Ph.D. Dissertation of Engineering

Urban Diversity, Social Cohesion, and Place Vitality in Songjiang New Town, Shanghai

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- 상하이 송지앙 뉴타운을 중심으로 -

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Seoul National University
Interdisciplinary Program in Landscape Architecture

Sea Eun Cho

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Advised by Prof. Saehoon Kim

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Seoul National University

Interdisciplinary Program in Landscape Architecture

Sea Eun Cho

Confirming the Ph.D. Dissertation written by

Sea Eun Cho

July 2020

Chair Dong Kun Lee (Seal)

Vice Chair Youngyel Ryu (Seal)

Examiner Youngkeun Song (Seal)

Examiner Soojeong Seo (Seal)

Examiner Saehoon Kim (Seal)

Abstract

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Sea Eun Cho

Seoul National University
Interdisciplinary Program in Landscape Architecture

Urban diversity is a multi-faceted subject studied in various fields of social science including urban design, planning, and housing policy. It is recognized as a normative value necessary to achieve place vitality and social equity in urban environments. However, the large-scale New Towns in China or other developing countries are often criticized for lacking urban diversity due to its uniform physical landscape and social environment. This study challenges this notion based on mass internal migration and the various development trajectories embodied in New Towns in transitional China and aims to understand the places of urban diversity in depth and examine how diversity relates to creating socially sustainable communities.

The study area is Songjiang New Town, an outer suburb approximately 40km distance away from Shanghai. Songjiang New Town is the epitome of the metropolitan expansion strategy of the early 2000s in post-reform China. Songjiang originally was an ancient city that flourished during the Ming and Qing dynasties which became incorporated as a satellite city of Shanghai in the 1950s. There was very little urban development up until the 1980s, however, due to the rapid economic growth and emergence of the entrepreneurial local government, Songjiang became designated as one of the nine strategic New towns of Shanghai to support the continued growth of the mother city.

The first chapter aims to offer a general understanding of where and how diversity occurs in this new second-tier urban terrain by measuring housing and social diversity of four neighborhoods using the entropy index. Through this, a nuanced understanding of diversity was captured depending on the locational characteristics of the neighborhoods. The old town was highly diverse due to the gradual and incremental development, while the newly built center was also highly diverse especially in regards to housing type and price generated through the housing market. Additionally, in areas where discrepancies between housing and social diversity were found, young migrant workers were subject to limited housing opportunities while relocatees from Shanghai were spatially separated from commodity housing residents, creating the adverse effects of diversity.

In the second chapter, 53 housing estates were analyzed using the cluster analysis considering housing and social diversity, and social ties in order to extrapolate characteristics of estates that were both diverse and socially cohesive.

The chapter revealed that there was a trade-off between diversity and social ties: diversity was only found to be moderate in estates with a high number of social ties. In view of this, the chapter suggested that moderate levels of social diversity may be encouraged in new housing developments while ensuring wide housing choices which would allow the laissez-faire development of diverse and socially sustainable communities. The chapter also highlighted that creating an environment that supports contact between a diverse group of residents may be important especially through ensuring a close-knitted internal street layout.

Based on this, the third chapter sought to further identify the places of contact related to high diversity and social ties by categorizing street patterns and green area layout of individual housing estates. The streets were divided into two types, the grid and the loop layout, and the green area into the centralized, dispersed, and strip layout. Housing estates with high diversity and social ties commonly had high street intersection density regardless of street layout type. In terms of green area layout, the centralized layout with low green area ratio estates was found to coincide with high diversity and social ties. The results illustrated the importance of a close-knitted street intersection, and showed that a high green area ratio was not necessary as this often resulted in places of aesthetic value but not supportive of the transient small-scale activities within the community.

Finally, the fourth chapter depicted how understanding local knowledge and information is essential for ensuring the effectiveness of a disaster vulnerability mitigation plan. This extends its significance to understanding the normative aspects of urban design, such as urban diversity and social cohesion,

with respect to its specific context, especially in the case of China which has experienced radical socioeconomic changes. The engendered urban diversity and the pivotal changes in social cohesion are related to the unparalleled juxtaposition of pre-reform conditions against modern changes: the economic reforms had led to housing reforms and entrepreneurial urban development, conjoined by mass internal migration. Illustrating how familiar concepts function under specific conditions may offer a nuanced understanding of the normative aspects and contribute to the urban design discourse.

Keywords: housing diversity, social diversity, New Town, large-scale development, place vitality, migrants, social cohesion, housing layout, street connections, green area layout, housing characteristics, hazard vulnerability, community resilience, localized knowledge

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Please note that Chapters 1-4 of this dissertation proposal were written as stand-alone papers (see below). Chapters 1 and 4 were published in 2016 and 2017, and chapter 2 will be submitted to an academic journal.

Chapter 1.

Cho, S. E., & Kim, S. (2017). Measuring urban diversity of Songjiang New Town: A re-configuration of a Chinese suburb. *Habitat International*, 66, 32-41.

Chapter 2.

Cho, S. E., & Kim, S. Understanding the diversity and social cohesion balance in Songjiang New Town, Shanghai.

Chapter 3.

Cho, S. E., & Kim, S. Toward "subtle integration": Built environment characteristics of socially cohesive and diverse urban spaces.

Chapter 4.

Cho, S. E., Won, S., & Kim, S. (2016). Living in harmony with disaster: Exploring volcanic hazard vulnerability in Indonesia. *Sustainability*, 8(9), 848.

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Introduction

Urban diversity is a core asset contributing toward the physical and social sustainability of cities through encouraging compact development and efficient land-use, stimulating economic growth through innovation, and creating active urban places and communities (Carmona et al., 2010; Fainstein, 2005; 2010; Florida, 2002; Jabareen, 2006; Jacobs, 1961; Lynch, 1960). It has long become the new orthodoxy in planning literature, an insurgence against previous development paradigms of orderliness, dullness, and homogeneity (Fainstein, 2005).

Yet the significance of diversity would be partially lost if it fails to create positive social outcomes, including social cohesion. A disconnected diverse society would fail to cultivate innovations that are key to the success of cities and developed economies, and also hinder the building of social capital and the workings of social mobility which may help ensure a sustainable society. Insofar, achieving social cohesion in the context of diversity has been elusive, and empirical evidence documenting socially successful and diverse neighborhoods are lacking (Nyden et al., 1997; Putnam, 2000). This is because a high level of diversity does not always create conditions conducive toward social cohesion as heightened differences between sub-groups often result in lowered social contact and intergroup hostility. In light of the divergent aspects of urban diversity and social outcomes, this study focuses on Songjiang New Town to understand urban

diversity and changed social relations precipitated by urban restructuring in the aftermath of economic reforms in modern China.

The thesis is composed of three chapters that are stand-alone papers, investigating the urban diversity of Songjiang New Town, an outer suburb of Shanghai. The final chapter serves as an epilogue, discussing disaster management under vulnerable conditions emphasizing the use of localized knowledge in drawing effective planning measures.

The first chapter measured the housing and social diversity focusing on four study areas in Songjiang New Town using the entropy index. This chapter aimed to isolate where and how diversity occurs in relation to the neighborhood characteristics and spatial hierarchy embodied in the master-plan of Songjiang New Town. Urban diversity was found to be high in the old urban center and in the new center built comprehensively under modernistic planning, pointing toward the possibility of planned diversity reflecting changes in the social make-up of the New Town residents. The study discussed that in areas where housing and social diversity did not align, relocatees' or younger migrants' – the newly-emerged vulnerable group of urban change – housing choice was limited, compromising their living conditions.

The second chapter examined social ties of the 53 housing estates – one dimension of social cohesion which serves as a basis for trust, help, and neighborhood attachment – with respect to the differing levels of diversity using cluster analysis. The underlying notion is that urban diversity and social cohesion are rarely achieved simultaneously and there is a need to build empirical evidence

delineating successful diverse communities and environments. The study identified four clusters and explored the housing characteristics of the cluster types, which partially supported the contact hypothesis. The study confirmed that highly diverse and socially cohesive estates can exist albeit a trade-off between the two aspects, and confirmed the advantages of having well-maintained old estates as well as estates with high street intersection density. This called for a further understanding of built environment characteristics that enable contact among diverse residents.

The third chapter explored the design measures of housing estate planning to identify which aspects are pertinent to high social cohesion amongst high diversity. This chapter was built upon the discussion of planning sustainable social environments in affordable housing with an emphasis on creating opportunities for social interaction. The chapter focused on street layout and green area layout as the main arenas of providing opportunities for contact and examined the diversity and social cohesion levels by street and green area types. The chapter concluded that subtle integration through minimal separation should be pursued through high street intersection density and small-scale green areas, catering toward the diverse needs of a diverse group of residents.

Finally, the fourth chapter forms a separate discussion of responding to hazard vulnerability in Central Java, Indonesia, based on a joint urban planning and design studio. The chapter explored the economic, environmental, and social vulnerability associated with the site surrounded by four active volcanic mountains, and emphasized the significance of understanding local knowledge

and capabilities to draw effective measures of disaster management. This section serves as an afterword to the earlier chapters demonstrating that urban planning needs to be contextualized through local knowledge. In other words, the colossal urban change hastened through the economic reforms of the 1970s have set a new course of development in contemporary urban China, and the urban diversity acutely embodied on the level of housing estates should be approached and understood within this context.

New dimensions of urban diversity cannot be generalized into being associated with older established areas alone in transitional China but need to be considered in light of the changing urban and social landscape of newly developed areas. Well-functioning old neighborhoods should be preserved as these areas often are reserves of high diversity, while the potential of new neighborhoods should not be dismissed. As such, urban design and planning should continually aim to identify places of diversity and social cohesion with respect to the specific local context, and aim to create wide housing opportunities while carefully structuring places of contact.

Chapter 1

Measuring urban diversity of Songjiang New Town: A re-configuration of a Chinese suburb

1. Introduction

Urban diversity is a multi-faceted issue discussed in many academic fields including social sciences, urban design, and planning (Lynch, 1960; Jacobs, 1961; Carmona et al., 2010; Laurence, 2014), and recently, has also been recognized as an important aspect of sustainable urban development in China. Diversity not only creates aesthetically pleasing environments through vibrant streetscapes and buildings, but Qiu (2012) recognized diversity, alongside compactness, as an effective planning framework to ensure urban intensification and mixed-use development which would deter uncontrolled urban growth in China. Diverse, denser and more connected urban areas are particularly relevant as this would alleviate development pressures on various natural and built environment resources (Song & Knaap, 2004; Guan & Rowe, 2016). Furthermore, the government recently announced that housing supply needs to be diversified to meet the aspirations of different social groups as a measure of improving public

services (CPC Central Committee and the State Council, 2016). However, in spite of such recognition, urban projects in China have been heavily criticized for its standardized urban forms and homogeneous identity (Seto & Fragkis, 2005; Abramson, 2016). Greenfield (2016) disapproved new large-scale developments sporadically emerging in various parts of China for creating empty, and physically homogeneous urban environments, while Caprotti (2014) expressed concerns that a socially resilient and diverse community may not emerge from New Town developments in China.

Yet urban diversity is not sufficient in creating desired urban environments if it fails to induce positive outcomes such as urban vitality and equity (Fainstein, 2005, 2010; Talen, 2006, 2008;). However, achieving these qualities can often be elusive. From a planning perspective, Fainstein (2010) argued that, albeit diversity-oriented planning principles, globalized architecture end up creating places that are more alike rather than differentiated. Not only this, efforts to increase social diversity through planned communities have failed in the past due to heightened group conflicts, eventually damaging community solidarity and worsening segregation (Johnston, 2002; August, 2014). In other words, while it is desirable to promote diversity, it is more important to not remain at an aggregate level and ensure the positive and synergistic outcomes of diversity – otherwise high levels of diversity could be inconsequential (Guan & Rowe, 2016).

Acknowledging the planning aspirations and criticism of urban projects in China, this study aims to highlight the post-socialist restructuring of China as a

strong backdrop for investigating urban diversity, especially in its new large-scale developments. Investigating Songjiang New Town, an outer suburb of Shanghai, the research asks whether urban diversity is found in New Town projects, and how this is experienced in regards to the positive aspects of diversity. This would test and extend the previous literature on where urban diversity is found and enable the discussions on the different contexts of urban diversity. Furthermore, the case of China would have stronger implications in other developing countries where rapid urbanization is re-structuring the urban environment.

The study specifies urban diversity in terms of housing – a sub-category of physical diversity – and social diversity. Housing is particularly significant in the context of New Towns as it is one of the main driving forces of suburban development, and in this study, social diversity mainly refers to examining socioeconomic characteristics as opposed to ethnic or racial aspects.

1.1. Where is urban diversity found?

The following section reviews previous literature in relation to describing places where urban diversity is found (Figure 1-1).

First, older and established areas within the city are identified to be more diverse than newly developed areas (Jacobs, 1961; Blanco et al., 2009). Older areas usually have undergone various building and regeneration processes, creating a physically heterogeneous environment through the mix of old and new properties. Once new buildings or housing stocks are introduced to an existing area, the physical environment diversifies through variations in building type,

density, and street formations. The mix between old and new properties also creates an apt environment for various income levels as older units become more affordable through the downward housing filtering process – where higher-end properties eventually become cheaper and available for moderate income households (Chowdhury et al., 2011). More accurately, the housing filtering process can either happen 'downward' as stated earlier or 'upward' where cheaper estates are replaced through gentrification. Hence, areas with stalled gentrification where old properties are not necessarily replaced by higher-end housings may ensure high levels of diversity (Nyden et al., 1997; Randolph & Freestone, 2012).

The second notion is to ensure incremental changes in the urban environment, which relates to the first notion of retaining existing buildings or housing stocks in a given area. A comprehensive report which empirically tested the contribution of diversity to urban vitality noted that "the rate of change is important," and that neighborhood changes should be piecemeal (National Trust for Historic Preservation, 2014). In this sense, large-scale developments potentially erase the existing elements of diversity and create repetitive and monotonous places. More significantly, these areas may be subject to rigid design controls, prohibiting the possibility for individualistic change or adaption (Southworth & Owens, 1993) further countering the conditions of urban diversity.

Lastly, housing policies and urban design regulations could be implemented to promote urban diversity. In principle, infill developments are encouraged so as not to destroy the existing conditions of the urban fabric and

ensure socioeconomic diversity and stability (Kim & Larsen, 2016), relating to the first and second notion of where urban diversity is found. Zoning regulations also have the potential to contribute towards diversity if land-use and housing unit type mix can be implemented on a varied scale (Blanco et al., 2009; Talen, 2012). Measures such as rent control and housing subsidization are also promoted to ensure a wide housing choice for the lower-income families and hence promote higher social diversity (Kleinhans, 2004; Musterd & Andersson, 2005).

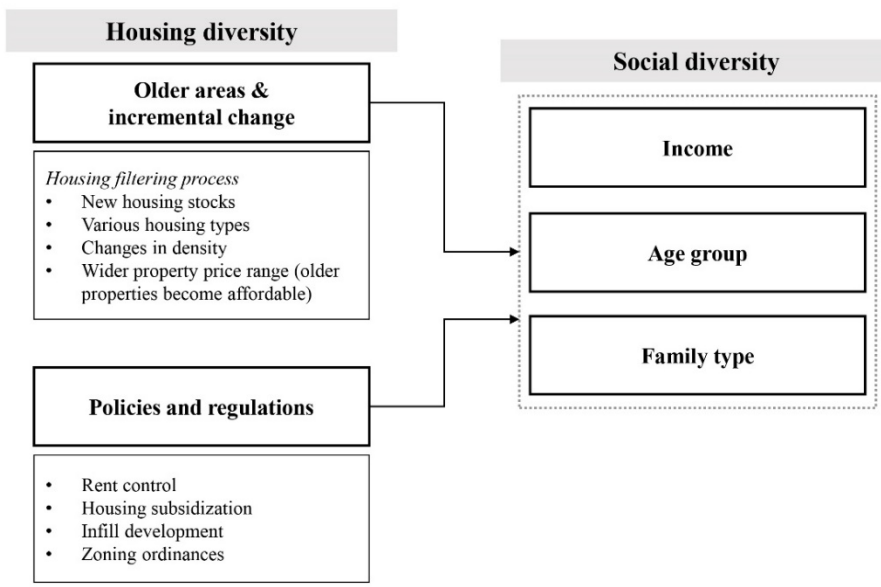


Figure 1-1 Where is urban diversity found? Relationship between housing and social diversity

1.2. Urban diversity in a Chinese suburb

Against such understanding, it is easy to dismiss the large-scale suburban developments of China as sites of homogeneity. However, there are two conditions to examine which may suggest a more complicated landscape.

First, the housing provision system in China experienced major changes ever since the 1990s which engendered new patterns of residents and housing diversification (Wang, 2000; Wang & Murie, 2000). After an experimental period of commercialization, in 1994, the government announced a two-tier housing provision system based on income levels (Wang & Murie, 2000; Wang, 2011). Housing commodification indicated that the market was now recognized as an important supplier of housing. In the wake of such change, developers experimented with various housing plans and residential complexes to accommodate for the differentiated social groups. However, the reliance on the housing market and rising prices became a serious issue during the mid-2000s and the government responded by introducing a multiple housing provision system since 2007 (Wang, 2011). Ever since, the notion of social housing and inclusionary housing has been emphasized and various types of affordable housing schemes are being introduced despite the problems of limited stock (Huang, 2015).

Second, there is an inherently social aspect which presupposes urban diversity in Chinese New Towns. This is due to the influx of migrant population, which is one of the driving forces of New Town projects (Wu, 2015). Rapid internal migration has followed the economic reforms in China, and the urban population is expected to reach 61.0% by year 2020 which is a drastic increase from 17.4% of 1975 (Zheng & Yang, 2016). The single most important factor of urban population increase is pointed towards internal migration, and in receiving cities such as Beijing, Guangzhou and Shanghai, the migrant population is approximately 40% of the total population (Zheng & Yang, 2016). In respect to

Songjiang, the floating population in 2013 was approximately 1.1 million which accounted for 62% of the total population (Songjiang District Government, 2014). Migrants are attracted to newly developed areas as they provide housing, urban infrastructure, and also open up job opportunities to the city center (Won et al., 2015). In the case of Songjiang, the metro line 9 extension from the Shanghai city center allowed the suburban area – located 40km southwest of the city center – to be recognized as a connected and an opportune place of settlement (Shen, 2011). Furthermore, the migrant population itself embodies diverse socioeconomic backgrounds ranging from rural migrants that are seeking to improve their living conditions to the highly-educated global talents attracted to the main city of Shanghai (Cui et al., 2014; Shen, 2011). Therefore, depending on the living situation and personal aspirations, migrants' duration of stay may also differ (Zhu, 2007), implying a dynamic and ever-changing condition of social diversity.

2. Data and Method

2.1. Study Area

Songjiang district is one of the main outer suburbs of Shanghai as presented by the 'One City Nine Towns' plan of 2001. Despite its primarily agricultural past, in 1958, Songjiang was recognized as one of the five satellite towns of Shanghai and administratively formed part of the Shanghai Municipality (Wu, 2015). However, it was only during the 1990s when Songjiang caught up with rapid urbanization, and authorities decided to develop the northern area of the Shanghai-Hangzhou Highway which bisected Songjiang district on an East-West axis (Tongji

University, 2003). The 1998 Songjiang Central Urban District Masterplan was the first plan to integrate the original city area and this new expansion to the north, and in 2001 an international competition for the master planning of the Songjiang New Town was held (Tongji University, 2003).

In this study, within the master plan boundary, four areas were selected to measure urban diversity. The two criteria for site selection were the development period (old vs. newly developed areas) and the pace of change (incremental vs. rapid development). Areas A and B, located south of the Shanghai-Hangzhou Highway represent the old and established areas, whereas areas C and D form part of the comprehensive new developments of the late 1990s situated north of the Highway (Figure 1-2). In relation to the pace of change, housing estates studied in area A were built over the longest period of time where the Chinese housing provision system transitioned from welfare to the housing market (Figure 1-3). Hence, this area is expected to show the highest level of urban diversity as it is closest to being incrementally developed. On the other hand, estates studied in areas B, C and D were built over generally shorter periods of 8 to 11 years after the late 1990s. In particular, area C is the only area where housing development was concentrated in the housing market formation period where all properties were commercially developed.

The following section briefly describes the urban and housing characteristics of each study area (Table 1-1).

There are 17 housing estates in area A, with the largest estate accommodating for more than 3,000 dwelling units while the smallest estate

houses 120 dwellings. Area A is well-serviced by public transportation with the Songjiang Sports Center subway station located nearby and has commercial activities occurring along all of its main streets. Area B is an area where there is a mix between commercial housing and relocation housing estates built after the mid-2000s. While the southern boundary is cut off by a river stream, building activities continue towards the west where new high-end commercial developments stand in stark contrast to open fields. Areas A and B belong to the *Yueyang jiedao* and *Yongfeng jiedao* respectively. For both *jiedao*s, there is a higher proportion of the aged population than areas C and D. In 2013, population aged 60 and above accounted for almost 24.5%, and those aged between 36 and 60 accounted for roughly 40% (Songjiang District Government, 2014).

Area C is near the new administrative center and central park of Songjiang New Town which consists of 14 housing estates. It is located south of the Songjiang University Town site and is relatively well-serviced through bus routes. Area D is an area directly serviced by the Songjiang University Town subway station, where there are visible sites of on-going housing construction. In terms of its built environment qualities, there are certain similarities with area B as it also borders the rural fields towards its northern boundary marking an abrupt edge between the built and unbuilt areas. Both areas C and D belong to the *Fangsong jiedao*, which has a comparatively younger population with those aged between 18 and 35 accounting for 48.6% (Songjiang District Government, 2014).

Table 1-1 Basic characteristic of study area

Location	Area	No. of housing estates	Total no. of households
Areas in between the Shanghai-Hangzhou Highway and Railway station	A	17	16,191
	B	13	18,280
Areas developed to the north of the Shanghai-Hangzhou Highway	C	14	11,315
	D	9	15,511
Total		53	61,297

Figure 1-2 Map of Songjiang District

Figure 1-3 Housing development period (Wang, 2011) and study area's typical housing estates

2.2. Measuring diversity using the entropy index

In order to measure urban diversity, the study used the entropy index. Among various diversity indexes, the entropy index has been used in housing and residential studies for its suitability of measuring the variation of nominal variables (White, 1986; Musterd & Andersson, 2005; Livingston et al., 2013). The entropy index is also applicable for this study as the diversity variables are categorically defined.

Equation 1

$$h_i = -\sum_{j=1}^{k} p_{ij} \ln(p_{ij})$$

For the final reporting of results, the standardized entropy index value was used so that values ranged from 0 to 1, enabling a more intuitive understanding of the results. The minimum value of 0 indicates absolute homogeneity, while the maximum value of 1 indicates the highest level of heterogeneity.

Ten variables were examined in terms of the housing aspect (Table 1-2). Year of build, housing density, the area of the site, street intersection density, and green ratio capture the urban structure and density of the developments which are common descriptive attributes used in urban design and morphological studies (Moudon, 1994; Talen, 2008; Ryan, 2013). Specific to this study, housing type was divided into the economic and building type classifications to understand where specific social groups such as relocated residents or low-income households may be located. In addition, housing price[1] and housing unit size were used to understand the variety of housing unit types provided by each individual estate.

For the social aspect, eight variables were set up. The household or family structure was represented by the marital status and family type, whereas the socioeconomic characteristics were represented by the employment status, occupation sector, education attainment and monthly household income. The research differentiated marital status and family type to better capture the

[1] The housing prices were current prices at the time of inquiry which was December 2015.

household compositions of migrants. Finally, the hukou[2] status and tenure years were included to understand the mix between migrants and original residents, as this may be a key social aspect in New Town areas.

Table 1-2 List of housing and social diversity variables

Housing diversity	
Year of build	1980s / 1990s / 2000s / 2010s
Housing density (total no. of dwelling units per 1,000m^2)	Less than 5 dwellings / 5 ~ 10 dwellings / 10 ~ 15 dwellings / 15 ~ 20 dwellings / More than 20 dwellings
Total area of site (m^2)	Less than 50,000 m^2 / 50,000 ~ 100,000 m^2 / 100,000 ~ 150,000 m^2 / 150,000 ~ 200,000 m^2 / More than 200,000 m^2
Street intersection density (no. of intersections per 1,000 m2)	Less than 0.2 / 0.2 ~0.3 / 0.3~0.4 / 0.4~0.5 / More than 0.5
Green ratio	Less than 30% / 30~35% / 35~40% / 40~45% / More than 45%
Housing type	Commodity housing / Relocation housing / Commodity and affordable housing (e.g. Economic and Comfortable Housing, Public Rental Housing etc.) / Commodity and relocation housing
Building type	Parallel block (6 floors or lower)/ High-rise development / Block or high-rise development with community facilities / High-rise and villa compound / Villa compound
Min. housing price (000, RMB)	Less than 1,000 RMB / 1,000~1,500 RMB / 1,500 ~ 2,000 RMB / 2,000 ~ 2,500 RMB / More than 2,500 RMB
Max. housing price (000, RMB)	Less than 3,000 RMB / 3,000~4,000 RMB / 4,000 ~ 5,000 RMB / 5,000 ~ 6,000 RMB / More than 6,000 RMB
Smallest housing unit size (m^2)	Smaller than 50m^2 / 50 ~ 70m^2 / 70 ~ 90m^2 / 90 ~ 110m^2 / Larger than 110 m^2
Social diversity	
Marital status	Single / Married, living together / Married, separated / Widowed / Others

[2] Hukou is the household registration system of China which allows the government to organize its population locationally. Under Maoist China the hukou system was comprehensively enforced as a national institution which rigidly controlled internal migration and also divided the population into rural or urban residents. Urban hukou holders were entitled to various goods and subsidies provided by the government which became the basis for social stratification. Although the hukou system has undergone changes in the economic reform era, its divisive function has largely survived.

Family type	One person living alone / Husband and wife / Parents with unmarried children / Parents with married children / Others
Employment status	Employed / Full-time student / Peasant / Retired / Unemployed
Occupation sector	Government or public sector office / Professional technician / Office worker / Service sector / Industrial worker / Private business / Others
Education attainment	Illiterate or Primary school / Junior high school / Senior high school / University / Beyond university
Monthly household income (RMB)	Less than 3,000 / 3,000~5,000 / 5,000~10,000 / 10,000~15,000 / More than 15,000
Hukou status	Shanghai non-agricultural hukou / Other city non-agricultural hukou / Agricultural hukou
Tenure years	Less than 3 years / 3~5 years / 5~10 years / 10~15 years / More than 15 years

2.3. Data collection

Housing data was obtained by personally visiting the residential committees and property management offices located at each housing estate from November 27 until December 4, 2015. While the property management offices held most of the required housing data, any missing information was supplemented by visiting the residential committee. Housing estate maps were photographed at each site, and average housing price of individual estates was obtained by inquiring local real estate offices. However, one property built in the 1980s in area A lacked proper documents so the total area of site and green ratio could not be found. These cases were eliminated when calculating the respective diversity aspects.

To collect the social diversity-related information, a resident survey was conducted through the intercept survey method. The survey was conducted from December 24 until 31, 2015 (i.e. two days for each study area) with the assistance of undergraduate students from Tongji University. For each study area, two main

streets along the East-West axis were identified and surveys were conducted at designated street intersections. The assistants were divided into two groups, and each day conducted two sessions of three-hour long street surveys – between 10AM until 1PM and 2PM until 5PM. The assistants were asked to engage with all passers-by who were willing to respond, and only those identified to be living in one of the study area's housing estates were eligible for the survey. In most cases, the assistants read out the survey and directly filled out the questionnaires to minimize mistakes or confusion. In total 98 people were surveyed from area A, 88 from B, 82 from C and 102 from D. Some respondents were unwilling to disclose information such as monthly income or education attainment, hence the total number of cases vary for different variables.

3. Results

The results of the standardized entropy index values are shown in Table 1-3. For each diversity aspect, the area with the highest entropy index value is highlighted in bold, and the column on the right shows the average entropy index value. Scores have been given based on the individual area's ranking of the entropy index value. For example, when considering 'year of build,' area A ranked first scoring the highest entropy index value, whereas area C ranked the lowest. Hence, area A is given a score of four and area C is given a score of one for this particular diversity aspect. The total score is the sum of all individual ranking scores. The following section describes in detail where high housing and social diversity is found.

Table 1-3 Standardized entropy index value results

Diversity aspect		Old City		New Development		Aver. value
		Area A	Area B	Area C	Area D	
Housing diversity	Year of build	**0.823**	0.498	0.186	0.496	0.736
	Housing density (total no. of dwelling units per 1,000m2)	0.814	0.666	0.678	**0.910**	0.767
	Total area of site (m2)	0.800	**0.964**	0.870	0.910	0.886
	Street intersection density (no. of intersections per 1,000 m2)	**0.947**	0.641	0.812	0.628	0.757
	Green ratio	0.861	0.641	**0.870**	0.683	0.764
	Housing type*	0.543	**0.788**	-	-	0.333
	Building type	0.569	0.558	**0.809**	0.714	0.663
	Min. housing price (RMB)	0.431	0.582	**0.929**	0.424	0.592
	Max. housing price (RMB)	0.301	0.534	**0.678**	0.659	0.543
	Smallest housing unit size (m2)	**0.738**	0.611	0.583	0.425	0.589
Housing diversity score based on ranking		27	24	27	21	
Social diversity	Marital status	0.391	0.287	0.435	**0.552**	0.416
	Family type	0.763	0.791	**0.926**	0.910	0.848
	Employment status	**0.803**	0.698	0.663	0.715	0.720
	Occupation	0.761	0.852	0.886	**0.889**	0.847
	Education attainment	0.828	0.824	0.781	**0.880**	0.828
	Monthly income	**0.855**	0.787	0.790	0.696	0.782
	Hukou status	0.903	0.882	**0.929**	0.803	0.879
	Tenure years	**0.957**	0.722	0.893	0.617	0.797
Social diversity score based on ranking		22	15	22	21	
Total score based on ranking**		49	39	49	42	

Note: *The housing type for areas C and D consisted only of commercial housing hence the values have been omitted; **The total score is based on the order of ranking amongst the four areas.

3.1. Where is urban diversity found? The two sides of housing diversity

The results showed that areas A and C had the highest level of housing diversity,

indicating that both an incrementally developed area and a newly planned area driven by the housing market can be diverse.

Area A was diverse in ‘year of build’ indicating a good mix between old and new properties, and this key aspect related to other variables such as housing unit size and street intersection density. The ‘smallest housing unit size’ was highly differentiated due to an even distribution of units in the ‘less than $50m^2$’ and ‘$50m^2$ to $70m^2$’ categories, which was particularly characteristic of older properties. There rarely was a case in other areas where units smaller than $50m^2$ were provided. Another notable aspect was the ‘street intersection density’ indicating that properties ranged in having dense or loosely-structured estate plans. This was due to the properties with mid-ranging densities, which was in turn particularly characteristic of large estates that were built since the 1980s over multiple phases. In other places, estates with similar site area showed a mix between mid-rise parallel blocks and high-rise towers, but in area A, a simple plan dominated by six story parallel blocks was typical of these estates. While area A, in general, scored moderately high for other variables, it lagged behind in building type variations and also did not have a particularly wide housing value, scoring relatively low for both minimum and maximum housing price.

While the above-mentioned results confirm conventional knowledge, it was found that area C – a comprehensively developed area – also showed high levels of housing diversity. The four variables which showed the highest entropy index values were ‘building type,’ ‘green ratio,’ ‘minimum housing price’ and ‘maximum housing price.’ The high diversity of ‘building type’ and ‘green ratio’

seemed related, since ‘building type’ captured the mix between apartment-style estates such as parallel blocks or high-rises where the green ratio is lower, and villa compounds with generally higher green ratio. This created a more diversified built environment and the provision of villas indicated that this may be a preferred neighborhood of the upper-middle class. In fact, this is reflected in the diverse ‘maximum housing price.’ However, it is interesting to note that the ‘minimum housing price’ was also highly diverse indicating that lower-income households were also catered for in this area through cheaper apartment-type housing estates. In other words, the fully commercially developed area offered the widest range of housing value. However, area C obviously was not diverse in terms of the year of build – the only variable that the area scored the lowest – while this was the strong driving force behind area A’s high urban diversity.

The two areas B and D showed either moderate or low level of housing diversity, however, it is worth noting that area B was the most diverse in terms of ‘housing type’ due to the presence of relocation housing. Although a number of relocation mixed with commodity housings were found in area A, housing estates that purely consisted of relocation housing was only found in area B. On the other hand, area D did not score very high in terms of housing diversity. In fact, area D scored the lowest for ‘minimum housing price’ and ‘smallest housing unit size’ amongst others. In other words, area D consisted purely of post-2005 commercial developments with most of its smallest housing unit size belonging to the single category of ‘larger than 50m^2 less than 70m^2.’ Also, all of the smallest units were priced less than 2 million RMB indicating that the price range and unit size of the dwellings were more standardized. Such homogeneous qualities were easily

recognized and experienced when visiting the area as well, and unlike area C, the physical characteristics of area D did seem to align with the criticisms of newly developed areas creating a monotonous landscape.

3.2. High social diversity and the heterogeneity of the migrant population

When examining the social aspect, areas A, C, and D showed high levels of diversity which were either related to the mixing of different population groups (areas A and C) or diversity inherent within a specific population group (area D).

Area A was most mixed in ‘tenure years’ indicating a mix between newcomers and original residents. Newcomers in the category of ‘less than 3 years’ accounted for 14.3% in area A, which in fact is the lowest percentage compared to other areas, but due to the higher percentage of residents who had lived in the area for more than 15 years (31.70%), the entropy index value scored the highest. Area A was also diverse in terms of ‘employment status’ and ‘monthly income.’ While in other areas the ‘employed’ category was dominant, in area A there was a comparatively higher number of respondents in the ‘full-time student’ category. In terms of the different income levels, area A comparatively showed a higher percentage of low-income families with more even distribution in the three categories earning less than 10,000 RMB per month. This may be due to the higher proportion of the elderly and retired population in the area. Therefore, the high social diversity of area A may be associated with receiving new young families with moderate income into an area where original residents were dominant.

The high social diversity of area C was due to the mix between original residents and migrants with diverse household structures as indicated by 'hukou' status and 'family type.' In area C, the 'other city non-agricultural hukou' accounted for a relatively high 42.7%, and agricultural hukou residents accounted for 16.0%, showing a balance between all hukou statuses. While area A is also very diverse in its hukou composition, it was the presence of agricultural hukou holders in area C which contributed to the highest entropy index value (Figure 1-4). Considering 'family type,' there was a relatively even distribution of single-person households to larger households but more importantly, there were those who belonged to the 'others' category which was mostly house-sharing respondents from workplaces.

Intriguingly, area D showed mixed messages because three variables – 'marital status,' 'occupation,' and 'education attainment' – showed highest levels of diversity while other three variables – 'monthly income,' 'hukou' and 'tenure years' – showed the lowest levels of diversity. As it is expected of a newly expanding area, most of the residents had arrived within the last three years (58.8%) with 64.0% of residents holding 'other city non-agricultural hukou.' The income level was generally higher than other areas with 52.2% of residents earning more than 15,000 RMB per month. This indicated that area D was where the most recently arrived, high earning migrants moved in.

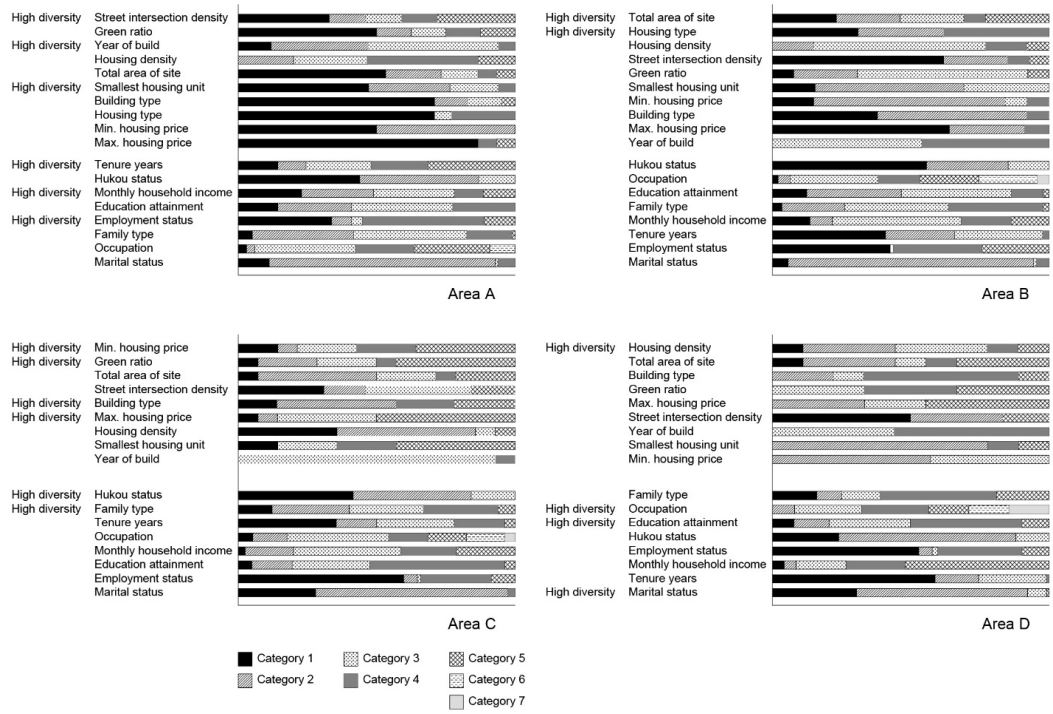


Figure 1-4 Data distribution of each diversity variables (in percentage)

Understanding that there is an identifiable dominant social group in area D, it is important to further explore the social aspects which scored the highest entropy index value. First, the reason behind a highly diverse marital status is due to a number of respondents belonging to the ‘married, separated’ category. In all cases, this condition was due to one of the spouses finding work in Shanghai, or in one particular case, a grandparent who had moved permanently to look after her grandchild. On the other hand, the highly diverse ‘occupation’ was due to the higher proportion of people working in the service sector, and those who answered in the ‘others’ category. This was evident at the survey conducting stage where a number of young, recently moved migrants were working as real estate agents or shop assistants, while there was also a unique job description of a

freelance translator and artist. Another interesting characteristic of the area was its high educational attainment with most respondents evenly distributed across the categories of 'senior high school' to 'beyond university.' Evidently, area D's social diversity differed from areas A and C in that heterogeneity rose from within the migrant population that was inherently socioeconomically diverse.

3.3. How is diversity experienced? Understanding urban diversity in the real-world

Learning from the entropy index results, it is difficult to simply classify an area as being heterogeneous or homogeneous. Furthermore, if the purpose of promoting urban diversity relies on bringing vitality and equity to the urban environment, it is important to discuss where and how these areas may appear. The following section compares areas C and B to delineate urban characteristics which may encourage urban vitality in relation to diversity.

High urban diversity manifested through various housing types and different price points became apparent along a successful commercial street in area C, namely *Songjiang-lu*. Along *Songjiang-lu* was one of the cheapest estates in the area, C1, with an average housing price of 16,500 RMB/m^2, where coincidentally the highest number of agriculture hukou holders lived. Directly across the C1 estate was the second most expensive apartment estate, C4, which was built in 2013, with an average price of 26,000 RMB/m^2. These two estates faced each other and were serviced by the same bus routes and urban amenities such as small shops, banks, cafes, and restaurants. At the eastern end of *Songjiang-lu* was the only residential complex mixed with hotels and a shopping

mall (C6) which provided housing for young professionals. This area livened up especially during the weekends when university students from the Songjiang University Town campuses came to shop and spend time with their friends. The young crowd was mixed with families who also did their weekend shopping near the mall area. Directly across this shopping and residential complex were C2 and C3 estates which comprised of low-rise apartments mixed with villas. Internally, these estates created a mix of building types and housing price differentiation, albeit catering more towards the middle-class. In general, housing estates with varying building types, target households and housing value seemed equally well-serviced along a successful commercial street, creating a balanced housing environment for a wide population.

Area B's high housing type diversity – due to the balance between relocation housing, relocation housing mixed with commercial housing, and commercial housing – indicated potentially a favorable condition towards high social mix and vitality. However, unlike area C, the area seemed spatially segregated, without any common streets or areas which bound the different housing types. The relocation housings were concentrated on the southern edge of the study area boundary, abruptly marked off by a wall and a natural stream. There were shop-lined streets within the area but not all spaces were occupied, and hence not many street activities were observed. Even with the opened shops, there seemed to be a lack of goods and stocks, by which one elderly complained that he had to travel far to do his daily shopping. However, traveling north two urban blocks were where the higher-end commercial developments were located with a large shopping mall and a vibrant atmosphere. The high-end commercial

developments implemented strict security controls and did not allow non-residents to enter into their estates. A particular housing estate developed by Vanke, a well-known real estate developer in China, was completely insulated through fences and security guards, which was actually one of the reasons for being popular among its residents. There was a large shopping mall near the area with shops and restaurants targeting a different income group from the shop-lined streets of the southern area. The stark physical boundaries coupled with large block sizes created a segregated environment where housing type diversity did not translate into a positive urban characteristic.

In conclusion, the housing and social aspects of diversity do not necessarily relate but rather create multiple conditions of urban diversity (Table 1-4). Area A was characteristic of accumulated diversity which depended on incremental changes over a long period of time, and area C demonstrated that planned diversity in conjunction with the housing commodification process could achieve a diverse environment as well. As for areas B and D, the housing and social aspects showed disparate tendencies, creating either uncoordinated or incongruous diversity. As demonstrated above, housing diversity was present in area B but the lack of coordination between the different housing types, further exacerbated by large urban blocks, indicated that moderate levels of diversity were ineffective. On the other hand, in area D, high social diversity was found but was contained in a homogeneous housing environment, exhibiting a mismatch and incongruity between the two aspects.

Table 1-4 Urban diversity characteristics of the four study areas

Area	Urban diversity levels			Context of urban diversity
	Total diversity score	Housing diversity	Social diversity	
A	49	High	High	Accumulated diversity that has been incrementally developed
B	39	Moderate	Low	Uncoordinated diversity creating a socio-spatially segregated area
C	49	High	High	Planned diversity achieved through a wide housing choice
D	42	Low	High	Incongruous diversity where a heterogeneous population is accommodated in a homogeneous environment

4. Discussion

The high housing diversity of area A confirms previous knowledge in that places that are older with a moderate pace of change are highly diverse. The development of the housing provision system from welfare to the market has contributed majorly to this area's high housing diversity as properties ranging from the 1980s danwei-turned-commodity housing to recent commercial developments coexist. In fact, area A, where diversity has been reached through accumulation, is characteristic of diverse suburban areas that are not subject to gentrification with a high differentiation of middle to low-income households (Randolph & Freestone, 2012).

More importantly, this paper contributes to previous knowledge by showing that urban diversity can be found in comprehensive new developments. Insofar, the key to where urban diversity is found relies on preserving the existing urban fabric and cumulatively introducing new urban developments and

population, which is why new comprehensive developments are considered unfavorably. However, in area C where new large-scale estates were built in a relatively compressed time – especially while the housing market flourished – wide housing choice provided through building type diversity and housing price was found. In other words, the pivotal transitioning into the housing market period had contributed to this area's high housing diversity which differs from the previous case of accumulated diversity. Hence, in the unique context of China, the role of the market should not be underestimated at least in respect to engendering diversity.

The high social diversity in both areas of accumulated and planned diversity was related to the balance between migrants and original Shanghai hukou holders. It is plausible that high housing diversity coupled with satisfactory urban infrastructure and amenities ensured that the two areas welcomed a stable mix of newcomers, migrants and households of various income levels. In particular, area C displayed areas of successful urban streets and spaces where high diversity created vibrant urbanism.

Understanding that each area differs, urban development measures need to be approached separately either to utilize the strengths of an area or improve a given situation as is demonstrated through areas B and D.

The high social diversity potential of area D should be recognized despite the incongruity with the housing environment. The convenience of the metro line 9 station and the job opportunities generated by a newly urbanizing area seemed to have made area D a suitable place for disparate populations such as younger

unskilled migrants as well as foreign or well-paid migrants. While the wide spectrum of migrants contributes to the area's high social diversity, it is the unskilled young migrants who endure unfavorable housing conditions in an area of standardized housing catered towards the middle class. It was found through the survey that many young migrants, mostly working as real estate agents, were either living in cheap hotels for extended periods or in small flats with other co-workers. Although the high social diversity of area D is more of a transient and dynamic nature, there need to be housing opportunities for those who plan on longer term residency, and therefore in this respect, housing type and unit size can be more differentiated as in area C.

Lastly, the relatively high housing diversity of area B should be utilized to positively induce place vitality. Area B showed uncoordinated diversity where relocated residents were location-wise disadvantaged and had less access to urban services compared to commodity housing residents. This contrasts against the success of *Songjiang-lu* in area C where different family types and income levels were serviced via the same route and facilities. In this respect, above all, there needs to be proper provision of urban services and amenities for the relocated housing estates. Moreover, while the already disadvantaged locations of relocation housing estates cannot be changed, the sense of marginalization can be reduced through urban design and planning measures by introducing shared spaces and better connections to the main northern blocks. This may also encourage exposure and interaction amongst relocation and commodity housing residents which would better utilize the conditions of housing diversity.

Chapter 2

Understanding the diversity and social cohesion balance in Songjiang New Town, Shanghai

1. Introduction

While urban diversity and social sustainability are often recognized as normative values in the post-modern planning literature, both objectives are rarely achieved simultaneously. Urban diversity is commended for creating vitality, economic growth, encouraging efficient land-use, and also promoting equity from a social standpoint, ultimately contributing toward social sustainability (Fainstein, 2005; 2010; Jabareen, 2006; Jacobs, 1961; Lynch, 1960). However, higher diversity often translates to heightened differences endured by the sub-groups in society, resulting in lowered social contact or even hostility. In other words, increased diversity does not seem to necessarily create conditions conducive to social cohesion. And although diversity embodied by cities is its great asset nurturing interaction among individuals that create active communities and stimulate growth, there is little empirical evidence delineating successful socially cohesive

and diverse communities on a neighborhood level (Nyden et al., 1997; Smith 1993). This is also evident in urban China where housing and many urban spaces have become contested due to the differences in socioeconomic background, social norms, and behavior embodied in the urban population.

Social cohesion in urban China is distinct in that it has undergone pivotal change before and after the economic reforms, and an underlying aspect of this change is diversity. Prior to the reforms, living and working were organized around the work unit compounds (danwei) in urban areas (Bray, 2005; Lee, 2000). An individual's employment was ensured by belonging to a danwei which also offered communal facilities such as housing, clinics, dining halls, and other urban welfares. The sense of community in danwei, although less voluntary than traditional neighborhoods, was understood as an extension of the workplace and an important aspect of organizing society (Wu, 2005). However, after the reforms, the danwei was dismantled and the once state-organized social cohesiveness became replaced and transformed under the socialist market economy (Fu et al., 2015; Tomba, 2015; Zhang, 2010). The dismantling of the danwei coupled with mass internal migration due to the economic restructuring, by which housing became a commodity, created new urban landscapes.

This meant that people from various socioeconomic backgrounds – the new middle-class, relocatees, indigenous residents, and migrants – agglomerated to varying degrees in different parts of the urban areas and lived alongside each other. Under this context, social cohesion took on varying paths. In some cases, neighborhood ties were strengthened through migrants who displayed intense

neighboring in order to assimilate into their host cities. Neighborhood ties could be said to have even strengthened in "commoditized China" where middle-class households coalesced to resolve property rights issues (Wang et al., 2017). Cai (2005) outlined cases in Guangzhou and Beijing, where residents organized meetings and rights protection groups to guard their interest against the building of a 40m wide road or 33 story tower next to their neighborhoods which was not included in the original plan. On the other hand, neighborhood ties weakened as migrants were discouraged from making social relations due to deep-seated regional prejudice, or simply the lack of time and motivation attributed to their long working hours. Also, social ties weakened in higher-end properties as residents chose self-isolation in which urban activities became more exclusive and less intense (Wang et al., 2012).

Mostly, this changed context has highlighted the socio-spatial segregation in urban China with a sharp focus on the migrant population (Gu & Shen, 2003; He, 2013; Lin & Gaubatz, 2017; Wang et al., 2012). According to the 2019 China Statistical Yearbook, the floating population in 2000 was 121 million which became almost twofold by 2018 at 241 million people3. Even with predictions of decreased flows for 2016-30 by The Economist4, Shanghai and Beijing are still the preferred destinations for a large population of migrants. The social diversity engendered by the mass internal migration is no longer limited to rural migrants versus local residents but the migrant population itself including highly educated migrants who seek job opportunities in first-tier cities, as well as the second

[3] http://www.stats.gov.cn/tjsj/ndsj/2019/indexeh.htm
[4] http://country.eiu.com/article.aspx?articleid=1326926316&Country=China&topic=Economy

generation migrants whose lifestyle choices have become similar to the inhabitants of their host cities. Hence, the continued regional discrimination, hukou restrictions, and the sidelining of second-generation migrants are often viewed as an aspect of diversity that threatens social stability (Chen & Wang, 2015; Li & Chui, 2011; Yue et al., 2010). Adverse experiences are reported by both migrants and local residents whereby the former feel socially excluded and looked down upon, while the latter feel that neighborhood safety and social norms are threatened (Liu et al., 2018).

Against this complex background of increased diversity and changed social relations, this study aims to understand how the varying degrees of diversity embodied in individual housing schemes relate to neighboring ties using cluster analysis. The study also explores the housing characteristics of the different cluster types to identify place attributes of diverse and socially cohesive communities. The following section first examines why diversity and social cohesion may be difficult to achieve simultaneously and also discusses how this is manifested in urban China. Then the place attributes of diversity and social cohesion are explored to understand the common aspects toward building socially successful diverse neighborhoods.

1.1. Can diversity co-exist with social cohesion?

Social cohesion, on a micro-level, can be closely defined in association with social capital which improves the efficiency of coordinated action in society based on trust networks, while on a macro- level, embodies vertical integration

between public institutions allowing social mobility and fairer distribution of opportunities (Turzi, 2008). However, diversity may be incompatible with social cohesion because different social sub-groups operate in separate social realms and urban spaces, failing to build the necessary social ties and subsequent trust network between the in-group (local residents) and out-group (migrants or new arrivals) (Bramley & Morgan, 2003; Putnam, 2000; Schlueter & Scheepers, 2010; van Kempen & Bolt, 2012). There are two hypotheses that are of concern. The contact hypothesis supposes that with increased opportunities for contact among different groups under the conditions of equal status, cooperation, non-competition, and institutional support, social ties may form through reduced prejudice (Allport, 1954). On the other hand, the threat hypothesis argues that due to differences in behavior or background and competition for resources or economic opportunities positive intergroup relations fail to formalize (Laurence, 2011; 2013; Putnam, 2000).

Intergroup relation is wide-ranging in urban China. Hostility between local residents and migrants has been widely publicized where migrants from certain provinces, especially the north-eastern areas, have been negatively stereotyped as being socially inferior or blamed for criminal behavior. Employers refuse to hire migrants from these provinces, and the media continually portrays them as being ignorant and violent causing nuisance in the neighborhood[5]. However, there is also evidence of shifting perception of migrants in a more positive direction (Tian et al., 2019). The following section describes the

[5]https://www.economist.com/china/2019/04/11/many-chinese-suffer-discrimination-based-on-their-regional-origin

workings of both the threat and contact hypotheses in urban China.

With increased urban diversity, as the threat hypothesis projects, the status gap between migrants and local residents have become the main obstacle of positive social contact. Migrants are not only the most discernible agents affecting social cohesion as they seem to fragment the existing comparatively homogeneous community but are also socially marginalized which is important since diversity coupled with low-income is found to negatively influence social cohesion (Laurence, 2011; 2013). Added to the economic differences are the social norms differences: there is often a large cultural and language difference between the migrants and locals. This leads to negative experiences and the rapid influx of the migrant population inevitably puts pressure on public amenities, sanitation, and safety control (Tian et al., 2019). There is also a lack of opportunities for contact since migrants often work long hours with very limited time to spend on leisure purposes (Lin & Gaubatz, 2017). This means that migrants often lack time or motivation to initiate urban activities and form positive relations with the indigenous community in their neighborhoods.

In contrast to the simplistic view of perceiving migrants as agents of diversity that adversely affect social cohesion, some findings suggest the opposite. Studies show that migrants tend to display intense neighboring comparable to locals because they are more dependent on neighborhood relations which help them assimilate into their new environments (Wang et al., 2017; Wu & Logan, 2016). More specifically, interaction with local residents was found to significantly improve migrants' social integration as they obtain area-specific

knowledge and resources helping them to better adjust and survive in their host cities (Chen & Wang, 2015). As such, the conditions of contact are highly dependent on the assimilative behavior of the out-group, which could be understood also as a means of gaining equal group status. Hence, while there may be persistent social stigma and institutional barriers that separate different groups of the population as reckoned by the threat hypothesis, strong personal motivation and subsequent assimilative behavior of an out-group may create the conditions for positive social contact as suggested by the contact hypothesis. In other words, this study conjectures that both hypotheses would be present in urban China and that a more nuanced understanding of where this occurs should be pursued to better understand socially successful diverse neighborhoods.

1.2. Identifying places of diversity and social cohesion

The study assumes that there are built environment characteristics that are more conducive toward producing desirable social conditions than others (Tiesdell, 2004). To understand socially balanced diverse neighborhoods, especially in respect to a diverse environment, the study identified that first, the opportunities for social contact needs to be made, and second, the dynamics of how social relations are formed needs to be considered. The following three recurring place attributes, density or compactness, the urban layout, and the rate of urban change, were identified to be relevant to both diversity and social cohesion in a housing environment.

First, density and layout are inter-related aspects concerned with creating

contact among urban residents through the built environment and is also relevant to the discussion of urban diversity. Compact city forms advocate higher densities and land-use intensification, and thereby increase diversity and mixed-use (Day, 2003; Jabareen, 2006; Karuppannan & Sivam, 2011). Higher densities are often associated with creating social sustainability not only because people are more likely to meet but also because it makes access to services easier, which in turn, may also increase contact opportunities among residents. Moreover, lower density is often associated with suburban areas which rely on car travel, and thereby, decrease opportunities for contact (Talen, 1999). Nonetheless, Bramley & Power (2009) discussed that higher densities may have an adverse effect on neighborhood satisfaction while increasing social equity through easy access to services, indicating that the relationship between high density and social sustainability is hardly straightforward. Insofar, the effects of density require further empirical evidence, nonetheless, the general approach in planning and design remains that higher density development is more appropriate in achieving diverse built environments and socially sustainable communities.

Likewise, the urban layout is also primarily concerned with providing the contact points for intergroup relations. A common characteristic, which is also associated with compact development, is street patterns that encourage street life through walkability and accessibility. Existing literature suggests that pedestrian-oriented and diverse neighborhoods are viable places of social capital as it allows residents to interact more (Freeman, 2001; Leyden, 2003). Additionally, there need to be places of commonalities that may help reduce differences among diverse groups, coined as “social seams” by Jacobs (1961), which are institutions

or places that allow the positive interaction between different populations (Nyden et al., 1997). This may be institutional as in religious places or community organizations forming alliances to resolve common local issues, and can also include the public realm of open space, parks, schools, or commercial strips.

Last, the rate of urban change is relevant as it describes the temporal aspect of how contacts are formed. If diversity increases rapidly in a short period of time, due to a sudden influx of migrants or an unstable residential turnover, social cohesion may decrease since a period of settling down is needed to establish associations within a community (Bramley & Morgan, 2003). In terms of the housing environment, this is related to the building age of the development and the type of neighborhood the development is located in: whether there are on-going urban changes in the area and to what extent and scale. It should be noted that even in cases where diversity had increased over a gradual period, thereby allowing more stable conditions of contact among different groups, efforts to maintain social connections and mediate between competing interests through promoting the value of diversity, fair housing opportunities, and strong social institutions are still required (Nyden et al., 1997). Hence, a period of stability is a pretext to social cohesiveness in the context of diversity, but even in communities where both diversity and social cohesion is achieved over time, continued efforts are required to sustain this condition (Figure 2-1).

As this study examines the diversity and social cohesion on a housing estate level in urban China, corresponding housing characteristics were considered concerning the above-mentioned attributes. Housing density was considered with respect to compactness, as well as the housing size in terms of

area and number of housing units. For the urban layout, street connections were measured as the number of street intersections per 1,000m2, termed as street intersection density, and the green area ratio was used as a proxy for places of commonality or social seams as it was a uniformly identifiable aspect of housing estate layout which is public in nature for the respective residents. The building age of the housing estate was considered as the temporal aspect.

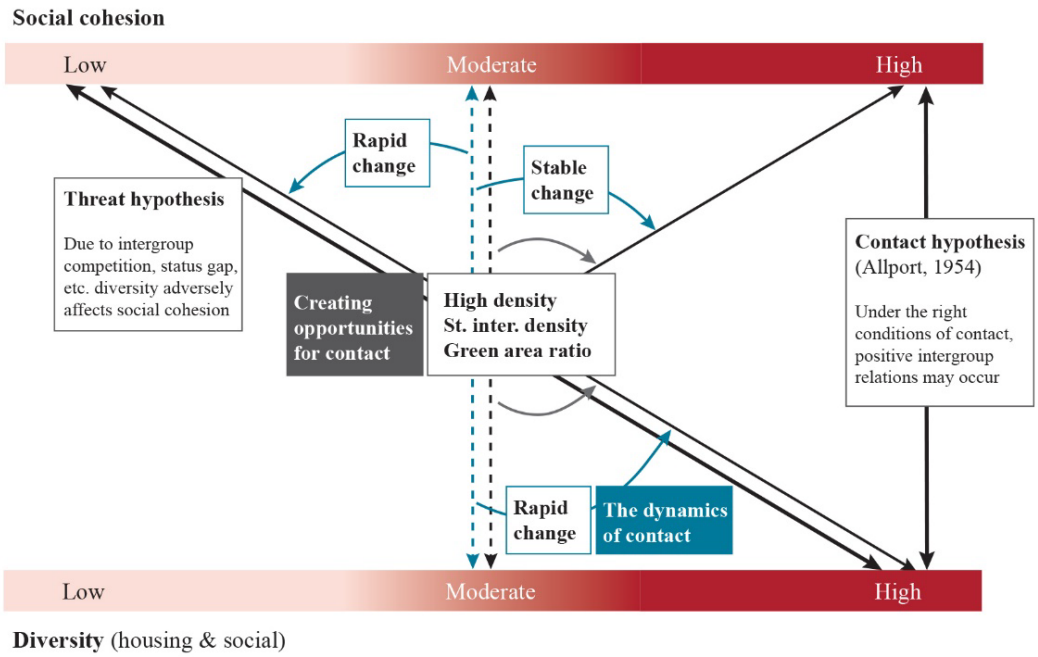


Figure 2-1 The place attributes of diversity and social cohesion

2. Data and Method

This section first discusses the study area characteristics and data collection, which is followed by the research method.

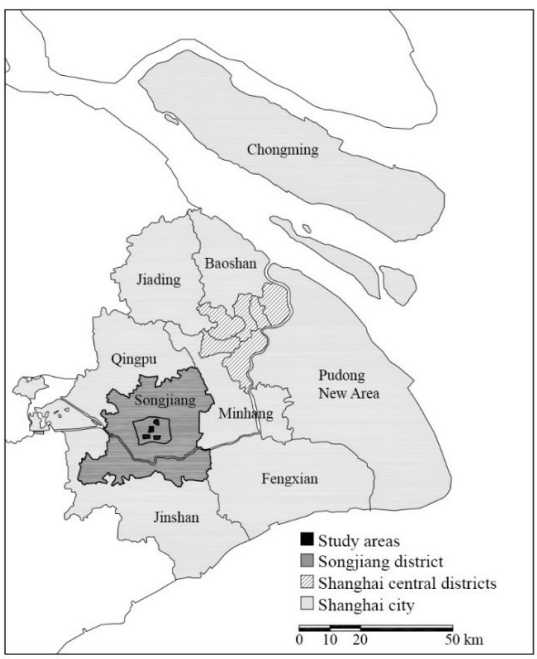
The study area is Songjiang New Town, an outer suburb of Shanghai, which was identified as one of the strategic growth areas in Shanghai. Songjiang

is both an old and a New Town. The site is largely divided by its former past located in the south of the Shanghai-Hangzhou highway, and its new city center to the north, built as a result of an international master plan design competition (Figure 2-2). Major infrastructure and housing development commenced from 2004, and the population grew almost 2.8 times within five years from 559,000 in 2005 to 1,583,000 in 2010[6]. This dichotomous characteristic is useful since it juxtaposes old housing estates against new modern estates. The different development period also indicates a wide variety of housing types affecting not only the physical aspects of housing, such as estate size and density, internal layout, and the range of individual housing units but also the social aspect through the population it accommodates. Depending on the social subgroup each of the neighborhoods accommodates – original residents, migrants, and relocatees – and to what levels of social diversity these areas embody, the level of social cohesion would also differ. As such, the master-planned area of 36km^2 offers a suitable ground to investigate social cohesion with respect to the various aspects of diversity. The study identified four neighborhoods within the master-planned area from which 53 housing estates were studied (Figure 2-3).

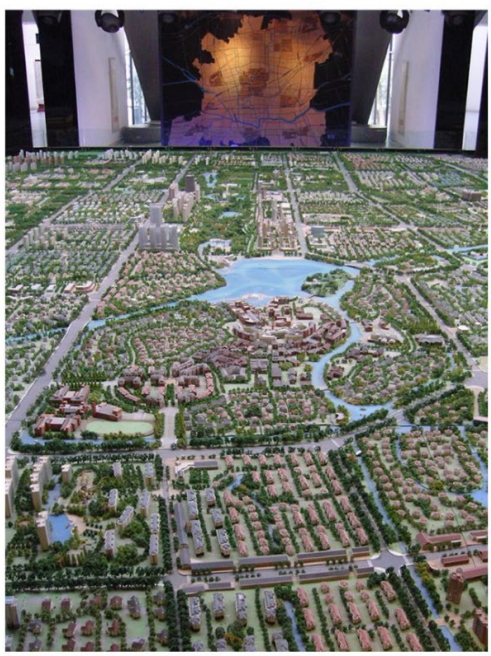
Areas A and B are located south of the Shanghai-Hangzhou highway. Area A partly encompasses the original old city and borders the historical and cultural district identified in the new master plan to its south. It is close to the Songjiang Sports Center subway station which opened at the end of 2012, and the neighborhood is generally pedestrian-friendly with easy access to urban amenities.

[6]https://www.ceicdata.com/en/china/population-municipality-district/population-shanghai-songjiang

Diverse and socially cohesive housing estates are expected to be found in area A. Area B is part of the periphery areas of the original urban development. Although somewhat removed from major housing developments, this is where newer relocation housing and up-scale commodity housing are built. Social cohesion may be more complex due to the presence of relocatees and new commodity homeowners who may be inclined to socially retreat, and the original residents who have may perceive such change as unstable residential turnover.



Map of Songjiang district in Shanghai



A large-scale model of the master-planned Songjiang New Town (photograph taken by the author while visiting the Songjiang Urban Planning Exhibition Center)

Figure 2-2 Map of Songjiang New Town

Areas C and D are the new crux of the master plan with differences based on the development period and proximity to the transit route. Area C overlaps with the new central business district and borders the Thames Town project to its west and University Town to its north, the hallmarks of *xincheng* development.

Although relatively further away from the Metro station and transit route, this is where the new center of the Songjiang New Town project is showcased. Area D encompasses housing estates in walking proximity of the Songjiang University Town Metro station. Development period-wise this is the newest area with visible on-going construction and where urban migrants reside. The newer housing estates in areas C and D may be characterized by high housing diversity driven by the market but have lower social ties than area A, generally. However, the presence of urban migrants and new arrivals in area D may offer mixed results of nonexistent to intense neighboring.

Figure 2-3 Study area map and characteristics

Data was collected for housing diversity, social diversity, and social ties to be used for the cluster analysis, and further housing estate information was collected to describe the physical characteristics of representative cluster types (Table 2-1).

Table 2-1 List of variables for cluster analysis and housing characteristics

Cluster analysis variables		
Housing diversity	Housing unit size	Smaller than 60m^2 / 60 – 90 m^2 / 90 – 120 m^2 / 120 - 150 m^2 / larger than 150 m^2
	Housing unit type	1 bedroom / 2 bedrooms / 3 bedrooms / More than 4 bedrooms
Social diversity	Marital status	Single / Married, living together / Married, separated / Widowed / Others
	Family type	One person living alone / Husband and wife / Parents with unmarried children / Parents with married children / Others
	Employment status	Employed / Full-time student / Peasant / Retired / Unemployed
	Education attainment	Illiterate or Primary school / Junior high school / Senior high school / University / Beyond university
	Monthly household income (RMB)	Less than 3,000 / 3,000~5,000 / 5,000~10,000 / 10,000~15,000 / More than 15,000
	Hukou status	Shanghai non-agricultural hukou / Other city non-agricultural hukou / Agricultural hukou
	Tenure years	Less than 3 years / 3~5 years / 5~10 years / 10~15 years / More than 15 years
Social ties		No. of neighbors/acquaintances within the housing estate
Housing estate variables		
Year of build		Year of construction completion
Housing estate size		total no. of units housing estate area (1,000 m2)
Household density		No. of households per 1000m^2
Street intersection density		No. of 3- or 4-way intersections per 1000m^2
Green area ratio		% of green area
Building type		1 = parallel block, 2 = High-rise, 3 = Apt with community facilities, 4 = Apt mixed with villa, 5 = Villa
Housing type		1= commodity, 2 = relocation, 3 = commodity and affordable, 4 = commodity and relocation

Housing estate characteristics included building age, type, the housing estate size, housing type classification, and green area ratio. This information was collected through maps, on-site observations, and property management offices.

In cases where further verification was required, the local real estate offices were visited. Also, Google maps were cross-referenced against various Chinese websites to determine street intersection density. Understanding the differing range of housing diversity embodied by the individual schemes was determined through housing unit sizes and unit types. The data was retrieved mainly from the Anjuke website, and the diversity index value was calculated using the entropy index.

The social diversity and social ties data was collected through a resident survey. Social diversity measured seven aspects including household structures, employment or economic status, hukou, and tenure years using the entropy index, and social ties were determined as the total number of acquaintances living within the housing estate. This was collected via a resident survey using the intercept survey method from December 24 until 31, 2015. With the assistance of undergraduate students from Tongji University, two sessions of three-hour-long street surveys were conducted along the two main street intersections for each of the four study areas. Assistants were guided to engage with passers who were interested in the survey, and after identifying the respondents' place of residence, carried out the questionnaire. In total, 370 residents were surveyed.

Clustering is used in exploratory data mining to partition and identify groups within a dataset. This study used the k-medoids algorithm where clusters are centered around a representative case which minimizes the dissimilarity between the respective case and the other objects in the cluster (Kassambara, 2017). The study first imputed missing data using the MICE function in R. The

study then used the t-SNE (t-Distributed Stochastic Neighbor Embedding) method to reduce dimensionality and locate each data point on a two-dimensional map, which renders a more intuitive visualization of the cluster scatterplot (Noiva et al., 2016). The t-SNE produced two vectors that were then standardized, and the PAM algorithm in R was used to conduct the k-medoids clustering.

Prior to clustering, the number of social diversity variables was reduced through factor analysis as it was redundant to use all variables in the clustering analysis. From this, three factors were retained (Table 2-2). Education, income, and tenure years diversity loaded on factor 1, which was characterized mainly as economic diversity. Marital and hukou status diversity loaded on factor 2 which represented the stronger presence of migrant households where the frequent cases of married couples living in different cities for employment reasons were captured through the high marital status diversity. The third factor was the family type diversity representing variegated household structures ranging from single-person households to large families of three generations living together. The three factor scores were used in the clustering analysis.

Table 2-2 Factor analysis of social diversity variables (factor loading lower than .3 omitted)

	Factor 1: economic	Factor 2: urban migrant	Factor 3: household structure
Edu_div	0.68		
Inc_div	0.89		
TenureYrs_div	0.64		
Marital_div	-0.43	0.76	
Hukou_div	0.34	0.76	
FamType_div	0.35		0.92
Empl_div			
Eigen value	2.12	1.31	1.02
Cumulative variance	30%	49%	64%

Note. *p-value* 0.948; Edu_div: education attainment; Inc_div: monthly income; TenureYrs_div: tenure years; Marital_div: marital status; Hukou_div: hukou status; FamType_div: family type; Empl_div: employment status

3. Results

3.1. Cluster Analysis

The optimal number of clusters was determined by considering the elbow method, the average silhouette width, and the gap statistic method, from which the elbow method and gap statistic suggested four clusters. This section describes the four cluster types, summarized in Table 2-3, which offered varied yet legible differences among the cluster types (Figure 2-4, 2-5).

The results showed that diverse and socially cohesive communities do exist. The moderately diverse cluster 1 estates showed the highest level of neighboring. However, there may be a trade-off between the two aspects as the

overall moderate level of diversity was attributed to the high social diversity albeit a low housing diversity. This was not to say that homogeneous communities were more socially cohesive since these communities diverged into two paths: neighboring either developed based on a similar socioeconomic background as expected (cluster 2) or resulted in the lowest level of neighboring due to the inherent behavior of a relatively homogeneous social group that was disinterested in neighboring (cluster 4).

Table 2-3 Description of cluster types

Cluster Type	No. of cases	Housing unit diversity	Social diversity	Overall diversity levels	Social ties
1	12	Moderately low levels of diversity	Moderately high level of diversity across all factors	Moderately diverse	Highest (15.3 people)
2	16	The lowest level of diversity in particular to housing unit size	Moderate social diversity albeit with very low family type diversity	Most homogeneous	High (10.9 people)
3	17	High levels of diversity for both unit size and unit type	Moderately high level of diversity	Most diverse	Low (7.0 people)
4	8	High levels of diversity for both unit size and unit type	Lowest social diversity but very high family type diversity	Moderately homogeneous	Lowest (1.3 people)

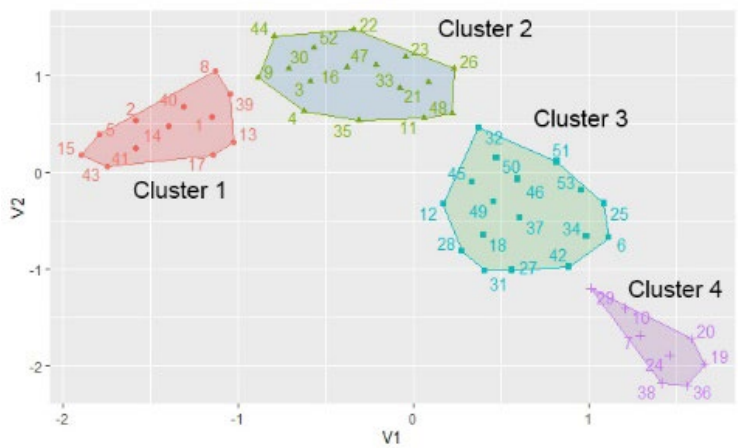
The first cluster estates tended to be populated by a well-connected heterogeneous group that was particularly diverse in relation to household structure, hukou, and marital status. It represented estates with the highest level of neighboring – the median value of the average number of neighbors was 15.3 people which lied in the top quartile – while displaying moderate levels of housing unit and social diversity. The housing unit diversity was actually moderately low where the median value for both unit size and type diversity lied in the 2nd quartile. Nevertheless, the social diversity aspects were moderately

high with both the urban migrant factor and family type diversity particularly higher than the overall median value. This indicated that there was even distribution of Songjiang locals and migrants with varying household sizes and structures from single-person households to large family households.

The second cluster was typical of generally well-connected homogeneous estates with limited housing choice. These estates had a high average number of neighbors of 10.9 people but had the lowest level of housing diversity especially with the median value of unit size diversity in the lowest quartile. Social diversity factors were somewhat variegated but were generally low: the economic diversity factor value was higher than the median, indicating wider income range, but both the urban migrant factor and family type diversity belonged to the 2nd and 1st quartile, respectively, showing that there may be a higher presence of local Songjiang residents.

The third cluster represented the most diverse estates with a wide housing choice and a simultaneously heterogeneous population albeit sparse connections among neighbors. In fact, clusters 3 and 4 both had high housing diversity: the median values for housing unit size and type diversity were very similar which lied in the 3rd quartile. The difference between clusters 3 and 4 were their social diversity characteristics. There seemed to be a strong presence of urban migrants and a wide range of family types in cluster 3 accommodated through a diverse housing choice. However, these estates were also characteristic of lower social ties. The average number of neighbors for cluster 3 was 7.0 people which lied in the 2nd quartile.

While the third cluster may not be ideal, the fourth cluster represented the least desired condition where a wide housing choice was catered towards a specific socioeconomic sub-group that failed to make social connections among neighbors. The fourth cluster showed the lowest level of social diversity albeit high family type diversity indicating a group of locals with similar income levels who were disinclined to make social connections. The average number of neighbors was considerably low at 1.3 people. This showed that social homogeneity is not necessarily a pretext to social connections.



Cluster 1		Cluster 2		Cluster 3		Cluster 4	
1	A1	3	A3	6	A6	7	A7
2	A2	4	A4	12	A12	10	A10
5	A5	9	A9	18	B1	19	B2
8	A8	11	A11	25	B8	20	B3
13	A13	16	A16	27	B10	24	B7
14	A14	21	B4	28	B11	29	B12
15	A15	22	B5	31	C1	36	C6
17	A17	23	B6	32	C2	38	C8
39	C9	26	B9	34	C4		
40	C10	30	B13	37	C7		
41	C11	33	C3	42	C12		
43	C13	35	C5	45	D1		
		44	C14	46	D2		
		47	D3	49	D5		
		48	D4	50	D6		
		52	D8	51	D7		
				53	D9		

Figure 2-4 Scatterplot of housing estates by cluster types

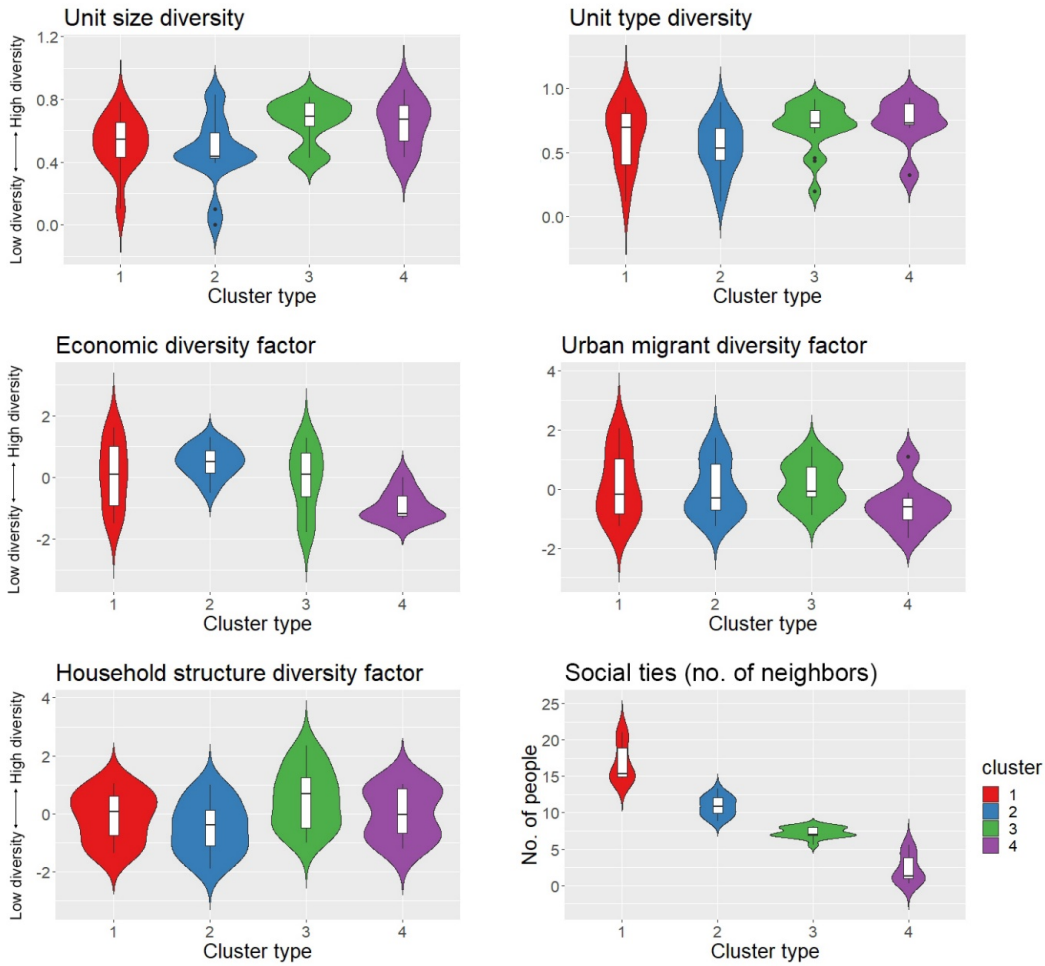


Figure 2-5 Violin boxplot of cluster types

3.2. Housing characteristics of cluster types and representative cases

The housing characteristics of the representative cases of each cluster type are summarized in Table 2-4 and mapped out in Figure 2-6. To summarize, the housing characteristics of clusters confirmed that the time or rate of urban change to be an important aspect when considering social ties among diversity. Internal

street connections offered conditions that support neighboring while compactness or the question of density required a more comprehensive understanding.

Table 2-4 Housing estate characteristics of cluster types

Cluster Type	**Year of build**	**No. of housing units**	**Area**(m2)	**Housing density** (no. of housing units per 1,000m2)	**Street intersection density** (inter. per 1,000m2)	**Green area ratio** (%)	**Building type**	**Typical estate**
1	1980-2005	141 – 3,342 (median 644)	22,100 – 230,000 (median 80,632)	1.41 – 46.20 (median 9.66)	0.32 – 0.79 (median 0.40)	12.1 – 68.0 (median 35.0)	Parallel block	A14
2	1982-2014	96 – 2,816 (median 673)	6,753 – 170,000 (median 76,177)	1.29 – 63.97 (median 13.60)	0.05 – 10.29 (median 0.46)	12.0 – 65.0 (median 35.4)	Parallel block, High-rise	D3
3	1998-2015	224 – 3,500 (median 1,357)	10,000 – 315,151 (median 137,976)	4.68 – 18.98 (median 11.30)	0.08 – 7.7 (median 0.31)	24.0 – 60.0 (median 37.0)	High-rise	C1
4	2004-2015	106 – 2,635 (median 1,280)	25,507 – 255,000 (median 100,003)	1.75 – 16.20 (median 10.33)	0.05 – 0.62 (median 0.29)	20.0 – 67.9 (median 35.0)	High-rise	B7

The socially cohesive and moderately diverse estates in cluster 1 were generally older, smaller parallel block estates with high internal street intersection density. This cluster represented incrementally built social ties in the context of housing supply variegation that has developed gradually over time. The building age of cluster 1 estates varied from 1980 to 2005 with the median value year 2001 which was the oldest of all the four clusters. While housing density and green area ratio was relatively low, probably because these physical aspects are related to older schemes, these estates had higher numbers of street intersections per 1,000m2 with its street intersection density median value in the 3rd quartile.

Cluster 1 estates were found in areas A and C, and the typical estate for cluster 1 was A14 (Figure 2-7). A14 was a relatively small parallel block estate completed in 2004 with 542 housing units and an area of 56,086m2. The street intersection density was 0.3209 which was lower than the median value for this cluster, nevertheless, it was the second-highest of the four representative cases. Residents had a relationship with an average of 15.6 neighbors in estate A14 which was on par with the median value of this cluster of 15.3 people.

Cluster 2 housing estates, the homogeneous communities with a high level of neighboring, were characterized by high housing density encompassing a wide range of building period. Aspects such as smaller-scale housing, high internal street intersection density, and low green area ratio were similar to cluster 1. The building age range for cluster 2 was widest among all cluster types with the earliest estate built in 1982 and the latest in 2014, and a median value of 2004. These estates were on a smaller scale with 673 units, comparable to cluster 1, and the green area ratio was 35.4% which lied in the 3rd quartile. However, the median value for housing density for cluster 2 estates was 13.599 which belonged to the 3rd quartile and was considerably higher than that of cluster 1. While the representative case for this cluster was A16, upon examining all the cases for this cluster, D3 was found to be more suitable with more attributes aligned with the median values of the cluster. D3 was a high-rise apartment completed in 2014 which accommodated 1,085 housing units with an area of 79,977m2. Although this is larger with respect to the number of housing units, the estate area was comparable to the median value of this cluster. The housing density was particularly high at 13.566 which was comparable to the median value of cluster 3,

and D3 had a particularly high street intersection density of 0.5877. The average number of neighbors was 10.0 people, which was comparable to the 10.3 people of this cluster.

Figure 2-6 Map of housing estates by cluster types

Cluster 3 housing estates, the most diverse type albeit low neighboring, were modern high-rise estates with low street intersection density. This type presented the opposite condition of cluster 1, by which diversity had been rapidly formed, and hence lacked sufficient time to develop social ties. These estates, however, were not necessarily densely populated and street connections were also on the lower side. Cluster 3 estates were considerably more modern compared to estates in clusters 1 and 2. Another characteristic was that the median value for both the housing area and the number of housing units was in the upper quartile, pointing towards relatively larger estates. These estates were found in all four

study areas, from which estate C1 can be considered a typical case. C1 was a large high-rise estate accommodating 1,826 households on an area of 226,619m2 completed in 2005. The street intersection was lower than clusters 1 and 2 at 0.2515 and housing density was 8.058 which was considerably lower than the median value of the cluster (11.30).

Finally, cluster 4 estates, the least favorable case where socially homogeneous yet disconnected communities resided, shared similarities with cluster 3. Cluster 4 estates were the newest estates built between the median year of 2008 and included newly-built relocation housing consisting of residents with similar income-levels and household structure attributing to a lower level of diversity and low social ties. In parallel to cluster 3, these estates were on the larger side with upper quartile median values of 1280 housing units and 100,003m^2 area. Housing density was also comparable to cluster 3 at 10.333 which lied in the 2nd quartile. However, the median value for the green area ratio was 35% which lied in the 2nd quartile and was the same value for cluster 1. These estates were dominantly found in area B and the representative case was B7. Although cluster 4's representative building type is the high-rise, B7 was a modern parallel block type estate. Nevertheless, the estate size was on the large side with 1,776 housing units accommodated in an area of 204,507m2. The housing density was 8.684, and street connectivity was also a low value of 0.2787 similar to the cluster median. This cluster was characterized by a low green area ratio, however, B7 was more comparable to the typical case of cluster 3. The average number of neighbors was very low at 1.3 people, on par with the cluster median (Table 2-5).

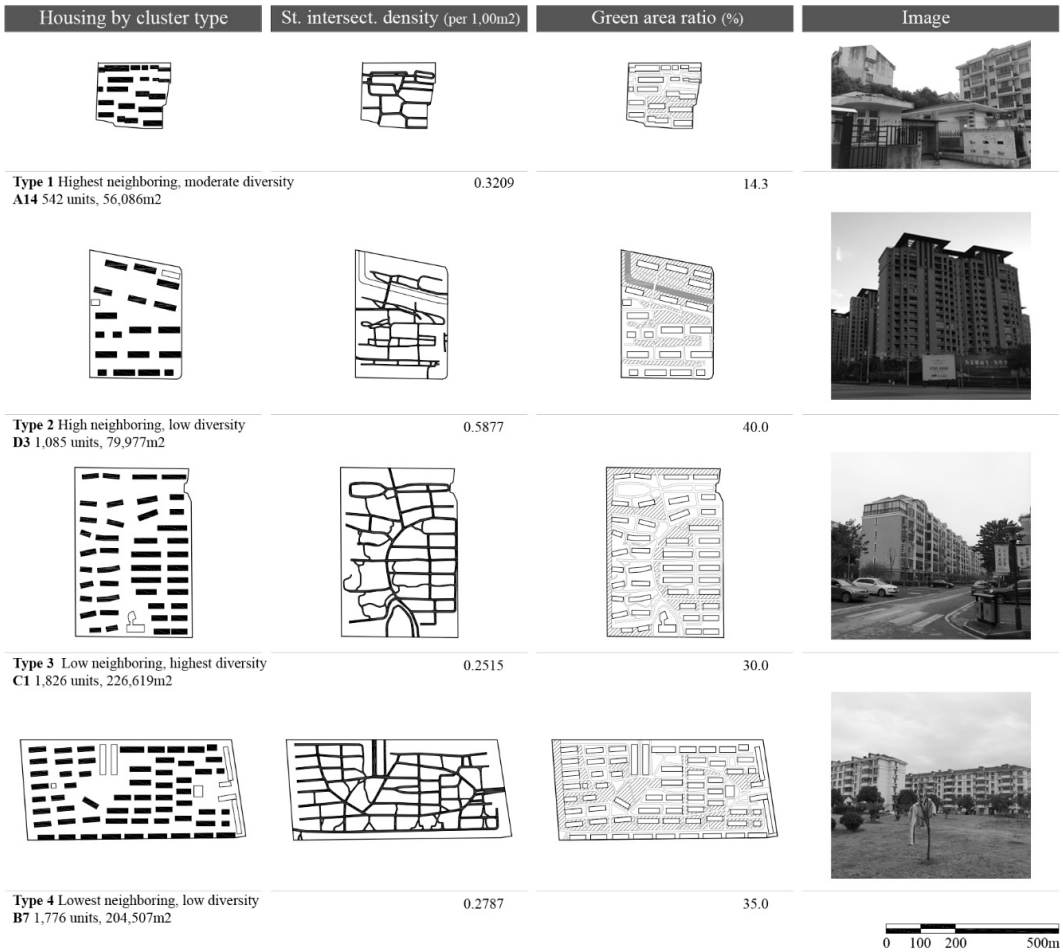


Figure 2-7 Housing characteristics comparison of representative cases for each cluster type

In summary, the cluster analysis revealed that the rate of urban change to be an important aspect in ensuring social ties among diversity, while the attributes related to creating opportunities for contact require further discussion.

First, the building age was used as a proxy of the rate of urban change and in which the dynamics of contact were conditioned. Rapid change is likely to lower social cohesion, as discussed earlier, while stability is associated with social connections. The results confirmed that time was an important pretext to

social connections since the number of acquaintances decreased in the order of the clusters from 1 to 4, which in terms of its building age was arranged from the oldest to the newest. Cluster 1 was represented by the oldest estates and showed the highest number of neighbors, while cluster 4 was typically the most modern estates and had the least number of neighborly connections. This was also supported in relation to diversity levels since cluster 1 estates accommodated a moderately diverse population while having the highest average number of neighbors. Cluster 3 estates were also more diverse than cluster 4 estates but was built comparatively earlier and had higher social connections.

Second, with respect to creating opportunities for contact, higher street intersection density seemed to be associated with more social ties. Street intersection density was a dividing aspect between better-connected estates (clusters 1 and 2) against less connected estates (clusters 3 and 4). High street intersection density, high social ties, and high level of diversity coincided in cluster 1 estates, while low street intersection density, low social ties, and low level of diversity coincided in cluster 4.

Last, the relevance of household density and green area ratio was ambivalent. For both aspects, comparing the median values do not seem to offer clear evidence, but by comparing the range of values, the clusters can be largely grouped into clusters 1 and 2 against clusters 3 and 4. For density, clusters 1 and 2 encompassed a wide range of housing estates, while clusters 3 and 4 seemed to represent similar estates with a narrow range of values. In this respect, higher social ties of clusters 1 and 2 may be related to its inclusion of higher density

developments, while the low level of social ties in clusters 3 and 4 related to its low-density developments. Also, in terms of the green area ratio, the median values of all four clusters did not differ much, but cluster 3 estates had the highest green area ratio. While the low green area ratio for cluster 1 was thought to be associated with older smaller-scale estates, the high green area ratio of clusters 2 and 3 and its relatively high social ties should be further explored.

Table 2-5 Summary of cluster description and housing characteristics

Cluster type	Cluster description	Housing characteristics
1	Ideal type – moderately diverse and highest social connections	Older smaller-scale parallel blocks with high street connectivity
2	Homogeneous type with high social connections	Smaller-scale high-rise or parallel blocks with higher housing density and street connectivity
3	Most diverse type with low social connections	Modern, larger, high-rise estates with moderately low housing density and low street connectivity
4	Least favorable type – moderately homogeneous and lowest social connections	Newest, larger, high-rise estates with low housing density, street connectivity, and green area ratio

4. Discussion

The study returns to the question of where and how diversity may coexist with social cohesion, which fundamentally hinges on the thought that social cohesion is more prevalent among homogeneity. The study showed that socially cohesive and moderately diverse neighborhoods exist where sufficient time has been allowed for neighborly associations to develop through cluster 1, which partly supported the contact hypothesis. On the other hand, the threat hypothesis was identified through cluster 3 where higher levels of diversity coincided with low

levels of social ties (Figure 2-8). Furthermore, the study demonstrated that there is a definite underside to homogeneity through cluster 4, which seemed to suggest that newly-built relocation housing may strike similarities with the lack of social engagement found in middle-class gated estates.

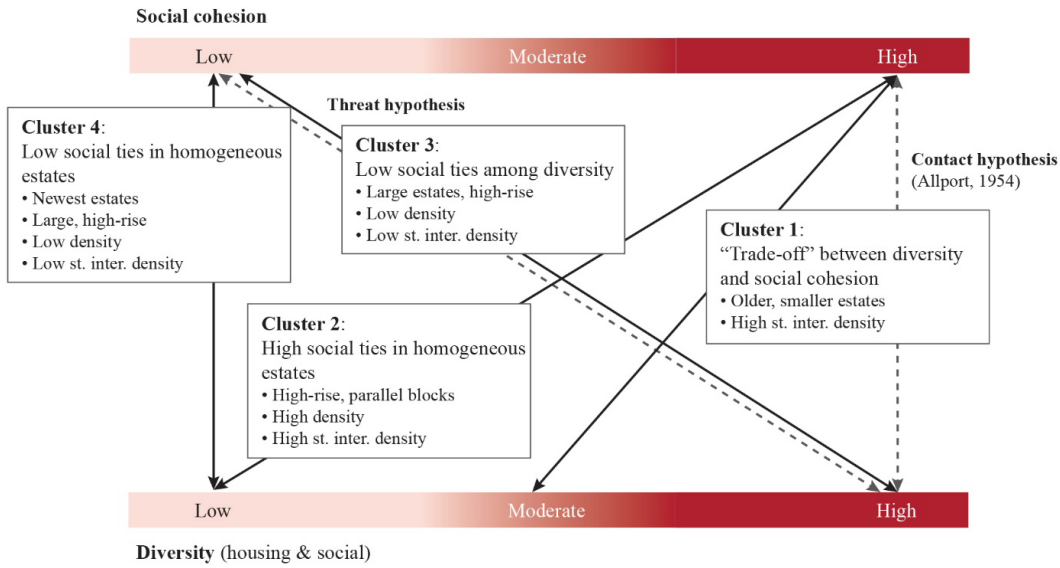


Figure 2-8 Social cohesion, diversity, and housing attributes by cluster types

This indicated that there may be a trade-off between diversity and social cohesion, since the high level of neighboring was found in moderately diverse estates (cluster 1), and the most diverse estates had low social connections (cluster 3). Upon this, the study suggests that a realistic expectation of achieving both diversity and social cohesion, especially in New Town planning needs to be considered. For instance, moderate levels of social diversity may be encouraged in the initial stages of new housing developments while ensuring high housing diversity to allow wide housing opportunities and housing estate layout which facilitate neighboring. This may allow the laissez-faire development of socially

sustainable diverse communities without heightening the obvious dissimilarities endured by different groups (Nyden et al., 1997).

While the study began to identify place attributes that support social ties, a more detailed investigation of how the contact hypothesis operates should be pursued. The housing characteristics demonstrated that time was an important aspect that increases similarity among diverse groups. With respect to creating opportunities for contact, the internal street connections were identified to be an important aspect. Nevertheless, street intersection frequency needs to be approached carefully since too many intersections can hinder walkability and fail to provide a complementary environment for social contact. Related to this, there are concerns in the existing literature that introducing thoroughfares in traditional housing compounds may disrupt the sense of community bound by urban blocks which have been prevalent since modern planning in China (Kan et al., 2017).

In the future, street connections and the arrangement of open or green spaces may be spatially categorized to investigate whether different configurations affect social cohesion. In addition, further understanding of how social institutions or community facilities function could provide a more holistic picture of locales that encourage intergroup relations.

Chapter 3

Toward “subtle integration”: Built environment characteristics of socially cohesive and diverse urban spaces

1. Introduction

In the discussion of promoting diversity and social cohesion, the importance of creating contact among diverse groups arise through understanding the disadvantages of segregation. Inter-racial conflicts in the U.S. and stigmatized neighborhoods, the deep-rooted segregation in post-Apartheid South Africa, and the regional discrimination experienced in legally dubious urban villages in China are examples of segregated communities taking physical forms in the urban environment. Segregation occurs in affordable or inclusionary housing schemes as well where market-rate and affordable housing units are placed on different sites or through the visible differences in design quality, building elevation, and the limited choice of housing unit types and living amenities (Huang, 2015; Suh et al., 2004). Such segregation is not desired by planning authorities who hope to achieve social mix through affordable housing schemes and create opportunities for upward mobility of low-income residents. Developers in the UK have also

expressed concerns that drawing unwanted attention to low-income units through design or location may increase the negative externalities associated with these units, and in the end, affect market-rate housing sales (Tiesdell, 2004).

Social integration or cohesion may be pursued through various means, including inclusive housing policies, cultural programs, community activism or education, of which planning and design may also play a positive role. In general, the design direction point towards creating opportunities for contact among diverse groups of residents through spatial and institutional means. The premise of the contact hypothesis rests on enhancing social relations by reducing prejudice among different groups (Allport, 1954), and in a similar vein, design measures which encourage mixed-use, accessible and lively streetscapes are argued to support cohesion through increased interaction among individuals (Tiesdell, 2004; Jabareen, 2006; Talen, 2006; 2008). This study focuses on the spatial arrangement of the housing estate layout to understand under which circumstances social cohesion may occur concerning differing levels of diversity embodied in an individual housing scheme. The study is aware of the limitations of physical determinism and agrees that the realistic aim of design should be less prescriptive but focused on isolating the instances where social interaction occurs. In other words, while the built environment can neither predict nor determine peoples' behavior it is still thought that certain design strategies would innately generate positive social outcomes as opposed to others (Patricios, 2002; Tiesdell, 2004).

Social cohesion and diversity in urban China are unique because it offers

the case of laissez-faire diversity on a housing estate scale (Nyden et al., 1997). Urban diversity emerged as a consequence of the economic reforms and the subsequent urban re-structuring. The rapid economic growth precipitated mass internal migration to large cities since the late 1980s where a population with different regional and socioeconomic backgrounds agglomerated to different degrees in the urban environment. The total floating population during the 1980s was less than 10 million, which soared throughout the 90s reaching 121 million in 2000, again doubled by 2018 at 241 million people[7]. Alongside such massive population movement, the dismantling of the danwei and the transitioning to the housing market in the early 2000s brought about the diversification of the housing environment. In large host cities like Shanghai, new modernity and urbanism were tested and promoted in suburban areas to accommodate long-term city growth under the metropolitan expansion strategy, and hence, created dichotomous areas like Songjiang New Town which embodies the housing development paradigms of the past and the new.

The housing estate in China is particularly unique as local governance, which serves a basis of a social unit, coincides with the physical neighborhood that is strongly bound on an urban block scale (Kan et al., 2017). This means that the underlying urban change of diversity is made apparent through the physical aspects of housing estates, such as housing layout, size, building type, and so forth, as well as the new communities that have changed the notion of social cohesion: the strongest community ties are associated with danwei where housing, employment, welfare, and governance were tied to a single housing compound

[7] http://www.stats.gov.cn/tjsj/ndsj/2019/indexeh.htm

whereas the xiaoqu and shequ of the 1990s onwards exemplify commodity and affordable estates with weaker community ties (Kan et al., 2017).

Against this background, this study aims to understand the design parameters in the housing estate layout, especially associated with creating opportunities of contact, and identify which aspects are relevant in ensuring socially cohesive diverse environments. The following section examines the two main design principles of preventing social exclusion found in inclusionary housing or mixed-income housing literature to shed light on how social cohesion may be achieved amongst diversity and reviews specific design aspects of the housing estate plan, namely street layout and green area, to understand its relation with social cohesion.

1.1. Design principles toward social cohesion

The purpose of mixed-income housing is to integrate lower-income housing into the overall design of the scheme and create positive spillover effects which may encourage increased job access and the possibility of homeownership, overall furthering the possibility of upward mobility of the disadvantaged group. Under this guidance, the following design principles materialize.

The first principle is to prevent obvious spatial segregation by not isolating affordable units. Affordable units or out-group can be isolated by being clustered in undesirable parts of the housing site, for instance, with difficult entry points, high noise pollution, or in some instances through barriers put up by market-rate housing owners. In Beijing, a housing project renowned for its

inclusionary scheme concentrated low-income housing in a single block facing a high-speed railway whereby residents could not open their windows (Huang, 2015). Other means of segregation may occur through lower quality building exterior, limited housing unit type choice, and low access to communal facilities. Even green spaces can be used as barriers between low-income and market-rate housing, and communal areas may be fenced off to discourage use by low-income residents (Huang, 2015). However, as mentioned earlier segregation is not desirable as this only intensifies the stigmatization of the out-group, hence, creating adverse social conditions among the residents.

In remedy of the above-mentioned situation, the second principle is concerned with how to ameliorate the negative externalities caused by segregation through creating shared spaces supported by social and institutional means that create contact between diverse residents. The design approach toward creating contact should not be naïve of the many circumstances where contact between in-group and out-group does not necessarily generate positive social outcomes: the operationalization of the threat hypothesis. Concerning this, a housing developer had aptly commented in Tiesdell's (2004) study that affordable housing design should aim toward either "subtle integration or segregation." This approach recognizes that although it is important to create shared and overlapping spaces for different residents to occupy and utilize, there is also the need for minimal separation which ensures that conflicting desires do not create marked segregation or retreat.

In light of this, Tiesdell (2004) proposed the design strategies of

“clustering” and “pepper-potting.” This means that low-income housing may be clustered in 5 to 10 units and spread throughout the development so that low-income housing is not concentrated in one area but are grouped with some distance. The key is that units or households of similar nature are grouped while being distributed evenly across the scheme in order to promote integration among diversity. The question remains as to how such subtle integration or segregation would be achieved in the external areas of the building blocks in a housing estate since this is where occasions of contact are more likely to occur.

1.2. Designing places of contact

The study examined two aspects, the internal street pattern and the arrangement of green spaces, to understand its relation to social cohesion and diversity with respect to the design strategies outlined earlier. Both the street and green areas are the public or semi-public realms of a housing site which may encourage social interaction merely through creating the opportunities for contact. Further than this, the street layout and green areas are the underlying structures that group and separate buildings within a housing scheme and is inherently associated with creating clusters or milieus within a site.

The relation of street layout and social cohesion is first concerned with increasing opportunities for social contact and is also related to creating a sense of place, which indirectly influences social interaction. Pedestrian-friendly and well-connected streetscapes coupled with mixed-use ensure lively urban areas as people use these spaces throughout the day for varying purposes, in turn, ensuring

a safe urban environment through constant occupation and natural surveillance. Existing literature emphasizes that accessible, connected, and legible street layout may encourage walking, offer alternative path-finding, and increase the possibility of contact (de Vries et al., 2013; Matsuoka & Kaplan, 2008; Rowe & Guan, 2016). Bramley et al. (2009) found that street layout may impact the feelings of safety and a sense of community, thereby positively influencing social interaction, and highlighted that safety was negatively associated "*with more elemental network*" (i.e. the cul-de-sac perceived to be safer than the grid layout).

What may be inferred from Bramley et al. (2009) is that different street structures create a different sense of place and thereby influence the possibilities of social interaction. In other words, open generic grid layout may offer efficient movement but merely function as passages, while the loop-like structure may create clusters and territories where social interactions occur more easily. With this in mind, the study examined both layouts to understand how the different street layout coincides with the levels of diversity and social ties.

Green areas are known to be conducive to social interaction as it encourages leisurely activities and walking for recreational purposes increasing the chances of contact, and social cohesion is found to be related to the quantity and quality of greenery (Bramley et al., 2009; de Vries et al., 2013; Matsuoka & Kaplan, 2008). There is also evidence pointing toward the mediating factor of residents' perception of neighborhood attractiveness where there is access to green areas, thereby inducing favorable conditions for social cohesion (Dempsey, 2009). Moreover, the perceived character of the place was found to be associated

with social interaction, by which large bland open areas were cautioned against as it discourages socializing.

Hence, the positive role of green spaces supporting social cohesion with respect to diversity should aim toward functioning effectively as a place of interaction tying different parts of the housing scheme or buildings. There are many organized and transitional uses of green or open spaces in housing developments in China including group exercise, ballroom dancing, card games, physical activities, and socializing among young families (Gaubatz, 2008), which require different scales and locations of green and open spaces. This study identified the most common types of green area formation in the study area, namely the centralized, dispersed, and strip-like formation, and examined how this varies with diversity and social ties.

2. Data and Method

The study area is Songjiang New Town, an outer suburb of Shanghai, which forms part of the 'One City Nine Towns' plan designating nine suburbs as strategic growth areas of Shanghai. Songjiang has been re-invented from its ancient past and is a typical case of metropolitan expansion that prevailed in the early 2000s in China (Hsing, 2010; Shen, 2011).

Songjiang was the first sub-district to be linked to Shanghai via the metro, which became a significant locational advantage for the area. This brought the north-eastern districts of Songjiang within a one-hour commuting distance to central Shanghai. The Metro No. 9 project was critical to the prospect of

Songjiang becoming a viable settlement, which was reflected in increased land prices along the line after the transit route plan was announced. Songjiang consolidated a new identity apart from its original old city area and built a flagship housing project, the Thames Town, modeling British housing from various periods to exemplify modern living. The architectural style is uncanny, to say the least, but this lent success to the area promoting new urbanism and modernity in post-reform China. Today, Songjiang is a dichotomous place of the old and the new, embodying the legacies of the various development paradigms the area underwent, with a diverse housing environment and an equally diverse population consisting of the indigenous Songjiang residents, migrants, and relocatees.

To explore the spaces of contact in the context of diversity, the study collected housing and social data. Basic information regarding the housing estate such as year of completion, the housing estate size, number of households, as well as green area ratio was obtained through on-site descriptions, property management offices, and local real estate offices. The study also referred to Google maps, various Chinese websites, and on-site maps to determine street and green area typology. Housing diversity of individual estates were determined as the diversity of housing unit size and housing unit type, as a proxy for capturing wide housing choice for a diverse population to be present. This data was retrieved from the Anjuke website, and the entropy index was used to calculate the diversity index value.

The study also collected social data to understand social diversity and

social cohesion. A resident survey, using the intercept survey method, was conducted from December 24 until 31, 2015. Two sessions of three-hour long street surveys were conducted along the main street intersections of the four study areas, and in total, 370 residents were surveyed. Social diversity included aspects of household structure, income and employment, and hukou and tenure years (Table 3-1). Social cohesion was limited to social ties in this study as it serves as a basis for other aspects of social cohesion such as experiences of help, trust, and place attachment. Social ties were determined as the number of acquaintances acknowledged within the housing estate. High or low levels of housing and social diversity and social ties were determined by comparing the values of individual housing estates against the average value (Figure 3-1).

Table 3-1 Housing and social diversity aspects

Housing diversity	
Housing unit size	Smaller than 60m^2 / 60 – 90 m^2 / 90 – 120 m^2 / 120 - 150 m^2 / larger than 150 m^2
Housing unit type	1 bedroom / 2 bedrooms / 3 bedrooms / More than 4 bedrooms
Social diversity	
Marital status	Single / Married, living together / Married, separated / Widowed / Others
Family type	One person living alone / Husband and wife / Parents with unmarried children / Parents with married children / Others
Employment status	Employed / Full-time student / Peasant / Retired / Unemployed
Education attainment	Illiterate or Primary school / Junior high school / Senior high school / University / Beyond university
Monthly household income (RMB)	Less than 3,000 / 3,000~5,000 / 5,000~10,000 / 10,000~15,000 / More than 15,000
Hukou status	Shanghai non-agricultural hukou / Other city non-agricultural hukou / Agricultural hukou
Tenure years	Less than 3 years / 3~5 years / 5~10 years / 10~15 years / More than 15 years

High diversity estate (A1)
Avr. housing diversity index 0.693
Avr. social diversity index 0.681

Moderate diversity estate (B9)
Avr. housing diversity index 0.391
Avr. social diversity index 0.626

Low diversity estate (D3)
Avr. housing diversity index 0.621
Avr. social diversity index 0.578

Figure 3-1 Housing estates with differing housing and social diversity levels

The study identified 53 housing estates in four areas within the master-planned Songjiang New Town area (Table 3-2). The building period of the estates ranged from the 1980s to 2010s with the average completion year of 2005. The total housing units of individual schemes varied widely as the area had high-end villa only estates to high-rise tower block estates and older large-scale *xiaoqu* with communal facilities. The average number of housing units was 1,157 units and housing density 12.8 households per 1,000m2. The average green area ratio was 37.2% which is a relatively high figure attributed by the high green area ratio embodied in villa estates. The green area ratio is an important aspect of housing from the consumers' perspective, and a higher green area ratio is often associated with modern estates.

The street typology was determined by the two categories of street structure (the grid and the loop) and street intersection density, the no. of street intersections per 1,000m2, categorized as high in cases where the intersection density value was higher than the average, and low in cases for below-average intersection density (Table 3-3). The main pedestrian path in the grid structure

runs parallel and connects directly to the arterial roads, dissecting the housing estate in a more generic open layout (Lee & Park, 2017). In this case, the buildings are more likely to be uniformly distributed parallel slab buildings. The loop structure differs by having a separated loop-like main thoroughfare which internally organizes the site into a cluster-like formation, and at times this internal division is marked by different building typology (i.e. villa type separated from tower blocks in a single housing scheme). There are also cases where natural features such as streams naturally dissect the housing estate into different parts, and under these circumstances, the street layout is more akin to a modified version of the loop structure (Figure 3-2).

Table 3-2 Housing estate characteristics by study area (mean)

Area	**Building period**	**No. of housing units**	**Area(m2)**	**Housing density** (no. of housing units/ 1,000m2)	**Street intersection density** (inter./1,000 m2)	**Green area ratio** (%)
A	1980 – 2012	952.4	75,252	16.3	1.08	32.3
B	2005 – 2015	1,406.2	117,190	16.3	0.34	35.2
C	2001 – 2013	808.2	118,708	6.9	0.45	43.2
D	2005 - 2014	1,723.4	156,454	10.3	1.07	43.2

Table 3-3 Street and green area typology descriptions

Street typology			
Type	St. layout	St. inter. density	Description
ST1	Grid	High	High internal division
ST2		Low	Low internal division
ST3	Loop	High	High internal clustered division
ST4		Low	Low internal clustered division
Green area typology			

Type	Green area layout	Green area ratio	Description
GT1	Centralized	High	Large centralized green area
GT2		Low	Small centralized green area
GT3	Dispersed	High	Large dispersed green area
GT4		Low	Small dispersed green area
GT5	Strip-like formation	High	Large green buffer surrounding estate boundary
GT6		Low	A strip of the green area along estate boundary/pathways

The green area typology was determined by the three green area layouts, the centralized, dispersed, and strip-like layout, which was then also divided in relation to green area ratio, categorized as high for values exceeding the average and low for below-average green area ratio. The centralized type had a strong central organization to the site while the dispersed type offered points of contact placed in different parts of the housing estate. The strip-like type was the least common case found in smaller older housing estates that were nestled in a larger urban block probably to create a buffer between the housing estate and adjacent sites. Tree-lined boundaries are a common feature in the majority of the estates, but this type was primarily concerned with estates that had limited identifiable green area other than the strip delineating its boundaries, hence, lacking the spaces of contact.

The study categorized the 53 estates by its street type and green area type separately to examine its diversity and social ties level. The study compared the average housing and social diversity index values of each type against the overall average to determine the diversity level. For instance, when a group of estates had below-average housing diversity index value while a higher than average social

diversity index value, the overall diversity level was determined as being moderate. The average number of neighbors of each type was considered with respect to the interquartile range to determine the level of social cohesion.

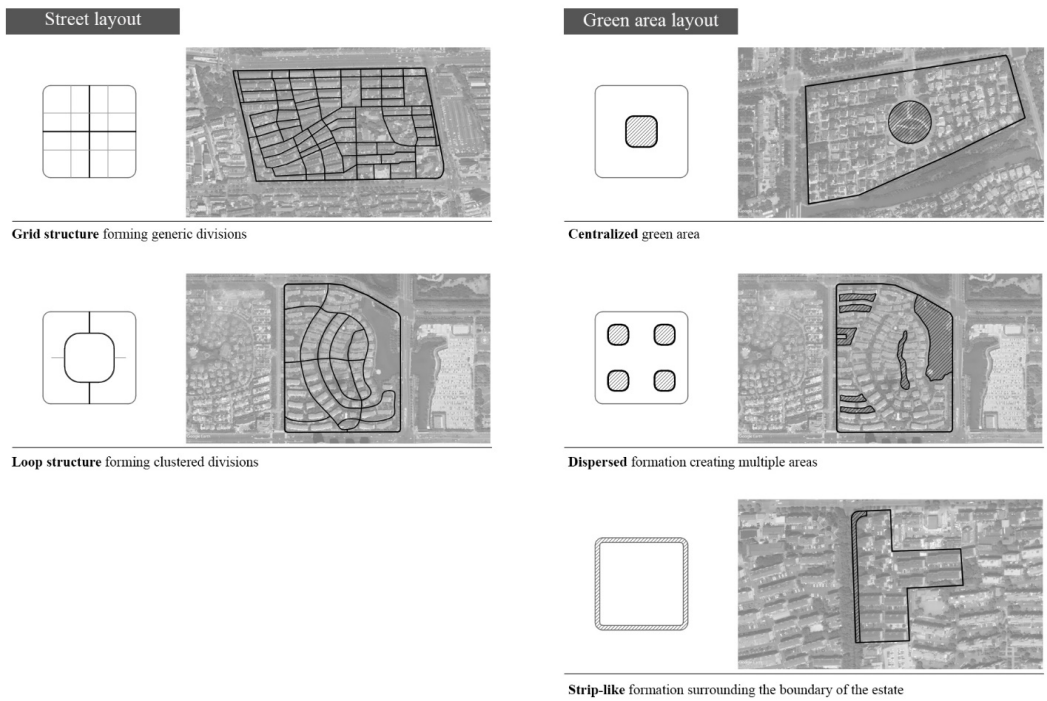


Figure 3-2 Street and green area layout typology diagram

3. Results

Higher street intersection density, for both the grid and loop layouts, coincided with higher levels of diversity and social ties, confirming in part the results of Chapter 2 whereby high street intersection density was a common characteristic of estates with high social cohesion. Although the loop layout was not clearly favored over the grid layout with respect to creating a clustered sense of place, the high internal division loop layout (ST3) did demonstrate the highest level of

social ties and moderate diversity for which it was considered the best-case scenario among the four options. On the other hand, the layout did matter for the green area: the small centralized green space and the strip-like formation coincided with high diversity and high social ties. The unexpected results showed that the scale of the green area and its relation to the changing housing design preferences were related to its level of diversity and social ties, which will be further discussed in section 3.2.

3.1 The street layout of socially connected diverse housing estates

First, the ST1 type showed that the generic and uniform spaces created through the grid structure were not disadvantageous in creating social ties. The many points of contact or internal divisions allowed for higher social ties in a moderately diverse neighborhood. The median value for social ties was 12.0 people which belonged to the 4^{th} quartile and was the highest among all options. The moderate diversity level was attributed to not having a variegated housing unit choice while a good mix of residents from the economically active to those in retirement, and local residents, as well as urban migrants, were present. Both housing unit size and type diversity were below average, but there was high social diversity, especially in terms of employment and hukou status.

Second, the ST3 type was identified as the most diverse estates with a high number of social ties. As such, while the loop structure was not necessarily favored as creating social milieu or territories for social interaction, the results reinforced that creating ample points of contact and internal divisions may be advantageous. The median value for social ties was 10.2 people which lied in the

2nd quartile, nevertheless, it was the second-highest number of neighbors out of all the options. The ST3 estates were the most diverse estates overall with wide-ranging housing options accommodating for various household structures and income levels. These estates were characterized by high housing diversity for unit size and unit type, as well as family type diversity and income diversity, demonstrating the highest level of diversity (Table 3-4).

Table 3-4 Street typology by diversity and social ties level

Street typology	Diversity category	No. of neighbors
ST1 Grid high internal division	LH (moderate diversity)	12.0 (4th quartile)
ST2 Grid low internal division	HL (moderate diversity)	9.2 (2nd quartile)
ST3 Loop high internal division	HH (highest diversity)	10.2 (2nd quartile)
ST4 Loop low internal division	LH (moderate diversity)	7.3 (1st quartile)

Examining the building characteristics of ST1 and ST3, the reason for the high diversity embodied in ST3 estates became evident through the housing density and building type (Table 3-5). The ST3 type estates with higher street intersections in the loop formation were lower density developments with values ranging from 2.36 to 15.33 households per 1,000m2. The mean for ST3 estates was 9.78 households per 1,000m2, almost half that of ST1 and below the overall average of 12.8 households per 1,000m2. This compared against the relatively higher densities of ST1 estates which ranged from 5.90 to 63.97 households per 1,000m2, with a mean value of a generally high 17.23 households per 1,000m2. The lower density of ST3 was largely based on that the loop formation was popularly found in estates where villa units were mixed with apartment blocks as

a way of creating a more internalized cluster for the villas. The high income diversity in ST3 estates is therefore understandable since the mix of higher value villa units with apartment blocks would necessarily indicate mixed-incomes albeit more skewed towards the middle-class.

Table 3-5 Building characteristics of street and green area typology

Type	**Year of build**	**No. of housing units**	**Area**(m2)	**Housing density** (no. of housing units per 1,000m2)
ST1	1982-2014 (mean 2002)	120 – 3,500 (mean 1143)	6,753 - 315,151 (mean 86,689)	5.90 - 63.97 (mean 17.23)
ST2	1980 – 2015 (mean 2007)	106 – 2,816 (mean 1224)	22,100 – 255,000 (mean 114,684)	1.29 – 46.20 (mean 12.08)
ST3	2001 – 2014 (mean 2006)	190 –1,720 (mean 1000)	10,000 – 220,000 (mean 99,662)	2.36 – 20.63 (mean 9.78)
ST4	2000 – 2010 (mean 2005)	96 – 3,359 (mean 1,190)	30,000 – 220,513 (mean 124,792)	1.41 – 15.58 (mean 8.85)
GT1	2001 – 2014 (mean 2007)	96 – 1,200 (mean 461)	6,753 – 137,700 (mean 53,320)	1.29 – 63.97 (mean 14.17)
GT2	1999 – 2012 (mean 2004)	106 – 2,800 (mean 1,173)	25,507 – 220,513 (mean 110,177)	1.75 – 20.63 (mean 10.00)
GT3	2001- 2015 (mean 2008)	190 – 3,500 (mean 1,555)	36,700 – 315,151 (mean 151,968)	2.36 – 16.57 (mean 10.45)
GT4	1997 – 2013 (mean 2006)	254 – 3,342 (mean 1,385)	13,600 – 230,000 (mean 120,314)	5.29 – 18.68 (mean 11.84)
GT5	1980 – 1996 (mean 1986)	120 – 1,021 (mean 583)	7,180 – 29,800 (mean 19,693)	16.71 – 46.20 (mean 27.77)
GT6	1994 – 2005 (mean 2000)	224 – 1,944 (mean 1,095)	11,800 – 133,000 (mean 79,452)	11.02 – 18.98 (mean 14.61)

In summary, higher street intersection density coincided with high social cohesion and high diversity. There was a positive tendency between street intersection density and social ties, although not statistically significant (Figure 3-3). The generic and uniform grid structure usually consisted of a uniform building type developed to higher densities while the more clustered arrangement of a loop

structure was characteristic of the villa and apartment-mixed estates with high income diversity. In the latter case, the loop street layout effectively clustered the villa units in the central area of the site while the apartment blocks surrounded the villa units, and the high street intersection density divided the apartment blocks into loose clusters sharing the same frontage to grassed areas. As such, this highly-intersected loop structure could be one way of organizing different housing typology, which increases both housing and social diversity of a single housing estate, while maintaining relatively satisfactory social ties.

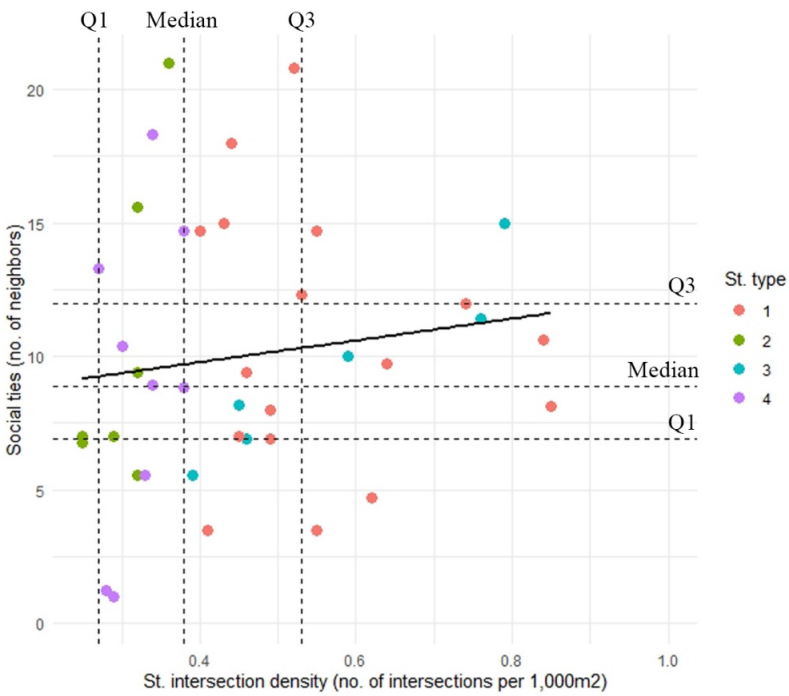


Figure 3-3 Street intersection density and social ties for all estates

3.2. The green area layout of socially connected diverse housing estates

Overall, a higher green area ratio was not necessarily associated with higher social ties in this study, irrespective of the green area layout. Again, although not statistically significant, there was a negative tendency between green area ratio and social ties (Figure 3-4). This became evident considering the green area ratio of the centralized and dispersed type showing a tendency that smaller green area ratio was related to a higher number of social ties (Figure 3-5, 3-6). There was also an unexpectedly high number of social ties in the strip-type estates, typically found in area A, the oldest neighborhood of the four study areas. Upon the results, the study identified that green area layout and ratio were closely related to the housing development paradigm – i.e. smaller green area ratio was related to older estates – and hence, the high levels of diversity and social ties needed to be considered in this light. However, this is not to say that the development period was the only deciding matter since estates with the small centralized green area did encompass a wide range of building age, indicating that the scale of the green area should also be taken into account.

The small centralized green area was preferred (GT2) over the large centralized green area (GT1) in terms of social ties and diversity (Figure 3-5, Table 3-6). The small centralized green area type was moderately diverse with high social ties of 11.3 people which lied in the 4th quartile. Despite the below-average housing diversity values, the social diversity was particularly high across many aspects: family type, employment status, education attainment, income levels, and tenure years were all found to be above the average value.

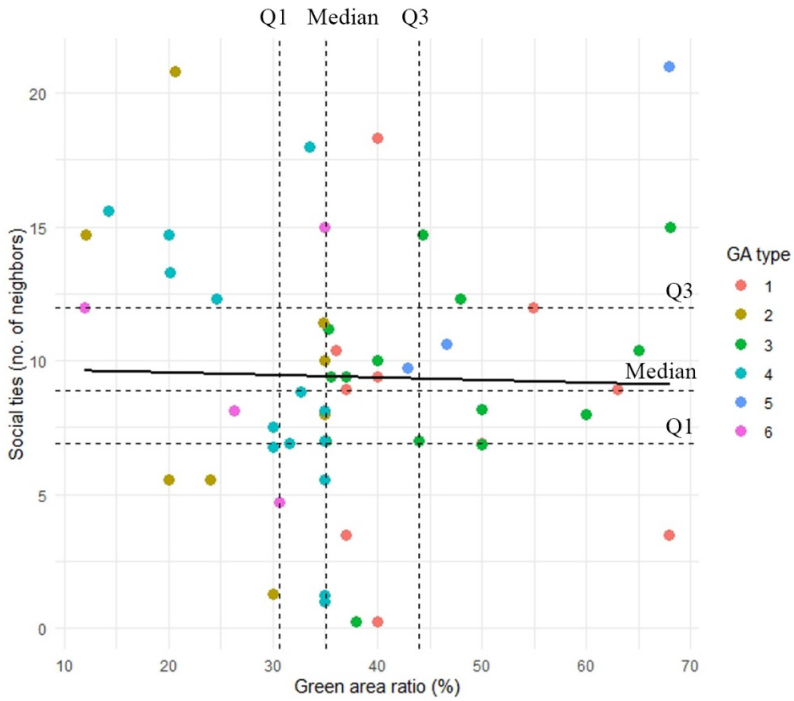


Figure 3-4 Green area ratio and social ties for all estates

Table 3-6 Green area typology by diversity and social ties level

Green area typology	Diversity category	No. of neighbors
GT1 Large centralized green area	LL (lowest diversity)	6.3 (1st quartile)
GT2 Small centralized green area	LH (moderate diversity)	11.3 (4th quartile)
GT3 Large dispersed green area	HL (moderate diversity)	10.2 (2nd quartile)
GT4 Small dispersed green area	HL (moderate diversity)	7.8 (1st quartile)
GT5 Green area surrounding estate boundary	LH (moderate diversity)	10.6 (3rd quartile)
GT6 Strip of green along estate boundary/pathways	HL (moderate diversity)	13.4 (4th quartile)

GT2 estates were small- to medium-sized estates with moderately low housing densities ranging between 1.75 to 20.63 households per 1,000m2. The high social ties were not tied to old building age in this case since the completion year of properties ranged from 1999 to 2012 (mean year of build 2004). The advantage of the small centralized green area may be a related aspect of the

smaller scale housings categorized into GT2 estates or may be related to the notion that large spaces are impersonal and hence do not promote social interaction. The case which reinforces these findings is GT1, estates with large centralized green area.

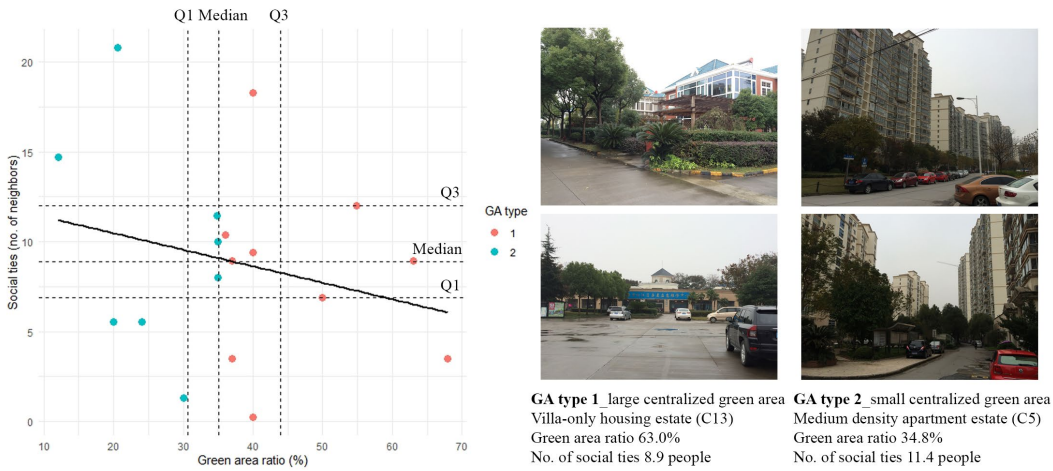


Figure 3-5 Centralized green area type comparison (GT1 & GT2)

GT1 estates not only had the lowest level of diversity, but its median value of neighbors was also almost half that of GT2 at 6.3 people. Examining the housing density of these estates (a very low 1.29 to a very high 63.97) indicated that this category included either small high-end villa only estates or high-density tower block estates. In other words, villa-only estates and high-density tower blocks were characteristic of housing and social homogeneity, and the large centralized green area in the forms of elaborate natural landscapes and streams in high-end villas or well-maintained central features in tower block estates failed to serve as successful places for social interaction.

The dispersed green area type estates offered a more complex understanding of social ties concerning green area ratio, layout, and diversity. Although the large dispersed green area layout of GT3 had higher social ties than the small dispersed green area layout of GT4, when considering the dispersed layout in general, social ties seemed to decrease with higher green area ratio (Figure 3-6). This indicated that similar to the comparison of the centralized layout, the smaller dispersed green area was more favorable in creating social ties, overall.

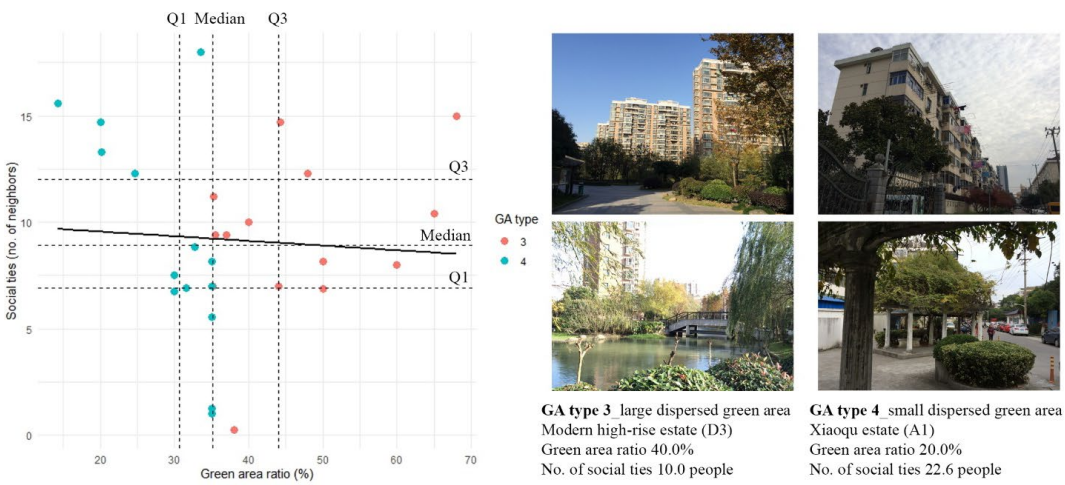


Figure 3-6 Dispersed green area type comparison (GT3 & GT4)

The high number of social ties of the strip-type was unexpected, as this type was included to represent the lack of green area functioning as an opportune place for contact. However, it was found that this was tied to the building age of the housing estates. GT5 and GT6 estates were moderately diverse with a high number of social ties, but these estates were limited to area A, and the average year of build was 1986 for GT5 and 2000 for GT6. This meant that these estates

were developed before the major *xincheng* development, and hence, the high number of social ties was really a demonstration of social ties gradually formed over time in a stabilized state of diversity usually found in older more established areas.

In summary, because the extent of green area provision and layout was strongly associated with the differing building period, social ties and diversity had to be first considered in this light. Smaller green area layout coincided with higher social ties and high diversity because these estates were associated with smaller- to medium-scale and older estates developed in the period when the green area was not an emphasized aspect of design. However, later on, green area and open space design became a valued feature of modern developments and a high selling-point for consumers. Hence, the increased green area ratio and its elaborate designs were associated with lower social ties and diversity since these estates were inevitably more recently built and more skewed toward high-end properties. On several occasions, residents expressed satisfaction with their living environment based on the high green ratio as it was perceived as being prestigious, while this did not seem to necessarily relate to the active use of these areas or high social interaction.

Nonetheless, considering GT2 estates which included old and new developments, the high level of social ties cannot be solely attributed to the age of the development. Rather, the results do render that small scale green areas may be more conducive toward creating a sense of community since large areas easily become impersonal and less engaging.

4. Discussion

This study investigated the design parameters in the housing estate layout, examining street intersection and green area, to understand which characteristics were relevant to the discussions of ensuring a socially cohesive diverse environment. As a result, the study concluded that high street intersection density regardless of street layout type was advantageous, while the small centralized green area in medium-density smaller-scale housing estates coincided with high social ties and high diversity.

High street intersection density is one way of creating small internal territories within the housing estate and may be a useful physical structure in creating social ties among diversity, which was demonstrated through both the grid and loop layout. There was a positive tendency between high street intersection density and social ties, which may be tested on larger data sets (Figure 3-7).

Moreover, the high street intersection density loop structure (ST3) best represented the "*clustering*" and "*pepper-potted*" formation discussed by Tiesdell (2004) and offered lessons toward subtle integration. In this example, high housing and social diversity were achieved through the mixing of two different building typology, the villa and the apartment block, which ensured high income mix, in particular. The villa units were clustered in the center through the loop street layout, in effect, subtly separating the villa units from the apartment blocks. However, the high street intersection density indicated that the separation was not solely based on building typology, but loose clusters of building units were

formed by sharing green frontages and small garden-like spaces. In this way, the street may structurally provide a means of separation but the green area can function as a place of small-scale integration in relation to the placement of buildings.

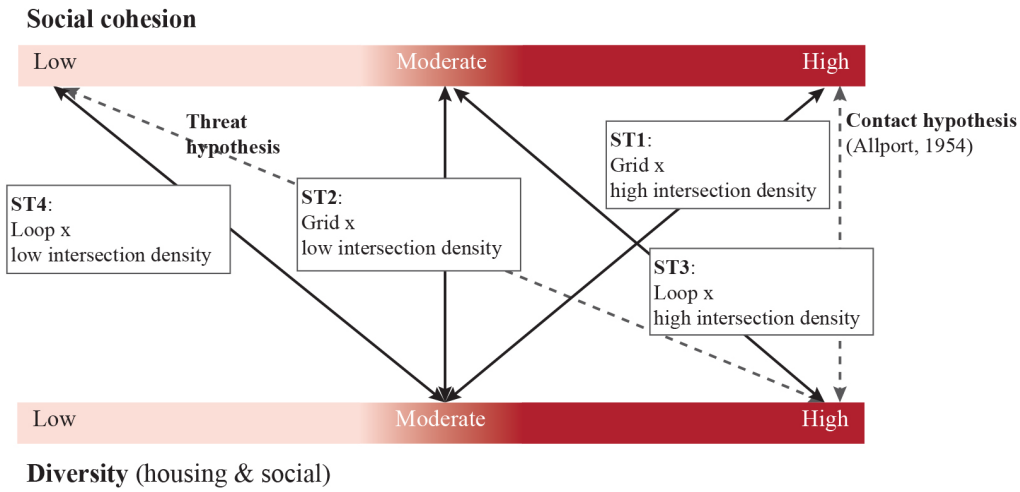


Figure 3-7 The level of diversity and social cohesion by street types

Green area coinciding with high levels of diversity and social ties had to be considered with respect to the housing development period as the extent of green area and its design reflected the changed housing consumer demands as discussed earlier. Green area layout of housing estates would be more useful as small-scale areas supporting the many transient social activities of the community, and as a means of creating shared spaces between a group of buildings that may be subtly divided (Figure 3-8). Taking this further, larger green areas may not necessarily serve the purpose of clustering nor "*pepper-potting*" since larger areas may be considered as a means of separation that diminishes the sense of clustering by which "*pepper-potting*" also loses its significance.

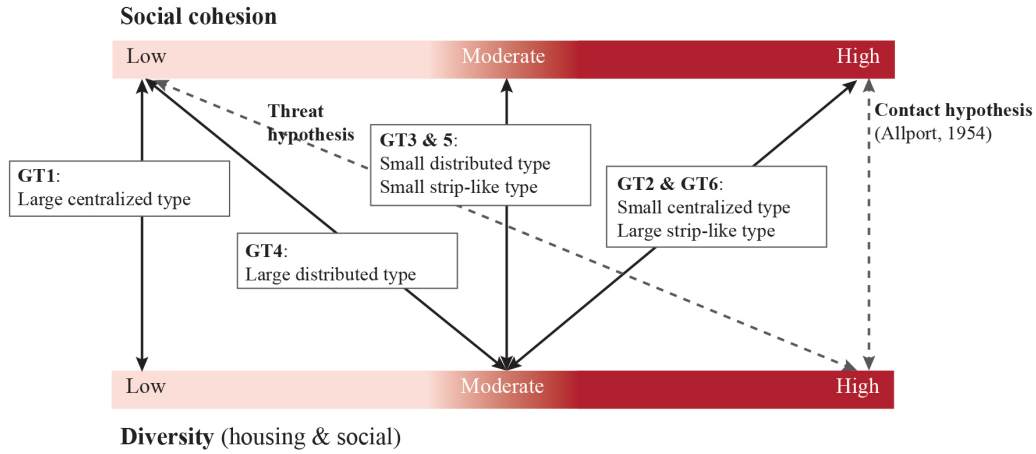


Figure 3-8 The level of diversity and social cohesion by green area types

Diversity embodied in a housing estate means there are diverse needs to be catered for. This may be reached through the division of spaces using street intersections and green areas that focus on creating the appropriate scale and place for social interaction. This study supports the notion of subtle integration and a looser sense of community in diverse neighborhoods which creates opportunities for contact among subtly divided areas. In the future, ways of examining how the different types of street layout and green area layout combine to create different social ties should be studied, and specific cases should be examined to contextualize subtle integration.

Chapter 4

Living in harmony with disaster: Exploring volcanic hazard vulnerability in Indonesia

1. Introduction

In many parts of the world, hazard is increasingly an inevitable part of contemporary cities and rural lives. *Hazard* is a potential source of threat to people and properties associated with either natural or man-made environmental processes, such as fires, earthquakes, and floods (Kim & Rowe, 2013; Smith, 2013). If a specific type of hazard is coupled with an actual probability of occurrence, *risk* becomes prominent. Natural hazards critically undermine the livelihoods of people and communities directly affected by it and also stifle future development potential of the vulnerable area. However, if the potential dangers of a hazard cannot be prevented altogether, successful adaptation to the environment is also required. The communities studied in this research constantly returned back to their original way of living despite the presence of a volcano and the high levels of destruction it caused.

This paper is based on a joint planning studio that was established in 2014 between the Graduate School of Environmental Studies (GSES) Seoul National University (SNU) and Diponegro University (UNDIP)'s Master of Regional Urban Development Program (MRUD). The site of the study, Magelang Regency, is an area in Central Java, Indonesia. Magelang Regency in recent years has been propitiously caught between the thriving economic activities of Semarang and Yogyakarta. Whilst the area hold potential for further urban and economic development, it is also home to four active volcanic mountains which surrounds the administrative border. In 2010, a large scale eruption of Mt. Merapi occurred and due to this almost 400 lives were lost and 400,000 had been left as refugees (Mei et al., 2013; World Health Organization, 2010). When people were able to return back to their communities, they were devastated once again to find their homes, fields and environment completely covered by ash fall which mounted up to, based on one villager interview, at least "two truckloads." Furthermore, structurally weak infrastructures were also destroyed and eventually the communities had to reconstruct damaged structures without the help of external aid. Such dire conditions were worsened when torrential rainfalls caused volcanic debris and fragments to violently flood down streams, again damaging weak structures along various streams and river ways.

The Indonesian municipal government responded by drawing up relocation plans, promising new homes and land but inhabitants of the affected communities refused to leave. Instead, an intriguing aspect emerged where disaster provided opportunities for new economic activities. The volcanic debris from Mt. Merapi, collected through manual labor, were sold to sustain the

immediate survival of the communities, despite the meager earnings of four U.S. dollars per day. Moreover, because the volcanic ashfall acted as natural fertilizers after a certain period of time, salak and mango crop productivity – one of the main sources of income in the area – was expected to increase. The Soil Research Institute laboratory found that soil nutrients such as calcium, potassium and iron were found after the 2010 eruption of Mt. Merapi (Kuncoro et al., 2012), and locals commonly believed that improved soil fertility would manifest in three to four years (Wilson et al., 2007). This study also identified perceptions of improved soil fertility to be one of the driving forces behind the reluctance to relocate. In other words, the volcanic eruption was acting as both a source of great damage and new economic gains. This aspect, compounded with the unique set of cultural and social values of the area, was enabling a passive form of community resilience where homes and fields were constantly reconstructed.

In such context, the intricate relationship a community forms with a natural hazard needs to be taken into account when suggesting practical ways of reducing vulnerability. Especially, when tackling an area which is relatively unknown and unfamiliar, first-hand experiences and engagement may provide indispensable insights into understanding what the issues of vulnerability really are. Furthermore, in many cases, there is more than one aspect of vulnerability acting in a community which may interact with yet again other aspects of vulnerability, requiring a holistic approach to planning solutions. In view of the inherent challenges dealing with environmental hazards of an understudied region, the research aims to demonstrate how local knowledge and wisdom can be instrumental in understanding issues of vulnerability and further enable

community-led planning solutions for improving resilience.

Vulnerability is often understood as the antonym of resilience which leads to the persistent dysfunction of an area in the aftermath of a hazard (Adger, 2000; Norris et al., 2008). The way to avoid such prolonged dysfunction is to increase community resilience and thereby adapt to the changed spatial and social structures after a hazardous event (Norris et al., 2008). However, improving community resilience is not a simple matter because hazard vulnerability consists of both geographical and social factors which may be inter-related (Cutter et al., 2003; Pais & Elliott, 2008; Tobin & Whiteford, 2002). In fact, a community's resilience, or the ability to effectively respond to a hazard is dependent on the social, economic and political conditions prior to the hazardous event as much as the post-disaster efforts (Boyce, 2000). Such conditions would produce very different results in the way communities manage uncertainties, learn from past experiences and improve recovery capabilities. Furthermore, depending on the cultural aspect, societies may show varying attitudes towards hazards and have unique perceptions of those who are adversely affected by it, which may either speed up or hinder the overall recovery process. Hence, it is the actual disaster compounded by the socioeconomic and cultural conditions of a particular community that contribute to the different levels of vulnerability a place or community is exposed to.

Reducing hazard vulnerability is linked to the notion of improving community resilience, which may be achieved through drawing up mitigation plans. Spatially, this may mean establishing land-use management and

development regulations which may include the use of building and design codes, comprehensive planning, advocating public awareness, and introducing planning mandates (Burby et al., 2000; Nelson & French, 2002). One of the key aspects of hazard mitigation plan is to identify and locate the issues of vulnerability which not only reduce risk but also designate areas that could be further developed. Once areas of different levels of vulnerability are identified, planners may impose development regulations such as zoning and setbacks to ensure safe developments, and also acquire hazardous properties to convert them for safer uses (Burby et al., 2000).

However, it is important to note that reducing vulnerability relies on the real-world conditions such as local government capabilities, available resources and the desires of the affected community. Especially, as in the case of this research, a vulnerable site located in an unfamiliar region may pose difficulties due to the limited knowledge of what the local conditions and available resources are. Although some basic understanding of the site may be pursued, little prior knowledge can be developed in advance of site engagement and field surveys. In other words, both the issues of vulnerability and appropriate mitigation plan need to be defined and learned within the context of the site and its inhabitants otherwise mitigation plans would be susceptible to failure, ultimately adversely affecting community resilience. This study provides a unique opportunity in which real-world vulnerability issues are investigated and lessons in proposing site-responsive mitigation plans are drawn.

2. Data and Method

In this study, field-based investigation, official data gathering and resident surveys were used to identify specific issues of vulnerability while working in collaboration with local students and experts. To understand the context of the research a brief background of the joint planning studio collaboration is necessary.

2.1. Studio background and site

The joint planning studio was structured into two parts. First students were prepared through a seminar course titled Studies in Urban and Regional Planning which was then followed by field-based investigations. A joint field trip by Korean and Indonesian students was made to Magelang where they had observed the state of housing, public sanitary facilities, local economic activities such as stone-breaking and salak plantations, and the conditions of evacuation sites. Based on the field investigation, students refined issues of vulnerabilities which later developed into a planning concept and neighborhood level design proposals (Figure 4-1).

The site, Magelang, is located in Central Java which consists of 24 sub-districts and covers an area of 110,385 ha (Figure 4-2). Out of 129 active volcanoes in Indonesia, 43 are located in the Java islands which are also one of the most populous islands in Indonesia (Seoul National University, 2014). Magelang is also situated in between Semarang, the capital of Central Java, and Yogyakarta. From a development perspective, this geographical position has been advantageous in the past and until now. Semarang, during the Dutch colonial period, had built its first railway in 1868 which spanned 405 km to Jakarta, and in

1903 this railroad connection was extended to Magelang. Today, various shopping and hotel complexes are being developed along the Magelang-Yogyakarta corridor acting as a major source of growth and urbanization in the area. However, considering the constant threat caused by natural hazards such rapid urbanization may also pose added dangers, and based on interviews with the local authority, intensifying developments is not recommended in this area (Figure 4-3).

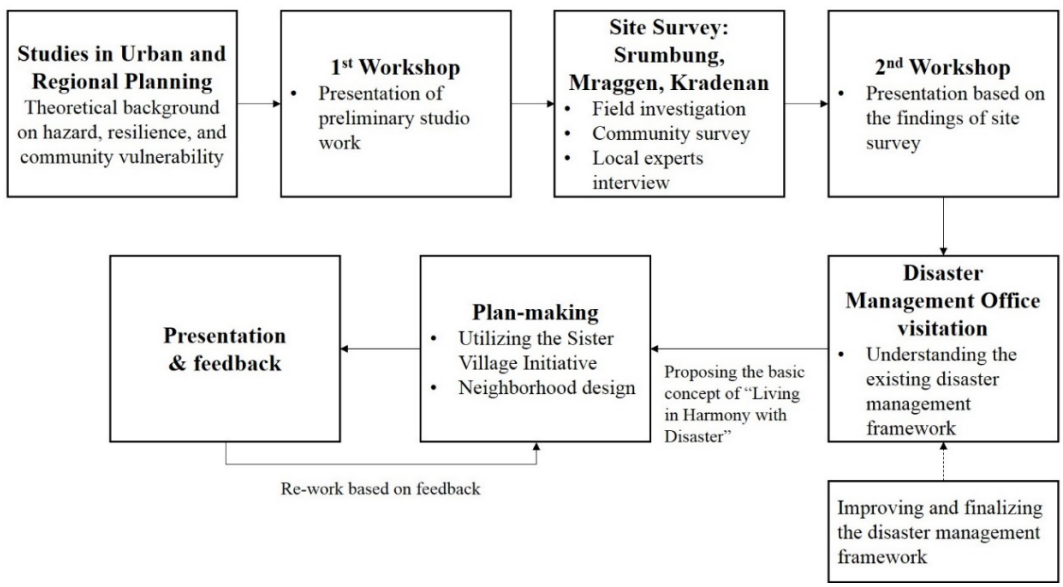


Figure 4-1 Diagram of planning studio process

As of now, Magelang Regency is still largely an agriculture-based are a where four active volcanic mountains – Mt. Merapi, Mt. Merbabu, Mt. Sind oro, and Mt. Sumbing – surround its administrative borders. The most vulner able areas in Magelang Regency are the four sub-districts known as Srumbun g, Muntilan, Salam and Dukun. The most recent eruption of Mt. Merapi in 2 010 was a hundred-year event which does not compare in magnitude with pre

vious eruptions, that caused the lives of almost 400 people (Mei et al., 2013; Surono et al., 2012). According to various reports on the 2010 explosion the critical dates range between late October to early November (Cronin et al., 2 013; Surono et al., 2012), and on the days where series of intense explosions occurred, between 3-5 November, pyroclastic flows reached 12km (Surono et al., 2012). Such pyroclastic flows were particularly detrimental to Dukun and Srumbung – both areas within a 15km distance of the volcano – where 10.13km^2 of the floriculture site in Dukun, and 14.20km^2 of salak plantation in Srumbung were destroyed (Seoul National University, 2014).

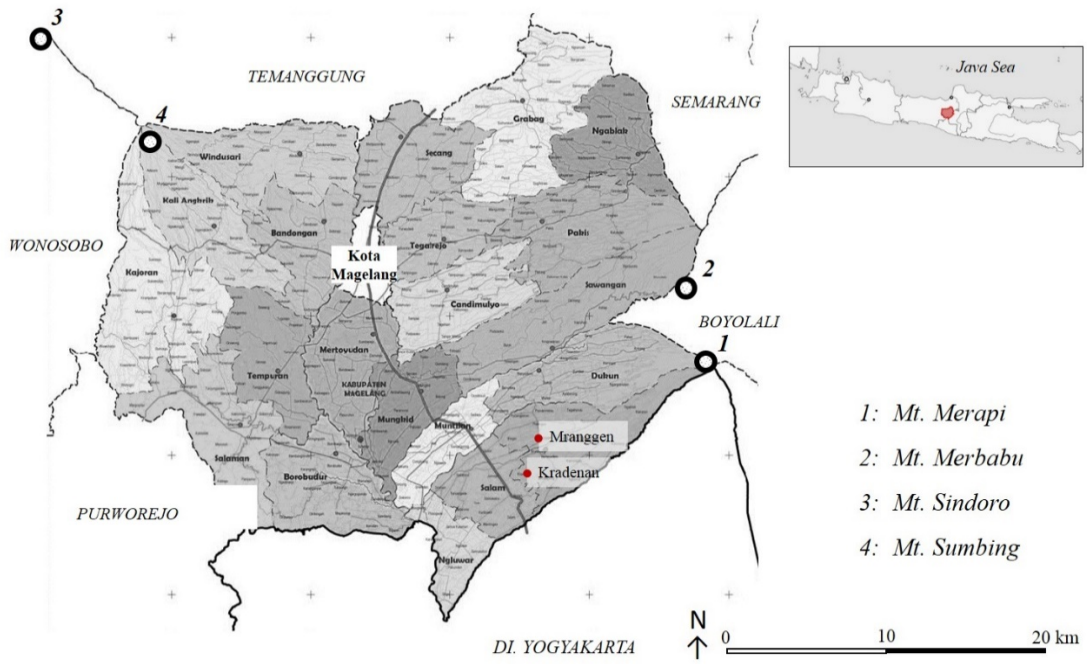


Figure 4-2 Map of Magelang Regency and the volcanic mountains

Figure 4-3. (a) Photograph of Mt. Merapi; (b) SNU and UNDIP staffs discussing risk management plan

2.2. Identifying issues of vulnerability

Based on various records, the issues of vulnerability in Magelang were identified to be both natural and human-induced which could be categorized into three different aspects: the economic; the environmental; and the infrastructural. The economic vulnerability rose from the fact that the majority of households were reliant on subsistence agriculture (Seoul National University, 2014). Considering that the agricultural sector is affected most in the event of a volcanic eruption and that the service sector is only concentrated along major transport routes, the residents of Magelang are thought to be economically marginalized. In terms of environmental vulnerability, the close proximity to the volcano, the subsequent flooding of rivers and other forms of natural disasters are critical. Furthermore, Magelang also suffers from poor infrastructure and public services which indirectly exacerbates the already vulnerable conditions of the site. There are currently no proper wastewater treatment facilities installed in Magelang, and hence serious problems of water pollution and odor are left

untreated. Villagers rely on local springs or village wells for drinking water which has a high possibility of contamination, and although there are local water supply companies, these only cover 3.5% of the total demand. Road conditions are poor and there are no proper mechanisms for treating urban waste, which adversely affects reconstruction efforts in the aftermath of a disaster.

Furthermore, through student-led surveys, a closer understanding of what the volcanic eruptions really implied in the community shed light on locally-specific vulnerability issues. A total of 49 villagers were surveyed: 15 from Srumbung; 15 from Mraggen; 10 from Kradenan and 9 village officers. The survey was conducted flexibly incorporating interview questions to encourage as much conversation with the villagers. Village officers were also interviewed to better understand the difficulties behind implementing relocation plans and the desires of the communities. Students had discovered through site investigations that despite the dangerous conditions posed by Mt. Merapi, villagers were high ly resistant towards relocation. Survey results showed that 82% of the local c ommunity disagreed to relocation for livelihood reasons (33%), and attachmen t to community environment (25%) (Figure 4-4). The majority of the local co mmunity (78%) were involved in salak plantation, by which Mt. Merapi prov ided good soil conditions for agricultural businesses. Additionally, there were post-disaster economic gains made through selling volcanic eruption materials, and so even after the 2010 eruption, most local villagers did not change or consider changing their source of income (91%). In fact, farmers waited until re-cultivation of salak was possible, whilst working in temporary job conditions and receiving government aid.

The survey also revealed the community's strong cultural attachment t o the environment. Local villagers displayed strong connections to the land that had been inherited for generations and also shared a common cultural view that Mt. Merapi was genuinely harmless. In fact, people perceived Mt. Merapi not as a threat but a positive element which allowed the blessings of fertility, providing a good source of water and other comforts. Inhabitants often said that the mountain had the right to "cough" once in a while and although hardships were caused by this, there was a sense of humble satisfaction that the mountain gifted the area with fertilized soil. Ironically, the community considered Mt. Merapi to be the source of sustainable living, which also influenced their perceptions of risk whereby fatalities were caused due to the refusal of evacuation.

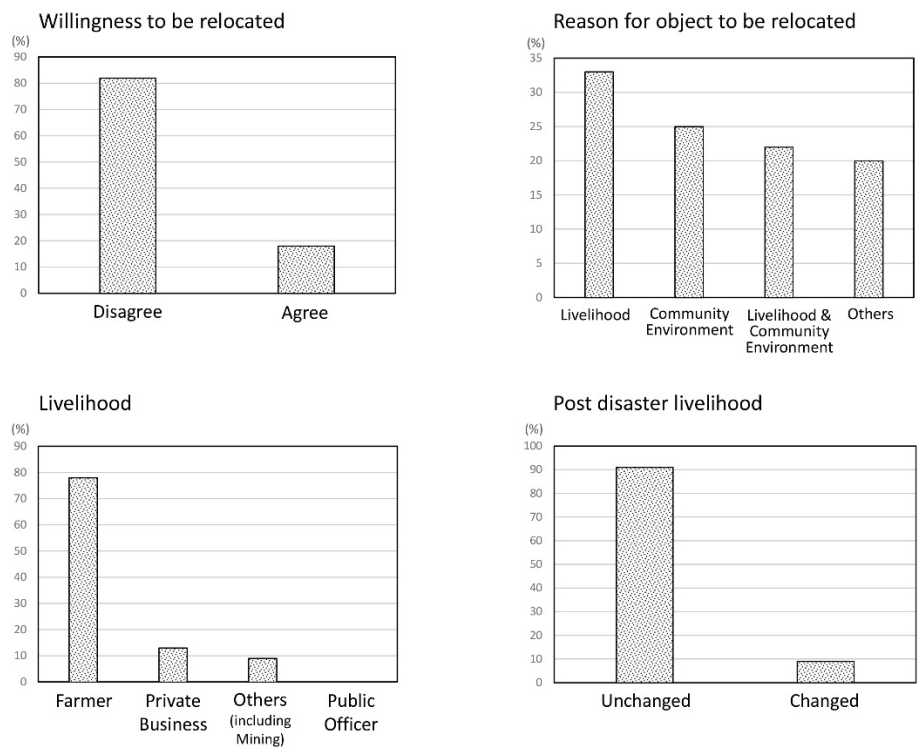


Figure 4-4 Student-led community survey results (n=49)

To summarize, the volcano which posed substantial hazard risks to the community also served as a source of economic resource and a place of communal belonging, complicating the understanding of vulnerability. The villagers chose to remain in an environmentally vulnerable site rather than expose themselves to further economic vulnerability due to the lack of alternative employment skills, and also refused to be detached from their social ties and traditional values. Such complicated notions of vulnerability significantly infor med the general planning and design directions in the later stages.

3. Results

Taking into account the complex understanding of vulnerability, the study put forth the concept of "Living in harmony with disaster." This was to respect the local community's desires and recognize that a permanent relocation plan would not be successful. The overall concept of embracing disaster was divided into four principles: community resilience, economic sustainability, shared responsibility, and design for all.

Based on this planning concept new ideas were introduced into the existing disaster management framework which mainly focused on reducing the environmental and infrastructural vulnerabilities of the area. For each stage of disaster—pre-disaster, during disaster emergency response and post-disaster—response measures were proposed by physical, socioeconomic and institutional aspects (Table 4-1). The pre-disaster stage is primarily concerned with preventative measures such as introducing zoning control along the Kali Putih

river, designating clear evacuation zones to minimize confusion, regulating sand mining and allowing for sustainable development in the area. The underlying thought is that development should not be undermined because of a natural hazard, and areas of strict regulation should be clearly defined. On an institutional level, an integrated forum between communities is suggested so that community relations can be strengthened prior to a disastrous event. During the impact stage of the volcanic hazard, efforts are concentrated on mobilizing various local and community-based funds to cope with the disaster and any immediate rehabilitation efforts. In the post-disaster stage, again zoning is a key component since fixed and temporary settlements need to be clearly designated so as to appease conflict and provide stable living conditions for those displaced. Another crucial aspect is legally resolving land use and improving infrastructure systems.

Table 4-1 The final planning concept of disaster management framework

Stages of disaster	**Areas of response**	
Pre-disaster	Physical aspect	• Implement zoning regulation to control development along Kali Putih River • Further develop the Sister Village Initiative concept for effective evacuation process • Designate clear evacuation zones taking into account for future development • Mobilize local residents to manage clean water, sanitation, and waste services
	Socioeconomic aspect	• Introduce alternative employment training during pre-disaster stage
	Institutional aspect	• Regulate to ensure sustainable sand-mining • Set up an integrated forum among directly affected communities and neighboring communities to strengthen co-operative relations

		• Introduce public hazard education to increase awareness of volcanic dangers
During disaster	Physical aspect	• Strengthen community-based refugee handling
	Socioeconomic aspect	• Mobilize local financial aid for rapid recovery • Implement community-based savings as disaster insurance system
	Institutional aspect	• Operate community-based funds as additional measures to local financial aid • Implement community-based village rehabilitation and reconstruction • Provide services through collaboration between public and private sectors
Post-disaster	Physical aspect	• Implement zoning for fixed and temporary settlement areas • Improve infrastructure services
	Socioeconomic aspect	• Mobilize local financial aid for recovery
	Institutional aspect	• Strengthen integrated forum to manage community funds and people's living conditions • Resolve legal aspects of land use and housing • Introduce innovative infrastructure systems

Incorporated into the disaster management framework is another key l ocal concept known as the Sister Village Initiative. This already existing concept of linking vulnerable villages with neighboring villages had been strengthened through the support of a UNDP project. By the end of 2014, 21 villages were linked with neighboring villages [8]. The Sister Village Initiative was further developed in this study by clearly designating evacuation routes and encouraging community bonds on a regular basis. In the event of a disaster, individual households could escape to the community shelter then temporarily migrate to a neighbor's home—or a paired sister's place—located in a safer

[8] https://undpid.exposure.co/sister-villages

community along a designated route with a reliable mode of transportation. Accordingly, urban design and transportation plans that facilitate the notion of the Sister Village Initiative was put forth by building a post-disaster refugee camp that also function as a pre-disaster meeting point (Figure 4-5). Also, it was evident from the Sister Village Initiative that the communities were determined on overcoming disaster rather than taking advantage of an unsettling situation where looting or illegal settling may occur.

Furthermore, the general idea of the planning concept and disaster management framework was materialized in the neighborhood design proposals which suggested ways of mitigating for economic vulnerabilities. Two areas, namely Mranggen and Kradenan, were selected as these exemplified the Sister Village Initiative concept. Mranggen, situated directly beneath Mt. Merapi stretching along the Kali Putih River, is the more vulnerable site of the two areas and severely lacks social and economic foundations. Most inhabitants cultivate salak individually in their home gardens. In the aftermath of the 2010 eruption, the fields and plantations in Mranggen took almost three years to recover. Therefore, improving income levels and livelihood conditions are of paramount importance in Mranggen. On the other hand, Kradenan is an area famous for the production of high-quality salak and is also the only area where a Farmers' Association overlooks the salak production process. Kradenan also enjoys good transportation links and is en route to a UNESCO World Heritage Site, the Borobudur temple, where over a million foreign tourists visit annually. Hence it was suggested that these two areas develop a cooperative business model which involve a salak farm tour at Kradenan and the production of salak processed

crafts at Mranggen. Against this background, the following design proposals were made.

The area in close proximity to the Kali Putih River in Mranggen was designated as a flexible disaster mitigation zone. This involved the removal of existing residential units and the community school near the Kali Putih River and utilizing this buffer area flexibly in pre-disaster, disaster, and post-disaster stages. The newly moved community school could also serve as the education center where inhabitants can train in making salak crafts and diversifying income sources. Under normal conditions, this flexible zone could be used to accommodate for sand-mining work where offices, delivery center, storage facilities and parking area can be located. However, in the event of a disaster the same area could be used as a parking lot where aid materials can be effectively transported to the site. In the post-impact stage, the same area could be used as the base camp for reconstruction efforts (Figure 4-6).

Kradenan served as a model for countering economic vulnerability through salak plantation agro-tourism. The area is already well-known for its sweet salaks which could potentially generate further income by introducing salak farm tours. Hence, the design strategy focused on planning a successful tourist site by incorporating the existing cultural and natural resources. Spatially, a better connection between the neighborhood's mosque and plantation site was proposed. This was to reinforce a strong axis between these two sites and allow for improved navigation for potential tourists. The main tourist area was designated in the southern part close to the salak plantation area and the newly proposed

central information center and shops. The proposed villas for tourists were located along a natural stream, which could also serve as an education center so that the activities of the Farmers' Association and the general economic capabilities of the villagers could be further supported (Figure 4-7).

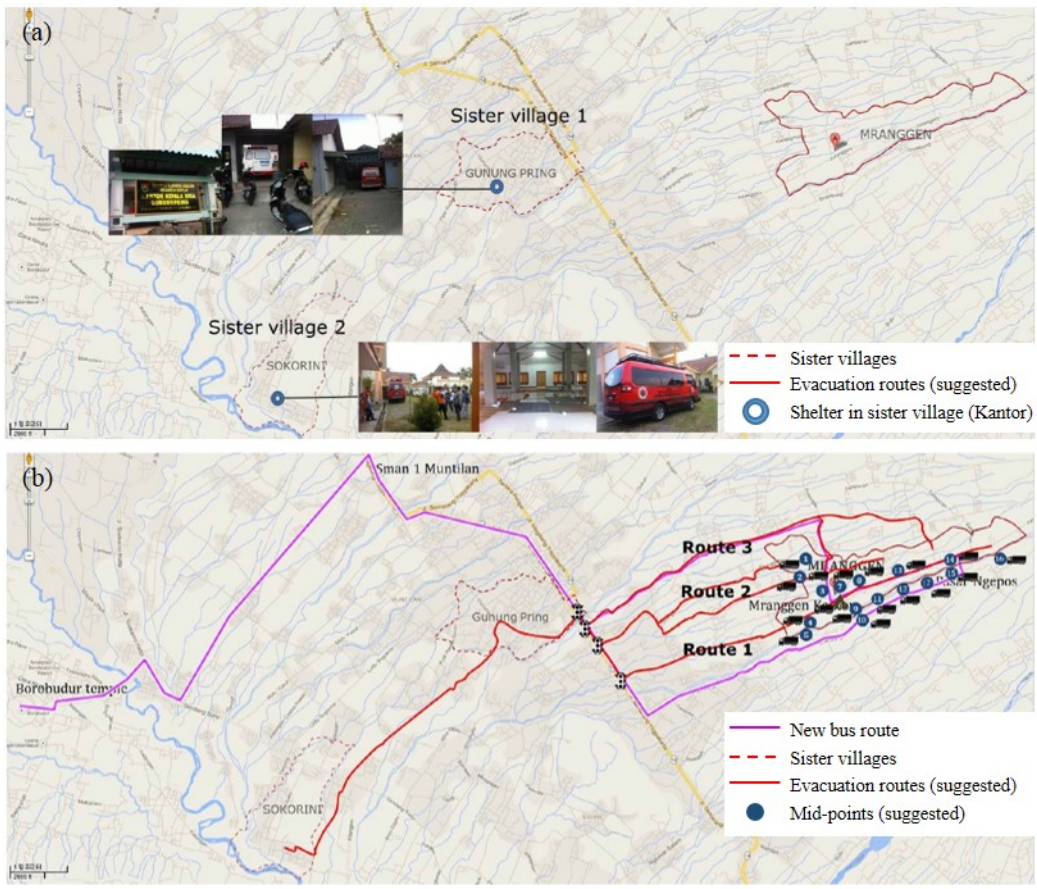


Figure 4-5 (a) Map of two Sister Village Initiative communities, 17 evacuation mid-points and 3 evacuation routes; (b) Sister Village Initiative communities' transportation master plan (drawn by Namkung Ok and Jiayan Yun).

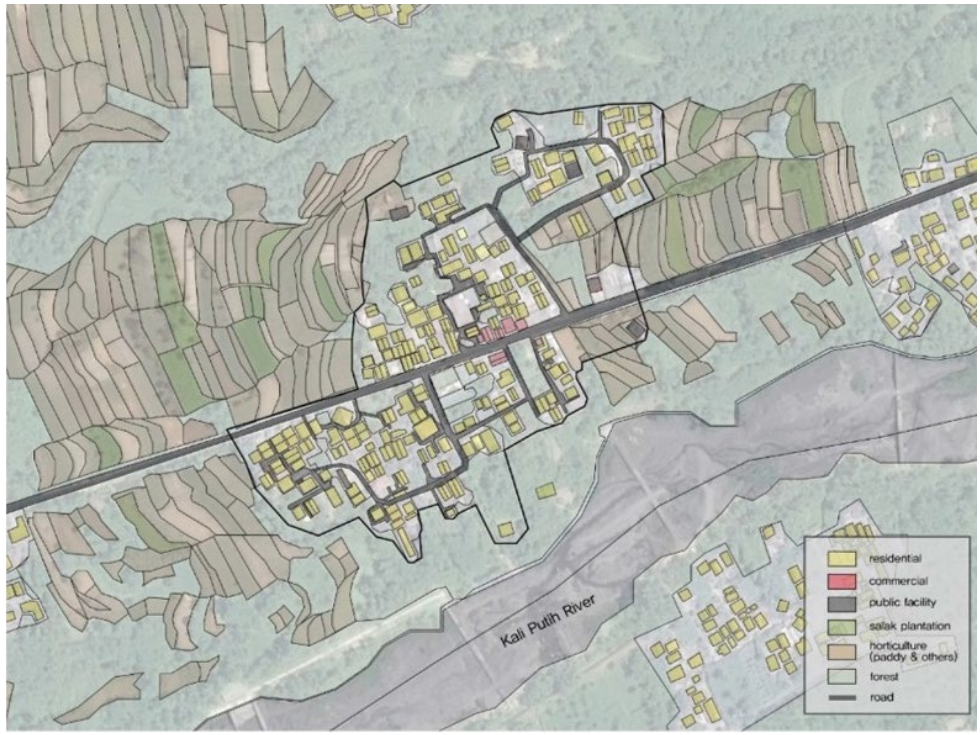


Figure 4-6 Mranggen neighborhood design in different stages of disaster (drawn by Minjeong Lee, Minkyung Kim, and Hyeyeoun Ji).

Figure 4-7 Kradenan agro-tourism neighborhood design (drawn by Minjeong Lee, Minkyung Kim, and Hyeyeoun Ji).

4. Discussion

4.1. Environmental hazard as a vehicle for understanding local wisdom

Interactive talks among participants and locals through intensive field studies on localized lifestyles enabled novel findings of the issues of vulnerabilities which cannot be reproduced prior to such engagement. From the outset, the study focused on defining the various aspects of vulnerability, and expected the environmental hazard to be the most detrimental aspect of them all. Therefore, resolving the problems of environmental hazard was directly linked to drawing up relocation plans. However, after understanding the complicated relation the community formed with the hazardous site, the studio recognized that an effective strategy for eliminating environmental vulnerability may in fact increase economic vulnerability. In this respect, a natural hazard acts as a catalyst where the intricately-linked issues of vulnerabilities are brought to the surface. In other words, the process of learning locally specific problems served as a vehicle in abolishing preconceptions and helped to reframe the planning approach. Without such involvement, it is difficult to expect practical mitigation strategies that avoid making the mistake of prescribing oversimplified measures.

4.2. Designing with local knowledge

By effectively using local wisdom, the study was able to put forth pragmatic planning approaches which were demonstrated through the strengthening of disaster management framework and the use of the Sister Village Initiative. In its original form the sister village concept was a simple mechanism of allowing

immediate shelter and external assistance to the affected communities. However, under normal circumstances communities showed very limited exchange. In recognizing the potential of this concept, the study suggested that the evacuation center prior to any hazard threats could be used as a community center where different communities can interact and form bonds on a regular basis. In the event of a disaster, households could be partnered so that evacuation and temporary settlement processes can be streamlined with improved transportation routes. Neighborhood design approaches were also sensitive towards the existing local activities and sought to better integrate economic means with spatial planning. As demonstrated above, key strategies discovered from the field investigation were further advanced when drawing up mitigation strategies that are appropriate and unique to the site.

However, there were also challenges in incorporating local knowledge into the overall planning and design approaches. Clearly local knowledge formed an invaluable part in prescribing mitigation measures and was considered one of the most successful aspects of the study. However, at the same time, local perspective and cultural knowledge can have an overwhelming influence on the progression and outcome of the mitigation plan and therefore it is important for participants to retain a critical standpoint. Deciding to what extent the complicated relations between people and the volcanic mountain need to be embraced was an issue that was continuously debated among participants.

As a conclusive statement, although many useful planning and mitigation strategies were presented, the research is limited in that the effectiveness of these

ideas could not be directly tested. Despite such limitations, this study provided an opportunity for both Korean and Indonesian participants to re-think the notion of community resilience which had evidently generated further discussions on site-specific hazard mitigation planning.

Conclusion

The study investigated the urban diversity of Songjiang New Town, a dichotomous site embodying planning paradigms of the past and present.

In providing an overview of where diversity is found, the first chapter demonstrated that older, incrementally developed areas were diverse, but more interestingly, that new comprehensively developed areas were also diverse through variations in building types and a wide housing price range. The study found disparate tendencies between housing and social diversity in other areas. The neighborhood where relocation housing was mixed with commodity housing displayed uncoordinated diversity: housing diversity was of moderate level but social diversity low, whereby relocation housing residents were disadvantaged and separated from higher-end commodity housing areas. On the other hand, the urban migrant concentrated area demonstrated incongruent diversity where a heterogeneous population was accommodated in a relatively homogeneous housing environment catered toward the middle-class. In conclusion, the study highlighted the need for drawing appropriate urban design measures that encourage the positive aspects of diversity such as urban vitality and equity taking into consideration the interplay between housing and social diversity.

The second chapter identified housing estates with high levels of diversity and social ties. The results showed that the highest number of social ties were evident in housing estates that had moderate levels of diversity, which

implied a trade-off between diversity and social ties. Nonetheless, there were housing estates that were hardly connected despite a relatively homogeneous group of residents demonstrating the underside of homogeneity. The housing characteristics showed that building age was an important aspect which supports social interaction among diverse groups, and additionally, high street intersection density coincided with high levels of diversity and social ties.

Building upon the results of the second chapter, the third chapter examined specific configurations that may encourage opportunities for contact in housing estate areas. The results illustrated that high street intersection density was advantageous when considering both diversity and social cohesion irrespective of whether the street layout was in the grid or loop structure. For green area layout, estates with small centralized green areas coincided with particularly high levels of diversity and social ties. In conclusion, the study suggested that a housing estate plan which creates many subtle divisions through street intersections and a loose grouping of buildings through green area placement may help achieve subtle integration and contact among diverse residents.

As an epilogue to the chapters discussing Songjiang New Town, the study which drew up a relocation plan in response to volcanic disaster management demonstrated the importance of utilizing localized knowledge. The study was cautious of adopting relocation measures that may help reduce environmental vulnerability but, on the other hand, increase economic vulnerability of local residents. The study decided upon an improved measure of

the existing framework and the Sister Village initiative which would increase the effectiveness of the mitigation plans, implying that local perceptions need to be aptly utilized to draw responsive measures.

In a similar vein, urban diversity that has developed under the unique circumstances of transitional China also requires localized understanding. The diversity of cities is a physical and social construct that changes depending on the urban development trajectories and values incorporated into urban policies. The study empirically examined the various aspects of housing and social diversity to offer a holistic understanding of urban diversity experienced in transitional China. This was studied in relation to the changed nature of social cohesion precipitated by housing reforms and internal migration, and the study argued for a realistic notion of social cohesion amongst diversity especially with regards to new developments.

Based on the findings of the research, investigating how the processes of intergroup contact operate through social institutions may be explored in relation to spatial aspects. Additionally, understanding the possibilities of macro-level social cohesion between public or social institutions in modern China may shed light on whether social mobility or the accumulation of social capital is possible under the context of rapidly realized urban diversity and its significance.

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국문초록

중국의 도시 다양성, 사회적 교류 및 장소
– 상하이 송지앙 뉴타운을 중심으로 -

조 시 은

서울대학교 대학원

협동과정 조경학

도시 다양성은 도시설계 및 계획과 주택정책, 경제 등의 사회과학 분야에서 연구되는 주제로서 도시 내 장소활력과 사회적 평등 달성을 위해 필요한 규범적 요소로서 논의된다. 반면에 중국 또는 다수의 개발도상국에서의 대규모 신도시 건설은 획일된 물리적 경관과 사회적 특성으로 인해 도시 다양성이 말살된 장소로서 비판의 대상으로 인식되고 있다. 그러나 경제개혁 이후 중국 도시 및 사회, 정책적 변화를 감안한다면 이러한 대규모 신도시 개발이 단순히 다양성이 부재한 장소라고 주장하기에 어려운 점이 있다. 거시적인 측면에

서 특히 교외도시는 신도시로 개발되기 이전 모도시(mother city)의 위성도시 혹은 산업지구로 지정되어 발전된 경우가 많으며 내재되어 있던 도시 맥락이 새로운 개발행위로 인해 재구조화되는 맥락을 지닌다. 더불어, 중국 대도시 내·외로 대규모 인구이동이 이루어지면서 중국의 도시 주변부는 사회경제적 다양성을 내재하는 장소로 발전하였다. 이러한 배경 아래, 본 연구는 중국 신도시를 대상으로 도시 다양성이 발현되는 장소들을 보다 심도 있게 이해하고, 다양성과 도시 활력의 지표가 되는 사회적 혼합 간 관계를 살펴보고자 한다.

본 연구의 대상지는 상하이시에서 약 40km 떨어진 중국 송지앙 뉴타운이다. 송지앙은 명·청나라 때 번성했던 중국 남동지역의 대표적 도시였으나 이후 상하이시의 부상으로 인해 1950년대 들어 상하이시의 위성도시로 편입되었다가 1990년대에는 산업 개발구와 수출가공업 지구로 지정되었었다. 중국의 급격한 경제성장 및 분세제 등의 요인이 작용한 결과 2000년대 초반 뉴타운 건설이 활발히 이루어졌는데, 이 시기에 송지앙 역시 상하이시의 9개 전략적 뉴타운 (‘One city nine towns plan’) 중 하나로서 발돋움하며 국제 마스터플랜 공모 운영 및 수립을 통해 개발되었다.

첫 번째 장은 연구대상지 내 4개 근린구역의 주택 및 사회적 다양성을 엔트로피 지수를 이용하여 측정하는 연구이다. 이를 통해 마스터플랜 상의 지리적 위치 및 위상에 따라 상이한 다양성의 양상을 전반적으로 파악하였으며, 기존의 구도심과 뉴타운 개발 사업을 통해 새롭게 조성된 중심지의 주거 및

사회적 다양성이 가장 높은 것으로 측정 되었다. 구도심의 도시 다양성은 점진적 개발을 통해 기존 도시 조직 및 건축물이 보존됨으로서 담보되는 한편, 신도시의 중심지에 해당하는 구역은 주택시장을 통한 다양한 주거형태 및 가격 조성으로 인해 다양성이 매우 높게 측정되는 것으로 나타났다. 이외 주택 및 사회적 다양성 간 간극이 발생한 구역에서는 서비스업 종사 타 지역 호구 이주민들이 낮은 주택 다양성으로 인해 주거 선택이 제한된다는 것과 상하이 구도심 강제 이주민들이 상품주택 거주민들과 분리되어 다양성의 긍정적 효과를 거두지 못하는 것으로 드러났다.

두 번째 장에서는 53개 주택단지를 분석단위로 개별 주택 유형 및 면적 다양성, 사회적 다양성과 사회적 혼합의 측면을 고려하여 클러스터 분석을 수행하였다. 이를 통해 두 측면 간 양자간의 관계(trade-off)가 존재함을 밝혔다. 다시 말해, 사회적 혼합과 다양성이 모두 높은 단지는 존재하지 않았으나 사회적 혼합이 높은 단지에서 다양성이 보통의 수준으로 나타난다는 것을 밝혔다. 그러나 다양성이 낮은 동질성에 기반한 주택단지에서도 사회적 혼합이 낮게 나타나는 등 사회적 동질성이 반드시 높은 사회적 혼합의 전제조건이 되는 것이 아니라는 것을 밝혔다. 더불어, 클러스터별 주택 특성들을 살펴본 결과, 건축시기가 오래된 단지 및 내부 가로 체계가 보다 세부적으로 짜여진 단지에서 사회적 혼합이 높은 것으로 나타나는 등 다양한 거주민 간 접촉이 이루어지도록 환경을 조성하는 것이 중요함을 밝혔다.

이를 바탕으로 세 번째 장은 가로 체계와 녹지 공간을 유형화하여 주택의 물리적 다양성 및 사회적 혼합이 높은 주거단지의 특성을 도출하고자 하였다. 가로는 두 가지 형태, 그리드(grid) 또는 루프(loop) 레이아웃으로 구분하여 살펴보았는데, 다양성 및 사회적 혼합이 높은 주거단지는 공통적으로 교차로 빈도가 높은 것으로 드러났다. 더불어, 녹지 공간은 중앙에 배치되어 있거나 분산배치 또는 주택지 경계 위주로 배치되어 있는 유형으로 구분하였는데, 다양성 및 사회적 혼합이 높은 주거단지는 녹지가 중앙 배치되어 있으면서 녹지율이 낮은 특성을 나타냈다. 이를 통해 가로 유형과 관계없이 세밀한 가로체계를 확보함으로서 거주민 간 다양한 접촉이 이루어지도록 하는 것이 중요하며, 높은 녹지율 확보를 통해 미적 가치가 부각된 공공영역 보다는 거주민들의 커뮤니티 내 소규모 활동들을 지지할 수 있는 녹지공간이 필요함을 시사하였다.

마지막으로 네 번째 장은 화산으로 인한 재해 취약성이 높은 지역을 대상으로 진행된 계획 및 설계 스튜디오의 제안을 검토함으로서 현지 지식 및 정보를 활용하는 것이 재해계획의 실효성 확보를 위해 필수적임을 시사하였다. 이러한 결과는 또한 도시 다양성 및 사회적 혼합과 같은 도시의 규범적 요소들이 급진적인 사회경제적 변화를 경험한 중국과 같은 특수한 맥락에서는 개별적으로 이해되어야 함을 의미하며, 또한 기존의 규범들이 어떻게 변형 및 작동하는지 이해함으로서 도시설계 담론에 기여할 수 있음을 의미한다.

주요어: 주거 다양성, 사회적 다양성, 뉴타운, 대규모 개발, 도시 활력, 이주민, 사회적 혼합, 공동주택 단지계획, 보행로, 녹지공간, 주택 특성, 재해 취약성, 커뮤니티 회복 탄력성

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