the most vulnerable cities to tropical

cyclones on the Guangdong coast, with an average of 3 to 5 events each year (Chen et al., 2018; Shenzhen Meteorological Bureau, 2021). And the threats from rainstorms and floods were predicted to increase from 2020 to 2100 (Shao et al., 2021).

2.2. Data collection and analysis

The study applied a mixed-method approach to unravel the social-ecological qualities of the space. Interpretive mapping was used in analysing the layered spatial patterns in the past and today, focusing on the landscape structure, settlement pattern, topography, and, more importantly, the relationships among them. The mapping was supplemented by non-participant observations of study social actions in context and real-time activities and interactions. The observations were documented through fieldwork photographs, qualitative descriptions and architectural ethnographic drawings, to present the social and ecological qualities of space.



Figure 1. Huaide Village in Fuyong Subdistrict, Shenzhen. Source: D.Tan based on google earth, November 2021.

3. Moral knowledge and relational space

The social-cultural forces are considered primary in shaping houses and settlements, and others like climate, materials and technology, and economics are secondary or modifying (Rapoport, 1969). In China, moral knowledge serves as the cultural forces; it is bound to the primitive cosmic view of the world and class thoughts, especially Confucianism. The former gives a reference for the ideal city or village; the latter stresses the order of society. They together set up a general framework for the configuration of settlements (Wu, 2015; Zhang, 2015). Within this framework, *Fengshui* was used as a geomancy rule (taking into account the site context) to modify the final settlement pattern which embeds both social and ecological qualities.

Moral beliefs require a relational pattern of configuration (Zou, 2004) that can show the order of society. In primitive and ancient times, people took the celestial world as a model and tried to establish their own ideal city or village. The four cardinal directions that were taken from the circumpolar constellations - the first to the north of pole-start, the second to the south, and the other two east and west are where sun rises and sun sets - were considered the first and foremost to identify the center of the territory (Xu and Chang, 2014), as early recorded in the classic book *Rites of Zhou* (*Zhouli*, 周礼). The centre where the emperor dwelled symbolises the supreme power of governing the territory. Also, the parallel of left (east) and right (west) was widely used, not only to differentiate things but more importantly to construct the moral order (Peng, 1997). The practice of *Zuozuyoushe* (左祖右社), that is, placing an ancestral shrine which keeps the late king's or family leader's spirit tablet in the left (左) while the *Sheji* altar for the god of land and grains in the right (右), showed the order of yin-yang (Peng, 1997). The worship towards the heavenly world through communication with ancestors was privileged in the left (east) direction, representing yang.

These normative rules and patterns applied strictly to the founding of the state, and also to the villages on a small scale, especially after the Song dynasty (960–1279) in the prevalence of Confucianism. In Huaide Village, sacred places are placed in the morally important locations. The ancestral hall of Pan (or the clan house of Pan) with a front square - first built in Yuan Dynasty (1271-1368) - is oriented north-south, facing south to the main gate of the village. With the subtle topography (that is higher in the north and lower in the south), the orientation facilitates the ritual actions of looking upon ancestors or sages. During the worship or festivals like weddings, the clan house becomes a stage for the performance of rites and music: the ritual ceremonies are organized in the main hall; music and dancing acts are at the front square. For worshipping, only limited senior people have the right to enter the main hall (Guangdong Cultural Centre, 2018). The construction of family houses also applies the time and direction reference from the celestial world. They are also in general north-south oriented, but there is a slight difference in the individual family house. The exact orientation is defined depending on the year of construction and date of birth of the owner, as related to five phases (*wuxing*, 五行) in Chinese cosmology (Lu, 2008). As a result, an aligned but heterogeneous pattern has formed.

Fengshui (literally wind-and-water) supports above moral aesthetics of relational pattern and at the same time function as a tool for the site and climate modification. Using geomancy rules, Fengshui works closely with the site (topography, ecological assets, etc.) to identify the 'right' orientation (Feng and Wang, 1992). While the rightness means the well placing of houses for the living and graves for the dead in a mystical environment, to gather the optimal 'qi' for the good fortune of the living descendants (Needham, 1956; Bruun, 1996), the living comfort (Rapoport, 1969) is also realised by favourable microclimate modified and accessible resources. Such a good place is evident from Huaide Village's relational position in the landscape (Figure 2). The houses were clustered and situated in a relatively higher place, at the foothills of *Wangniuting*, facing the south. This helped to prevent floods during the rainy season in this lowland area on the eastern bank of the Pearl River Delta. The main mountain in the north and small hills on the other sides embraced the village; water flowed from the hills and filled in the ponds constructed in the southwest. In this way, with the prevailing southerly wind in the summer, the 'qi' settled in the village. The wind flew through villages and north-south houses also contributes to a comfortable microclimate. Tree planting was compulsory along with the village, especially in the north and also next to the sacred places like ancestral hall was a way for defence and territory demarcation. This can help reduce erosion in heavy rains and cool down the temperature, which further provides an ambient environment for ritual activities and ordinary life.

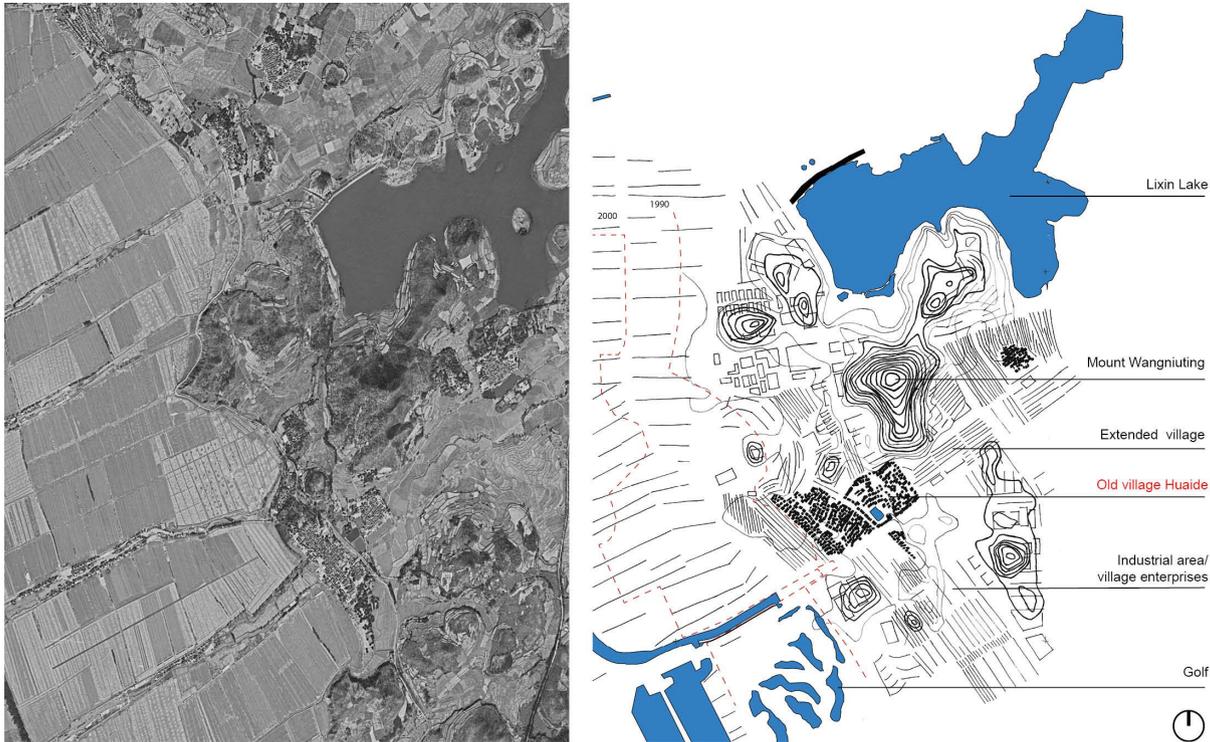


Figure 2. settlement patterns of Huaide village of 1975 (left) and 2021 (right) . Source: Earth Explorer (Left); D. Tan based on google earth 2021 (right).

In 700 years, the village and its surroundings have experienced dramatic changes. Nevertheless, it retains the traditional settlement pattern (Figures 2 and 3). While the farmlands, terraces, and even small hills around the village were reclaimed for extended communities and (collective owned) industries, the main mountain in the north is preserved to safeguard the village's territory. The layout of houses remains being aligned almost north-south, slightly towards the southeast. Though residents have replaced almost all traditional family houses with the modern dwelling of the early 20th century, they still carefully considered the orientation following the normative rules and *Fengshui* principle. In between houses lies three hierarchies of streets: 6-meter wide main streets stretching from the south gate and east gates, secondary 3-meter wide alleys, and thirdly 1.5-meter wide alleys. The first two dimensions allow for car access while maintaining a pedestrian or even socialising environment by being covered by trees or shaded by 2-4 floor buildings. The narrowest alleys are for pedestrian access. These alleys are mainly oriented north-south to receive natural daylight. Due to the compact layout between houses, most low-rise houses (2 floors) have a courtyard in the front and a balcony to obtain sufficient sunlight. This also promotes the connection with people outside of the wall. The previous natural defence wall of trees and water ponds are replaced by the mid-rise buildings (3-4 floors) with ground-floor shops opening along passageways. The sacred structures like the clan house of Pan were preserved, sitting in the privileged spaces, to maintain the prestige of value of locality. On the right side of the clan house of Pan, with a distance, now lies the Huaide property management company, which oversees the maintenance of the constructions, with an implication to claim the villager's right on the communal land of their lineage.



Figure 3. Existing spatial pattern of Huaide Village. Source: D. Tan based on Google Earth 2021

Moral knowledge in ancient times showed a far-reaching effect on the spatial pattern that goes hand in hand with the order of society. It offers an abstract and relational structure that frames the village or city through orderly arranging of essential nodes like the central space and scared figures. In other words, spaces have their social meaning and are *relational constituted* (Fuller and low, 2017). At the same time, the site context modifies such structure with the given climate, topography, wind, rainfall, and other natural conditions. In the end, with the conjunction of moral rules and geomancy, the village itself bares a glue of social and ecological values evident from reading the morphology and the moral practices.

4. Urban redevelopment and socio-ecological values

Early in 2004, the local government of Bao'an District launched the old village redevelopment programme in Huaide Village; later on, in 2010, it became part of the Shenzhen urban renewal programme (Urban Renewal and Land Preparation Bureau of Bao'an District of Shenzhen, 2020). A completely new 'urban look' was proposed (Figure 4) on top of the traditional settlement pattern to modernise the entire old village. Spatial control and regularisation - among the popular ways of resolutions to modernisation (Pan and Du, 2021) - were used. In this control plan, the entire old village is boldly divided into blocks: a public green park in the middle as an axis, large residential blocks on two sides, and one commercial block on the east-south corner. The important scared figures are to be isolated and framed into the park axis. In residential blocks, about more than half of the land is reserved for green spaces; a high floor area ratio (of 6.6) is required. The average footprint of a high-rise building is about 6 times of a current house. Moral rules seem to be constrained in the few heritage architectures decorated by the green parks, between the divided blocks. The renewal plan creates rather an illusion for

the valuable land property which can draw great attention from the developers and future investors. The demolishing process of the Huaide Village goes relatively slow, compared to the industrial area in its south which was cleared to give away for the new subway station. Houses are being torn down one by one depending on the individual negotiation, and then the areas were temporarily marked as parking plots, to demarcate the land as the domain of the state.



Figure 4. Block division and index control map (left) and schematic diagram (right). Source: Urban Renewal and Land Preparation Bureau of Bao'an District of Shenzhen, 2020

In the demolishing process, however, the village shows resistance to the claiming of the land and homogenised urban spaces (Herrmann-Pillath, 2018), through the persistence of its relational pattern and naturally developed social life. The streets, sacred or public structures, collective parks (preserved from patches of trees), shop fronts, and the newly demolished squares constitute a network (Figures 5 and 6); the field of the network is essentially a space of society (Figures 6 and 7). This field accommodates all forms of social-cultural life: it welcomes not only local residents but also newcomers, including migrants. First, streets are among the most prevalent form of social space linking the different destinations. The pedestrian environment with trees and plants promotes communication. Second, the sacred or public structures are unique and form the urban spectacle. Sacred places like clan houses and old trees all become a public domain. Formal and informal activities transact around these places depending on the circumstances. They could be worshipping saints and heroes at the temple, worshipping ancestors of all households at the ancestor hall, or spontaneous and self-organised ordinary life such as playing Mahjong in the hall or dancing in the front square (Figure 7). On the one hand, such a sacred landscape maintains and strengthens the expanding kinship by reaffirming the social hierarchy; on the other hand, it is a space of society that invite social connections beyond the lineage. Third, collective parks centred on old trees (i.e. *Ficus Concinna* and *Dimocarpus Longan*) provide an ambience that gathers residents to relax in the cool, chat with friends, etc. The *Ficus* tree, usually next to the temples, bears a symbolic cultural meaning, while the *Longan* tree is a popular local species for fruits. Last, the continuity and openness of shop fronts encourage both information and financial exchanges. The paved way in front of the shop entrance is used as the extension of a privately owned shop for displaying goods or mobile stalls.



Figure 5. Spatial network that accommodate urban social life in urban village Huaide. Source: by D.Tan based on google earth map 2021

Inheriting old traditions and integrating new social interests, the village itself is a space for urban daily life that facilitates people to encounter and interact with each other. This spatial structure is ambiguous without clear division and set a framework for the social-cultural life of the population. In contrast to the oversized 'new look' under the urban redevelopment programme, the network links the essential spatial fragments from sacred trees to shop fronts and retains the social and ecological values.



a) East-west alley



b) North-south alley



c) North-south alley



d) North-south road



e) Shops along the street outside village



f) Park, sacred tree (*Ficus concinna*), and open square



g) Open front yard

Figure 6. Various spaces that host social and ecological qualities. Source: photos by D.Tan, July 2021

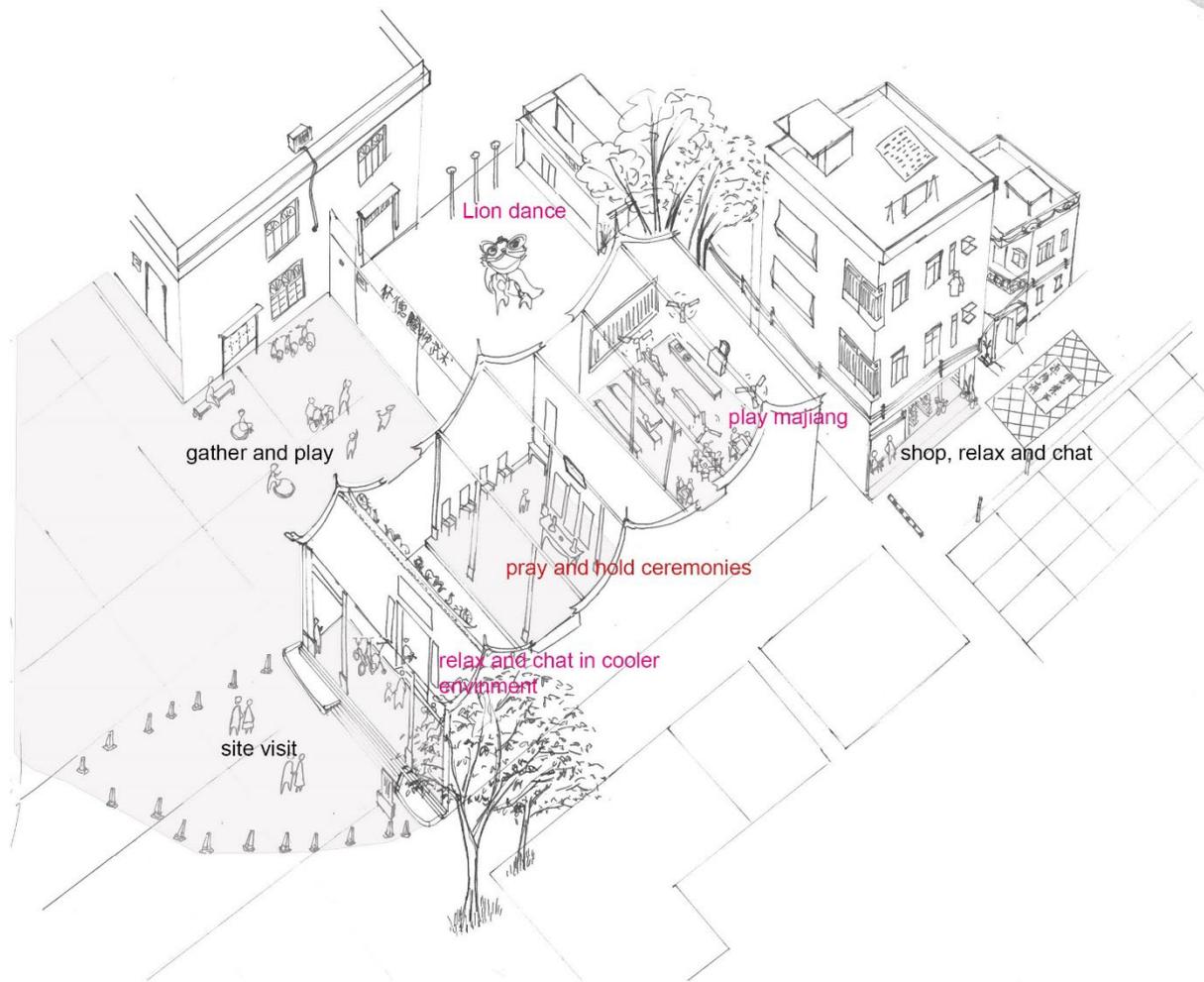


Figure 7. Diverse civic life at sacred site clan house and its surroundings. Source: by D.Tan based on fieldwork held in July 2021.

5. Conclusion

The study departs from the prevailing perspective on Chinese urban villages and instead provides an alternative way to unravel their space qualities from a cultural and ecological perspective. In Huaide Village in Shenzhen, the moral beliefs as social-cultural forces, working with the site context, have profoundly guided the way of life and settling. As a whole, the urban village landscape constitutes a relational pattern functioning as a space of society. However, the current transitional path to modernised urban life dismissed this learning.

This study highlights the need to recognise the values of urban villages themselves, to trigger a new approach to urban design and strategic planning to sustain life qualities, rather than seeing it alone as a reserved land budget. The current interests of governments and developers accrue from the rationality for renovation and profit maximisation for the planning, design and management of urban villages. When applied to all urban villages, such a way can lead to a homogenised urban environment. Indeed, the ancient wisdom shown through urban villages may provide many advantages for constituting a social-ecological balance that fits the cultural requirements and landscape. Such values are implicit, but further discourse on them can help understand the diversity of urban spaces in the Chinese context. Studying diverse social life within the urban village can also inform a better citizen engagement in future urban spatial strategies.

This study also raised questions regarding our attitude toward urban heritage. The historic urban landscape is the urban area understood as the result of a historic layering of cultural and natural values, as affirmed by UNESCO (2019). Urban renewal concerning the urban village should not be limited to conserving those individual historic buildings and certain forms. Instead, it should consider the area an urban landscape (in a broader context) that bears the local culture and daily social life. Protection of natural and cultural heritage is urgently needed.

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AN ANALYSIS ON THE DEVELOPMENT GAP BETWEEN THE NORTH AND THE SOUTH IN CHINA UNDER THE NEW PATTERN: CHARACTERISTICS, CAUSES AND COUNTERMEASURES

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With the continuous development of China's economy and the entry of socialism with Chinese characteristics into a new era, the main social contradiction in China has been transformed into the contradiction between the growing needs of the people for a better life and the unbalanced and insufficient development. Regional economic disparity is an important manifestation of unbalanced development, a long-standing phenomenon in the process of China's economic development, and also the focus of continuous academic attention. With the continuous promotion of the "western development" and the "rise of central China" strategies, the economy of the western region has grown rapidly. In 2019, the economic growth of the western region will reach 10.17%, the total GDP will account for 20.8% of the country, and the imbalance between the East and the West will gradually decrease. In contrast, in the northern region, the economic development has been slow in recent years, and the GDP growth rate has declined rapidly, while the southern region still maintains a stable development trend. In 2019, the GDP growth in the North was negative, about 11 percentage points lower than that in the south. The regional development pattern at the national level has gradually changed, and the East-West imbalance has gradually shifted to the North-South imbalance, and the gap has gradually widened. The unbalanced development between the north and the South has gradually become a new problem facing China's regional development. So, what are the main aspects of the unbalanced development between the north and the south? What are the factors that cause these imbalances? What can be done to promote the coordinated development of North and South China? These will become the key issues to be discussed in the process of building a regional economic layout with complementary advantages and high-quality development during the "fourteenth five year plan" period. However, for a long time, the academic research has focused on the gap between the East, the middle and the west, including the analysis of the difference characteristics from the overall perspective, the factor perspective, the employee income perspective, and the analysis of the causes and relevant countermeasures from the perspectives of governance, system, economy. However, there are few studies on the unbalanced development of the north and South regions, and most of them are analyzed from a single factor.

Therefore, this paper believes that at the key point of the opening year of the "fourteenth five year plan" period, it is necessary to comprehensively sort out the reality of the unbalanced development between the north and the South and analyze the influencing factors of the imbalance, so as to put forward optimization suggestions for narrowing the gap between the north and the South and promoting the coordinated development between the north and the south, in order to provide reference for the strategic decision-making of China's regional coordinated development.

1 RESEARCH OBJECT AND DATA SOURCE

1.1 Define the study area

In the selection of research objects, the traditional geographical North-South Division method is adopted, that is, the Qinling-Huaihe River line is used as the boundary to divide the North-South areas. Due to the availability and continuity of data, the provinces and cities included in this study are 31 provinces and cities in the mainland, excluding Hong Kong Special Administrative Region, Macao Special Administrative Region and Taiwan Province. The southern region includes Jiangsu, Anhui, Hubei, Chongqing, Sichuan, Tibet Autonomous Region, Yunnan, Guizhou, Hunan, Jiangxi, Guangxi Zhuang Autonomous Region, Guangdong, Fujian, Zhejiang, Shanghai and Hainan; The northern region includes Beijing, Shandong, Henan, Shanxi, Shaanxi, Gansu, Qinghai, Xinjiang Uygur Autonomous Region, Hebei, Tianjin, Inner Mongolia Autonomous Region, Liaoning, Jilin, Heilongjiang and Ningxia Hui Autonomous Region.

1.2 Data source

This paper aims to make a comprehensive analysis of the unbalanced development between the north and the south through the inter provincial panel data, and analyze the influencing factors reflected behind the data, and on this basis, put forward the corresponding optimization ideas and development paths. It mainly selects relevant indicators of economic aggregate level, investment level, consumption level, industrial structure, population flow, innovation ability, etc. the time span is mainly from 2000 to now. The data are mainly from China Statistical Yearbook, China Urban Statistical Yearbook, statistical yearbooks and economic development reports of all provinces and cities, and other relevant official reports.

2 CURRENT SITUATION AND CHARACTERISTICS OF UNBALANCED DEVELOPMENT IN THE NORTH AND SOUTH REGIONS

2.1 Proportion of economic aggregate "rising in the South and falling in the north"

Since the reform and opening up, the economic aggregate of the South has been higher than that of the north. As can be seen from the figure, from the early stage of reform and opening up to the early 1990s, the proportion of the total economic output of the north and South regions gradually increased; From 1993 to 2003, the proportion of the total economic output of the north and South regions tended to be stable, and from 2003, it began to shrink; However, with the impact of the financial crisis, taking 2013 as the watershed, the economic proportion of the northern region began to decline significantly, from 57.4:42.6 in 2013 to 61.5:38.5 in 2018. In terms of per capita GDP, since the population in the north is significantly less than that in the south, the per capita GDP in the North was higher than that in the south from 2004 to 2014. However, since 2015, the per capita GDP in the South has exceeded that in the north and has an expanding trend. In 2018, the per capita GDP in the South was 8800 yuan higher than that in the north.

2.2 Economic growth is "fast in the South and slow in the north"

In terms of economic growth, the economic growth of the southern region has exceeded that of the northern region since about 2013, and the gap has shown a continuous widening trend. In 2018, the economic growth rate in the North was 6.3% and that in the South was 7.3%. At the provincial level, the last five provinces in China in 2018 were all northern provinces, including Tianjin, Jilin, Heilongjiang, Inner Mongolia Autonomous Region and Liaoning. However, the growth rate of southern provinces is basically higher than the national average, of which Guizhou and Tibet Autonomous Region have reached 9.1%, Yunnan Province has reached 8.9% and Jiangxi Province has reached 8.7%.

2.3 Traffic network "dense in the South and sparse in the north"

In terms of high-speed rail network, the northern region started earlier. China's first high-speed rail Beijing Tianjin Intercity Railway was opened in August 2008, but the northern region failed to keep up with the subsequent construction.

At present, it presents a pattern of overall branch line development and local network development; The south high-speed rail started relatively late. In 2009, the first long-distance high-speed rail from Guangzhou to Wuhan via Changsha was opened, but the follow-up development speed is very fast. As of the beginning of 2018, China has opened 24548 km of high-speed rail lines, 8878 km in the north and 15670 km in the south.

2.4 Innovation ability "strong in the South and weak in the north"

The innovation ability can be analyzed from such factors as innovation subject, innovation talents, innovation input and innovation output. From the perspective of innovation subjects, the innovative enterprises in the south are significantly more than those in the north, especially the unicorn enterprises, and the gap is growing; From the perspective of innovative talents, the number of double first-class universities is the same from north to south, but the universities in the north are mainly concentrated in Beijing, while the distribution in the south is relatively balanced, but the number of undergraduate graduates in the south is higher than that in the north; From the perspective of innovation investment, the growth of innovation investment in the north is slowing down, and the gap between North and South innovation investment has widened significantly. In 2018, the difference reached 427.16 billion yuan. In terms of innovation output, the number of patent applications in the south is 2.8 times that in the north, which is overwhelming the north.

3. INFLUENCING FACTORS OF UNBALANCED DEVELOPMENT IN THE NORTH AND SOUTH REGIONS

3.1 Differences in industrial structure

Due to good resource conditions and national decisions, the northern region mainly develops heavy industry represented by coal and steel, while the service industry develops slowly and the proportion of industrial structure is unbalanced, so it is difficult to adjust. In the first three quarters of 2019, the GDP of the northern region was 27trillion, accounting for 38.3% of the country, while the steel output accounted for 58.6% of the country, and the beverage product output accounted for 29.7% of the country. Taking Shaanxi Province and Shanxi Province as examples, the industrial structure of the province is 7.7:46.5:45.8 and 4.8:43.8:51.4 respectively, and the industrial proportion remains at a high level. Compared with the southern region, which is dominated by high value-added manufacturing and service industries, its industrial structure transformation and upgrading is in good shape. The provinces represented by Shanghai, Guangdong and Zhejiang vigorously promote scientific and technological innovation, and actively develop emerging industries such as the Internet and the new generation of information technology.

3.2 Differences in systems and mechanisms

The system and mechanism reform in the North lags behind that in the south, which is an important factor affecting the unbalanced development between the north and the south. First of all, in the ownership structure of the northern region, the proportion of public ownership is relatively high, especially with more state-owned enterprises, and the reform process is slow. In 2018, the proportions of state-owned holding industrial enterprises, private industrial enterprises, foreign-invested and Hong Kong, Macao and Taiwan invested industrial enterprises in the South and North were 4.88:75.92:19.20 and 10.37:79.11:10.51 respectively. The proportion of state-owned holding industrial enterprises in the North was 5.49 percentage points higher than that in the south, but the proportion of total profits of state-owned holding industrial enterprises in the North was 14.2 percentage points lower than that in the south. It can be seen from the figure that before 2014, the total profits of state-owned holding industrial enterprises in the north were higher than those in the south.

3.3 Differences in the degree of opening to the outside world

Opening to the outside world means that regions integrate into the world economic system, expand market scope, and welcome corresponding capital investment and technology investment, which greatly promotes economic growth.

The degree of opening up in the south is significantly higher than that in the north. There are two main reasons: on the one hand, the geographical location of the southern coastal areas is superior, which is convenient for foreign trade and cultural exchanges; On the other hand, under the idea of "unbalanced development", China has successively set up special economic zones in Shenzhen, Shantou, Xiamen and other places, giving rich policy support. In recent years, the opening up of the southern region has been further accelerated. The construction of the Yangtze River Delta region and the Guangdong Hong Kong Macao Great Bay area has been continuously and effectively promoted, and the establishment of free trade zones has been continuously approved.

3.4 Differences in the degree of regional cooperation

The degree of regional cooperation refers to the degree of integration of cities into the regional economic system. The cooperation and linkage between cities is conducive to giving full play to the comparative advantages of all parties, avoiding homogeneous competition, and achieving win-win results and high-quality development. The degree of regional cooperation in the north is lower than that in the south, which is also one of the important reasons for the unbalanced development between the north and the south. The degree of regional cooperation can be reflected by business contact flow data such as "headquarters branches" of enterprises. From the national level, it can be seen that the density of cooperation network in the south is higher than that in the north, and the degree of regional cooperation in the northeast and northwest is significantly lower than that in other parts of the country. The regional cooperation network shows an obvious "core edge" feature. Except Beijing and Tianjin, other core cities such as Shanghai, Nanjing, Hangzhou, Chengdu and Chongqing are located in the south.

4 OPTIMIZATION IDEAS AND PATHS FOR UNBALANCED DEVELOPMENT IN THE NORTH AND SOUTH REGIONS

4.1 General idea: coordinate the relationship between the government and the market, and clarify the division of their roles

4.1.1 Government level: accelerate the reform of system and mechanism and improve the regional policy system

At the government level, efforts should be made to accelerate the reform of systems and mechanisms, improve the regional policy system, and ensure the coordinated development of regions from the system, which mainly includes three aspects. First, the government should actively formulate laws and regulations, build institutional mechanisms for regional coordinated development, including cooperation mechanisms in key areas and major policy communication and coordination mechanisms, break down regional administrative barriers, move from single regional development to multi regional coordinated development, improve the unity of policy formulation, rule consistency and implementation synergy, and strengthen cooperation between the north and the South and within the northern region.

Secondly, the northern region should change its concept, speed up the reform of ownership structure, treat the public sector and non-public sector equally, create a good investment and market environment, and attract more excellent private industrial enterprises to build factories and put them into operation; Accelerate the internal reform of state-owned enterprises, improve incentive measures, improve the production and operation efficiency of state-owned enterprises, and further expand the pilot scale of comprehensive reform of state-owned enterprises in the north.

4.1.2 Market level: give full play to the role of the market and promote the free flow of factors

The market is "an invisible hand" and plays a decisive role in the allocation of resource factors. The key to regional coordinated development lies in the rationality of factor allocation and the freedom of factor flow. First of all, we should strengthen the division of labor and cooperation among various capital markets and promote the orderly and free flow of capital across regions. The northern region should further deepen the reform of the financial system and the fiscal and tax

system, and strengthen the market vitality and factor circulation power; Secondly, establish and improve the market management system with unified standards. The South and North regions should establish a regional standard system according to their own conditions under the requirements of the national unified market to ensure fair competition and orderly cooperation in the market; Finally, we should improve the property rights trading market between regions and promote the cross regional online trading of various existing property rights trading markets. The northern region should actively promote the interconnection of public resource trading platforms, promote cross regional property rights trading, realize the sharing of property rights trading information and data, and protect the legitimate rights and interests of various industrial enterprises.

4.2 Industrial structure: strengthen industrial division and cooperation and optimize the industrial structure system

Reasonable industrial structure will promote the orderly and healthy development of urban economy to a great extent. The second industry in northern China is too heavy, the service industry develops slowly, and the industrial structure is unbalanced. In the future, we should effectively integrate resources, continuously promote the optimization and upgrading of industrial structure, and strengthen the industrial division and cooperation among regions. First of all, the northern region should strengthen the technological transformation of traditional manufacturing industries, actively develop new industrial formats, and speed up the transformation between old and new driving forces, such as health care, cold land tourism and other industrial growth points.

Secondly, the northern region should learn from the experience of the southern region, give full play to the comparative advantages of various regions, strengthen regional division of labor and cooperation, and achieve complementary development. Taking the three northeastern provinces as an example, we can sort out the resource endowments and advantageous industries of each province from the regional level, form a reasonable and complementary industrial division from the overall level, and achieve co construction, sharing and win-win results; In addition, the three northeastern provinces can strengthen industrial ties with Beijing Tianjin Hebei region, make full use of the innovative cluster industries in Beijing and Tianjin, strengthen industrial innovation and technological innovation, make full use of Russia's border advantages, strengthen industrial complementarity and commodity trade, and promote economic development.

4.3 Spatial pattern: optimize urban pattern network and strengthen regional linkage development

It is an economic law that industries and population are concentrated in advantageous regions, forming a growth power source with urban agglomeration as the main form, and then driving the overall efficiency of the economy. The national new urbanization plan also puts forward that China's urbanization development should take urban agglomeration as the main form to promote the coordinated development of large, medium and small cities and small towns. The northern region should rely on the pole driving role of the existing urban agglomeration, especially the Beijing Tianjin Hebei Urban Agglomeration, to fully strengthen the regional linkage development. At present, there is a certain gap between the Beijing Tianjin Hebei Urban Agglomeration and the Yangtze River Delta Urban Agglomeration and the Pearl River Delta urban agglomeration. We should speed up the adjustment and optimization of the spatial layout, enhance the competitiveness and economic strength of the central cities in the urban agglomeration, and drive the northern hinterland. Secondly, the northern region should accelerate the integrated development of metropolitan areas, including Shenyang metropolitan area, Lanzhou metropolitan area, Harbin metropolitan area, etc. To implement specific regional linkage development measures, the northern region should actively promote the construction of inter provincial industrial cooperation parks, such as the Hebei Beijing coordinated development demonstration park and the inter provincial cooperation Industrial Park jointly built by Nanchang Economic Development Zone and Tianjin Economic Development Zone; The northern region can focus on developing cross regional cultural tourism projects, such as the northwest ring road project in Lanzhou and Xining.

4.4 Infrastructure: accelerate the construction of interconnection and enhance the guarantee of coordinated development

The infrastructure of connectivity and management coordination is the support and guarantee for regional coordinated development. Regional transportation facilities, regional information facilities and regional energy facilities are indispensable. First of all, the northern region should strengthen the construction of comprehensive transportation system, including rail transit system, highway system, airport system and port system, especially the construction of high-speed rail network in the northeast and northwest regions, which currently account for only 6.5% and 9.6% of the national high-speed rail mileage respectively. Secondly, the northern region has gradually strengthened the construction of a new generation of information infrastructure, built a high-speed ubiquitous information network, and promoted the intelligent development of urban agglomerations, such as further promoting the scale layout based on Internet Protocol version 6 (IPv6), and promoting the construction of 5g networks. Finally, the northern region should further optimize the construction of energy facilities, coordinate the exploitation and utilization of oil, gas and coal energy, jointly promote the construction of new energy facilities such as wind energy and solar energy, further promote the construction of regional power grids, and improve the power exchange and supply guarantee capacity. It is worth noting that the northern region not only needs to further improve its internal infrastructure connectivity, but also should strengthen the links between the northern and southern regions.

5 CONCLUSION

China's economy has changed from a high-speed growth stage to a high-quality development stage, and the corresponding economic and social structure is undergoing profound changes. In the future, China will accelerate the construction of a new development pattern with the domestic big cycle as the main body and the domestic and international double cycles promoting each other, which puts forward higher requirements for optimizing the regional economic layout in the new era. Over the past two decades, the development gap among the eastern, central and western regions has gradually narrowed, while the economic development gap between the northern region and the southern region has gradually widened due to industrial structure, system and mechanism, and the degree of opening to the outside world, resulting in chain effects such as lagging infrastructure construction, insufficient innovation investment, and large population outflow. Under the new situation, the northern region should change its concept, focus on strengthening the innovation of system and mechanism, break down administrative barriers, respect market choice and objective laws, actively develop advantageous regions, strengthen the division of labor and cooperation within the region and with the southern region, and gradually narrow the gap with the Southern region and promote the coordinated development of the northern and southern regions by relying on the national strategic support such as the coordinated development of Beijing, Tianjin and Hebei and the comprehensive revitalization of the northeast and North. Of course, the revitalization of the northern region has a long way to go, and involves the overall consideration of all aspects. Starting from the objective data and factual characteristics, this paper puts forward the corresponding optimization ideas and paths, hoping to provide some reference for the coordinated development of the north and the south.

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CHARACTERISTICS OF TOD GUIDANCE SYSTEM AND ENHANCEMENT STRATEGIES IN CHINA

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As urbanization progresses, the rapid growth of urban population size and the surge in demand for land will lead to continuous urban development and spatial expansion. In the last century, the motor-oriented development model adopted by many cities in Western developed countries has induced a series of urban problems [1, 2], including traffic congestion, air pollution, energy overload consumption, social differentiation and land waste. In this context, the concept of "New Urbanism", which advocates compact, high-density, diverse, mixed and sustainable development, has emerged [3, 4], of which Transit-oriented Development (TOD) is an important component. TOD is a type of urban development that maximizes the amount of residential, commercial, and recreational space within walking distance of public transportation; it emphasizes a close symbiotic nesting relationship between urban form and public transportation, and it is a concept that has been developed by the American architect Peter Calthorpe in his book *The American Metropolis of the Future: Ecology-Community-American Dream*. The TOD model has been used by many cities around the world [5-8] and has played a crucial role in promoting intensive urban development [9, 10], enhancing urban vitality and transportation synergy [9, 11, 12], and promoting low-carbon travel [1, 10].

Many cities in China are now vigorously developing urban public transportation to improve urban transportation services. It is urgent to explore how to scientifically guide the development of station areas, promote the efficient and high-quality construction of station-integration, improve the spatial quality and human-oriented experience of the city, and thus achieve sustainable urban development. Cities in North America have undergone a transformation from sprawling development to smart and intensive development, in which the TOD model has played a significant role. Therefore, this paper adopts an inductive and case study approach, firstly, to analyze the characteristics of the current TOD guidance system in China, and at the same time, to analyze the experience of North American cities in order to provide a reference for China's practice.

1 China's TOD Guidelines

The preparation of TOD guidelines in China is still in the preliminary exploration stage. At the national level, only one TOD guideline has been prepared for each of the three spatial categories: city as a whole, rail line area or integrated hub area, all of which are group standards with limited legal effect (see Table 1). In terms of content, all three guidelines have constructed an overall framework for clear planning, design and development guidance based on the division of station types and multi-level influence scope delineation, and the content is relatively complete, but the *Guidelines for Planning and Design of Facilities Space around Urban Rail Transit Stations* do not cover land use, development intensity control and urban morphology and landscape shaping, etc. Meanwhile, the *Guidelines for Planning and Design of Areas along Urban Rail Transit Lines* and the *Guidelines for Development Planning of Passenger Hub Areas* mostly adopt qualitative

descriptions, with fewer specific quantitative indicators and graphic control, which may reduce the operability of the guidelines.

In terms of local cities, only Chengdu City has prepared a comprehensive TOD guideline *Urban Design Guidelines for the Integration of Rail Transit Yards and Stations in Chengdu City* at present, while *Chongqing City's Guidelines for the Articulation of Rail Transit Stations in Chongqing City* prepared in 2019 focuses more on the traffic organization of rail transit areas (see Table 1). In general, the two guidelines are relatively complete in terms of guidance content, but they can be further optimized and improved in terms of understanding local cities' own conditions and development demands, the TOD concept and its significance to local development, quantitative guidance and control, flexible and variable development and public participation.

Table 1 List of China's TOD-related guidelines

Level / City	Guideline Name	Year	Keywords
National level	Planning and design guidelines for areas along urban rail lines	2015	Public transportation support, leading urban structure, three-level spatial guidance scope, station classification, urban center structure, differentiated intensity control, function mixing, commuting distance control, transit pilot area, traffic corridor layout, potential parcel analysis, function priority optimization principle, traffic connection, pedestrian system guidance, rail facilities and line control, planning preparation and management process, preparation results composition
	Passenger Hub Area Development Planning Guidelines (Draft for Comments)	2021	Passenger hub classification, core area + expansion area + impact area, mixed functions, thematic study on development scale requirements, pedestrian priority, traffic connection, station-city integration, integrated construction of above-ground and underground space, interface with higher planning, appropriate development intensity, outcome requirements
	Spatial Planning and Design Guidelines for Facilities in Areas Surrounding Urban Rail Transit Stations (Draft for Comments)	2021	Station classification, traffic connection, station accessory space, distribution space, public service space, municipal space, implementation process, bus priority, transfer distance control, pedestrian network construction, quantitative control
Chengdu	Urban Design Guidelines for the Integration of Rail Transit Yards and Stations in Chengdu	2018	Positioning integration, industrial development, mixed functions, open and coherent urban form, vibrant and open space, intensive underground space, people-oriented slow walking system, preparation of results requirements
Chongqing	Chongqing Rail Transit Station Articulation Guidelines	2019	Special guidelines, pedestrian connection, bus connection, bicycle connection, temporary shuttle connection, motor vehicle exchange connection, signage system, station classification

Source: by author

2. North American Cities' TOD Guidelines

In this paper, we use the terms "TOD Guidelines", "TOD Guides", "TOD Handbook" (Handbook/Guidebook) or "TOD Guidelines" to refer to the development of TOD. Guidelines", "TOD Guidelines", "Handbook/Guidebook" or "TOD Design"

were used as keywords to search for city-level guidelines documents in domestic and international search engines, and the final 15 North American and 5 domestic TOD-related guidelines were used as the basic data for the analysis of this paper.

In general, the TOD guidelines for North American cities are characterized by a wide geographical coverage, a long-time span, and outstanding focus.

In terms of coverage area and time span, the cities in the United States that have prepared TOD guidelines cover the East Coast and West Coast regions, and there are also guidelines in the island territories (Honolulu, Hawaii); meanwhile, cities in central and eastern Canada have also carried out related work. The late 1990s and the early years of the 21st century were the time when the number of guideline preparation results was high. After the completion of the TOD design guidelines for San Diego, California, USA, led by Peter Calthorpe in 1992, many cities faced with development dilemmas and actively adopted the TOD development model, which contributed to the widespread development of related guidelines.

In terms of focused content, site type delineation and key elements of control and guidance are the main points of general concern in the guidelines. On the one hand, most guidelines emphasize differentiated development strategies for different site area characteristics, which can better accommodate local characteristics and development conditions. For example, in the TOD Guidelines of Atlanta, USA (2010), based on the location, urban function and form, and land use characteristics of the site, the site area is divided into seven types, such as urban core, town center, commuter town center, neighborhood station, arterial corridor, special area destination, and distribution station, which provide a basic type framework for specific development or design strategies. On the other hand, these guidelines generally specify the characteristics that TOD site areas need to have in terms of land use characteristics, development intensity, pedestrian environment, traffic organization, and street space, reflecting quantitative control and human-centered characteristics. For example, the City of Persepolis' TOD Design Guidelines: A Basic Guide to Transportation Construction in Indianapolis uses the Lot Development Criteria Table to propose control indicators for building height, lot coverage and building setbacks, while specifying the design principles and methods for various elements of street space at the pedestrian scale, including frontage, street interface, trees, furniture, public art and water bodies.

In addition, some of the guidelines also give full consideration to public participation, social equity and the long-term development of the site area, emphasizing that the development of the site area should focus on the synergy of multiple interests, promote mixed housing construction and community inclusion, and adapt to the long-term development of the site area by continuously updating the content of the guidelines, which helps to improve the operability of the guidelines and maximize the comprehensive social effects.

Table2 List of TOD guidelines for North American cities

Nation	City	Guideline Name	Year	Keywords
USA	San Diego	City of San Diego Land Guidance System: TOD Design Guidelines	1992	Clear definition, functional mix, walkable environment, differentiated guidance between areas, long-range planning, incorporation of environmental assessment, response to zoning and urban standards, special plans (public services and infrastructure investment and financing plans)
		Master Plan: TOD Design Guidelines	2011	Continuation of previous version, site location selection, site characteristics, residential and commercial density, relationship to surrounding land use, quantitative control
	Austin	TOD Guideline	2006	Site classification, service targets, development longevity, special study support, public participation
		TOD Guidelines - A Resource Manual for Good Urban Design		Integration with other transportation, evidence support, social effects, fiscal measures, self-review checklist
	Atlanta	TOD Guideline	2010	Interface with other plans, case studies, site classification, compact and dense development, diverse land uses,

				integrated public realm, non-traditional parking, quantitative indicators, innovative zoning
	Sacramento	A guide to TOD	2009	Site classification, quantitative controls, flexibility of guideline framework, land use for community character, mobility and accessibility, open space and municipal facilities, land use assessment, roles and responsibilities
	São Paulo	St. Paul Central Corridor TOD Guidebook	2011	Public infrastructure, corridor development strategies, stand-alone station area plans, development supplemental studies, design elements
	Persepolis	TOD Design Guidelines: The Essential Guide to Transit Construction in Indianapolis	2018	Site Types, Lot Development Development Standards Table, Smaller Building Setbacks, Detailed Design Guidelines, People Oriented
	Edmonton	TOD Guidelines	2012	Differentiation Strategies, Land Use and Intensity, Building and Site Design, Public Realm, Smaller Building Setbacks, Street Network, Complete Streets, Site Areas, Site Neighborhoods
	Denver	TOD Design Guidelines	2012	Active edge, mixed-income housing, defensible space, interface with zoning, site organization, compact and mixed, high-quality pedestrian environment, street network connectivity, parking management, public participation, case studies
	Honolulu	TOD Design Guidelines, Special Areas	2019	Street facade transparency, setback control, parking control, sidewalk design, quantitative control, development incentives
Canada	Ottawa	TOD Guide	2007	Interface with other standards, scope of application, site types, land use, layout, built form, walking and cycling, vehicles and parking, streetscape and environment, housing priority policies, station-city integration, quantitative control, people-oriented, landscape vision
	Calgary	Transit Oriented Development Policy Guidelines	2004	Transit-supportive land use, increased density, pedestrian connections, all-season design, vibrant streets, station classification, community collaboration
		TOD Practice Manual	2004	Land use, promoting density, pedestrian connections, urban design, compact development, parking management, integrated places, adapting to the market, public participation, long-term vision
	Winnipeg	Transit Oriented Development Handbook	2018	Evidence supports, integrated benefits, high density development, mixed use, high quality pedestrian environment, vibrant centers, parking strategies, public leadership, site selection, evaluation, battlefield design, site types, urban parks and open space, transit/town squares

Source: by author

3. Implications for the preparation of urban TOD guidelines in China

3.1 Differentiated guidance strategy according to local conditions

The diversity of TOD site areas is an important feature of urban development and is closely related to the heterogeneity of functions and spaces within the city. The design guidelines for TOD site areas need to fully understand the natural environment, development stage, location conditions, traffic conditions, land use and spatial form of the target city and other factors that influence the reasonable setting of TOD site type delineation criteria and the multi-level spatial scope threshold of the site surrounding areas. On this basis, the differentiated guiding strategies of different site areas in terms of planning and design elements are refined. For example, the TOD Guide issued by the city of Atlanta, USA, innovatively proposes a TOD Zoning Overlay District (TOD) model based on the characteristics of TOD sites and the surrounding community, which provides detailed guidance on various elements in the zoning district and effectively enhances the applicability of the guide; for example, the guide of Sacramento city divides the TOD site area into downtown area For example, Sacramento's guidelines divide TOD site areas into five categories: downtown, urban center, employment center, residential center, commuter center, and high-frequency transit corridor, and use a table to specify quantitative guidance indicators for each category in three main areas: land use, transportation, open space, and municipal

facilities. The localized design guidelines can add uniqueness to the guidelines and also better adapt to the differences in demand for development within our cities.

3.2 Strengthen evidence support and quantitative control guidance

The formulation of guidance strategies based on realistic evidence will be more realistic, and the control and guidance of key elements through quantitative indicators can effectively improve the operability of TOD guidelines. On the one hand, many cities in North America have conducted extensive case reviews of TOD development practices in existing areas during the preparation of TOD guidelines, which have summarized the key elements of TOD control and formed the basis for specific strategies, such as Austin and Atlanta in the United States. On the other hand, many guidelines provide detailed quantitative guidance on neighborhood scale, development intensity, building setbacks, slow traffic, street space scale and appearance, and public plazas. In Winnipeg, Canada, the Transit-Oriented Development Manual specifies the range of built-up density values for the area around the site and establishes the principle of increasing with the volume of traffic passengers; at the same time, in order to facilitate the shaping of a compact, high-density human environment, the manual also establishes recommended values for neighborhood size (maximum length of 122m or perimeter of 488m) and recommended values for sidewalks that guarantee peaceful traffic (by residential areas, multifunctional major neighborhoods, and high-density urban centers). Although China's national-level "Guidelines for Planning and Designing Facilities Space around Urban Rail Transit Stations" has certain quantitative index guidelines for the traffic connection, station affiliation, distribution and retention, public services and municipal public space around rail transit stations, it still lacks content on land use, development intensity and street quality. For this reason, local cities should further increase the analysis of existing foreign cases and research evidence in the process of preparing their own TOD guidelines, and actively learn from relevant experience, while meeting their own city characteristics and development needs of quantitative control points.

3.3 Human scale and perception design guidance

Generally speaking, the concept of "people-oriented" runs through all TOD guidelines in North America, and the main strategies are based on residents' travel experience, focusing on three aspects: spatial delineation based on slow walking characteristics, emphasis on slow walking right-of-way and design to enhance comfort. In terms of spatial extent delineation, with a threshold of 5min to 10min walking, the TOD-oriented Policy Guidelines of the City of Calgary, Canada, adopt 600m around the site planning area as the planning and design guiding area, and give the potential guiding area to the road network characteristics around the site. The San Diego General Plan: TOD Design Guidelines continues the main content of the first version of the guidelines in 1992, and further defines the "core space - secondary area" guideline at 402m (¼ mile) and 340ha (840 acres) according to the characteristics of residents' travel. In terms of right-of-way, many North American guidelines emphasize the priority of the right-of-way for pedestrians and cyclists, and are designed to provide a safe and continuous slow-moving environment. For example, the City of Ottawa's TOD Guidelines emphasize the need to reduce or limit the number of sidewalk separations in transportation planning, and that parking lots should be placed behind buildings to minimize disturbance to pedestrians. In terms of enhancing comfort, the TOD Design Guidelines: Basic Guidelines for Transportation Construction in Indianapolis provides detailed guidelines on the physical components of various spaces, including streets, public/private space buffers, courtyards, bicycle and car parking, etc., reflecting a thorough consideration of people's feelings of use. In the future, the preparation of local TOD guidelines in China should also focus on promoting slow transportation and enhancing walking and cycling experience, organizing the planning and design guidance of land use, transportation, landscape, municipal and other elements.

3.4 Promoting Broad and Positive Social Effects

In addition to the desire to make cities more sustainable through the TOD model, many city guidelines also emphasize the broader, positive social effects that can be achieved through more rational planning and design under this model, mainly in terms of equitable transportation access, housing equity, and crime prevention. For example, the City of Austin's guidelines emphasize the promotion of greater opportunity through equitable transit-oriented development and the consideration of "intermediate housing" and subsidized housing in site areas, while the City of Ottawa's guidelines specify the principle of locating the highest density mixed-use housing as close as possible to rail stations. Due to the complexity of traffic and pedestrian flow in the TOD site area, the city of Edmonton, USA has also specified urban design and environmental design crime prevention principles in its TOD guidelines, including specific design principles for surveillance, accessibility and activity. In general, we should shift our traditional perceptions and consider the TOD model not only as a pure and effective tool for smart development, but also for its positive and negative spillover effects. Therefore, local cities in China should also target TOD development as an effective way to alleviate specific social problems in accordance with the actual problems of their own cities in the guideline preparation process, fully learn from international advanced experience, conduct thematic studies, and scientifically develop corresponding planning and design control or guidance strategies.

3.5 Strengthen organizational management and promote public participation

The implementation of efficient and precise TOD concepts and plans requires systematic organizational management and broad consensus support. Many cities in North America have guidelines that specify specific initiatives for organizational management, public participation, and financial financing for the development of public transit station areas. In terms of organizational management, the City of Wimborne's TOD guidelines identify the need for public leadership throughout the lifecycle of a site area, with multi-sectoral collaboration and innovative tools to complement and enhance planning efforts and facilitate implementation effectiveness. The City of Sacramento has even defined in detail in its guidelines the detailed roles and responsibilities of six main entities, including the regional government commission, city and county governments, private developers, the State Department of Transportation, and utility commissioners, in supporting the regional vision, transportation advancement, site planning and specification, detailed element enhancement or design, internal consistency, and leadership, to jointly promote TOD efforts. In terms of public participation, North American cities emphasize promoting the integration of residents' opinions into the preparation of TOD guidelines and the whole process of planning and construction of TOD areas through diverse forms of participation (e.g. focus interviews, workshops, public hearings, etc.), typical cities include the cities of Austin and Denver in the United States. In terms of financial measures, some cities have proposed centralized financial financing programs in consideration of the limited local government finances, which provide positive suggestions for economic support for TOD project development. For example, the financial financing measures mentioned in the U.S. City of Austin guidelines specifically include fund support, direct user-provided fees, debt instruments and bonds, and credit assistance. In the future, it is also necessary for our local TOD guidelines to include organizational management and public participation elements in the guiding principles or recommendations to provide comprehensive guidelines to guarantee the implementation of specific work.

4. Conclusion

In the dual context of rapid growth of public transportation scale and smart urban development needs in China, the promotion and application of public transportation-oriented development model is of practical significance. However, how to better promote local TOD-related work and achieve efficient and high-quality urban development requires systematic and scientific guidance. This paper summarizes the advanced experience of the existing TOD guidelines in North America,

and provides a positive reference for local cities in China to further develop local TOD guidelines and carry out specific planning and construction work. However, it is worth emphasizing that the development background, scale and density, development stage and social demands of foreign cities are quite different from those of China, so it is still necessary to fully analyze and explore the applicability and transformation possibilities of these experiences in the future, and continue to explore and develop differentiated and characteristic TOD guidelines that meet the specific needs of local cities in China.

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AGE STRUCTURE, RESIDENTIAL DENSITY, AND HOUSING QUALITY: USING CITIZEN HOTLINE DATA TO UNDERSTAND COMMUNITY CONFLICTS IN SHANGHAI

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1. Introduction

Community conflicts make communal life complete. From the perspective of urban governance, mitigating neighbourhood conflicts and creating a harmonious society are key duties for administration at the grass roots. As for residents, community conflicts add chaos to everyday life. And sometime, as Crenson (1983) found, they also create community bonds. All of this means that community conflicts play an important role in shaping community life. So, what factors influence the occurrence frequency and content characteristics of community conflicts, and further to say, how they function? This has been a question of great interest to urban managers, community planners and residents.

Both in terms of social structure and spatial pattern, urban communities are diverse and heterogeneous, which is becoming more so as urban economic growth and population mobility accelerate. Neighbouring communities may have vastly different spatial characteristics and environmental qualities, housing families with a wide range of occupations, educational backgrounds, and income levels, as well as access to wholly distinct property management. In varied urban communities that carry an increasing number of social affairs, it is crucial to critically examine the patterns of community conflict and governance, contradiction and change. However, the problems that arise between neighbours have not received the academic scrutiny they deserve (Cheshire and Fitzgerald, 2015).

To deal with the growing complexity of community governance, the purpose of this research is to explore how community characters affect the intensity and types of neighbourhood conflicts. For instance, what age and social structure of communities tend to have less conflicts? Is there a link between residential density and the frequency of community conflicts? How do community characteristics affect the main types of neighbourhood conflict in different ways? Is the planner's drive to develop a higher-quality, more diversified community space in a high-density setting of social value? Understanding the mechanisms of community conflicts will help us to comprehend cities and move towards *Good Governance*.

Research into the patterns of community conflicts once relied on the analysis of traditional social statistics. For example, basing on self-reported neighbour problems across Brisbane, Australia, Cheshire and Fitzgerald (2015) observed how neighbourhood levels of concentrated disadvantage, residential mobility and population density all increase the chances of residents encountering a combination of nuisance and antisocial or criminal neighbour problems over nuisance problems

only or no problems at all. Through the survey in five megacities in China, Yuan (2017) found that community conflict degree of the different types of urban community is different, the highest severity is the succession transition community, the second is the hybrid integrated community, and the third is the single unit community and the traditional neighbourhood community, while the modern residential community conflict is relatively lower.

Along with the construction of digital cities, 'big data' from administrative sources shows the potential of a broader understanding of communities. Using council data, Liu, Y., Cheshire, L., Wang, S. and Fu, X (2019) explored the incidence of complaints about neighbours across urban neighbourhoods, finding that animal related and health and visual amenity issues are distributed more widely as well as appearing higher density across the city, while building construction and property management issues are contracting towards the inner city areas over time. Economic and labour market restructuring, immigration, housing market logics and processes of gentrification and urban redevelopment have induced a process of spatial sorting across Brisbane. As New York 311 data shows (Minkoff, 2016), the overall socioeconomic status and resources of a space are tied to 311 contacting volume, including that contacting on government goods increases as owner-occupied housing increases, while contacting on graffiti and noise decreases. It is evident that the frequency and content characteristics of neighbourhood conflict are clearly related to the socio-spatial characteristics of the communities, and the administrative citizen hotlines provide researchers with a long, extensive, first-hand record of grassroots issues that can be used as a clue to investigate this relationship.

The official promotion of 12345 Citizen Hotlines in Chinese cities has provided new data and methods. Based on the data of neighbourhood complaint calls in Shanghai in 2019, this paper uses a negative binomial regression model to evaluate how the age structure, residential density, and housing quality of a community affect neighbourhood conflicts, as well as the similarities and differences in the effects on the three main types of conflict: group renting, noise nuisance, and illegal constructions, to contribute to innovation in research methodology, multi-source data exploitation and community research.

2. Community Characters and Conflicts

2.1 Definition

The term 'Community' refers to a social collectivity in a certain territory. From the perspective of urban and community planning, this paper focuses on communities as spatial units with clear boundaries (usually defined by urban arterial roads or natural geographical boundaries), based on neighbourhoods or subdivisions, sharing common public resources and public services, and serving primarily as a residential function.

Both social and spatial aspects characterise communities. Age structure, household structure, occupational composition, income composition, average education level, home ownership composition, community organisation and services are among the socio-economic attributes, while physical-spatial attributes include dimensions like location, size, neighbourhood scale, residential density, building height, environmental quality, and land-use mix.

Disputes are referred to as community conflicts in this paper that occur at the 'community' level, including residents and involving the distribution of communal resources or public interest (Zhang and Xia, 2011; Zhang, 2018), as well as conflicts that arise as a result of neighbourhood interactions. In the everyday spaces of urban life where people coexist alongside

others day in, day out, many authors have agreed in stating that the mere fact of sharing a relatively dense physical space inevitably generates certain kinds of nuisance or irritation, such as unwelcome noise, bad smells, arguments over pet ownership, the proffering of insults, or even frequent quarrels between neighbours (Méndez and Otero, 2018). These ostensibly minor, perhaps unintentional, not necessarily intense, and not even necessarily face-to-face community conflicts reveal the temporal and spatial competition between and within classes and generations over urban and community resources, as well as the collision of values over daily urban life, which relates to larger population movements, spatial shaping, and social change.

2.2 Research Hypotheses

This paper chooses three main community characteristics for in-depth analysis: the community's age structure, social composition, and residential density. They are directly relevant to community planning, easily measurable, and have been preliminarily proven to have a significant impact on neighbourhoods. Urban planners have emphasised the value of inclusive design for preserving heterogeneity in the community (such as recognizing that age composition is a dimension of diversity) and high-density development, which is at odds with popular social preferences. In terms of social psychology, for example, individuals like to live in clusters and prefer homogenous communities; besides, tolerances and preferences for community density and intensity, as well as high-rise vs multi-story or low-density, differ a lot. Using data from Shanghai 12345 Citizen Hotline, this research proposes the following three hypotheses to justify the classical planning principles and social common values.

H1: The age structure of a community affects the intensity of neighbourhood complaints. Communities with a higher proportion of young people and older people tend to have a higher intensity of neighbourhood complaints.

It is generally acknowledged that age variations in people's demands and habits for community space use manifest more clearly as a significant source of conflict (Lv and Li, 2014). With Chinese aging population, intergenerational value conflicts and competing interests have grown more obvious. For example, the common square dance conflicts today are essentially caused by different age groups competing for the use of community public space at specific times (Lu, 2019).

On the other side, there is a correlation between age structure and family structure, which has been found to influence neighbourhood interactions and conflict (Minkoff, 2016; He and Liu, 2016). When the population reaches adulthood, nuclear families become the predominant family structure; single and incomplete families increase during the older age structure stage of the population (Mao and Zhou, 1988). Residents with family links are more inclined to interact with their neighbours and participate in community construction and maintenance. A tract-level analysis of 311 contacting in New York City shows, family life in a space likely reduce the presence of graffiti and noise (Minkoff, 2016). Communities with a high proportion of young and elderly individuals have, first, significant intergenerational differences and, second, related to a low proportion of nuclear families and an increased proportion of single and incomplete households, which is supporting H1.

H2: The residential density of a community affects the intensity of neighbourhood complaints. Communities with a higher residential density tend to have a higher intensity of neighbourhood complaints.

As one of the primary control elements, modern urban planning theory has always emphasised the impact of density on the quality of life, and there are two perspectives: one believes that modern urban diseases are largely related to overcrowding, that high density of settlements will increase neighbourhood friction, reduce privacy, and increase psychological pressure, and that low density settlements are more comfortable and pleasant, as exemplified by the fact that they have fewer people per square metre (E Howard, 1902). The opposing view asserts that high density may contribute urban vitality, create close-knit neighbourhoods, and nurture community culture and amenities, see, for example Jane Jacobs and New Urbanism, Urban Smart Growth, and the Compact City (Hong and Wang, 2021).

The research in Australia indicates that higher levels of neighbourhood residential density also increase the likelihood of residents encountering problems with their neighbours, particularly about noise transmitted by buildings (Cheshire and Fitzgerald, 2015; Liu *et al.*, 2019). On this basis and the prevalent belief that high density may exacerbate neighbourhood nuisance, it is hypothesized that residential density in Shanghai areas is positively correlated with the intensity of neighbourhood complaints.

H3: The housing quality of a community affects the intensity of neighbourhood complaints. Communities with a higher housing quality tend to have a lower intensity of neighbourhood complaints.

From a planning and design standpoint, the rational organisation and design of space is a crucial means of facilitating communication amongst community members. The enhancement of the physical environment can strengthen people's ties to the community and reduce feelings of isolation (Cai and He, 2014). Due to the complexity of evaluating the quality of the physical environment, this research provisionally uses high property fees and year of construction as indicators. In Shanghai neighbourhoods, higher property fees typically indicate higher housing quality and higher maintenance costs; and the timing of a neighbourhood's construction is also closely, but probably not linearly, related to the neighbourhood's newness and quality of its physical environment, as longer build times tend to indicate greater resident diversity (more resale and move-in and move-out).

3. Data and Method

3.1 Community selection and spatial unit division

Minhang District, a periphery area of the megacity Shanghai, has been developed firstly as a satellite town in the late 1950s, then a fast growing new town and industrial park in the 1990s, now is accommodating more than 2.65 million native and new Shanghainese, including 1.24 million foreign permanent residents¹, with the collage of urban residential superblocks, industrial districts, and villages. With a total area of 372.56 square kilometres, it governs 9 towns, 4 streets and 1 industrial zone.

In order to make statistics on Citizen Hotline data and population, it is necessary to divide appropriate statistical analysis units. According to the distribution of residential land, urban arterial roads, complaints distribution and the size of community in Minhang District, the continuous residential area not separated by main roads at the suitable scale is taken

¹ Data source: the Seventh Population Census in 2020.

as a *community*. As indicated in Figure 1, the spatial units of analysis consist of 65 plots measuring between 0.67 and 3.11 square kilometres.

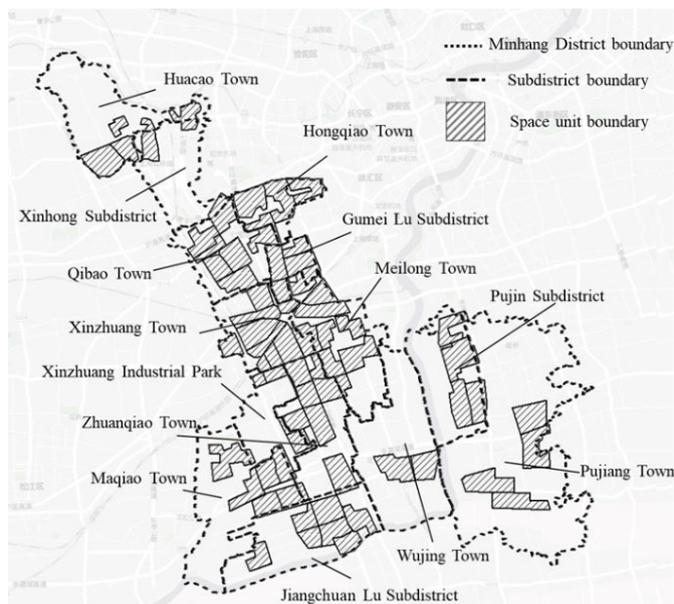


Figure 12 Division of spatial units in Minhang District

3.2 Complaints of Community Conflict

This study obtained the data of residents' demands over the years since the launch of 12345 citizen hotline in Minhang District, Shanghai. Each record includes the larger categories, categories and sub categories of the case, the detailed description of the case and the location of the case. According to the definition of community conflict, the cases are reclassified, and the conflicts that occur within the community and are related to community public resources or community relations, such as community environmental damage and neighbourhood noise, are selected to screen the cases related to community conflict. In order to ensure the efficacy of the community conflict analysis, the community conflicts from 2018 and 2019 are selected for analysis, totalling 16778. This is due to the small number of users at the beginning of Shanghai Citizen Hotline's launch, and the soaring number of complaints about the outbreak of COVID-19 since 2020. The 2019 nighttime population numbers are adopted as the local resident population data.

Considering the sub categories of community conflicts, as shown in Figure 2, the three with the highest proportion are group renting, noise nuisance, and illegal constructions. Therefore, the three types of complaints are further analysed.

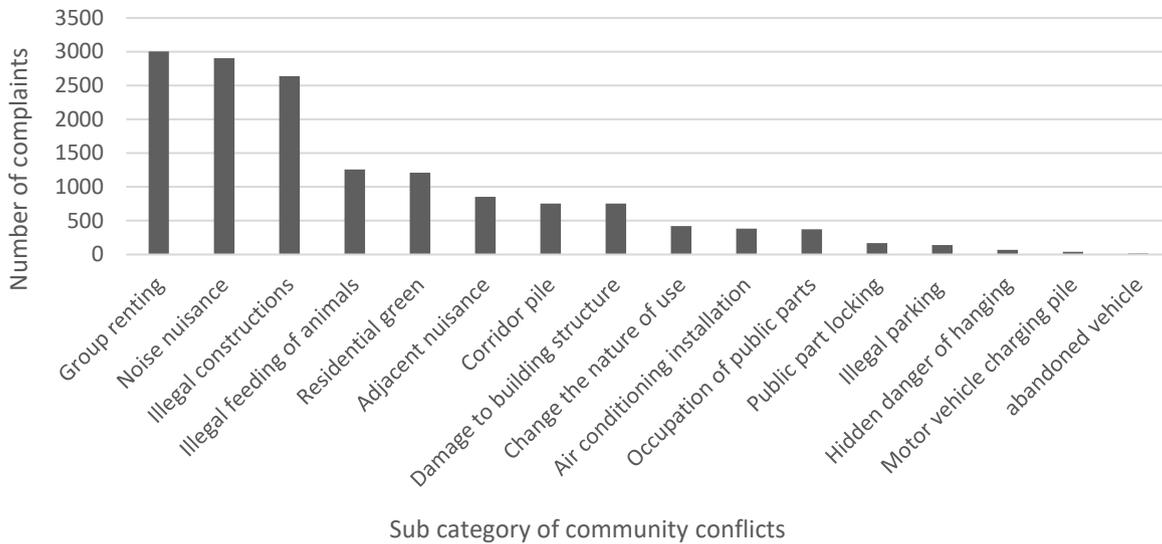


Figure 13 Sub category of community conflicts and corresponding number

Following the incorporation of community disputes into the aforementioned statistical spatial unit, a total of 15,000 data are used effectively for subsequent analysis. The ratio of the total number of complaints in each community divided by the population (i.e. the number of complaints per capita) is defined as the community conflicts complaint intensity of the community, so as to obtain the distribution of the total number of conflict complaints and the conflict complaint intensity of each community in Minhong District, as shown in Figure 3.

In terms of the total amount, the overall number of community complaints in the more centre urban region is relatively high, compared to Maqiao Town and Jiangchuan Lu Subdistrict in the southwest. Per capita, the complaint intensity of the central area is not large, whereas the complaint intensity of some communities in Hongqiao Town, Pujiang Town and Jiangchuan Lu Subdistrict is the highest, indicating that the high total number of community complaints in the central area is primarily attributable to its high population density. The three subdistricts and towns with higher complaint intensity contain more immigrants, relocated residents and inhabitants in former industrial regions. The subsequent will be assessed alongside certain community characteristics.

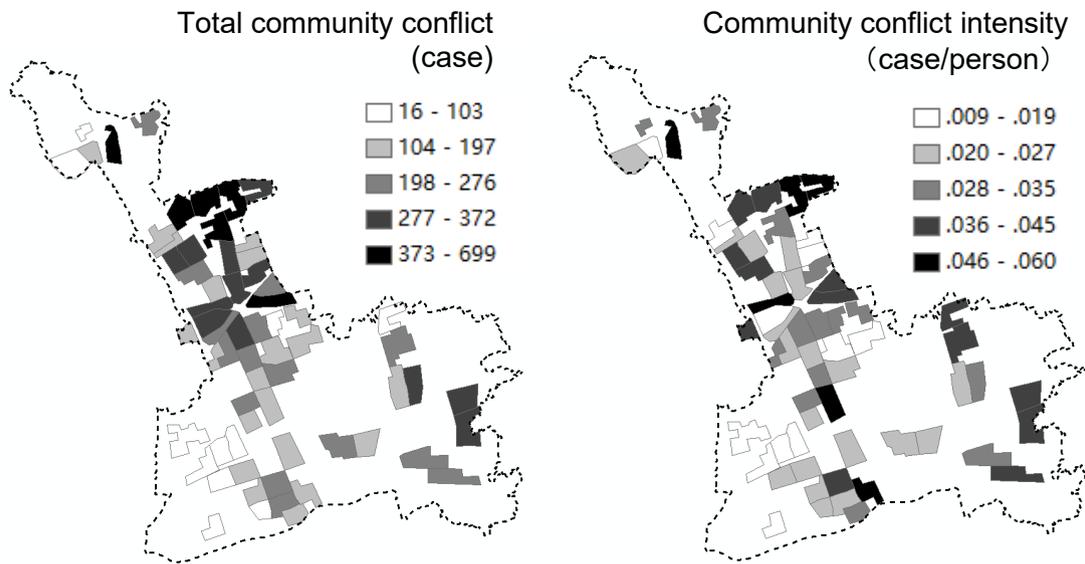


Figure 14 Distribution map of total number and intensity of community conflict complaints

3.3 Community index selection and data processing

On the basis of the three hypotheses and the availability of data, the following indicators have been chosen to characterise urban communities: age structure, residential density and property fee. At the same time, the average construction year of each community is included in the model.

3.3.1 Population age structure

The population data source for this study is the nightly population grid data of the Minhang District in 2019, which is a 250m grid unit and includes the population of various age groups. The proportion of minors is not included as the target of study because the majority of community conflicts involve adults and the conflicts produced by children can be summarised by their parents. Adults are divided into four categories: former youth (19-29 years old), later youth (30-39 years old), middle age (40-59 years old) and old age (60 years old and above), and the proportion of each age group in each community is calculated respectively, K-means Clustering is used to divide the community into four categories according to the age structure. The average proportion of each age group in each category is shown in Table 1. For example, the elderly group represents that the proportion of the elderly in this type of community is the highest compared with other communities, while the proportion of other age groups is relatively low.

Table 1 Grouping characteristics of each age structure

Grouping	Average proportion of former Youth	Average proportion of later Youth	Average proportion of middle-aged	Average proportion of the elderly
Elderly group (19 communities)	0.074	0.267	0.375	0.284
Middle aged group (25 communities)	0.077	0.273	0.423	0.227
later youth group (12 communities)	0.078	0.322	0.368	0.232
former youth group (9 communities)	0.119	0.311	0.369	0.201

The spatial distribution of communities in Minhang District grouped by age structure is shown in Figure 4. It can be found that the middle-aged and the elderly account for a relatively high proportion in the communities in central locations such as Xinzhuang Town, while the communities with a relatively high proportion of young people are mostly distributed around the central area.

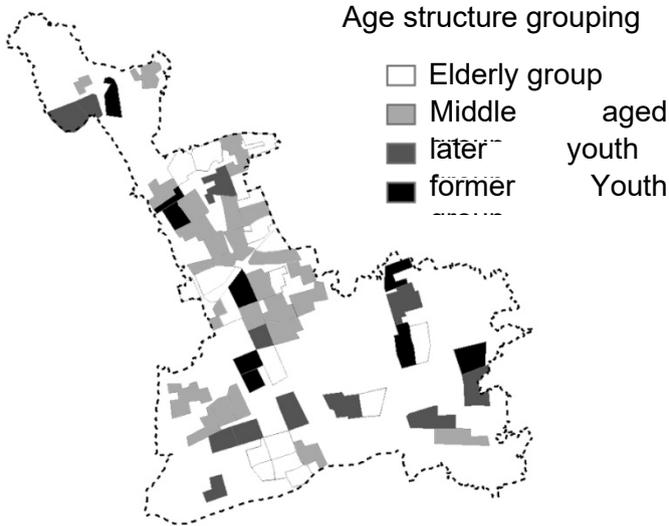


Figure 1 Age structure grouping of communities in Minhang District

3.3.2 Population density

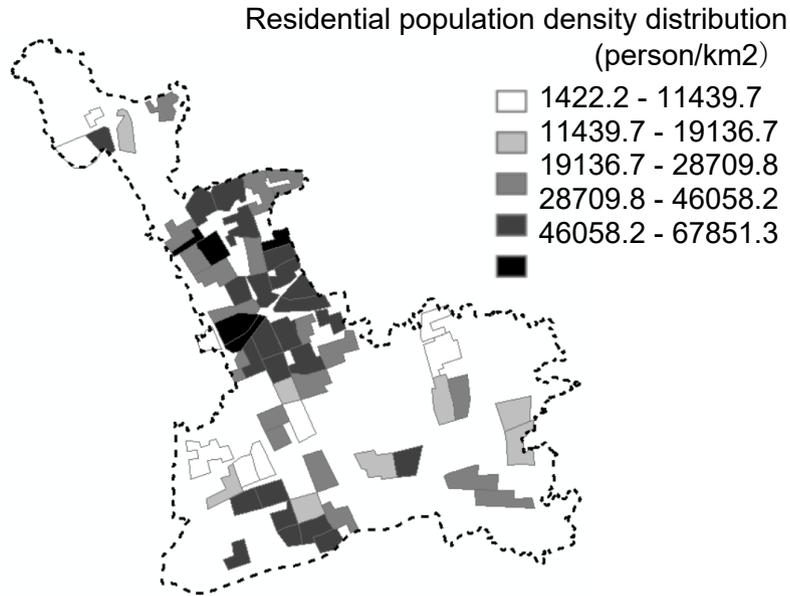
Residential population density is defined as the ratio of the total adult population in the community to the residential land area in the community, in person / square kilometre.

The nighttime population grid data of Minhang District in 2019 is used as the population data source. Integrate this data with the above spatial units and allocate the population to the spatial units according to the area, so as to obtain the population information of the spatial units. The formula is as follows:

$$Q_i = \sum_j \frac{s_{ij}}{S_j} \cdot q_j \tag{1}$$

Where, Q_i is the population of the i th space unit, q_j is the population of the j th grid, S_j is the area of the j th grid, s_{ij} is the area where the j th grid coincides with the i th spatial unit.

The distribution of residential population density of communities in Minhang District is shown in Figure 5. The population density of Xinzhuang Town, Qibao Town, Gumei Lu Subdistrict in the central area of Minhang District and Jiangchuan Lu Subdistrict in the south is higher, while the population density of Maqiao Town in the West and Pujin Subdistrict in the East are less.



**Figure 2 Distribution map of residential population density
of communities in Minhang District**

3.3.3 Property fee

The community contains multiple neighbourhoods. The average property fee of each community is selected as the average property fee of the neighbourhoods, which is used as an indicator to measure the housing quality of the community. The unit is yuan / m² / month.

Using the information of pre-owned dwellings from the Anjuke website in 2019 which includes communal property fees, as the data source, a total of 1394 data were collected. After combined with the above-mentioned space units, a total of 1312 data are valid. The formula for calculating the average community property fees is as follows:

$$m_i = \frac{\sum_j v_{ij}}{N_i} \quad (2)$$

Where, m_i is the average value of the i th community property fee, N_i is the total number of cells contained in the i th community, and v_{ij} is the property fee of the j community in the i community.

The average property fee distribution of communities in Minhang District is shown in Figure 6. The average property fee in central areas such as Xinzhuang Town and Qibao Town in Minhang District is relatively medium and low, while the average property fee in Huacao Town in the North and Pujin Subdistrict in the East is relatively high.

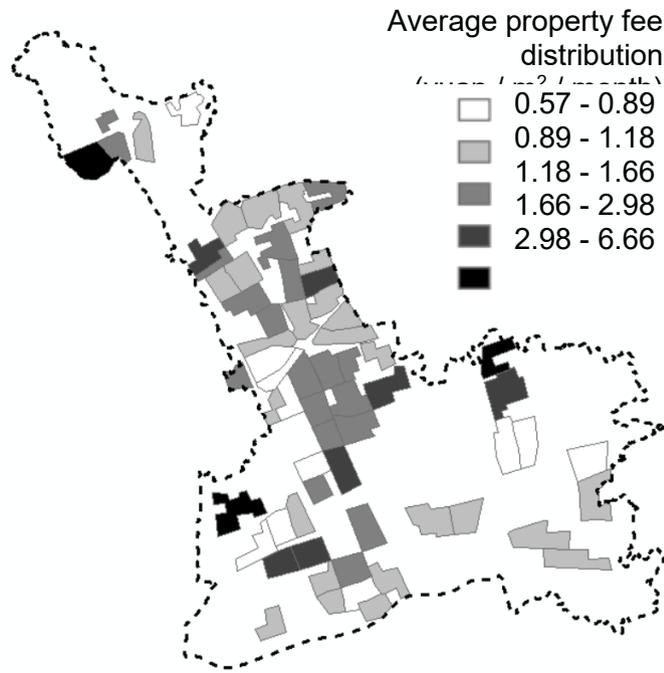


Figure 3 Distribution map of average property fees of communities in Minhang District

3.3.4 Year of construction

The building year is included in the regression model because of the influence of community construction age on residential environment quality and resident diversity. Choose the average construction year of each community and use the 2019 pre-owned dwelling data from the Anjuke website as the data source. To determine the average construction year of each community, the processing is identical to 3.3.2.

Figure 7 depicts the distribution of average construction years in several regions of the Minhang District. The villages in Xinzhuang Town, Qibao Town, and other locations in the centre of Minhang District were built significantly earlier than Huacao Town, Zhuanqiao Town, Pujin Subdistrict, and Pujiang Town towards the east.

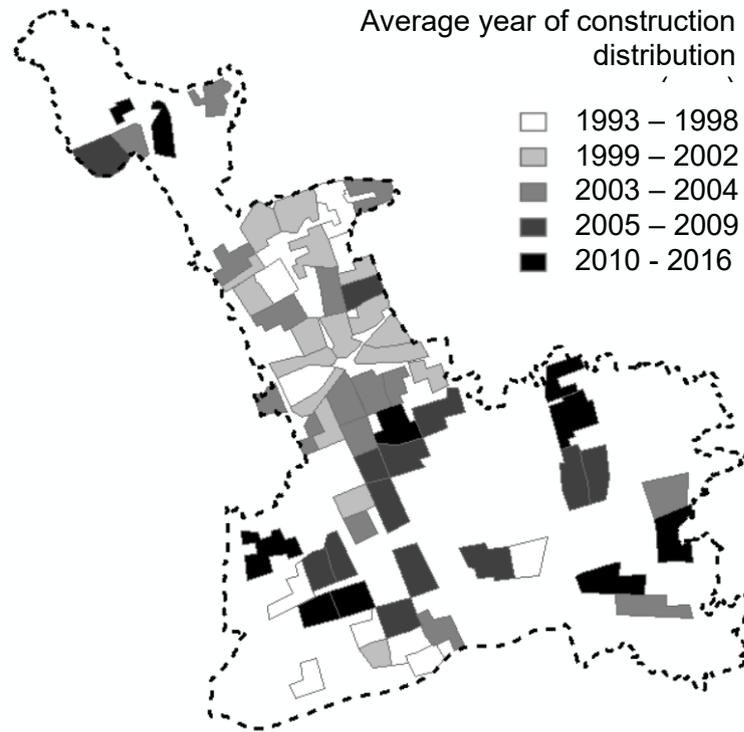


Figure 4 Distribution map of average construction years of communities in Minhang District

3.4 Model selection and construction

Since the number of complaints is a counting variable, it is more appropriate to use the negative binomial regression model as the influencing factor model of community conflict. The intensity of community conflict is used as the dependent variable to establish a negative binomial regression model:

$$p(y) = P(Y = y) = \frac{\Gamma(y+1/\alpha)}{\Gamma(y+1)\Gamma(1/\alpha)} \left(\frac{1}{1+\alpha\mu}\right)^{1/\alpha} \left(\frac{\alpha\mu}{1+\alpha\mu}\right)^y \quad (3)$$

$$\ln\left(\frac{\mu}{Q_i}\right) = \beta_0 + \sum_i \beta_i x_i \quad (4)$$

Where: y is the number of community conflicts, μ is the average number of community conflicts, α is the heterogeneity parameter, Q_i is the adult population of the community, μ/Q_i represents the intensity of community conflict; β_0 is a constant, x_i is each influencing factor, β_i is its parameter, which represents the influence of factors.

4. Results

4.1 Regression Results of Community Conflict

Use equations 3 and 4 to analyse the community conflicts. See Table 2 for the model results.

Table 2 Regression results of community conflict

Parameter	Meaning	Estimated value
β_0	constant	-3.917 ***
age_2	Middle aged group	-2.768×10^{-1} *
age_3	later youth group	-2.825×10^{-1} *
pop_dens	population density	-1.199×10^{-5} **
mean_property	average property fee	-1.411×10^{-1} *

- Parameter significance: . <0.1, * <0.05, ** < 0.01, *** <0.001

- Eliminate insignificant parameters from the model, which is equivalent to a parameter of 0

The results indicate that the community with the highest share of middle-aged or later youth (middle-aged or later youth group) has low conflict intensity, confirming hypothesis 1. Contrary to hypothesis 2, the higher the population density, the lower the severity of communal conflicts. The severity of community conflict complaints is negatively connected with the average property tax, i.e., the higher the average property tax, the lower the intensity of the conflict. The third hypothesis is valid. When the main age group of the community changes from former youth or old age to later youth, the intensity of community conflicts decreases to 75.4%; when population density increases by 10,000 people per square kilometre, the intensity of community conflicts decreases to 88.7% of the original; and when the average property fee increases by 1 yuan per square metre per month, the intensity of community conflict decreases to 86.8% of the original.

4.2 Regression Results of Main Types of Community Complaints

In order to further examine the influence of age structure, residential density, and housing quality on various types of community conflicts, equations 3 and 4 are used to conduct regression analysis on the three most prevalent types of community conflict: group renting, noise nuisance, and illegal constructions. The outcome is as Table 3.

Table 3 Regression results of main types of neighborhood conflict

Parameter	Meaning	group renting estimated value	noise nuisance estimated value	illegal constructions estimated value
β_0	constant	-4.950 ***	-7.902×10^1 ***	1.337×10^2 ***
age_1	Elderly group	-5.831×10^{-1} *	-	-
age_2	Middle aged group	-7.048×10^{-1} **	-4.974×10^{-1} ***	-
age_3	later youth group	-1.075 ***	-3.665×10^{-1} .	-
pop_dens	population density	1.409×10^{-5} *	-	-1.902×10^{-5} ***

mean_property	average property fee	-2.014×10 ⁻¹ .	-2.314×10 ⁻¹ *	1.395×10 ⁻¹ .
mean_build	average construction year	-	3.66×10 ⁻² *	-6.973×10 ⁻² ***

- Parameter significance: . <0.1, * <0.05, ** < 0.01, *** <0.001

- Eliminate insignificant parameters from the model, which is equivalent to a parameter of 0

Considering age structure, for the complaints on ‘group renting’, communities with a relatively high proportion of former youth have the highest complaint intensity compared to other communities, while communities with a relatively high proportion of later youth have the lowest complaint intensity; for complaints of noise nuisance, communities with a relatively high proportion of young and middle-aged people have relatively low complaint intensity; however, for complaints of compulsive gambling, communities with a relatively high proportion of former youth have the highest complaint intensity.

Taking into account the population density, the higher the population density of a neighbourhood, the greater the intensity of group rental complaints and the lower the intensity of unlawful construction complaints. When the population density grows by 10,000 persons per square kilometre, the complaint intensity of group renting rises to 115% while the complaint intensity of unlawful building falls to 82.75%.

Considering the average property cost, the higher the average property charge, the fewer complaints about group renting and noise annoyance, but the contrary is true for complaints about illegal construction. When the average property fee increases by 1 yuan per square metre per month, the complaint intensity of group renting falls to 81.8%, the complaint intensity of noise annoyance falls to 79%, and the complaint intensity of unlawful building rises to 115%.

And for construction year, the later the average year of building, the greater the intensity of noise annoyance complaints and the lower the intensity of illegal construction complaints. When the construction year is 10 years, the complaint intensity of noise disturbing residents rises to 144,2%, whereas the complaint intensity of illegal building falls to 49,8%.

5. Discussion

Consistent with Hypothesis1, neighbourhood conflict complaints are least intense in communities with a relatively high proportion of middle-aged people in the traditional sense (i.e. later-youth aged 30-39 and middle-aged aged 40-59 in this paper), whereas neighbourhood conflict is more intense in communities with a relatively high proportion of former-youth aged 20-29 and elder people aged 60 and older. This may be owing to the bigger disparity in living habits between former youth and older people, which makes them more prone to conflict; however, it may also be related to the fact that these two groups are more likely to conflict within their own groups compared to other age groups. Young people comprise a greater proportion of complaints about ‘group rent’ and noise, which reflects the social reality that young people, who are typically less rent-affordable and more active, are the predominant group where group rent and noise occur, whereas older people have a lower tolerance for group rent and noise.

The outcomes about the second hypothesis warrant additional research. According to 12345 Citizen Hotline data in Shanghai, population density has an inverse relationship with the intensity of neighbourhood conflict complaints, contradicting hypothesis two. There are numerous potential causes for this result. One is that density and settlement environment do not have a straightforward linear connection (Hong and Wang, 2021). Australia's residential density is normally low, but Shanghai's is substantially higher. When residential densities reach a particular range, further increases in density lead to a decrease in per capita neighbourhood conflict, which may be due to both physical and psychological causes, such as an increase in people's tolerance of their neighbourhood as density increases. Secondly, in the context of the continuous promotion of grid-based and refined community administration in Shanghai, it is feasible that the negative consequences of the existing population density are outweighed by its favourable benefits on management. In addition, this may be partly related to the peculiarities of Minhang, where the areas with higher residential density are primarily central areas with relatively mature development and high housing quality, dominated by local residents, whereas the areas with lower residential density are primarily located in the periphery with relatively poor housing quality and dominated by foreigners. Factors that could not be accounted for in the model may also affect the intensity of neighbourhood conflicts.

Consistent with Hypothesis3, the severity of complaints decreases as the property fee increases. Accordance with the overall pattern, the higher the average property fee, the lower the intensity of complaints about group rentals and noise; however, for illegal structures, the results are reversed, i.e. the higher the property fee, the higher the intensity of complaints, likely because residents in communities with higher property fees are more stringent about illegal structures. Besides, the later a neighbourhood was constructed, the more complaints about noise nuisance and the less complaints about unlawful structures there were. Although newer neighbourhoods do not mean higher quality, the affection of construction year is different with the relationship between property fees and neighbourhood complaints.

6. Reflection and Perspective

This research applies a negative binomial regression model to examine the relationship between the intensity of neighbourhood conflict complaints and age structure, residential density, property fee levels, and year of construction, but there are numerous limitations, such as the abundance of complaint data but the dearth of spatial socio-economic data for cross-comparison. The Citizen Hotline data spans multiple years (even days), whereas the neighbourhood's population, property values, and year of construction are 'static' data that are difficult to match precisely, and the imprecise nature of the latter data makes it possible that the analysis results are inaccurate. Due to the limitations of the available data, it is also unable to discuss the influence of more significant physical and social elements on neighbourhood conflicts.

Using urban administrative sources as an object does reveal patterns in varied communities, but merits further investigation. There are the following issues with the data analysis in this paper: First, there is a discrepancy between the number of cases reported by the public and the actual number of neighbourhood conflicts occurring in the community; the high number of certain types of cases may indicate that the public has a strong desire for the government to solve the problem, but not necessarily the high frequency of such conflicts. Secondly, the screening of cases in the study is based on the initial classification from the grid-based centre, and the analysis of the specific content of the complaints may aid in gaining a deeper understanding of community. Thirdly, depending just on the regression analysis of complaint intensity makes it challenging to understand the process of community conflicts and its causal relationship with community characters. In order to optimise community research based on Citizen Hotline data, subsequent attempts can be made to combine field surveys, qualitative research, natural language processing, and other methods, to understand residents' preferences for using the Citizen's Hotline and to mine the raw data for information such as detailed case descriptions.

How can we develop a more peaceful community based on this? It is evident that the frequency of community conflicts is related to the age structure; all-age communities may generate inevitable neighbourhood conflicts, but residents between the age 30 to 59 can serve as the pacifier. In settlements above higher density levels, the conflict density is not necessarily to pull down by residential density, but can be reduced by the influence of other factors, such as socio-demographic structure, management, and housing quality, so that higher densities promote neighbourly interaction and the establishment of mutually supportive and friendly neighbourhoods, which are conducive to harmonious community.

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