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by

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Abstract

February 2016 by China's central government to transform gated housing blocks into open patterns for addressing "obvious issues" and "urban ills". This guideline aims to make traffic networks intensive and unclog urban roads by removing bounding walls of gated housing blocks and connecting internal roads with urban roads. However, the transforming of boundary walls and internal roads have changed the physical environment of housing blocks such as the outdoor space that residents have been accustomed to and has affected environmental behaviors correspondingly. Meanwhile, after a gated housing block was reconstructed to an open, without solid barriers, such as boundary walls and gates, it is a further question how residents adjusted their territorial cognition and behaviors (including the ways of space occupation and the attitude toward the penetration of external space by outsiders) to adapt to the different environment.

Based on environmental behavior research and architectural approaches, this study is to clarify the reconstruction of housing blocks from gated to open and the influence of it on residents. This dissertation consists of 8 chapters as following:

Chapter One presents an overall introduction of the background and status of housing blocks, including disputes and differences in the definition of research objects, and the concepts of open housing blocks and gated housing blocks are elaborated separately. In addition, this section also describes the research hypotheses, research questions, research scope, research structure, research purposes and significance of this study.

Chapter Two gives a literature review from two aspects, it includes the implementation of transformation policy and literature of theoretical approaches related to typo-morphology, environmental behavior and territoriality. The first part introduces policies in detail: the first opening policy in 2016 and the further opening policy in 2018. The second part introduces existing theoretical approaches and also develops these approaches to be appropriate for this research.

Chapter Three reviews the development process of residential areas in China and explains the distinctive characteristics of China's residential development in each phase. For example, it was influenced by the neighborhood model of the Soviet Union at the beginning of its birth, and later formed its own real estate concept in 1980, and experienced two housing system

reforms at the end of the 20th century. All of the above processes are deeply related to the existing gated housing blocks and the reasons for the open transformation.

Chapter Four is about the materials and methodology. It first figures out the identification of case studies in this research through sampling and screening. After that, qualitative and quantitative research methods are introduced in detail. They consist of investigating methods and analyzing methods. For the investigation methods, Questionnaires, Semi-structured interviews, Likert scale, Visual Encounter Survey method, Behavior Mapping, Snapshot were conducted. The analyzing methods include Typo-morphology, Factor analysis, clustering analysis, etc.

Chapter Five clarifies "what the open housing block is" from the definition of a special and specific context and from the typology way. This primary question includes three branches: 1. what kind of housing blocks have been reconstructed? 2. What methods have been used to reconstruct these housing blocks? 3. For different types of housing blocks, are the types of reconstructing methods different? The answers to these questions form the main analysis part of this article, and they will be shown in sub-chapter under Chapter 5. The answers to these three sub-questions can be combined to reveal what is the OHB and its actual implementation. In the reconstructed cases that have been found, the scale, plot and building layout of these housing blocks and their relationship with cities are diverse. According to these different basic conditions, the methods of the open-reconstruction are also not completely similar. Therefore, it is necessary to analyze the types of these housing blocks and the types of reconstruction methods, and to discriminate what transformation methods were adopted/applied in different types of housing blocks. After this, to extract the commonness and typical transformation methods of each type of residential areas, in order to provide other cities a reference for the subsequent reconstruction.

Chapter Six indicates how open housing blocks influence residents in environmental behaviors and their interaction spaces. From perspectives of spatial types and environmental behaviors, this chapter compared an open housing block (which is reconstructed from gated one) with a comparable original gated housing block. The Behavior Mapping Method was used to capture environmental behaviors in two housing blocks; factor analysis and cluster analysis were used to extract spatial characteristics and classify spatial types; and finally, differences

between the open housing block and the gated housing block were shown by comparing the distribution of environmental behaviors in each space type. The results indicate that the presence or absence of the enclosing walls affects the division of space types and environmental behaviors in housing blocks.

Chapter Seven introduces how open housing blocks influence residents in territoriality. Residents have territorial cognition with different hierarchies and conduct corresponding behaviors in the outdoor space of housing blocks through sharing space and facilities. This mechanism stems from human needs and might be influenced by physical environmental elements. To understand this effect, especially after a guideline for transforming existing gated housing blocks was enacted in China, this chapter compared the territoriality of open and gated housing blocks from the view of cognition, behavior, and space through combined methods. Interview, snapshot, and observation were conducted to capture the situation of these three dimensions, then they were evaluated and grouped by factor analysis and quartiles. Obtained results in the open housing block were found to be inferior to that in the gated case. The conclusion was drawn based on the above that there are remarkable differences between open and gated housing blocks on the intensity of residents' territorial cognition, the level and quantity of their territorial behaviors, and the distribution as well as continuity of the territorial space.

Chapter Eight summarizes the conclusions of this study, re-examines the significance of the research, gives proposals on the strategy of open transformation, and discusses the issues involved in further opening transformation in the future. This paper reviews the definition of the open housing block, analyzes its spatial types and summarizes the existing open transformation methods. After knowing what is OHB, this paper further discusses and summarizes its impact on residents. After this, come up with an integrated proposal on the strategy of open transformation to improve residents' environmental behaviors. 1) proposal for the design and planning: according to the diverse situation about scale, plot and building layout of target housing blocks and their relationship with cities, develops appropriate methods of open-reconstruction for different types. 2) proposal for management: the organic coordination of planning measures and safety management should be considered comprehensively in open housing blocks, and the management of public space should also pay attention to its

accessibility and availability. 3) proposal for public approach and education for residents: cooperation between government and social organizations to create communication channels of OHB system policy to promote policies and relevant information to people. In fact, the process of promotion and transformation of open housing blocks in China didn't pay enough attention to residents' opinions and participation, while the cognition and demands of residents are precisely the keys to promoting and improving the transformation. After a traffic-oriented guideline changed residents' familiar living space, how could they expanding their attributes outward and interacting with outdoor space as well as maintain or improve living sustainability in a more open environment are questions worthy of our consideration.

__Keywords:__ Housing blocks; space transformation; spatial types; environmental behaviors; territoriality; cognition; China.

Thesis Supervisor: MORI Suguru

Title: Professor

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Chapter 1. Introduction

1.1. Background

China's urbanization rate has increased from 17.92% in 1978 to 57.35% in 2016 [1], which was also accompanied by massive housing developments and continuous growth of urban traffic pressure [2–6]. The gated housing block has also been developed in this background and has become the dominant residential form in China. This kind of blocks covers a large area and is usually zoned by urban arterial roads, whose lengths are 300–500 m. It is isolated by bounded walls, fences, plants, gates, guard houses, etc., and has certain shared community facilities and internal roads inside (Figure 1.1). The wide existence of this kind of housing blocks has caused some traffic problems such as limited connectivity and low density of road network [7,8]. Because of this state, the central government of the People's Republic of China released a guideline in February 2016 to address "obvious issues" and "urban ills", such as making traffic networks intensive and unclogging the urban roads by two main approaches (Figure1.2, Figure1.3): (a) promoting open housing blocks with small areas among newly-built residential areas; and (b) reconstructing gated housing blocks by removing bounding walls and connecting internal roads with urban roads [9]. After the guideline was promulgated, the part of transforming residential type immediately ignited the topic and became a domestic focus.

As mentioned above, this guideline is traffic oriented, while the contents towards residential type in it, especially towards the existing gated housing blocks, may bring unexpected impacts on residents' lives such as social interaction and places of it due to the change of space features [10–13]. The residents have been accustomed to gated housing blocks for a long time; this traffic-oriented transforming of boundary walls and internal roads has changed the living environment and might affect the environmental behaviors of residents correspondingly. Since there will be a lot of reconstruction throughout the country, it is necessary to understand what this effect is.

Besides the general environmental behaviors, in a residential housing block, connecting the self with other targets to expand personal identity is also the inherent need of residents, and we can perceive its significance in many aspects. It is called territoriality in the residential

environment, which is closely related to physical elements in this environment. Based on the traffic-oriented guideline, the transformation of existing gated housing blocks into an open mode is gradually being implemented in some cities [14,15]. However, the living habits of residents re disturbed since the transforming of boundary walls and internal roads has changed the physical environment, such as the outdoor space that residents have been accustomed to [16–18]. Therefore, after a gated housing block was reconstructed to an open one due to policy, without solid barriers, such as boundary walls and gates, it should be determined how residents adjusted their territorial cognition and behaviors (including the ways of space occupation and the attitude toward the penetration of external space by outsiders) to adapt to the different environment.
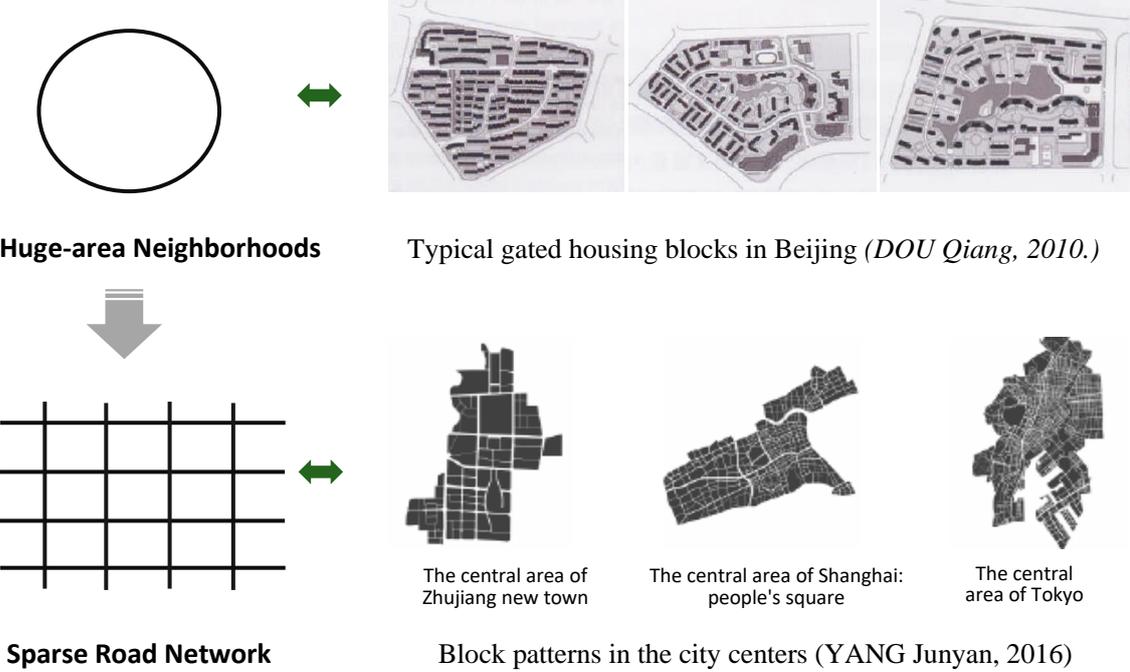
Figure 1.1. The comparison of blocks and road networks between cities.
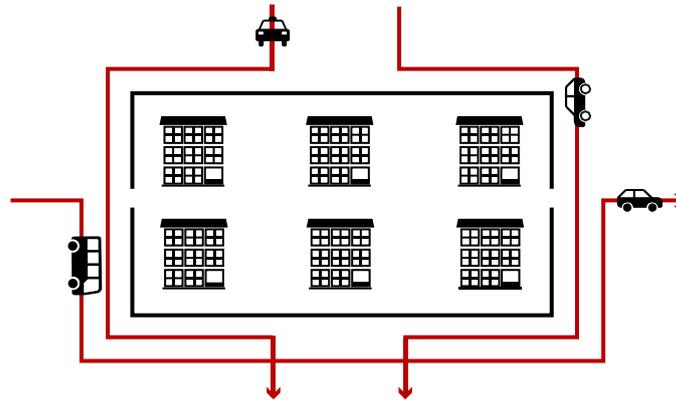
Figure 1.2. Gated Housing Blocks and surrounding roads
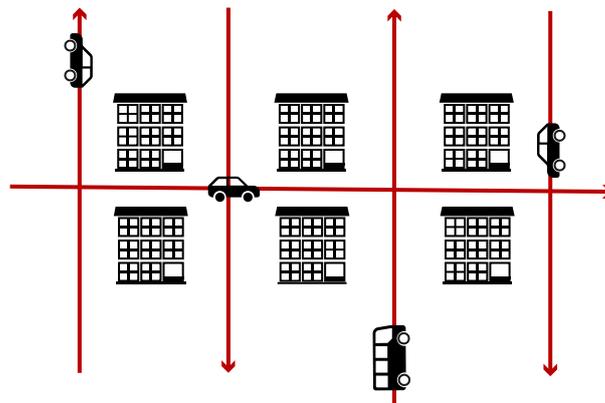
Figure 1.3. Open Housing Blocks and roads go through it (ideal pattern).

1.2. Definition of Housing Blocks

1.2.1. Controversial and Diverging Definitions

To understand the definition of "gated housing blocks" and "open housing blocks" more accurately, a similar concept, gated communities, needs to be clarified. Chinese scholars have been using the same term "gated communities" to refer to gated private housing developments in Chinese cities [6,19–21]. At present, there is no exclusive fixed definitions of gated and open housing blocks in China in academic circles and design codes. Some concepts are borrowed words, such as "gated communities", "closed communities" and "enclosed communities", while due to the translation they are apt to be mixed and confused. The term of gated communities described in "Fortress America" has certain differences with Chinese gated settlements.

1.2.2. Open housing blocks

The guideline is implemented in residential blocks, which involves various internal spatial

elements of residential blocks and the external relationship between residential blocks and urban space. According to this guideline, many housing blocks have been constructing among Chinese cities, most of which is the transformation of existing gated housing blocks (GHB). The new form of neighborhoods that meet the policy guidelines after transformation is called open housing blocks (OHB). The "open housing blocks" is a literal translation of "开放街区" in the guideline. It comes to describe a category of residential areas. Without boundary walls, internal roads of this open housing blocks will connect with urban roads for public use.

1.2.3. Gated housing blocks.

Different from the suburban island distribution in United States, Chinese gated housing blocks exist in various districts of cities. With diverse prices, this kind of gated communities served all social classes. Moreover, on the scale characteristics, most Western gated communities have the characteristics of small scale and low density, while, in China, more gated housing blocks have the characteristics of large scale and high density. From the closed degree, gated communities are often wall distance, taking strict security measures, and need identification to enter residential areas. Chinese gated housing blocks are mainly isolated from lowwalls, fences or green belts, and might be equipped with guards [22]. As above, the socioeconomic connotation of gated communities in the US is not applicable to many gated housing complexes in Chinese cities including private housing complexes for low-medium income households (affordable housing), work-unit compounds, and traditional housing complexes [20]. In other words, "gated housing blocks" in China is a broader concept than "gated community" in the US, and it emphasizes more on the physical form of enclosure, not the legal and social aspect.

In this research, the "gated housing blocks" is defined as a China-typical residential quarter in this study, which is surrounded by walls, fences or vegetation and equipped with several gates as entrances. It is written as "gated housing blocks" in order to be corresponding with the "open housing blocks".

1.3. The Purpose of this Work and Its Significance

Since a large number of such kind reconstructions will take place across the country, it is important to understand what this reconstructed housing block (OHB) is. This primary question includes three branches: 1. what kind of housing blocks have been reconstructed? 2. What methods have been used to reconstruct these housing blocks? 3. For different types of housing blocks, are the types of reconstructing methods different? The answers to these questions form the main analysis part of this article, and they will be shown in Chapter 5, 6 and 7. The answers to these three sub-questions can be combined to reveal what is the OHB and its actual implementation.

In the reconstructed cases that have been found, the scale, plot and building layout of these housing blocks and their relationship with cities are diverse. According to these different basic conditions, the methods of the open-reconstruction are also not completely similar. Therefore, it is necessary to analyze the types of these housing blocks and the types of reconstruction methods, and to discriminate what transformation methods were adopted/applied in different types of housing blocks. After this, to extract the commonness and typical transformation methods of each type of residential areas, in order to provide other cities a reference for the subsequent reconstruction.

The necessity of this question: It is not the first time that the "open" pattern of residential blocks emerged in China. Since 1999, perhaps influenced by new urbanism or for commercial considerations, some real estates started to develop their so-called "open" residential blocks. They do not emphasize that "internal roads can be used as public roads" but lay the main purpose of serving residents and convenient commercial use. The starting point and spatial form of these "open" are not consistent with the emphasis in the "guideline". However, some scholars began to publicize this so-called open model in order to find a reference for the following broad reconstruction after the policy was first introduced. As above, it is necessary to figure out What is the OHB emphasized by the "guideline "in this special and specific context, and it's also necessary to know its actual form after cases of reconstruction are found.

Significance: Although the "guideline" has been published for more than three years, there are still few cases to be implemented accordingly, and the actual implementation of open

housing blocks is still in the pilot and experimental phase. Therefore, it is of great significance to study how the "guideline" was interpreted, implemented in these cases, and to analyze and summarize their open patterns and types.

1.4. Research Questions

As mentioned above, this guideline is traffic oriented. However, the part towards residential type in it, especially towards the existing gated housing blocks, may bring unexpected impacts on residents' lives. This part of guideline indicates that: New residential neighborhoods must expand the urban block structure. In principle, enclosed residential neighborhoods are not to be built. Existing residential neighborhoods and work unit compounds have to be gradually opened; Transform internal streets into public ones, resolving street layout problems and promoting efficient land use; Open up various types of 'dead-end roads', forming a complete street network, improving overall road connectivity [10].

However, residents have been accustomed to gated housing blocks for a long time, this traffic-oriented transforming of boundary walls and internal roads has changed the living environment, thus has affected environmental behaviors of residents correspondingly. Since there will be a lot of reconstruction throughout the country, it is necessary to understand what this effect is. As the impact from architectural and environmental behavior aspect is still unclear up to now, this research attempt to reveal the influence of spatial transformation on outdoor behaviors of residents. Meanwhile, it also aims to point out in which type of outdoor spaces that residents are affected. These will be learned through a crosswise comparison between an open housing blocks and a comparable gated housing block. After studying and understanding these effects qualitatively and quantitatively, we could put forward reasonable suggestions for the following transformation.

1.5. Scope of this study

Step1-Screening open cases： all open explorations emerged in China are summarized, and then eligible cases based on the conditions described in the policy and the purpose of the paper are selected, the OHB cases from the perspective of its specific context can be clarified

and screened.

For selecting case studies of this research, the following conditions should be satisfied: 1. Newly-built or reconstructed according to the open "guideline" promulgated in 2016; 2. Cases of completed construction; 3. Identified as open housing blocks by official government documents or press releases. After screening, only 5 cities were found to fulfill all filter conditions.

Step2-Fixing samples in a specific area: Type extraction requires multiple samples. Changchun City was selected from the 5 cities because it has 155 housing blocks reconstructed, which ranks 1st in the amount of construction. Further, in order to eliminate the disturbance variables, it is necessary to choose cases with similar external conditions (such as the location and the relationship with the city), thus a specific area, Lvyuan District, was chosen also due to the largest construction amount in Changchun.

In August 2016, the Lvyuan Government introduced an implementation plan of urban renewal to most areas within the Third Ring Road. These areas belong to the old urban district, whose infrastructures and traffic network are gradually unable to meet the needs of urban development. Therefore, combined with the "guideline" of 2016, the urban renewal project was formulated. This project contains several themes, including open-oriented reconstruction project with 24 cases of OHB.

1.6. Structure of Dissertation

Chapter 1: Introduction
- Background, the issue of housing block transformation.
- Definition of open housing blocks and gated housing blocks.
- Research purpose, question and significance.
- Scope of this study, dissertation structure.

Chapter 2: Literature Review
- Previous studies on Housing Block Transformation.
- Policy change regarding block renovation in China.
- Urban morphology and Architectural typology.
- Environmental behaviors and interaction spaces.
- Territoriality.
- Theoretical Framework of this work.

Chapter 3: Review of Chinese Housing Blocks
- Four phases: 1949-1979, 1980-1995, 1996-2000 and 2001 to present.
- Unit compound, community, and real estate (gated housing blocks).
- TOD, TND, Traffic-oriented guideline.
- Challenges and issues of housing block transformation (from gated to open).

Chapter 4: Theoretical Framework and Methodology
- Methodology approach.
- Research methods (semi-structured interviews, questionnaires, Caption Evaluation Method survey, informal site observations).
- Site selection.
- Statistic Analysis.
- Research limitations and delimitations.

(what) **Chapter 5:** The actual implementation of the open-oriented reconstruction	*(how1)* **Chapter 6:** Environmental Behaviors and Spatial Types in Open and Gated Housing Blocks	*(how2)* **Chapter 7:** Territorial cognition, behavior and space of residents

Chapter 8: Conclusions
- The characteristics and types of OHB and open-oriented transformation.
- The influence of open-oriented transformation on residents' environmental behaviors and interaction spaces.
- The influence of open-oriented transformation on residents' territoriality.
- Improvement approaches, regulation and proposals.
- Future work for the study of housing blocks transforming (further open).

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Chapter 2. Literature Review

This chapter reviews the literature from two aspects, it includes the implementation of transformation policy and theoretical approaches related to typo-morphology, environmental behavior and territoriality. The first part introduces policies in detail: policy change regarding block renovation in China in 2016 and the further opening policy in 2018. The second part introduces existing theoretical approaches and also develops these approaches to be appropriate for this research.

2.1. Transformation from Gated Housing Blocks to open

The author defines "gated housing blocks", a spatial concept, as a China-typical residential quarter in this series of researches [1]. Its verbatim contrasts to the "open housing blocks" which issued by the guideline and differs in both social construction and social implication from gated communities in the US based on profound differences in cultural, social, and architectural history [2]. Since the government advocated the transformation of gated housing blocks into open housing blocks or open models, some researchers have paid attention to such renovations. Kan suggested that gated housing blocks should not be denied completely, and a modest approach should be laid on the reconstruction [3]. Zhang focused on the peri-urban area, he thought gated mode is a new institutional tool of social management for those areas and the consequences of the gated village are in general positive [4]. Sun didn't take a position for or against the opening of gates but merely asked how the movement potential of a heavily gated city would change if gates were opened [5]. Zhao discussed un-gating the gated housing block based on the spatial restructuring of a resettlement neighborhood, he points that the restructuring usually occurs through a top-down approach, and residents have little influence regarding the neighborhood planning [6].

Scholars have explored the situation of the gated housing block and its transformation into open pattern from the perspective of policy formulation, policy implementation, urban vitality and even the development of peri-urban area areas. However, less attention has been paid to the change of residents' feelings (such as territoriality) caused by this spatial transformation, even

the residents are most directly involved.

In the two years since the policy was enacted in 2016, some researchers, national press and local news report have also responded to the question. From the sociality and the policy level, they have combed the development of the closed block and the possible impact of the transformation [7–9]. Experts from the China Urban Planning and Design Research Institute and the National Development Reform Commission have also largely expressed their support. In their opinion, the reforms would help to transform Chinese cities into "truly modern ones that are open and defined by their public places and services" [10] (Xinhua News 2016b). While on the other side, some researchers are still skeptical of this massive reconstruction, and

The reform guideline still faces many problems of policy enforcement and legal contradiction. As of December 2016, the guidelines have been deemed to be policies at the party and state levels. According to the Supreme Court of the People's Republic of China, the reforms would still have to be legalized because they implicate property rights issues related to the affected owners and business operations [11] (Li 2016). Some experts have suggested that there ought to be a transition phase to prepare and implement complementary policies that would address the potential tensions arising from the guidelines [12] (Guangzhou Daily 2016), and the complementary policies should relate to property management, security and property rights, as well as the planning and allocation of public amenities and services [13] (Han and Wang 2016). Kan argued for more tempered, light-handed approaches and cautioned against a complete rejection of the superblock [7]. The Vice-Minister for Housing and Urban-Rural Development clarified that the initiatives to "open up" existing enclosed neighborhoods and work unit compounds were "not intended to remove their walls", but to "open the gates" instead [14] (Wu 2016a). Although the clarification itself is still somewhat vague, it suggests that the new guidelines will not necessarily usher in the end of gating as a practice. However, in many cities, reconstruction of existing gated housing blocks has already begun and

has been completed in some places. The authors conducted screening and sampling of cities in China prior to April 2017, involving open housing blocks and reconstructed gated housing blocks, and found different phases of reconstruction in Beijing, Chengdu, Zhengzhou, Changchun, etc. It cannot be neglected that the physical conditions and space environment of closed residential areas have been transformed already. Therefore, it is necessary to explore the

impact of spatial transformation on the environmental behavior of residents after transformation.

2.2. Policy change regarding block renovation in China

2.2.1. Previous policy

The interpretation of article 16 in the "opinions". It states the popular layouts of current residential districts and points out the gated housing block affecting the urban spatial benefits layout and causing low efficient transportation. In addition, the "opinions" list purposes and measures of building open housing blocks [15]. Interpretation of article 16 by using splitting method:

Table 2.1. Interpretation of the opening policy

Order	Policy text	Significance	Analysis
1	Optimizing the road network structure of blocks	Overall purpose	road rather than traffic network, emphasizing on material form.
2	Strengthen the planning and construction of blocks	More specific purpose	Blocks rather than communities, blocks is a concept of urban form the latter is a sociological concept
3	Promote the development of open and convenient, suitable scale, complete supporting and harmonious housing blocks	Ditto	Respectively from the social attributes (open and convenient, harmonious), spatial scale (appropriate), facilities rationing (complete) to emphasize the value of blocks and the quality of life
4	Promoting block system in new residence, no longer building gated housing blocks in principle	Purposes and means	Building the new principle, negating gated housing blocks
5	Opening built communities and unit compounds gradually, solving problems of the road network layout, promoting land conservation	Implementing measures	Making internal residential road public in order to relieve urban traffic pressure
6	Establishing a road layout concept of "narrow road, dense network"	Establish a form of road network	Stating the form model of perspective traffic network
7	Smoothing broken roads, forming complete road net, improving traffic accessibility	Technological measures	Emphasizing on traffic connectivity and accessibility

Overall, the policies present opportunities and challenges across three different but inter-

related areas: (1) design and planning; (2) law and property rights; and (3) socio-political realities in the neighborhoods. The following section is organized into a discussion along these three areas. While it may seem more straightforward to rework the bounded super- blocks from a design perspective, the greater challenge lies in reconciling the tensions between the existing property owners and the local planning agencies because of the property rights issues and the socio-political realities in the neighborhoods.

2.2.2. Current policy

After a few years of implementation of the 2016 "guideline", scholars' views on open housing blocks have been further extended. They believe that the construction and development of open residential areas in China should not only remove the physical space wall, but also focus on psychological activities of residents towards urban public life, and moderately open resources of social space to reconstruct their concept of public life.

In 2018, the new national standard, "Standards for Planning and Design of Urban Residential Areas", issued by Ministry of and Urban-Rural Development supported this idea. In the new Standard, the organizational structure and constituent units of urban residential area were re-divided.

The new structure is based on residents' fundamental living needs of and walking range arriving at public service facilities, taking the reasonable service radius and operation scale of the main supporting facilities into account. With the basic spatial organization of 2-4 hectares of residential neighborhoods, the new hierarchical organizational structure was formed. (residential neighborhoods→ 5 minutes life circle→ 10 minutes life circle→ 15 minutes life cycle).

The concept of openness is forced to develop from "demolition of the wall" to the sharing of public space and facilities. In this trend and situation, both the permeability of residential space and the activities of residents might be affected.

2.3. Spatial morphology and Architectural typology.

The research of this paper is mainly based on space morphology. Morphology starts from the field of biology. It mainly studies the spatial morphological characteristics, structural organization and transformation of organisms. Although the concept of morphology analysis appeared in German geography at the end of the 19th century, the first formal use of "urban morphology" by J. B. Leigh, an American anthropologist, in 1928 was considered as a symbol of morphology as an obvious academic field [16]. The analysis methods commonly used in spatial morphology include qualitative, quantitative, classification and graphic analysis. The research media are urban large-scale plans, urban historical maps, archives and historical documents, and status information of built-up areas.

In terms of the ontological logic of the physical objects of morphology, the analysis of urban planes and the analysis of building types constitute the two basic sources of urban morphological research [17]. Based on these two points, urban morphology and architectural typology from the field of historical geography have been developed. They are represented by the Conzernian approach and the Caniggia approach. On the research path, the former expands morphological analysis from macro to micro: identify and analyze morphological regions, morphological units, plan units, plots, and building fabric, building layout within the plot, etc. The latter builds an analytical framework more from micro to macro: a systematic classification of urban architecture and urban texture. Although there are differences in research ideas, there are many similarities between the two in terms of philosophical ideas and methods [18-19]. Both consider that the material form of a city is readable and analyzable and use it as a research object to reveal its internal organization rules and evolution through morphological analysis.

In addition, the similarities between these two approaches are also reflected in three basic principles[20]: 1. The form of a city is composed of three basic material elements: Architecture and its related space, plot and street; 2. The form of a city can be understood at different levels, and the consensus includes four levels: Building/plot, street/block, city and region; 3. Urban elements must be understood in historical context, because urban form is a process of dynamic and continuous change. It can be seen that morphology, scale and time constitute the three basic dimensions of urban morphology research, and all morphological type research must be

understood in a specific time and scale.

According to the objects involved in the content of this research, the article selects two levels of scale: building / plot, street / block, and combines them to explain the spatial morphological characteristics of Open Housing Blocks.

2.3.1. Spatial morphology (M.R.G. Conzen)

In town-plan analysis, M. R. G. Conzen's ideas, strongly grounded in a German intellectual tradition, though developed in England in the 1950s and 1960s, continue to be highly influential (Slater, 1987; Scrase, 1989; Bond, 1990). This influence is particularly apparent in Slater's elucidation of medieval town plans in the English Midlands (Slater, 1990a), but is also evident in the work on urban morphogenesis undertaken by Polish geographers (Slater, 1989). It extends well beyond the study of towns of medieval origin, which continue to be Conzen's special concern (Conzen, 1988), to industrial cities (Koter, 1990). The immaculate application of this type of analysis to the US cities of Boston and Omaha by M. P. Conzen (1990) should reassure any who doubted its relevance outside the Old World. Furthermore, advances in research in this field have by no means been confined to new empirical applications. Barke (1990) has demonstrated the scope for further theoretical development by exploring deductively the implications of town size for Whitehand's (1972) linking of the fringe-belt concept to building cycles and bid-rent theory. Thus, a concept that started life in Germany in the 1930s (Louis, 1936) and was developed nearly a quarter of a century later by M. R. G. Conzen (1960) is still being energetically pursued.

2.3.2. Architectural typology (Caniggia& Muratori)

Caniggia's contribution was crucial for a number of reasons: primarily for having proven-in simple, general and accessible terms (without, however, oversimplifying the built environment)-the applicability of Muratori's design thought. This was an aspect about which Muratori himself was not exhaustive. Having outlined for instance, Venetian and Roman history, he would ask his assistants to provide solutions for individual stages and specific urban specimens. Therefore Caniggia, by developing the typological method of interpretation-design, made Muratori's 'architectural' thought fully convincing, putting it into practice and providing the experimental support essential to uniting theory and practice.

2.4. Territoriality

Since "territoriality" was introduced into human behavior studies by environmental psychologists in the mid-1960s, researchers have proposed ideas and developed their theories related to it. According to most scholars, territoriality in humans can be defined as a comprehensive mechanism in which people's territorial cognition and territorial behaviors are intertwined together based on their ownership of physical space [21–24]. Literature was sorted from the following three aspects:

2.4.1. Territorial cognition

Altman and Chemers [25] indicated that territorial cognition is a feeling or thought stem from occupying, controlling or personalizing a place, especially concern the cognition of affiliation and dependency on this territory. Sack's opinion supported the former theory, he stated that everyone has a sense of territory, a degree of ownership, and control over physical spaces. Taylor [26] compared territorial cognition with other concepts of similarity, such as personal space and private space, and clarified it furtherly.

2.4.2. Territorial behavior

Taylor listed four main themes of defining territorial behaviors: 1. active defense; for example, residents in gated housing blocks reinforce the main entrance or other gates of their residential quarters. 2. laying claim through the use of marks and signs; in this study, extra covering or other personal maintenance were found on some rest benches (located in public space of the housing block) in case of rain. 3. defense and control over non-spatial and nonphysical entities, Bakker defined this behavior as "an individual exerts control, takes initiative, or accepts responsibility". 4. association to a place due to repeated usage or the passage of time. Altman [27] also mentioned behaviors such as defense response or using markers and signs to reinforce territoriality. He made a summary of that definition as: "a self/other boundary-regulation mechanism that involves personalization of or marking of a place or object and communication that is 'owned' by a person or a group" [28]. Combining with the actual situation, the territorial behavior is defined as a behavior of residents which have changed or influenced the outdoor space in this paper, such as putting personal objects in the

outdoor space for temporary or a long term, reforming the outdoor space or facilities in it, or creating a new space for individuals or groups with shelters and enclosures, etc. (see detailed classification in chapter 4)

2.4.3. Territorial space and its classification

Territories were also classified according to the nature of physical space. [29] Altman has broken human territory into three main categories base on privacy and publicness of them: primary territory, secondary territory and public territory. Altman and Brown [30] complemented the meaning of primary territory. Taylor [26,31] explained Altman's theory in detail and distinguished each territory as well as the continuity flowing between them. Another classification was proposed by Newman (defensible space) in 1972 [32], which divided the territory into four degrees: private territory, semi-private territory, semi-public territory and public territory. Unfortunately, Newman didn't offer a specific definition for his territorial degree theory.

Based on Altman's classification, in addition to the home environment (primary) and urban space (public), there is only one-degree, secondary territory, left for outdoor space of housing blocks, while it was found not enough to describe that complex situation after knowing residents' territorial cognition in the pilot survey. Therefore, the authors adopted Newman's theory but attempted to classify outdoor space into separate territories clearly according to residents' territorial behaviors occurred in these spaces.

2.5. Theoretical Framework of this work

This thesis is about a question answering story of what the open housing block is and how does it influence resident's environment behaviors and territoriality.

2016 Guideline

Start, Background

For solving traffic problems, the central government of the People's Republic of China released a guideline in February 2016 to address "obvious issues" and "urban ills", such as making traffic networks intensive and unclogging the urban roads by two main approaches: (a) promoting open housing blocks with small areas among newly-built residential areas; and (b) reconstructing gated housing blocks by removing bounding walls and connecting internal roads with urban roads.

This guideline is traffic oriented, while the contents towards residential type in it, especially towards the existing gated housing blocks, may bring unexpected impacts on residents' lives such as social interaction and places of it due to the change of space features.

Since a large number of reconstructions will take place across the country, it is necessary to understand what this reconstructed housing block (open housing block) is and what impact it will have on residents.

Open-reconstruction of gated housing blocks

Phenomenon

Open housing blocks?

Questions

Q1: what is the OHB?

Q1-1: What is the OHB in this special & specific context? How is it actually implemented?

Q1-2: what is the OHB in terms of space type?

Q2: How does the OHB affect residents who were accustomed to the gated pattern?

Q2-1: How does the OHB affect residents' behaviors & and the places where behaviors take place?

Q2-2: How does the OHB affect residents' cognition/perception of the outdoor space in their housing blocks?

Figure 2.1. Framework of this thesis

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Chapter 3.   Review of Chinese Housing Blocks

This chapter presents the history of the Chinese housing block since 1949 (Founding of P.R. China). Planning of housing blocks in China has been closely interwoven with social, economic and political changes, and it can be roughly divided into four phases. In the 1950s and 1960s, under the influence of Western Europe and Soviet Union, the neighborhood unit theory has gradually transformed from expanded neighborhood into housing district based on elementary school. However, under the doctrine of "producing first and living second", the planning of residential forms was then stagnated. Entering the 1970s till 1990s, with the recovery of socio-economic conditions, a new theory of community planning was formed with a spatial hierarchy of several levels of housing districts. Since 1998, the development of commercial housing market has brought unprecedented diversity to Chinese housing blocks, housing qualities have been significantly improved, and community planning theory and practice has been gained substantial development. In this background, the gated housing blocks has become the overwhelming dominant residential form in China and accompanied with traffic problems.

3.1. From 1949-1979, residential neighborhoods affected by the Soviet Mode

The idea of being able to build a neighborhood – a residential district with an identifiable core or boundary, that also has a social reality – has been a recurring one in urban planning in the past century or more [1, 2]. Several key approaches have had wide international use. Some are based on the physical superblock or mega-plot, a structure separating pedestrians from fast-moving vehicles and providing a protected area, in this case residential.

In the 1950s, the residential neighborhoods introduced from the former Soviet Union and formed in enclosed group spaces had an important influence in China at the time. This planning form generally has a relatively clear axis. The outer buildings follow the layout of the street and connect with the urban space through the neighborhood interface; This kind of residential form has a north-south and east-west orientation, creating an enclosed external space; The service

public buildings are arranged in the center of the neighborhood, showing a clear sense of order and formalism in general. For example, in 1957, the urban master plan of Beijing formally proposed to use 30 to 60 hectares of communities as the basic unit for organizing the life of urban residents [3].

This planning idea holds that in a socialist city, the social and political life of the people should be organized according to a certain residential area, and the corresponding cultural education and living service system should be configured to combine architecture, urban planning and basic social management. From the perspective of the planning concept, apart from the characteristics that are compatible with certain ideologies and administrative organizations, the Soviet-style residential quarters were not very different from the western neighborhood units at that time, but they were larger in scale [4].

While a largely physical structure, the superblock has been seen as a way to bring people together on shared paths and open spaces; it has also been overlaid with additional services [1]. One way of structuring services, important in China as well as many other places in other countries, has been the neighborhood unit, or the "xiaoqu", typically centered around a school and other community facilities [5]. Finally, neighborhood-level community governance structures have been either integrated into the wider government, representing a form of shadow government such as a homeowner association, or become the product of social activism [5, 6]. As such, while the physical superblock, the physical-social neighborhood unit and neighborhood governance are distinct entities, these can overlap in practice. While some of these neighborhood governance structures may be integrated into planning processes, many are not.

The most influential of these were the perimeter and parallel neighborhoods that defined much of planning and architectural practice since the 1950s [7, 8]. A national debate on the strengths and weak- nesses of the perimeter and parallel designs ultimately ruled in favor of the latter through- out much of the 1960s and 1970s [7]. More contemporary residential estates from the 1980s onwards were constructed in the vein of Modernist super-scaled plats. These were developed at a range of densities and coverages. Superblocks also varied: from traffic calmed to traffic free, from completely walled, gated and guarded developments on parking podiums to relatively porous boundaries that mainly slow through traffic [8].

3.2. From 1980-1995, preparation stage of the gated mode

Several factors generated the bounded nature of existing Chinese superblocks. Before the 1980s, gated "danwei" or work unit compounds and estates defined the residential arrangements in communist China [9]. In the 1980s, China once again listed residential construction as an important part of economic construction, and the development and construction of large pieces was still in the ascendant. In terms of planning ideas, the previous community model has basically continued. From 1986 to the end of the 1990s, the projects of "urban residential district pilots" and "well-off residential demonstration districts" carried out by the Ministry of Construction throughout the country have strong influence and demonstration, making the residential district-oriented planning approach, rapidly spread in cities of different regions and sizes across the country [9, 10].

With the deepening of the reform of China's social and economic system, the functions of "danwei" have gradually weakened, and the residential units produced by the unit system have gradually disintegrated [11]. And also, with the complete disintegration of the unit housing system in the 1990s, the reform of housing marketization, privatization, and the continuous advancement of globalization and rapid urbanization, urban residents have shown a longing for Western lifestyles. In response to the disappearance of the unit system and the weakening of state-level control, access control settlements first appeared in megacities such as Beijing, Shanghai, and Guangzhou, and then quickly spread in China, which essentially ended the era of unit system domination of urban space [9].

With the commodification of housing, early experiments in the design of residential neighborhoods between 1986 and 1990 were organized in the form of housing clusters surrounding central green spaces and recreational facilities [12]. Although the then Ministry of Construction did not mandate the construction of enclosed neighborhoods, the development model stipulated that property developers were responsible for providing the necessary amenities in the project itself. This helped to reduce the amount of public investment to be undertaken by the Ministry, but it meant that the costs of the public facilities were borne collectively by the property owners, prompting developers to exclude outsiders from using these facilities [13].

The danwei or work-unit organization that prevailed from the late 1940s to the early 1990s was the basis of urban community formation and governance. Each danwei was not only the place of employment but very often the place of welfare, health, education, culture, safety and financial support to its workers. Many built their own residential compounds, creating live-work communities that encompassed welfare, employment and governance [14]. A system of governance that operated in parallel to the danwei from 1954 was the residents' committee, or the jumin weiyuanhui. Extending the reach of the Communist Party to urban residents and managing local affairs, each jumin weiyuanhui corresponded roughly to the neighborhood unit or xiaoqu boundaries [15, 16].

With the dismantling of the danwei, the shequ or community emerged as the local administrative structure beginning in the 1990s. This state administration unit can correspond physically to three types of urban spaces: (1) a single danwei or work-unit com- pound, including the residential areas; (2) a single xiaoqu or bounded neighborhood unit; or (3) an urban block [8]. Bonds in the current shequ or community are fostered through the social interactions in the local governance, as well as the common spaces of the neighborhood.

3.3. 1996-2000, rapid development of the gated mode

Even China has begun to reform the housing system for around two decades, this reform had not fundamentally jumped out of the distribution of physical objects under the planned economic system. In June 1998, the State Council decided that party and government agencies should stop implementing physical objects that have been implemented for more than 40 years. The practice of allocating welfare housing promotes the monetization of housing allocation. From July 1, 1998, a continuation of the housing welfare system was announced. After a full 10 years of housing system reform, it has entered a new round of reforms in the marketization of housing construction and the monetization of housing consumption, which has started the privatization of housing assets. New chapter. Judging from the historical data of the country and even Shanghai, Guangzhou, Beijing and other cities, the sales area of commercial housing since 1998 has increased significantly compared to before 1997 [17].

"Gated management" has become a popular form of management in residential communities. According to statistics, from mid-1990 to 2000, 83% of residential communities

in Shanghai were closed in some way. During the same period, Guangdong Province closed 54,000 communities, covering more than 70% of the urban area and more than 80% of the population [18].

In the mid-to-late 1990s, with the differentiation of the living class, modern high-end residential areas in the economically developed areas began to implement modern intelligent dual-channel access control systems. Among them, the entrance of the community is the first road, the visitor must be contacted by the security guard to verify the identity before being released; the entrance of the residential unit is the second lane, and the visual intercom electronic lock device can be accessed by the resident to enter the unit building.

Since such settlements are to prevent outsiders from entering, they are also referred to as the most serious diseases: First, high-end residential areas often occupy good urban landscapes, and once occupied, they are monopolized by residential areas, and the overall sharing of public landscape resources is weakened; Second, the various facilities such as commercials enclosed in the residential area are artificially isolated from the city, and they are self-existing in the source of foreign tourists. Thirdly, the system of "accessing the door" is naturally the more favorable the management, the developers at the moment are large-scale enclosures and the development of the market, which is undoubtedly worse for the traffic of residents and urban congestion. Fourth, developers are keen to build rich areas, which encourages the differentiation of social strata and affects the stability of Chinese society in the future.

3.4. 2001-present, integrity stage and problems appeared

After 2000, the gated housing block has been developed in this background and has become the dominant residential form in China. This kind of blocks covers a large area and is usually zoned by urban arterial roads, whose lengths are 300–500 m. It is isolated by bounded walls, fences, plants, gates, guard houses, etc., and has certain shared community facilities and internal roads inside. The wide existence of this kind of housing blocks has caused some traffic problems such as limited connectivity and low density of road network. Thus, there is a growing need for openness in housing blocks [19-22].

Around 2000, in response to the commercial depression of the two-door access control area, some settlements began to explore the courtyard access control mode, that is, the entrance

commercial street was opened to attract external customers, or to further integrate the external space of the residential center. It is open to the public, and the access control is located at the entrance of each courtyard. For example, in the Shanghai Vanke Youshimei project, a 150-200-sized enclosure group is planned, and the "housekeeping house" access control is set up at the entrance of the group. Access. The "housekeeping house" specializes in the elderly with a good image of over 60 years old. It is mainly responsible for the business of door-keeping, storage, booking, warranty, etc., so that hundreds of residents in each group have a common place. Vanke Property's move aims to create a harmonious and warm family management atmosphere.

Miao Pu (2006) conducted a lot of research on this, starting from unmanned sidewalks, exploring the divided public facilities, and analyzing from the perspective of daily life dysfunction. His research is mainly reflected in these three In terms of closed areas, his description is very appropriate and sharp: "urban cancer" [23].Guo Jing (2012) believes that closed communities have created a "security illusion" for residents, which actually not only destroys the road network texture of the city, but also eliminates the most effective security measure advocated by the American sociologist Oskar Newman: the city " Natural surveillance" [24]. Huang Yaozhi and Su Shanjun (2013) believe that closed communities are unreasonable housing models, which is equivalent to privatizing urban public resource space, which will lead to social discrimination and exclusion. The connection between the residential area and the outside space was suspended, the social network structure was weakened and dismantled due to the impact, the standardization of the residential area, the real estate design and development were affected by the reproducibility, the buildings lost their characteristics, and the city became similar and lost due Characteristics [25].

In order to alleviate the current problem of "urban disease", the State Council promulgated a guideline to transform gated housing blocks into open pattern on February 6, 2016. It is clearly stated that "newly built dwellings in China should promote the block system, and in principle no more closed residential quarters should be constructed. The completed residential quarters and unit courtyards should be gradually opened to realize the internalization of internal roads." The determination to plan urban public space reasonably by replacing gated housing blocks with open housing blocks.

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Chapter 4. Materials and Methodology

In this chapter, the materials and methodology are presented. In this chapter, the materials and methodology are presented.

4.1. Framework and Investigation

After reviewing the literature on theories of various aspects of territoriality, combined with the actual situation in case studies during pre-investigation in August 2017, the theoretical framework of this research was established, followed surveys and analysis were both conducted according to this structure. Finally, this paper determined the classification criteria of territoriality. An integrated survey method and combined analysis methods were applied to investigate territorial cognition, territorial behaviors, and territorial degrees of space areas as shown in Figure 4.1.
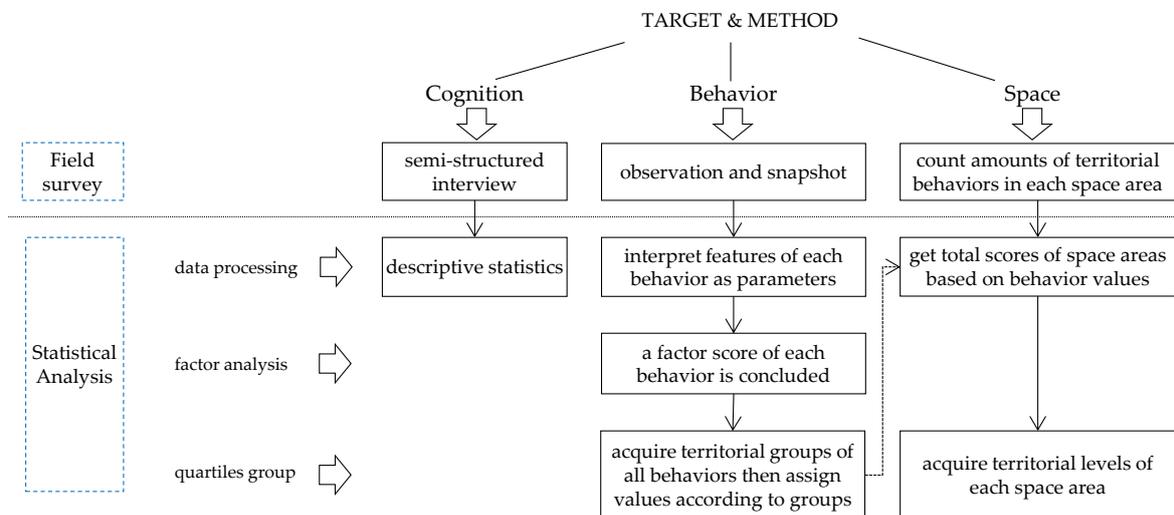
Figure 4.1. Framework.

The data of territorial cognition was conducted by a face to face interview from late August to mid-September 2018, and a total of 107 valid answers were obtained, of which 42 were from the open housing block and 65 were in gated one. Territorial behavior was collected in the same

period, the behavior was identified and recorded by snapshot for later analysis. A total of 183 behaviors were recorded in open housing block and 312 times were marked in the gated group. The outdoor space was divided into various areas for analyzing territorial spaces after acquiring results of territorial behaviors in these areas.

4.2. Identification of Case Studies

4.2.1. Environmental behaviors and spatial types comparison

By April 2017, Beijing, Shanghai, Changchun and six other cities were reported to promote open housing blocks after the opinion was issued, yet most of these cities only stay on the propaganda level and have not begun to implement construction or reconstruction (Figure 4.2). Changchun city, located in north of China and the provincial capital of Jilin province, is chosen as the research area for this study by screening and sampling because of the following reasons (Figure 4.3): 155 housing blocks have been completed reconstruction to open from gated, covering many districts and involving comprehensive categories especially the most general category of residential patterns in China. All these characteristics make Changchun a good sample to represent typical region of China cities for learning the transforming of housing blocks.

Figure 4.2. Features of cases national

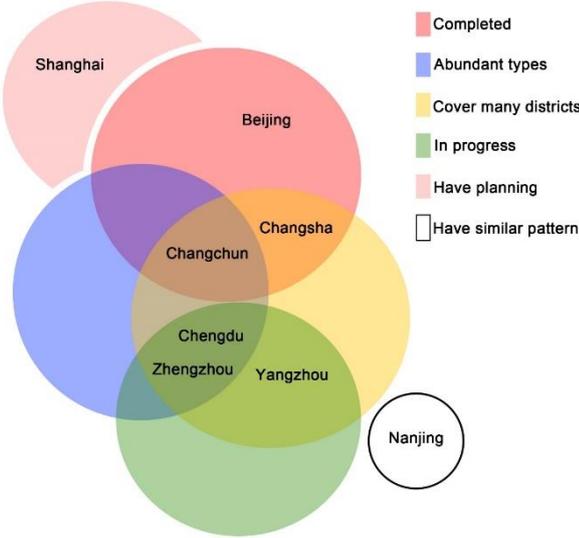| City	Scale	Scope of newly-build or reconstruction	Construction time or reconstruction process	Category	Detailed information	Remarks
Beijing	capital (mega city)	a single residential area (newly-built)	2016~2017 completed	Public Rental Housing	Name：Guogongzhuang public housing; Location: Fengtai district(suburb); surroundings: Surrounded by urban roads, adjacent to the west side of the kindergarten, primary school and public green spaces；Layout：An open housing block consisting of 9 small blocks. Land area: 5.8786 hectares; volume rate: 2.50; high limit: not more than 60 meters; households: the set of 3000.	At present, there is no case in Beijing to carry out the reform of the existing gated housing blocks
Shanghai	province-level municipality (mega city)	a single residential area (newly-built)	Not yet begun	commercial dwelling	There will be the first newly built open housing blocks in Lingang area in Shanghai, however; there isn't a reconstructing example among existing gated housing blocks.	Under planning and design
Nanjing	provincial capital of Jiangsu province (megalopolis)	Not yet begun (reconstruction)	Not yet begun	Not yet begun	Some existing residential areas are similar to the open housing blocks in layout and surroundings. For example, Vanke nine collection is cut into 7 compounds by municipal roads. Hexi real estate and Kaisa city square are both divided into 3 groups. Minerals unit community is separated into 5 groups. Apart from these examples, there is no other information (maps, gov webs, news)	There are no newly built or reconstructing housing blocks in Nanjing currently.
Chengdu	provincial capital of Sichuan province (megalopolis)	The plan is excepted to implemented in 9 districts (reconstruction)	Will be implemented from 2017 to 2018	Unit compounds, commercial dwellings	Chengdu high-tech area, Chengdu Tianfu area, Wucheng area and other 6 districts already have had the regulation of reconstruction by December 2016, and the reconstruction of these gated housing blocks will be basically completed by the end of 2018, so do the satellite cities.	Plan to conduct the open reconstruction in 9 districts.
Changchun	provincial capital of Jilin province (megalopolis)	Seven districts including Luyuan district and Erdao district，155 housing blocks (reconstruction)	From 2016 to 2017 Already completed	Unit compounds, commercial dwellings	Within the area of 166 square kilometers, 39 streets, 221 roads, 155 gated housing blocks, 6 old districts, Changchun city have completed the reconstruction to open housing blocks. The reconstruction quantity of Luyuan district ranks the first in Changchun city. This transformation covers multiple urban districts, involves abundant Construction ages of gated housing blocks. The category of residential areas are also comprehensive.	All existing settlements in urban areas have been completed
Zhengzhou	provincial capital of Henan province (megalopolis)	21 Century community in Jinshui district，Forest community in Jianye district (reconstruction)	From 2016 to ~	commercial dwellings and villa community	21 Century community covers an area of 675 acres, the population reached sixty thousand or seventy thousand. Consisting of fitness square, basketball courts, tennis courts, shops, this big gated housing block is like a small town. Based the planning from local planning bureau, 5 inner roads will be changed to the municipal road.	The reconstruction planning has been completed. Due to strong opposition from residents, it hasn't been transformed.
Changsha	provincial capital of Hunan province (megalopolis)	Kaifu district: Chenjiahu, Xinghe, Jindi, Xiangyuan (four blocks in one district) (reconstruction)	2016~2017	Unit compounds	The action of "Removing boundary wall" was implemented among government units in Changsha city, 115 municipal and county departments and gated housing blocks were transformed to open.	It has been completed, involving a large number of gated housing blocks. While there is only a single type, all gated housing blocks are units compounds.
Yangzhou	provincial capital of Sichuan province (large city)	5 districts (newly-built)	2016~	Newly built commercial dwellings	Guanglin, Shengtai, Binjiang, Xiqu and Jiangwang will be the first five examples to build as open housing blocks.	Under planning

Figure 4.3. Details of open-cases national

Compared with five other districts in Changchun city, Lvyuan district was selected to be the survey area due to the appropriate quantity and categories of housing block reconstruction. After a one-week observation in this district, CHANGKEB and QICHECHANG34 were randomized to be comparable experimental and control groups, as these two sites have a lot in common. CHANGKEB, the reconstructed open housing blocks, is abbreviated as CKB. The gated housing block, QICHECHANG34, is shortened to be Q34 later. The location of cases and the detailed characteristics are shown in Figure 4.4 (p.35) and Table 4.1 (p.36).

Figure 4.4. Location of the case studies.

The open housing block CKB and gated housing block Q34 in this paper belong to the Changchun Bus Factory and the Changchun First Automobile Factory, respectively, which are the unit settlements for employee in the two factories. Changchun Bus Factory and Changchun First Automobile Factory were established in 1954 and 1953, respectively. They are the heavy industrial bases that China's first five-year plan had focused on and have developed rapidly since the reform and opening up in the 1980s. The two existing settlements were built during this period: CKB in 1988 and Q34 in 1985. They are not only similar in socio-economic context, but also have common physical features such as location, area, construction age, building layers, etc. (Table 4.1). This similarity excludes many other factors besides openness, making them highly comparable for this study.

Table 4.1. Details of open and gated housing blocks (from the sub district offices, 2017).

Name	open housing block: CKB	gated housing block: Q34
Location	Lvyuan District	Lvyuan District
Area	60,952 m^2	83,430 m^2
Building density	22%	24%
Age	completed in 1988	completed in 1985
Story	6~7	6~7
Building Amount	21	22
Household	1140	1300
Population	3100	3541
The Aged	28.4%	29.7%
Residents	employees of Changke factory	employees of the Yiqi factory

4.2.2. Territoriality comparison

The reconstructed open housing block, CHANGKEB, is shortened to be CKB later; QICHECHANG34, the gated housing block, is abbreviated as Q34. These two cases are located in Changchun city and belong to the unique but most common residential pattern of China (residential settlements for employees of state-owned enterprises). Changchun city is the heavy industrial bases that China's first five-year plan (1953-1957) had focused on and have developed rapidly since the reform and opening up in the 1980s [3]. Changchun Bus Factory and Changchun First Automobile Factory were two key projects in this stage, and built their own residential quarters for employees in 1985(Q34) and 1988(CKB). Both of them were gated housing blocks until the CKB was reconstructed to be open mode according to the guideline 2016. The employees who lived in these two places at the beginning are basically retired because of the age. They constitute the majority of existing residents, and the other part is their children or relatives and a small number of tenants. Meanwhile, they are very similar in terms of many aspects such as location, size, and population (see details in Table 4.2 next page). In summary, these two housing blocks are comparable in both social and cultural background as well as physical attributes. By comparing Q34 of gated housing block with reconstructed housing block CKB, it is clear to exclude other possible interfering factors and clarify the effect of changes on residential territoriality.

Table 4.2. Basic information of two housing blocks.

Open housing block: Changke B	Gated housing block: Qichechang 34
Location: Lvyuan District	Location: Lvyuan District
Area: 60,952㎡	Area: 83,430㎡
Age: completed in 1988	Age: completed in 1985
Story: 6~7	Story: 6~7
Building amount: 21	Building amount: 22
Household: 1140	Household: 1300
Population: 3100	Population: 31541
The aged: 28.4%	The aged: 29.7%
Residents: employees of Changke factory	Residents: employees of Yiqi factory

Residential land   non-residential land   greening

100 200   500m

4.3. Investigation of Activities in Outdoor Spaces by the Place-Centered Behavior Mapping Method

The investigation was conducted during 4–10 September; two weekdays and two weekend days were chosen to avoid dramatic phenomenon. The routes that consists of six sections and passes through the entire residential area were set in two housing blocks, respectively. The author walked on the predesigned routes, and recorded outdoor activities on the base map by place-centered behavior mapping method. Staying for about 15 min on each section of the route, and making sure the accuracy of information recording, the whole route took around 1.5 h. A 12-h day, from 7:00 a.m. to 7:00 p.m., was divided it into six periods, such that each period could meet the time requirement to finish the whole route. Information was recorded in all six periods per day.

4.4. Data Processing and analysis

4.4.1. Data processing for comparison of environmental behaviors and spatial types

Averaged the amount of behaviors of four days, 1004 behavior points were found in two housing blocks, behaviors of six time periods were recorded and overlapped to be a whole one.

The behavior maps of resident activities of CKB and Q34 are roughly divided into 43 and 41 sections, respectively, according to space locations. The elements of these areas were extracted and classified by factor analysis and cluster analysis for learning the relation of space types and environmental behaviors.

A area refers to the boundary space, where housing blocks has relationship with the public space. In the open housing block CKB, these boundary spaces are totally open to the public, and is defined as Ao area; for the gated housing block Q34, residential areas have relationship with public spaces through gates, and is defined as Ag type.

B area means the intersection space of housing blocks, while internal roads in CKB have been reconstructed to urban roads, this kind of spaces is defined as Bo type; and the similar space in Q34 is Bg type.

C area, the unit front road space, is also divided into Co and Cg type in CKB and Q34 due to the difference of road functions. The typical space of each housing blocks can be seen in Figure 4.6.

4.4.2. Data analysis for comparison of territoriality

For data collecting and analyzing of territorial cognition: The design of question structure is based on the theory from the literature review and draws on Iran and Wang Fang, involving two parts: basic information and territorial cognition (TableA1). The answer was given by the Likert Five-Point Scale. SPSS was used to conduct descriptive statistics and reliability and validity analysis of the data obtained through the interview, and the Cronbach's coefficient is 0.679 and 0.819 respectively in the open and the gated case, indicating a good consistency of the questions about territorial cognition.

The territorial behavior is defined as the outdoor placing behavior, which is abundant in the amount and has obvious characteristics. It is considered to be able to reflect four dimensions of measuring territorial behavior in the theoretical structure.

Firstly, the recording of space-occupying was conducted by snapshot and observation, then interpret the attributes of these placed objects into variables based on the theoretical structure for statistics. After that, factor analysis was used to get the comprehensive score of attribute variables, at last, divided all scores into groups by quartiles. After grouping, the corresponding territorial analysis is performed according to a theoretical basis selected by this article.

For the territorial space: Outdoor space of two housing blocks were divided to be various areas according to the location. After obtained the territorial score and grouping of placed objects, all objects in each space area are counted, and then the quartile statistics are used again to group the space areas. Again, these groups were combined with the theoretical basis. Finally, the territorial characteristics and anomaly values of placed objects and space areas are explained.

Chapter 5.   The actual implementation of the open-oriented reconstruction on housing blocks

5.1. Introduction

5.1.1. Background and Purpose

For consideration of solving traffic problems, the central government of the People's Republic of China released a guideline in February 2016 to address "obvious issues" and "urban ills", such as making traffic networks intensive and unclogging the urban roads by two main approaches: (a) promoting open housing blocks with small areas among newly-built residential areas; and (b) reconstructing gated housing blocks by removing bounding walls and connecting internal roads with urban roads.

This guideline is traffic oriented, while its contents are implemented in residential blocks. It involves various internal spatial elements of residential blocks and the external relationship between residential blocks and urban space. According to this guideline, many housing blocks have been constructing among Chinese cities, most of which is the transformation of existing gated housing blocks (GHB). The new form of neighborhoods that meet the policy guidelines after transformation is called open housing blocks (OHB).

Since a large number of such kind reconstructions will take place across the country, it is important to understand what this reconstructed housing block (OHB) is. This primary question includes three branches: 1. what kind of housing blocks have been reconstructed? 2. What methods have been used to reconstruct these housing blocks? 3. For different types of housing blocks, are the types of reconstructing methods different? The answers to these questions form the main analysis part of this article, and they will be shown in Chapter 3, 4 and 5. The answers to these three sub-questions can be combined to reveal what is the OHB and its actual implementation.

In the reconstructed cases that have been found, the scale, plot and building layout of these housing blocks and their relationship with cities are diverse. According to these different basic conditions, the methods of the open-reconstruction are also not completely similar. Therefore,

it is necessary to analyze the types of these housing blocks and the types of reconstruction methods, and to discriminate what transformation methods were adopted/applied in different types of housing blocks. After this, to extract the commonness and typical transformation methods of each type of residential areas, in order to provide other cities a reference for the subsequent reconstruction.

5.1.2. Necessity and Significance

The necessity of this question: It is not the first time that the "open" pattern of residential blocks emerged in China. Since 1999, perhaps influenced by new urbanism or for commercial considerations, some real estates started to develop their so-called "open" residential blocks. They do not emphasize that "internal roads can be used as public roads" but lay the main purpose of serving residents and convenient commercial use. The starting point and spatial form of these "open" are not consistent with the emphasis in the "guideline". However, some scholars began to publicize this so-called open model in order to find a reference for the following broad reconstruction after the policy was first introduced. As above, it is necessary to figure out What is the OHB emphasized by the "guideline "in this special and specific context, and it's also necessary to know its actual form after cases of reconstruction are found.

Significance: Although the "guideline" has been published for more than three years, there are still few cases to be implemented accordingly, and the actual implementation of open housing blocks is still in the pilot and experimental phase. Therefore, it is of great significance to study how the "guideline" was interpreted, implemented in these cases, and to analyze and summarize their open patterns and types.

5.2. Materials and Methods

5.2.1. Identification of Case Studies

Step1-Screening open cases: all open explorations emerged in China are summarized, and then eligible cases based on the conditions described in the policy and the purpose of the paper are selected, the OHB cases from the perspective of its specific context can be clarified and screened (Table5.1).

Table 5.1. Basic situation of cities with open housing blocks

Order of appearance	Time	City	Urban hierarchy	Construction phase	Defined by	Land usage	Cases
①	1989	Guangzhou	Provincial capital	■	△+◬	●	LiuYun，THsouth2Rd
②	1995	Shanghai	Municipality	■	△+◬	●+◎	Gubei phase1
③	1999	Shenzhen	SEZ	■	△+◬	●	Vanke seasons garden
④	2003	Shanghai	Municipality	■	△	●+◎	CZTZ park
⑤	2003	Wuhan	Provincial capital	■	△	●	Vanke city garden
⑥	2004	Beijing	Capital	■	△+◬	●+◎	Jianwai SOHO
⑦	2005	Dalian	Vice-provincial city	■	△	●	Vanke city garden
⑧	2009	Yibin	Common city	■	△	●	Rhineside estate
⑨	2011	Nanjing	Provincial capital	■	△	●+◎	Vanke JDH，CWJC
⑩	2011	Beijing	Capital	■	△+◬	●+◎	Coastal City of Celo
⑪	2013	Wuhan	Provincial capital	■	△	●+◎	RK city
⑫	2013	Zhongshan	Common city	■	△+◬	●	HJ garden
⑬	2016	Zhengzhou	Provincial capital	□	△+▲	●	21 Century Community
⑭	2016	Qingdao	Vice-provincial city	■	△	●	HSP community
⑮	2017	Nanning	Provincial capital	⊟	△+▲	●+○	Multiple neighborhoods
⑯	2017	Beijing	Capital	■	△+◬+▲	●	GGZ public rental house
⑰	2017	Yangzhou	Common city	□	△+▲	○	Road planning of new town
⑱	2017	Changsha	Provincial capital	■	△+▲	●	Multiple neighborhoods
⑲	2017	Changchun	Provincial capital	■	△+◬+▲	●	Multiple neighborhoods
⑳	2018	Chengdu	Provincial capital	■	△+▲	●	Multiple neighborhoods
㉑	2018	Jinan	Provincial capital	■	△+◬+▲	●	YZS community
㉒	2019	Shouguang	Common city	⊟	△+▲	●+◎	Wanda Area
㉓	2019	Beijing	Capital	⊟	△+▲	●	SJS shared property housing

*Legend: Construction phase (□planning ⊟ under construction ■completed); Define by(△mass media ◬ literature ▲government); Land usage(○traffic ◎commercial ●residential)

For selecting case studies of this research, the following conditions should be satisfied: 1. Newly-built or reconstructed according to the open "guideline" promulgated in 2016; 2. Cases

of completed construction; 3. Identified as open housing blocks by official government documents or press releases. After screening, only 5 cities, ⑯⑱⑲⑳㉑, were found to fulfill all filter conditions (Table 5.2).

Step2-Fixing samples in a specific area: Type extraction requires multiple samples. Changchun City was selected from the 5 cities because it has 155 housing blocks reconstructed, which ranks 1st in the amount of construction. Further, in order to eliminate the disturbance variables, it is necessary to choose cases with similar external conditions (such as the location and the relationship with the city), thus a specific area, Lvyuan District, was chosen also due to the largest construction amount in Changchun.

Table 5.2. construction situations and categories

Construction Age

before 2016	after 2016
①②③④⑤⑥⑦⑧⑨ ⑩⑪⑫	⑬⑭⑮⑯⑰⑱⑲⑳ ㉑㉒㉓

Land Usage

traffic	residential	commercial
⑰⑮	⑬⑭⑯⑱⑲⑳㉑㉓	㉒

Construction Method

newly built	reconstruction
⑯⑰㉓	⑬⑭⑮⑱⑲⑳㉑㉒

Construction Amount

single housing block	multiple housing blocks
⑬⑭⑯⑰㉑㉒㉓	⑮⑱⑲⑳

Category and Hierarchy of Cities

Capital	Provincial capital	Vice-provincial city	Common city
⑰㉓	⑬⑮⑱⑲⑳ ㉑	⑭	⑰㉒

Construction Phases

Planning announced	Stagnation after the	Under construction	Completed
⑰	⑬	⑮㉒㉓	⑭⑯⑱⑲⑳ ㉑

Recognized and Characterized as open by

Government	Literature	Media
⑬⑮⑯⑰⑱⑲⑳ ㉑㉒㉓	⑯⑲㉑	⑬⑭⑯⑰⑱⑲⑳ ㉑㉒㉓

In August 2016, the Lvyuan Government introduced an implementation plan of urban renewal to most areas within the Third Ring Road (Figure 5.1). These areas belong to the old urban district, whose infrastructures and traffic network are gradually unable to meet the needs of urban development. Therefore, combined with the "guideline" of 2016, the urban renewal project was formulated. This project contains several themes, including open-oriented reconstruction project with 24 cases of OHB.
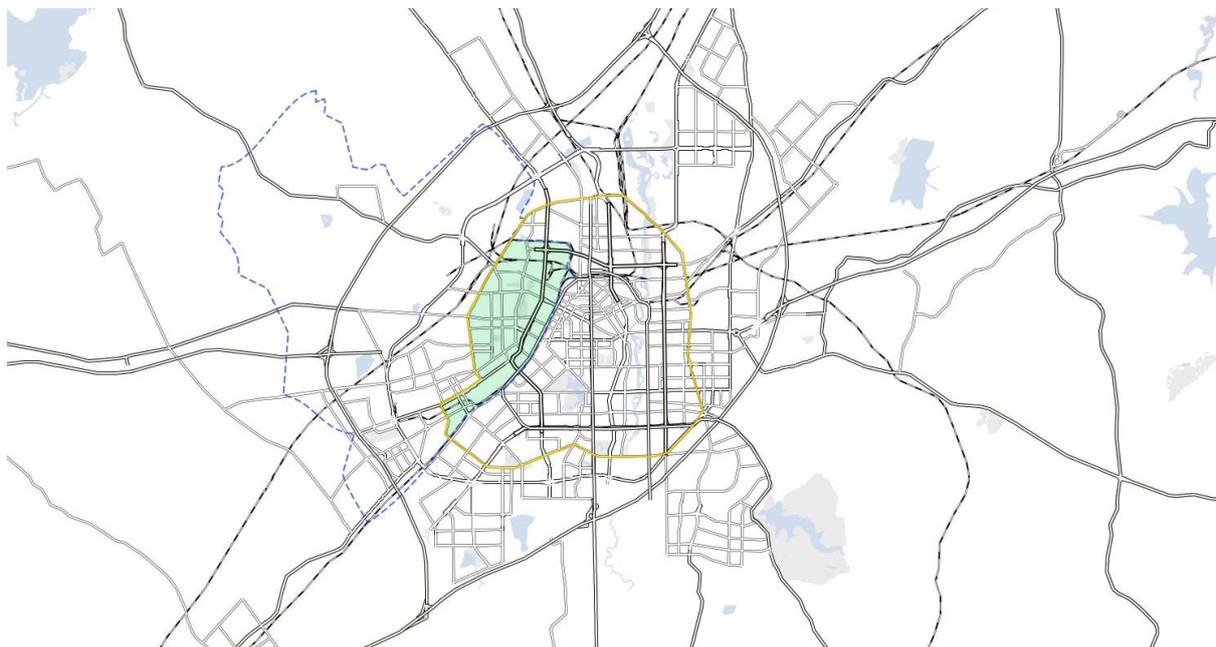

Figure 5.1. Study area: the overlap of the 3d Ring Road and the Lvyuan District (add scale)

5.2.2. Methods of Investigation and Analysis

After reviewing the literature of Typo Morphology, conducting case screening, and grasping the characteristics of the research objects in pre-survey, this paper identifies the research framework and develops an integrated survey and analysis method to answer the primary question.

From August 20th to September 16th, 2019, 24 samples of reconstructed OHB were identified through urban map collection, field survey and measurement. The details of their plot, shape, internal organization and relationship with the urban street roads were also determined. Besides, interviews were conducted with residents and neighborhood committees, and

information on transformation methods was obtained. After that, the above materials were classified and graphically analyzed in section 5.3 and section 5.4 respectively. Then the research contents were transformed into variables to conduct quantitative analysis, cluster analysis, for extracting types of the OHB and types of transformation methods. At last, the results of these two types were qualitatively described and discussed. Finally, the questions of this research have been analyzed and answered through above methods.

5.3. Types Analyzing of reconstructed housing blocks in selected cases

This section mainly refers to the type analysis of the OHB cases.

Since the open-oriented transformation involves three aspects (from inside to outside): 'the internal elements of a housing block', 'the housing block itself', and 'the relationship between housing blocks and urban roads and streets', it's necessary to integrate all these three aspects to extract the commonness and characteristics of residential morphology for learning what OHB is.

These mentioned aspects belong to two hierarchical scales in morphological typology: building/plot and street/block. According to the characteristics of OHB transformation, they were subdivided into five parts: scale and form of the plot, building layout and internal road organization, and the relationship with urban roads or streets. After the specific classification and graphic analysis of these five parts, the results were combined to carry out the type extraction by clustering analysis, and finally, the spatial features of OHB were obtained.

5.3.1. Classifying by scale of the plot

The new urban residential area planning and design standards have been promulgated since December 2018, and the classification and structure of residential areas have been redefined in the standard (Table 5.3). We will examine 24 reconstructed cases based on the above criteria. Before these cases went through an open-oriented transformation, they were gated housing blocks with different volumes, but half of them exceeded the size of the basic units (2-4 ha) in the new regulations, and some cases even reached the size standard of the

superior units (5minute life circle). Referring to the definition of the new regulations, these cases can be divided into three categories: SP1, SP2 and SP3. SP1 is defined as suitable scale, the area of such housing blocks does not exceed the basic units (2-4ha) in the regulations; SP2 is the housing block that exceeds the scope of the basic units but does not reach the upper scope of the 5minute living circle; A housing block whose area has reached the scale of the 5minute living circle belongs to SP3.
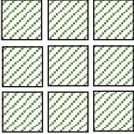
Table 5.3. Spatial hierarchical scale of residential blocks in China

Distance and scale	15min pedestrian scale neighborhood	10min pedestrian scale neighborhood	5min pedestrian scale neighborhood	Neighborhood block
Are (ha)	130-200	32-50	8-18	2-4
Population	50000~100000	15000~25000	5000~12000	1000~3000
Household	17000~32000	5000~8000	1500~4000	300~1000

*Interpretation from "Standard for urban residential area planning and design" (GB50180-2018).

It is presented in Table 5.4, half of the OHB samples belong to the first category, SP1. In the remaining half, two-thirds are classified into the second category, and one-third is divided into SP3. It can be seen that the open-oriented renovation involved housing blocks of various scales, and the quantity of settlements with moderate volume are equivalent to the quantity of large-scale housing blocks. Before reconstructed into the open pattern, housing blocks of SP2 and SP3 did have the quite large gated area to impact urban road network.
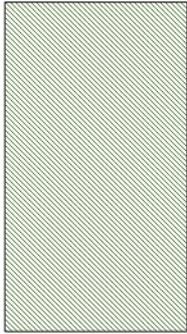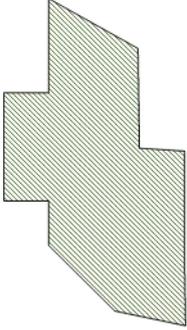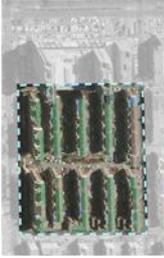
Table 5.4. Scale of the plot of OHB samples (SP)

	Name	Area(ha)	Classification	
H1	HL dormitory	0.55		
H2	SLW dormitory	0.85		
H3	RL dormitory	1.21		
H4	TX garden	1.37		
H5	GH community	1.62		
H6	JM community	1.75		SP1:
H7	JH community	1.76		moderate scale
H8	YL community	1.82		
H9	YZ community	2.03		
H10	513factory dormitory	2.49		
H11	LY dormitory	2.49		
H12	LY new garden	3.8		
H13	ANJ community	4.2		
H14	CK west new garden	4.56		
H15	133factory dormitory	4.92		
H16	CF community	5		SP2:
H17	WX garden	5.16		slightly larger scale
H18	CKB	5.25		
H19	FH new garden	6.65		
H20	MS homeland	7.32		
H21	CK garden	8.68		
H22	New blue city	9.11		SP3:
H23	CY community	9.4		Large scale
H24	WJ garden	14.2		

After obtaining this classification, it's possible for us to compare how the transformation methods different due to the volume of each case in the analysis of the transformation method in Section 5.4.

5.3.2. Classifying by form of the Plot

In addition to the area size, the plot form of housing blocks is also an important entry point for examining OHB morphological types, as shown in Table 5.5. The graphical analysis shows that there are three main types of plot forms in reconstructed cases, of which FP1, the approximate rectangular, accounts for two-thirds. The Irregular-shape FP3 ranks second with 5 samples, and the belt-shape which has 3 cases only follows at the end. The plot form is closely related to the internal organization of housing blocks, and it will also influence the transformation method to adapt to its own shape.

Table 5.5. Form of the Plot

Sort	FP1 Approximate Rectangle-Shape	FP2 Belt-Shape	FP3 Irregular-Shape
Image			
Sample	H1, H3, H5, H7, H8, H9, H10, H12, H13, H14, H15, H17, H18, H22, H23, H24	H4, H6, H21	H2, H16, H11, H19, H20
photo	*H17*	*H4*	*H16*

5.3.3. Classifying by Building Layout

Housing blocks with the same volume or plot form could also show different morphological characteristics due to differences in internal organization, it mainly refers to building layout here. The internal structure of housing blocks varied because of the different building layout. For example, in a housing block where buildings are completely arranged in a determinant settlement or a scatter layout, there is no strong connection between units, nor forming a closed-ended internal group. For such housing blocks, a variety of open transformation methods can be implemented conveniently. While in some s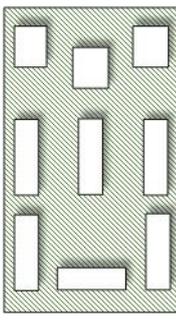amples with wraparound arrangements or mixed arrangements, there will be some internal compounds with a strong sense of enclosure. For this type of housing blocks, the implementation method of open-oriented reconstruction might be slightly limited. It is better not to open or break such internal groups in order to reduce the impact on residents' activities. As can be seen from the analysis in the table below, most OHB samples belong to determinant layout BL1, and a few open housing blocks belong to mixed layout BL4, while wrap-around and scattered arrangement type account for only one respectively.

Table 5.6. Building Arrangement

Sort	BL1 Determinant Layout	BL2 Wrap-around Layout	BL3 Point-group Layout	BL4 Mixed Layout
Image				
Sample	H4, H5, H6, H7, H8, H9, H10, H11, H12, H14, H15, H17, H18, H19, H20, H21, H22, H23, H24	H1	H2	H3, H13, H16
Photo	 H18	 H1	 H2	 H16
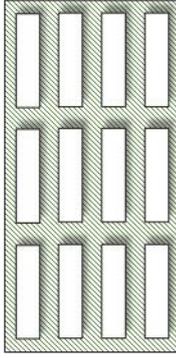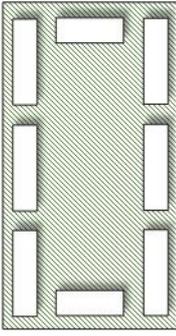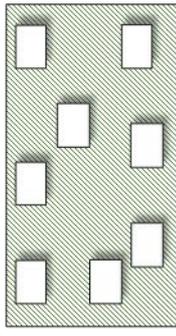
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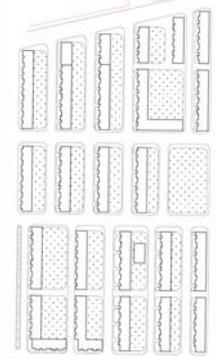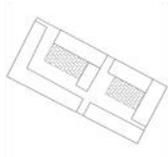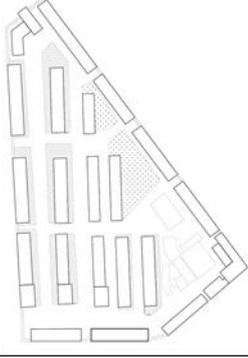
5.3.4. Classifying by Internal Road Network

In the internal organization of the OHB, the road organization is the most important part. Its layout and design directly affect the accessibility and safety of the traffic inside and influence what part of the settlement can be divided from the inside, and it almost determines how to connect internal roads to urban road network when performing open transformation. The road organization and the architectural layout are complementary and closely related but not completely consistent. For example, the road organization in housing blocks of scattered building layout may be wrap-around or cross-through type. This paper classifies the internal road network into four categories according to its structure. Most of them are grid types which is suitable to connecting with urban roads and passing through. A small portion of the samples belongs to wrap-around and mixed roads. Even if they are connected to urban roads for traffic, their organization and direction can hardly be predicted in advance when vehicles attempt to cross.

Table 5.7. Internal Road Network

Sort	IRN1 Grid roads	IRN2 Wrap-around roads	IRN3 Cross-through roads	IRN4 Mixed roads
Image				
Sample	H4, H5, H6, H7, H9, H10, H12, H14, H15, H17, H18, H22, H23, H24	H1, H3, H13, H21	H2, H19, H20	H8, H11, H16
Photo	H17	H21	H2	H16
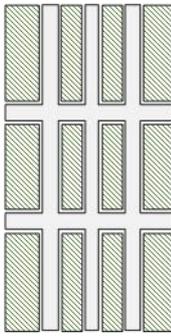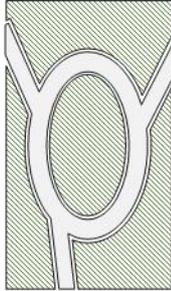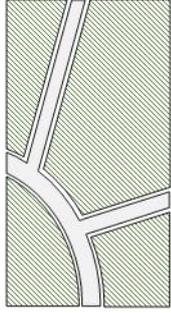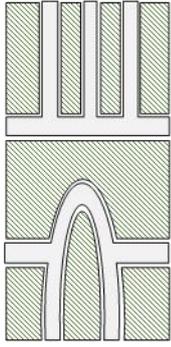
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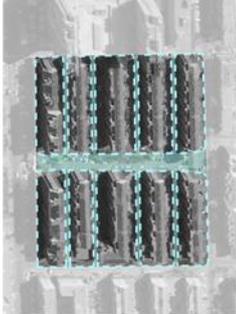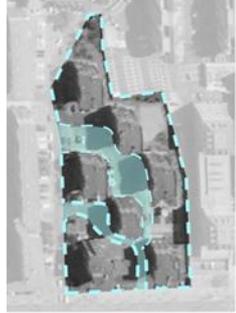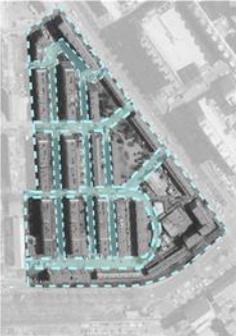
5.3.5. Classifying by Relations with Streets

The location problem discussed here is at a micro-level: to examine the relationship between housing blocks and urban roads, which is also the purpose and focus of the open oriented transformation. As shown in Table8, OHB can be roughly divided into four types according to its relative position: RS1 single-street relation, RS2 double-street relation, RS3 street corner relation and RS4 three-street type. The largest number is the three-street RS4 with the closet relationship with urban roads, which also equals to the sum of RS2 and RS3. The relationship with urban roads in samples of RS1 is relatively weak, while the number still accounts for one-fourth of the total. Overall, these samples include various types of OHB-urban road relationship. In three-street cases, internal roads can be connected to the public by opening multiple interfaces, while single-street types have only one option to connect, which shows that the transformation methods for different types of housing blocks are diverse.

Table 5.8. Relations with Streets

Sort	RS1 Single Street Relation	RS2 Two Street Relation	RS3 Street Corner Relation	RS4 Three Street Relation
Image				
Sample	H8, H9, H10, H11, H20, H24	H1, H4, H17	H2, H3, H6, H15, H16, H21	H5, H7, H12, H13, H14, H18, H19, H22, H23
Photo	*H24*	*H17*	*H21*	*H13*
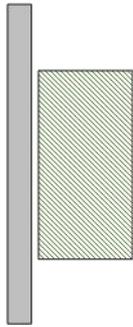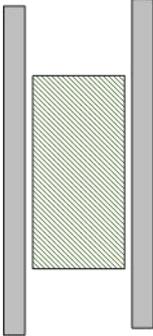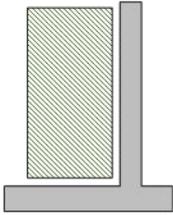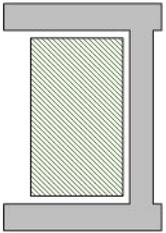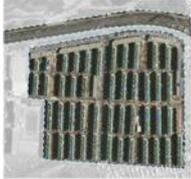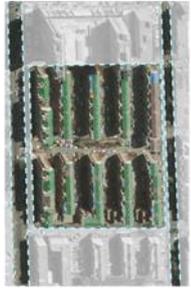
5.3.6. Classifying by Types

After the specific classification and graphic analysis on scale and form of the plot, building layout and internal road organization, and the relationship with urban roads or streets, we obtained the characteristics of OHB in five morphological parts (see appendix1). These characteristics can be combined to answer what the OHB is completely. Thus, all results were interpreted to variables to carry out the type extraction by clustering analysis (SPSS 22.0), and finally, the spatial features of OHB were obtained.

Combined with the actual characteristics of case studies, the clustering results can be divided into five types. The housing blocks of Type I have a plot with larger volume and regular rectangle shape, a layout of buildings and roads in the form of row and column, and a closer relationship with urban roads or streets (RS4). For the open transformation, the basic conditions of such housing blocks are more appropriate, and the transformation difficulty of connecting internal roads with the outside is lower than other types. Type II cases vary in volume and street relationship, but their internal building and road layout are similar, with a combination of IRN2 and IRN4. Even if the housing block of this condition is opened, the connection with urban roads is less than ideal. Samples of Type III have similar building arrangements as the road organization, which is BL1 and IRN4 respectively. The reconstruction of this type is not as difficult as Type II, but it is not closely related to urban streets (RS1), the transformation will not increase its openness and benefit outside too much. The residential areas of Type IV are relatively special, they are narrow and strip-shaped, and the layout is of row and column. The open reconstruction should focus on the middle part. Type V consists of irregularly shaped housing blocks, and they have flexible or dotted layout. Although the above conditions don't seem to be conducive to open renovation, the internal roads of these settlements are connected to the external streets in a throughway, and most of them are the street corner type (RS3) which is closely related to urban roads.
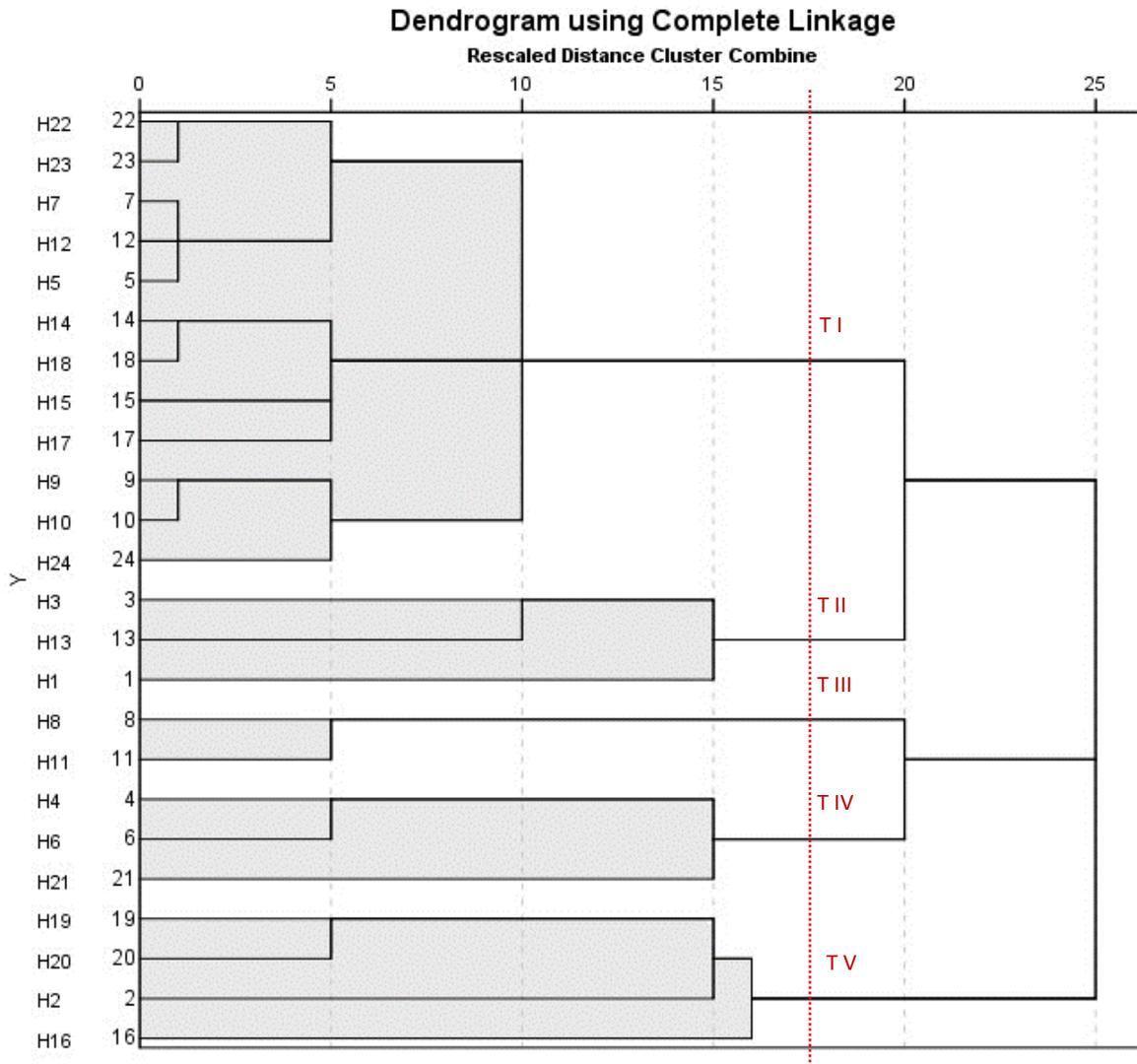
Figure 5.2. Clustering results of OHB spatial features

After steps from 5.3.1 to 5.3.5, types of reconstructed housing blocks and the types of reconstructing methods are acquired. Then Analyze the relationship between these two kinds of types and distinguish the different types of reconstructing methods used in different types of reconstructed housing blocks. After this, extract the commonness and typical transformation methods of each type of residential areas, in order to provide a reference for the subsequent reconstruction.

Table 5.9. Classification of Types (summarize types according to 5.3.1-5.3.5)

Case studies	Scale of the Plot		Form of the Plot		Building Layout		Internal Road network		Relations with Streets
H1	SP1	+	FP2	+	BL1	+	IRN2	+	RS4
H2	SP2	+	FP2	+	BL3	+	IRN3	+	RS1
H3	SP3	+	FP1	+	BL2	+	IRN2	+	RS2
H4	SP1	+	FP2	+	BL1	+	IRN1	+	RS2
H5	SP1	+	FP1	+	BL1	+	IRN1	+	RS4
H6	SP1	+	FP2	+	BL1	+	IRN1	+	RS3
H7	SP1	+	FP1	+	BL1	+	IRN1	+	RS4
H8	SP1	+	FP1	+	BL1	+	IRN4	+	RS1
H9	SP1	+	FP1	+	BL1	+	IRN1	+	RS1
H10	SP1	+	FP1	+	BL1	+	IRN1	+	RS1
H11	SP1	+	FP3	+	BL1	+	IRN4	+	RS1
H12	SP1	+	FP1	+	BL1	+	IRN1	+	RS4
H13	SP2	+	FP1	+	BL4	+	IRN2	+	RS4
H14	SP2	+	FP1	+	BL1	+	IRN1	+	RS4
H15	SP2	+	FP1	+	BL1	+	IRN1	+	RS3
H16	SP2	+	FP3	+	BL4	+	IRN4	+	RS3
H17	SP2	+	FP1	+	BL1	+	IRN1	+	RS2
H18	SP2	+	FP1	+	BL1	+	IRN1	+	RS4
H19	SP2	+	FP3	+	BL1	+	IRN3	+	RS3
H20	SP2	+	FP3	+	BL1	+	IRN3	+	RS1
H21	SP3	+	FP2	+	BL1	+	IRN2	+	RS2
H22	SP3	+	FP1	+	BL1	+	IRN1	+	RS4
H23	SP3	+	FP1	+	BL1	+	IRN1	+	RS4
H24	SP3	+	FP1	+	BL1	+	IRN1	+	RS1

5.4. Distinguish open transformation approaches adopted in housing blocks

This chapter mainly refers to transformation methods adopted on the OHB cases.

As we mentioned, the open-oriented transformation is reconstructing gated housing blocks by removing bounding walls and connecting internal roads with urban roads. Thus, the analysis of transformation methods is mainly on boundary demolition, road reconstruction and the open state associated with surrounding plots. The classification of these three aspects on OHBs will be integrated to explain types of transformation methods.

Distinguish what transformation methods were adopted/applied in terms of elements related to reconstruction and extract specific types.

5.4.1. Classifying by boundary demolition

The transformation of the boundary wall is mainly carried out in three ways (Table 5.10): BR1, BR2 and BR3. BR1 refers to the complete demolition of walls, fences and gates, which means the whole residential buildings and internal facilities are exposed to outside blocks, and fully integrate with the city. This implementation account for more than half of all cases. The BR2's reconstruction method is to remove the gates, fences or walls near the main entrances, making a housing block more open from a single axis or multiple axes, but still retaining some of the walls or fences to maintain a discontinuous, intermittent sense of encirclement, the transformation of this way accounts for around one-third. There is also a small amount of BR3, which doesn't demolish too many walls or fences, but only opens a few parts as entrances, and these entrances are generally only for pedestrians and not for vehicles.

Table 5.10. Boundary demolition

Sort	Image	Explaination	Sample	Photo
Original gated		The original gated type with bounding walls and fences		H2
BR1 Total demolition		Removing all wall-boundaries	H2, H5, H6, H7, H9, H12, H13, H14, H15, H16, H17, H18, H19, H23	H2
BR2 Partial demolition		Removing parts of walls and fences near the main gate (on one direction or two)	H1, H3, H8, H10, H11, H20, H24	H4 H19
BR3 Hardly demolishing		Hardly demolish walls but open some parts of fences to be extra entrance	H4, H21, H22	H21

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5.4.2. Classifying by Road Reconstruction

The second key point of the open-oriented transformation is towards the original internal roads in housing blocks, which has a certain correlation with the transformation of the boundary, also in three ways (Table 5.11). RR1 extends all internal roads and connects them with urban roads, allowing external vehicles to pass through. The number of such implementation is about half. RR2 is to connect the main roads inside with the urban roads from one axis or multiple axes, which also accounts for about half. The RR3 connects few roads to the outside only for pedestrians (with two cases), it restricts the passage of vehicles by limiting the width, manufacturing height differences, or building stairs.

5.4.3. Open state associated with surrounding plots

The final state of the transformation is closely related to surrounding blocks. Whether the open renovation is carried out independently in one housing blocks or along with the surrounding plots is also the key point of the transformation method. Among the three summarized categories (Table 5.12), OS1 refers to a housing block that opens independently. The housing blocks around it are still gated and not interconnected. OS2 means that the surrounding plots have a certain connection with the OHB, but only one or a few main arteries are connected. The OS3 is completely open together with surrounding plots. it not only connected to the urban trunks, but also to adjacent housing blocks, forming a deeper level of openness. These classifications all accounts for about one-third, which are quite even.

Table 5.11. Road Reconstruction

Sort	Original internal roads	RR1 All roads reconstruction	RR2 Partial reconstruction	RR3 Another reconstruction
Image				
Explanation	Internal roads are only used by residents, not for public	Connect all internal roads with outside urban roads for vehicular use.	Connect one or two main internal roads with outside urban roads for vehicular use.	Connect few internal roads with outside just for pedestrian use.
Sample		H2, H5, H6, H7, H9, H12, H13, H14, H17, H18, H23	H1, H3, H4, H8, H10, H11, H15, H16, H19, H20, H22, H24	H21
Photo		*H24*	*H4*	*H21*
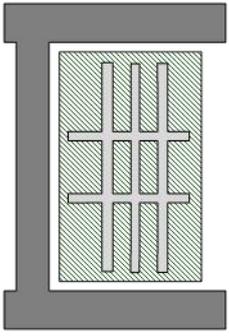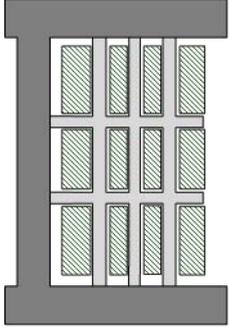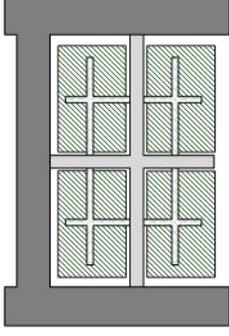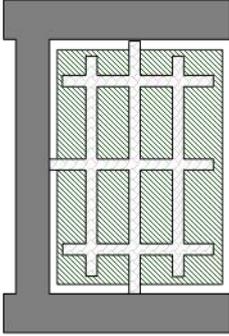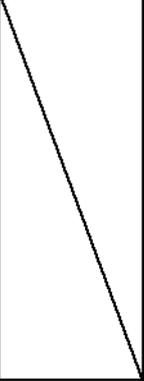
Table 5.12. Open state associated with surrounding plots

Sort	OS1 Open alone	OS2-1 Joint open	OS2-2 Joint open
Image			
Explanation	A housing block opens by itself, not related to the surrounding plots.	Open in conjunction with surrounding plots, one of the housing blocks only opens its main road to connect public.	Open in conjunction with surrounding plots, housing blocks are totally open their internal roads to connect public.
Sample	H1, H3, H9, H11, H17, H21, H24	H4, H8, H10, H13, H16, H19, H20, H22	H2, H5, H6, H7, H12, H14, H15, H18, H23
Photo	\n*H3*	\n*H10, H13*	\n*H18*
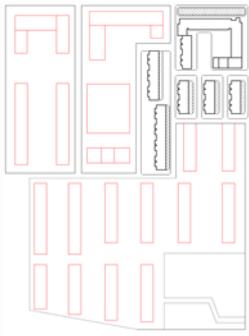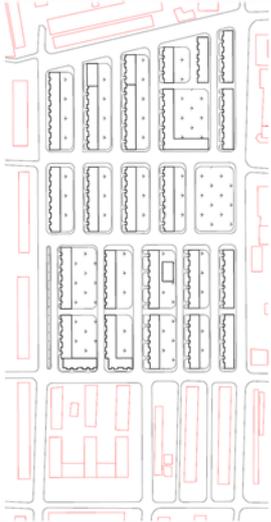
5.4.4. Sub conclusion: Classification of Transformation approaches

The overall approach to open transformation of all cases was implemented by combining the above three measures. After the cluster analysis, these overall transformation techniques can be divided into four approaches (Figure 5.3). A2 and A3 are relatively unique of which, both accounting for only two samples. The A2 is retrofitted with almost no demolition of the wall, only setting a handful of entrances, connecting a few internal roads to the outside for pedestrians only, and opening independent without connection with surrounding plots. A3's reconstruction method is to remove all boundaries, connect all internal roads with urban roads, but still not connect with surrounding housing blocks. The A1 modification method accounts for one-third of the whole samples. It removes some of the boundary enclosures and connects one or multiple internal arterial roads with urban roads for the vehicle. The relationship with the surrounding land parcels is either open or partially open. A4 accounts for more than half of the samples. The walls are completely dismantled, and the internal roads are partly or totally connected to urban roads for vehicles, and the degree of integration with surrounding blocks is higher. From the perspective of overall openness, A4 is more radical; A3 follows behind, but different from the interconnection with surrounding plots; A1 opens moderately in all three measures; and A2 comes last with the most conservative transformation mode, it hasn't changed too much compared to the original state.
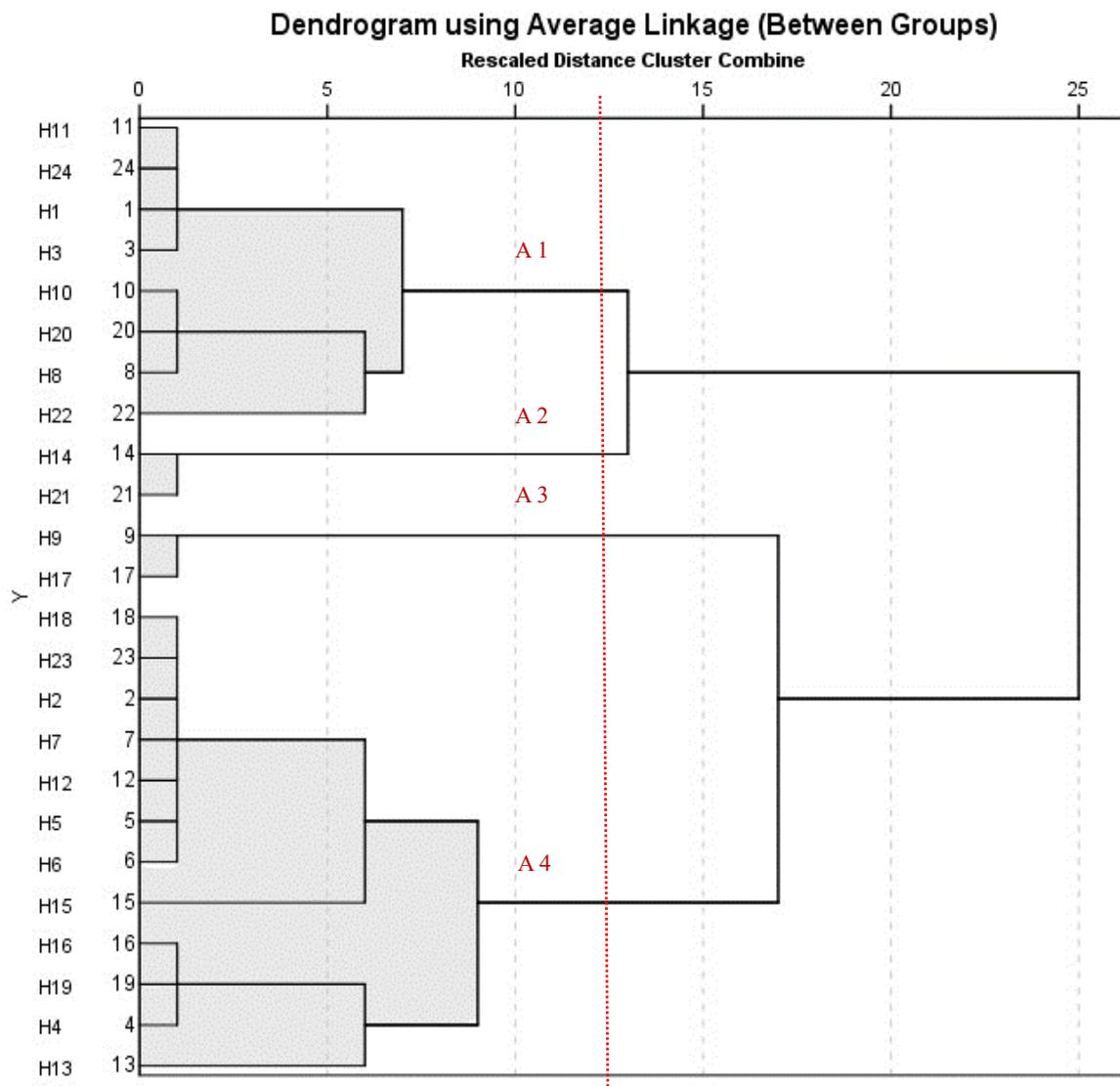
Figure 5.3. Clustering results of transformation approaches

5.5. Concluding remarks

After step3&step4, types of reconstructed housing blocks and the types of reconstructing methods are acquired. Then Analyze the relationship between these two kinds of types and distinguish the different types of reconstructing methods used in different types of reconstructed housing blocks. Their relationship and spatial characteristics are as follows (Figure 5.4):

Figure 5.4. Open transformation approaches in various types of OHB

1) half of the settlements have chosen A4 transformation mode, which involves multiple types except T3. On the other hand, it can be considered that A4, an overly radical and completely open transformation method, may not be suitable for residential areas such as T3, which are not closely related to urban streets and have complicated internal road organization. This transformation method is more commonly used in communities where the layout of internal buildings and roads is simple and clear and has a close relationship with urban roads.

2) One-third of the settlements have chosen A1 for renovation. These settlements involve

many types other than T4. It can be understood that: A1, a milder and moderate modification of all elements, is suitable for most types of settlements, but it is not suitable for the unique strip-shaped settlements such as T4.

3) Only two settlements have chosen A3 reconstruction, and both belong to T1 type. These two settlements are not strange in themselves. They are regular in shape, medium in size, and clear in layout of internal buildings and roads. However, they have applied the A3 mode of "not jointly open with other adjacent plots". It is speculated that because they are surrounded by high-grade urban roads of urban expressways, these roads are not easy to cross and connect to adjacent plots.

4) The last and most unique transformation method, A2, is also only used in two settlements. These two settlements belong to T1 and T4 types, and they do not have much similarity in spatial characteristics (except that the plots are larger), but these two settlements belong to the same state-owned enterprise (Changchun Bus Factory). They have adopted A2, the most conservative transformation method with little change in openness, which may be related to specific social and economic factors.

The open transformation of housing blocks involves three aspects: the housing block itself, the transformation method, and the relationship between them. This article interprets the housing block and the transformation approaches from the perspective of typology and reveals their relationship by combining the former two. Based on a typical region, Changchun City, which has implemented a large number of open-oriented transformation, this paper selects all kinds of available cases. As for the form of housing blocks, we sorted it out from the aspects of scale and shape of the plot, the internal structure of the housing clock, and the external relationship with urban blocks, then summarized the cases into five types. As for the transformation approaches, the analysis was carried out from the aspects of boundary demolition, road reorganization, and joint opening, thus the transformation methods were classified into four types. The five types of housing blocks and the four types of reconstruction methods are intertwined, and we have found suitable and inappropriate combinations. This can provide a reference for the subsequent transformation and make recommendations for the guiding policy of the transformation.

Chapter 6.   Comparing Characteristics of Environmental Behaviors and Spatial Types in Open and Gated Housing Blocks

In this Chapter, an open housing block (which is reconstructed from gated one) with a comparable original gated housing block were compared from perspectives of spatial types and environmental behaviors. The Behavior Mapping Method was used to capture environmental behaviors in two housing blocks; factor analysis and cluster analysis were used to extract spatial characteristics and classify spatial types; and finally differences between the open housing block and the gated housing block were shown by comparing the distribution of environmental behaviors in each space type. The results indicate that the presence or absence of the enclosing walls affects the division of space types and environmental behaviors in housing blocks. For gated housing blocks, spaces with strong privacy attract various types of activities, which are overwhelming in categories and the number of people, while in the open housing blocks, this situation is not as obvious as in the former.

6.1. Introduction

6.1.1. General Context and Its Peculiarities

China's urbanization rate has increased from 17.92% in 1978 to 57.35% in 2016 [1], which was also accompanied by massive housing developments and continuous growth of urban traffic pressure [2–6]. The gated housing block has also been developed in this background and has become the dominant residential form in China. This kind of blocks covers a large area and is usually zoned by urban arterial roads, whose lengths are 300–500 m. It is isolated by bounded walls, fences, plants, gates, guard houses, etc., and has certain shared community facilities and internal roads inside. The wide existence of this kind of housing blocks has caused some traffic problems such as limited connectivity and low density of road network [7,8]. Because of this state, the central government of the People's Republic of China released a guideline in February 2016 to address "obvious issues" and "urban ills", such as making traffic networks intensive

and unclogging the urban roads by two main approaches: (a) promoting open housing blocks with small areas among newly-built residential areas; and (b) reconstructing gated housing blocks by removing bounding walls and connecting internal roads with urban roads [9]. After the guideline was promulgated, the part of transforming residential type immediately ignited the topic and became a domestic focus.

6.1.2. The Purpose of this Work and Its Significance

As mentioned above, this guideline is traffic oriented, while the contents towards residential type in it, especially towards the existing gated housing blocks, may bring unexpected impacts on residents' lives such as social interaction and places of it due to the change of space features [10–13]. The residents have been accustomed to gated housing blocks for a long time; this traffic-oriented transforming of boundary walls and internal roads has changed the living environment and might affect environmental behaviors of residents correspondingly. Since there will be a lot of reconstruction throughout the country, it is necessary to understand what this effect is. As the impact from architectural and environmental behavior aspect is still unclear, this research attempted to reveal the influence of spatial transformation on outdoor behaviors of residents. Meanwhile, it also aimed to point out in which type of outdoor spaces that residents are affected. These aims were pursued through crosswise comparison between open housing blocks and comparable gated housing blocks. After studying and understanding these effects qualitatively and quantitatively, we could put forward reasonable suggestions for following extensive transformation in China.

6.1.3. Research Status

In the two years since the policy was enacted in 2016, some researchers, national press and local news report have also responded to the question. From the sociality and the policy level, they have combed the development of the closed block and the possible impact of the transformation [14–16]. Experts from the China Urban Planning and Design Research Institute and the National Development Reform Commission have also largely expressed their support. In their opinion, the reforms would help to transform Chinese cities into "truly modern ones that are open and defined by their public places and services" [17] (Xinhua News 2016b).

While on the other side, some researchers are still skeptical of this massive reconstruction,

and the reform guideline still faces many problems of policy enforcement and legal contradiction. As of December 2016, the guidelines have been deemed to be policies at the party and state levels. According to the Supreme Court of the People's Republic of China, the reforms would still have to be legalized because they implicate property rights issues related to the affected owners and business operations [18] (Li 2016). Some experts have suggested that there ought to be a transition phase to prepare and implement complementary policies that would address the potential tensions arising from the guidelines [19] (Guangzhou Daily 2016), and the complementary policies should relate to property management, security and property rights, as well as the planning and allocation of public amenities and services [20] (Han and Wang 2016). Kan argued for more tempered, light-handed approaches and cautioned against a complete rejection of the superblock [14]. The Vice-Minister for Housing and Urban-Rural Development clarified that the initiatives to "open up" existing enclosed neighborhoods and work unit compounds were "not intended to remove their walls", but to "open the gates" instead [21] (Wu 2016a). Although the clarification itself is still somewhat vague, it suggests that the new guidelines will not necessarily usher in the end of gating as a practice.

However, in many cities, reconstruction of existing gated housing blocks has already begun and has been completed in some places. The authors conducted screening and sampling of cities in China prior to April 2017, involving open housing blocks and reconstructed gated housing blocks, and found different phases of reconstruction in Beijing, Chengdu, Zhengzhou, Changchun, etc. It cannot be neglected that the physical conditions and space environment of closed residential areas have been transformed already. Therefore, it is necessary to explore the impact of spatial transformation on the environmental behavior of residents after transformation.

6.1.4. Controversial and Diverging Definitions

To understand the definition of "gated housing blocks" and "open housing blocks" more accurately, a similar concept, gated communities, needs to be clarified.

Chinese scholars have been using the same term "gated communities" to refer to gated private housing developments in Chinese cities [6,22–24]. At present, there is no exclusive fixed definitions of gated and open housing blocks in China in academic circles and design codes. Some concepts are borrowed words, such as "gated communities", "closed communities"

and "enclosed communities", while due to the translation they are apt to be mixed and confused. The term of gated communities described in "Fortress America" has certain differences with Chinese gated settlements.

Different from the suburban island distribution in United States, Chinese gated housing blocks exist in various districts of cities. With diverse prices, this kind of gated communities served all social classes. Moreover, on the scale characteristics, most Western gated communities have the characteristics of small scale and low density, while, in China, more gated housing blocks have the characteristics of large scale and high density. From the closed degree, gated communities are often wall distance, taking strict security measures, and need identification to enter residential areas. Chinese gated housing blocks are mainly isolated from low walls, fences or green belts, and might be equipped with guards [16]. As above, the socioeconomic connotation of gated communities in the US is not applicable to many gated housing complexes in Chinese cities including private housing complexes for low-medium income households (affordable housing), work-unit compounds, and traditional housing complexes [22]. In other words, "gated housing blocks" in China is a broader concept than "gated community" in the US, and it emphasizes more on the physical form of enclosure, not the legal and social aspect.

The "gated housing blocks", a spatial concept, is defined as a China-typical residential quarter in this study. It is written as gated housing blocks to correspond with the "open housing blocks". Based on the guideline issued in February 2016, the definition of open housing blocks comes to describe another category of residential areas: without boundary walls, and internal roads of open housing blocks connect with urban roads for public use. The opinions attempt to promote two kinds of open housing blocks: newly-built open housing blocks and reconstructed housing blocks from the gated. Since few newly-built open housing blocks have been founded, it mainly refers to reconstructed type in this research.

6.2. Materials and Methods

6.2.1. Identification of Case Studies

By April 2017, Beijing, Shanghai, Changchun and six other cities were reported to promote open housing blocks after the opinion was issued, yet most of these cities only stay on the propaganda level and have not begun to implement construction or reconstruction. Changchun city, located in north of China and the provincial capital of Jilin province, is chosen as the research area for this study by screening and sampling because of the following reasons: 155 housing blocks have been completed reconstruction to open from gated, covering many districts and involving comprehensive categories especially the most general category of residential patterns in China. All these characteristics make Changchun a good sample to represent typical region of China cities for learning the transforming of housing blocks.

Compared with five other districts in Changchun city, Lvyuan district was selected to be the survey area due to the appropriate quantity and categories of housing block reconstruction. After a one-week observation in this district, CHANGKEB and QICHECHANG34 were randomized to be comparable experimental and control groups, as these two sites have a lot in common. CHANGKEB, the reconstructed open housing blocks, is abbreviated as CKB. The gated housing block, QICHECHANG34, is shortened to be Q34 later. The location of cases and the detailed characteristics are shown in Figure 6.1 and Table 6.1.
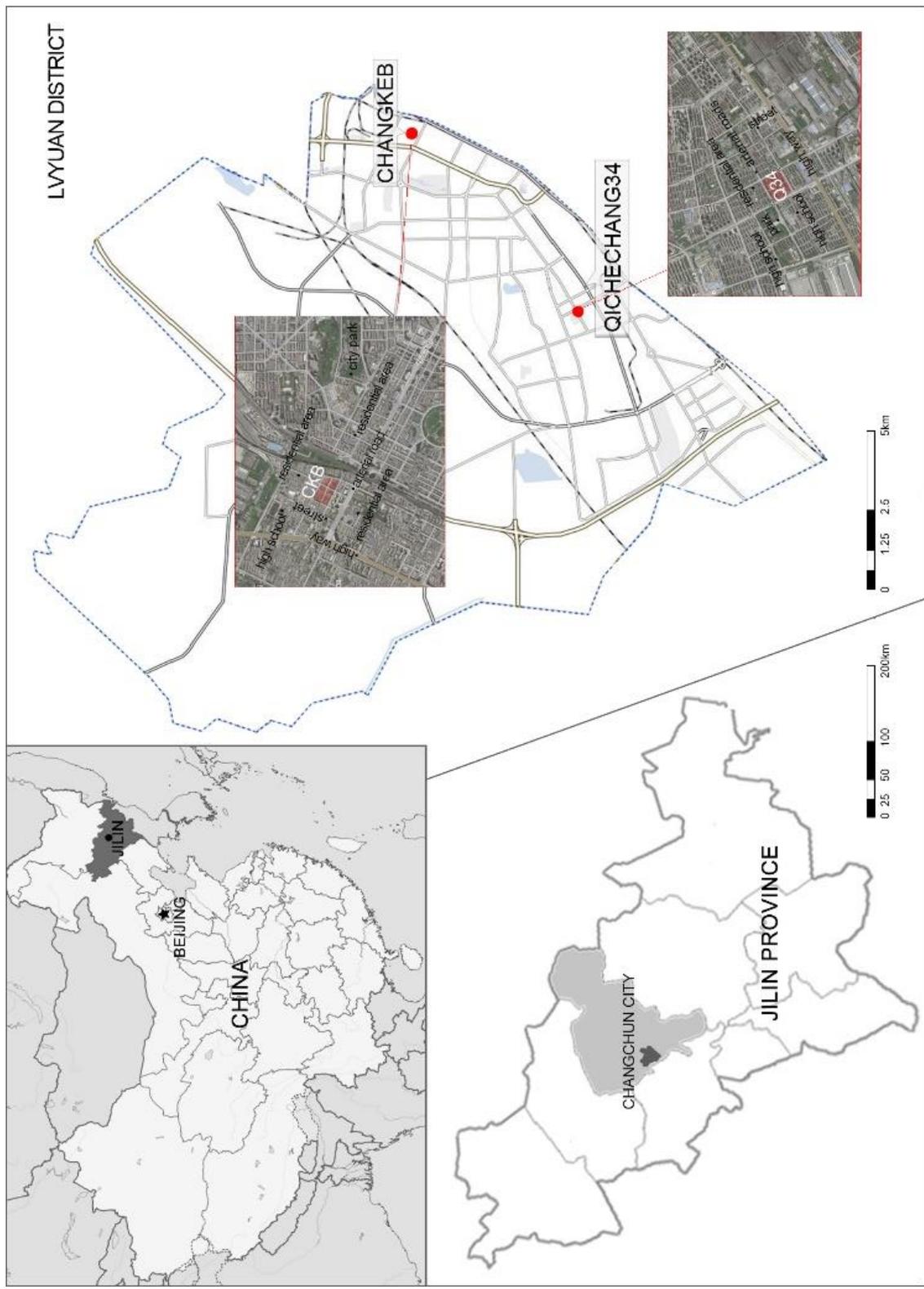
Figure 6.1. Location of the case studies.

The open housing block CKB and gated housing block Q34 in this paper belong to the Changchun Bus Factory and the Changchun First Automobile Factory, respectively, which are the unit settlements for employee in the two factories. Changchun Bus Factory and Changchun First Automobile Factory were established in 1954 and 1953, respectively. They are the heavy industrial bases that China's first five-year plan had focused on and have developed rapidly since the reform and opening up in the 1980s. The two existing settlements were built during this period: CKB in 1988 and Q34 in 1985. They are not only similar in socio-economic context, but also have common physical features such as location, area, construction age, building layers, etc. (Table 4.1). This similarity excludes many other factors besides openness, making them highly comparable for this study.

Table 6.1. Details of samples (from the sub district offices, 2017).

Name	open housing block: CKB	gated housing block: Q34
Location	Lvyuan District	Lvyuan District
Area	60,952 m^2	83,430 m^2
Age	completed in 1988	completed in 1985
Story	6~7	6~7
Building Amount	21	22
Household	1140	1300
Population	3100	3541
The Aged	28.4%	29.7%
Residents	employees of Changke factory	employees of the Yiqi factory

6.2.2. Investigation of Activities in Outdoor Spaces by the Place-Centered Behavior Mapping Method

The investigation was conducted during 4–10 September; two weekdays and two weekend days were chosen to avoid dramatic phenomenon. The routes that consists of six sections and passes through the entire residential area were set in two housing blocks, respectively (Figure 6.2). The author walked on the predesigned routes, and recorded outdoor activities on the base map by place-centered behavior mapping method [25,26]. Staying for about 15 min on each section of the route, and making sure the accuracy of information recording, the whole route took around 1.5 h. A 12-h day, from 7:00 a.m. to 7:00 p.m., was divided it into six periods, such that each period could meet the time requirement to finish the whole route. Information was recorded in all six periods per day.

6.2.3. Data processing

Averaged the amount of behaviors of four days, 1004 behavior points were found in two housing blocks, behaviors of six time periods were recorded and overlapped to be a whole one (Figure 6.3).

The behavior maps of resident activities of CKB and Q34 are roughly divided into 43 and 41 sections, respectively, according to space locations (Figure 6.4). The elements of these areas were extracted and classified by factor analysis and cluster analysis for learning the relation of space types and environmental behaviors. A area refers to the boundary space, where housing blocks has relationship with the public space. In the open housing block CKB, these boundary spaces are totally open to the public, and is defined as Ao area; for the gated housing block Q34, residential areas have relationship with public spaces through gates, and is defined as Ag type. B area means the intersection space of housing blocks, while internal roads in CKB have been reconstructed to urban roads, this kind of spaces is defined as Bo type; and the similar space in Q34 is Bg type. C area, the unit front road space, is also divided into Co and Cg type in CKB and Q34 due to the difference of road functions. The typical space of each housing blocks can be seen in Figure 6.5.

SECTION 5   SECTION 4   SECTION 3   SECTION 2   SECTION 1

(a)

SECTION 6

SECTION 5

SECTION 4

SECTION 3

SECTION 2

SECTION 1

(b)

Figure 6.2. Behavior mapping route: in CKB (a); and in Q34 (b).

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(a) CKB

(b) Q34

Figure 6.3. Environmental behaviors: in CKB (a); and in Q34 (b)

Ao10
Ao11
Ao12
Ao13
Ao14

Ao1,Ao2,Ao3,Ao4,Ao5　　Ao6,Ao7,Ao8,Ao9

Ag12
Ag13
Ag14

Ag1,Ag2~Ag5　Ag6,Ag7　Ag8,Ag9　Ag10,Ag11
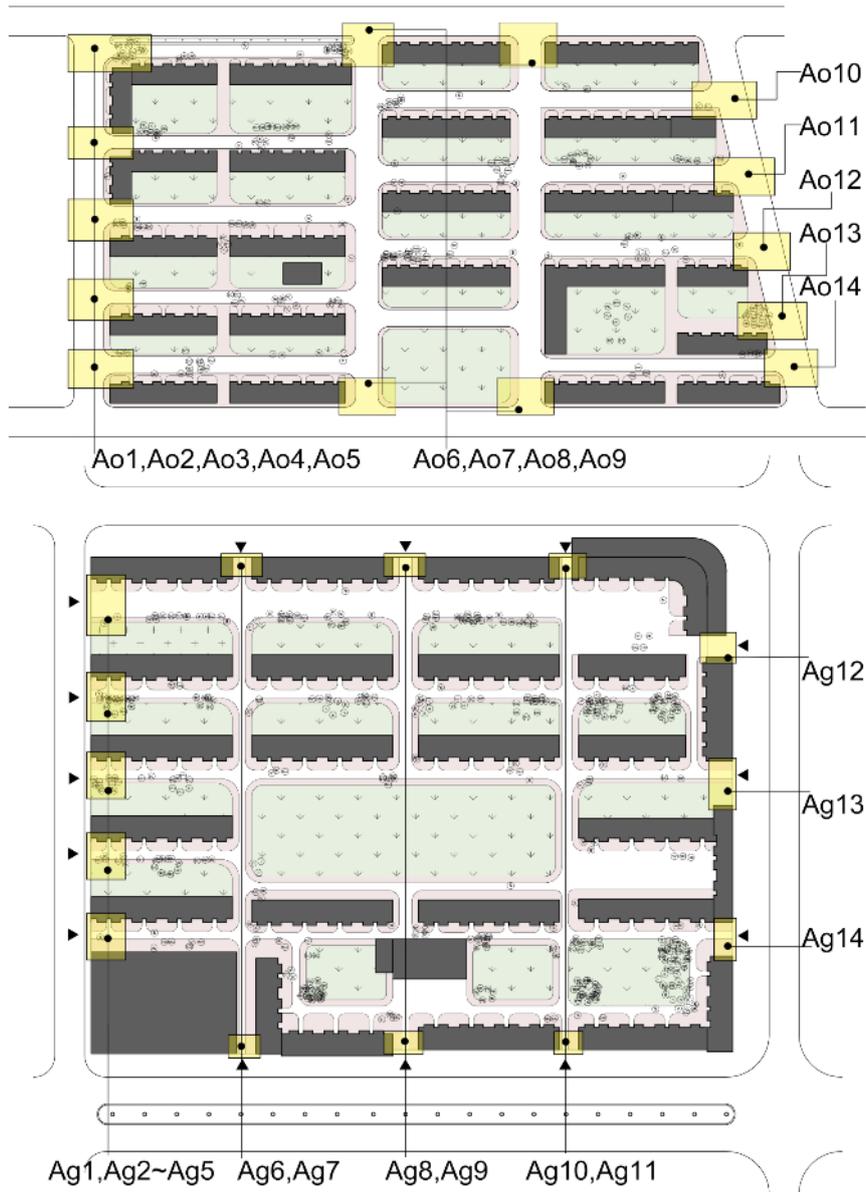
(a1)

(a2)

Figure 6.4 (a). A area-boundary spaces;

Bo1,Bo2~Bo5   Bo6,Bo7~Bo11

Bg1,Bg2~Bg6   Bg7~Bg10   Bg11~Bg15

(b1)

(b2)

Figure 6.4 (b). B area-intersection space;

Co1,Ca2~Co10   Co11~Co14   Co15~Co18

Cg1,Cg2~Cg5   Cg7~Cg13   Cg14~Cg16

(c1)

(c2)

Figure 6.4 (c). C area-unit front road space.

Figure 6.4. The area distribution.
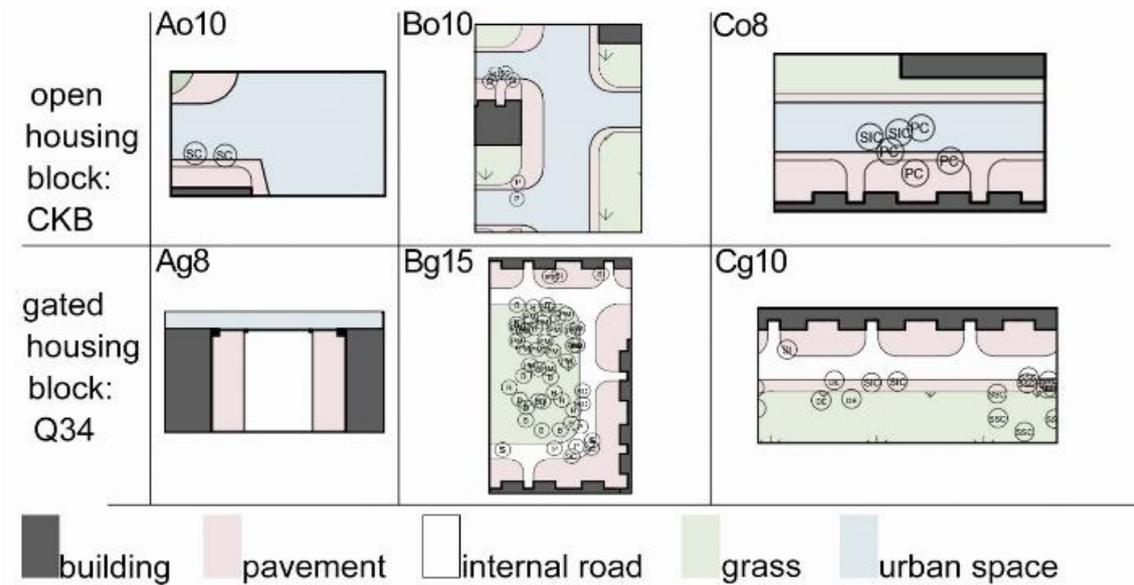
Figure 6.5. Typical areas in CKB and Q34.

6.3. Results

6.3.1. Characteristics of Residents' Behaviors

Behaviors were divided into two main categories based on their movement (Table 6.2): (staying activities) and (non-staying activities). The duration of non-staying activities is very short; people are usually just passing by when they do these activities. Comparing with staying activities, these behaviors are relatively less dependent on the environment and the space. Since we wanted to understand the relationship and its differences between spaces and behaviors, we focused on staying activities, which stay in a certain space longer and are more related to the space. Four kinds of activities are extracted from staying activities: (1. standing activities); (2. sitting activities); (3. certain group activities); and (4. others).

Table 6.2. Behavior frequencies in two housing blocks.

Behavior Frequency in CKB				
Non-Staying Activities		Cycling	37	
		Passing by	94	141
		Walking dog	10	
		Walking baby	33	78
		Walking together	45	
Staying Activities	Standing activities	Standing	17	
		Standing and chatting	25	46
		Standing with cellphone	1	
		Standing with wheelchair	3	
	Sitting activities	Sitting	18	
		Sitting and chatting	77	
		Sitting with tea table	1	101
		Sitting with newspaper	2	
		Sitting together with pets	3	
	certain group activities	Playing cards	22	
		Playing chess	18	46
		BBQ	6	
	Other activities	Kids playing	8	
		Sweeping around	1	13
		Washing car	2	
		Airing clothes	2	

Behavior Frequency in Q34				
Non-Staying Activities		Cycling	14	
		Passing by	103	127
		Walking dog	10	
		Walking baby	34	34
Staying Activities	Standing activities	Standing	18	73

	Standing and chatting	55	
Sitting activities	Sitting	19	169
	Sitting with cellphone	1	
	Sitting with pets	1	
	Sitting and chatting	148	
certain group activities	Playing cards	16	110
	Playing mahjong	60	
	BBQ	34	
Other activities	Kids playing	18	32
	Doing exercise	3	
	Airing clothes	2	
	Washing car	1	
	Smoking	5	
	Sleeping on the bench	3	

In the open housing block CKB, resident behaviors were recorded 425 times, consisting of 219 non-staying activities and 206 staying activities, which is quite equal. Among the staying activities which is more related to physical environment, sitting activities rank first with 101 times; standing activities come next with 46 times, the same as certain group activities; and other activities were last with 13 times. Gated housing block Q34 showed different situation from CKB. Staying activities account were recorded 384 time, more than twice as many as non-staying activities (161). Sitting activities also ranked first in this gated housing block, with 169 times; certain group activities followed with 110 times; and standing activities and other activities came as third and fourth, with 73 times and 32 times, respectively. Although the two ranks are in a similar order, the frequency of human behaviors in the gated housing block are much higher than in the open housing block. Nevertheless, sitting activities were popular in both housing blocks. In addition, gated housing block Q34 had obvious "certain group activities", which is not so obvious in the open housing block.

6.3.2. Spatial Types Analysis According to Classification of Elements in Outdoor Spaces

(1) Classification of Space Elements

Data related to the elements of a space, such as boundary, interfaces, and relation to buildings and roads were collected and tabulated. These elements were classified according to their existence or non-existence in each section (Table 6.3) as 1 and 0, respectively. The spatial elements in CKB and Q34 were analyzed using Factor Analysis method. The result shows that the cumulative contribution rate is over 80% and 70%, respectively. Data can be seen in Columns 1–3 of Table 4.

In Table 6.4, there were negative eigenvalues in Column 1 for features (facing the unit building) and (near the unit entrances), while positive eigenvalues for features (facing the side of the unit building) and (having more than two roads crossed). Therefore, Column 1 compares spaces near unit buildings. The negative eigenvalues in Column 2 indicate constituting elements of closure by (having 2 or more enclosure interfaces), while the positive eigenvalue indicates openness by (adjacent to urban space). Therefore, Column 2 indicates the openness and closure of spaces. The maximum eigenvalue of Column 3 indicates features (having partition between residential and urban space), which is similar to Column 2. Therefore, Column 3 indicates the boundary and closure of spaces.

Table 6.3. Existence and Non-existence of spatial elements in two housing blocks.

Element / Area	Ao1	Ao2	Ao3	Ao14	Bo1	Bo2	Bo3	Bo11	Co1	Co2	Co3	Co18	Ag1	Ag2	Ag3	Ag14	Bg1	Bg2	Bg3	Bg15	Cg1	Cg2	Cg3	Cg16
adjacent to urban space	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
partition b/w residential & urban space	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
having more than two roads crossed	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	1	1	1	1	0	0	0	0
the width of road is more than 6 meters	0	0	1	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0
facing the unit building	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1
facing the side of unit building	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0
having 2 or more enclosure interfaces	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1
having plants	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1
near the unit entrance	1	0	1	0	0	0	0	0	1	1	1	1	1	1	1	0	1	0	0	1	1	1	1	1

Only two columns were extracted by factor analysis in gated housing block Q34. The negative eigenvalues in Column 1 indicated features (facing the unit building) and (near the unit entrances), while the positive eigenvalues indicated features (facing the side of unit building). Therefore, Column 1 compares spaces near unit buildings, which is similar to the phenomenon in CKB. The negative eigenvalue in Column 2 indicates constituting elements of closure by (having 2 or more enclosure interfaces), and the positive eigenvalue indicates openness by (having more than two roads crossed). Therefore, Column 2 indicates the openness and closure of spaces from another way.

Table 6.4.   Rotated Component Matrix of two housing blocks.

Elements	CKB			Q34	
	1	2	3	Axis1	Axis2
adjacent to urban space	0.350	0.855	0.174	0.658	0.709
having partition between residential and urban space	0.155	0.037	0.919	0.658	0.709
having more than two roads crossed	0.847	0.285	0.024	0.194	−0.876
the width of road is more than 6 m	0.340	0.477	−0.527	0.168	−0.562
facing the unit building	−0.885	−0.392	0.018	−0.924	0.028
facing the side of unit building	0.876	0.393	0.022	0.950	−0.147
having 2 or more enclosure interfaces	−0.227	−0.838	0.192	0.037	0.481
having plants	−0.047	−0.753	0.046	−0.611	−0.427
near the unit entrances	−0.915	0.100	−0.030	−0.841	0.307
Cumulative contribution rate	38.01%	29.22%	13.26%	41.88%	29.09%

(2) Classification of Space Types

Spatial types in two housing blocks were summarized by clustering analysis which is widely used in Typological analysis (Figure 6.6) [27]. Four types were extracted in open housing block CKB defined as To (Type of open). Three types were picked in gated housing

block Q34 named as Tg (Type of gated).

In CKB, To1 consists of seventeen Co areas, referring to the area located on unit front roads in open housing block. There are some subtle differences inside, such as Co17 and Co18, which have a cross road. To2 is a special space type because it only made up a single area of Co14. Although it has a similar location with other Co areas in Type 1, Co14 is different from others in the enclosure. It is close to urban space. There is no partition or unit building between it and outside, therefore, visually and spatially, the privacy of Co14 is lower than other Co areas. To3 is formed by all Ao areas, which represents the boundary space in CKB. In this type, Ao7 looks difference with other Ao areas on the interface. It is located between the side face of two-unit building, and it has two solid interfaces accordingly, which is different from other boundary spaces with one only. Areas of To4 all belong to Bo, which are intersection spaces. Bo1 and Bo5 see one difference of location. They are closer to urban space than remaining Bo areas. As can be seen, To2 is the most special type in the open housing block CKB. Before CKB was transformed into an open block, one side of this type is the apartment building, and the other side is the enclosure of the urban space. The demolition of the space elements is similar to other Co areas while dismantling boundary walls made this area separate from other Co areas and became a new type of space, To2. Meanwhile, in the other three types, there are also differences within space types accordingly because of the different spatial elements in each region.
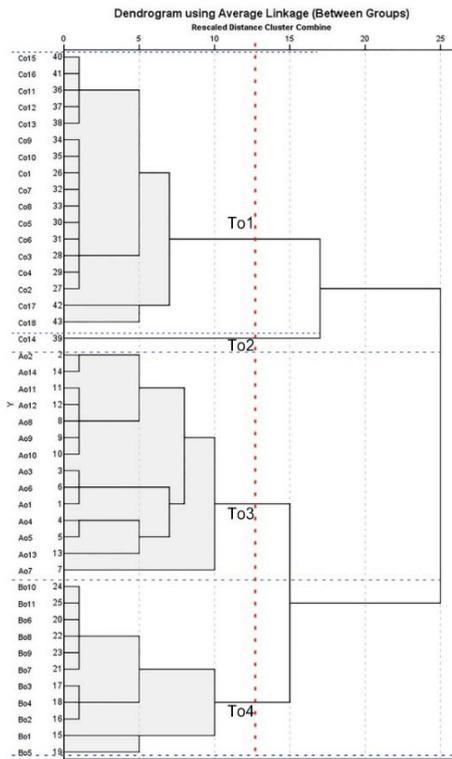
(a) open housing block CKB
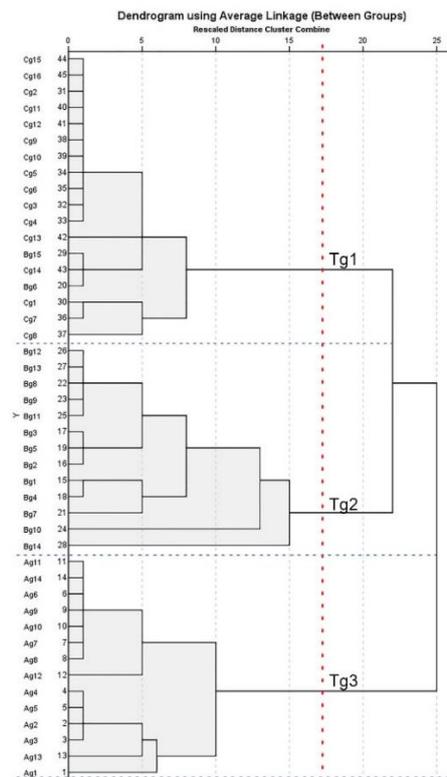
(b) gated housing block Q34

Figure 6.6. Cluster of areas in: open housing block CKB (a); and gated housing block Q34 (b).

In gated housing block Q34, areas are classified into three types only. There are 18 areas belonging to Tg1 (Tg: Type of gated), most of which are located in the Cg area of unit front roads, but Bg6 and Bg15 at the road intersection also belong to this spatial type. There are different spatial interfaces between Bg6 and Bg15 and other intersection areas. These two regions have three solid enclosure surfaces. Compared with other Bg spaces, they have weaker openness. The composition of Tg2 is relatively clear, which is the rest of all Bg regions, and there is no significant difference between this type of region. Tg3 includes all Ag areas, which are boundary spaces. Obviously, the internal difference exists in T3. Ag1, Ag2, Ag3, Ag4, Ag5, and Ag13 are different from other space, as these six boundary spaces are located on the two sides of the residential area and close to the entrance of the cell building. This means that people are more likely to appear in such spaces, while the other Ag spaces are far away from the cell exit.

6.3.3. The Distribution of Behaviors in Space Types

To understand the reflection of behavior on the type of spaces, we compare the distribution of four activity categories in each space type.

In open housing block CKB, 22 areas were recorded to have [standing activities]. As the average frequency in these 22 regions is about 5%, the number of occurrences over 5% is defined as "high frequency". In Figure 6.7, three areas in Type 4 are higher than 5% (Bo6, Bo8 and Bo4), while there are only one or two areas of other types. Twenty-four regions were found to have [sitting activities], and the "high frequency" is also set as 5% similar to the last behavior type. Three regions in Type 3, Ao1, Ao6 and Ao13, exceed this standard. For the [certain group activities], it is noticed in nine areas, thus the frequency standard is defined at around 10% accordingly. Type 1 has several areas whose frequency is higher, especially for Co3 area (17%). For the [other activities], eight regions of this category have other activities. Using the general standards of 10%, Co15, Co10 and Co13 in Type 1 were picked as noticeable areas. As above, each type of space attracts specific activities, particularly for Type 1, which is the high-frequency area of [certain group activities] and [other activities], but the overall distribution is relatively even.
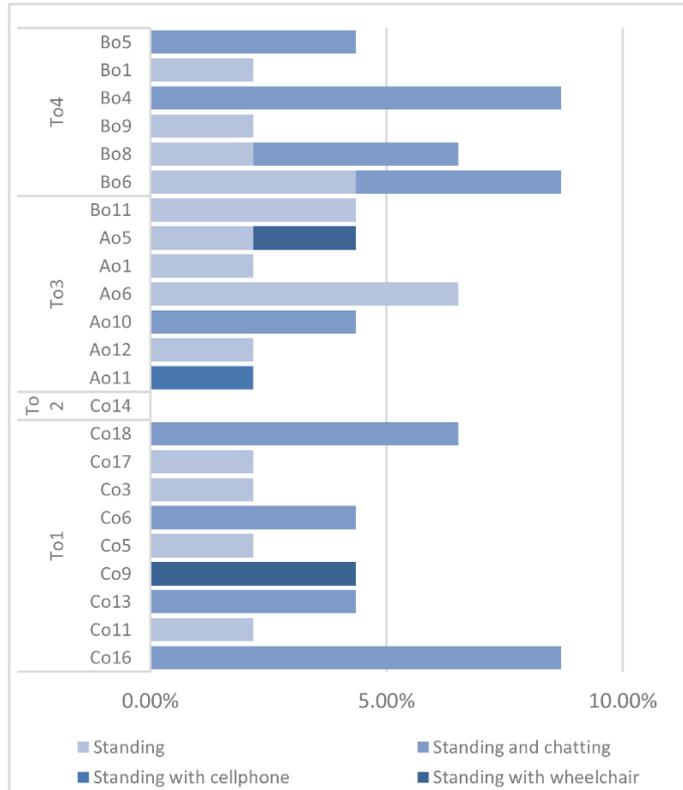
(a) standing activities in open housing block CKB
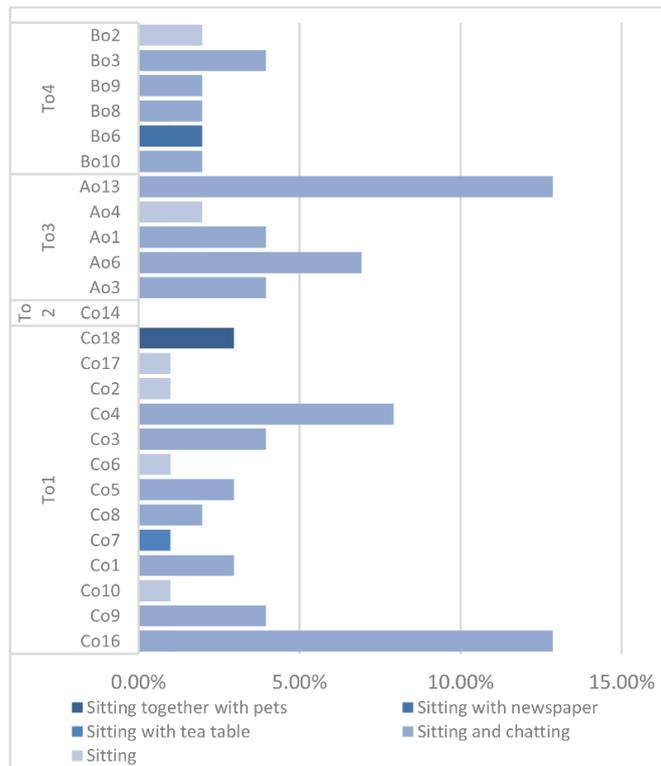
(b) sitting activities in open housing block CKB
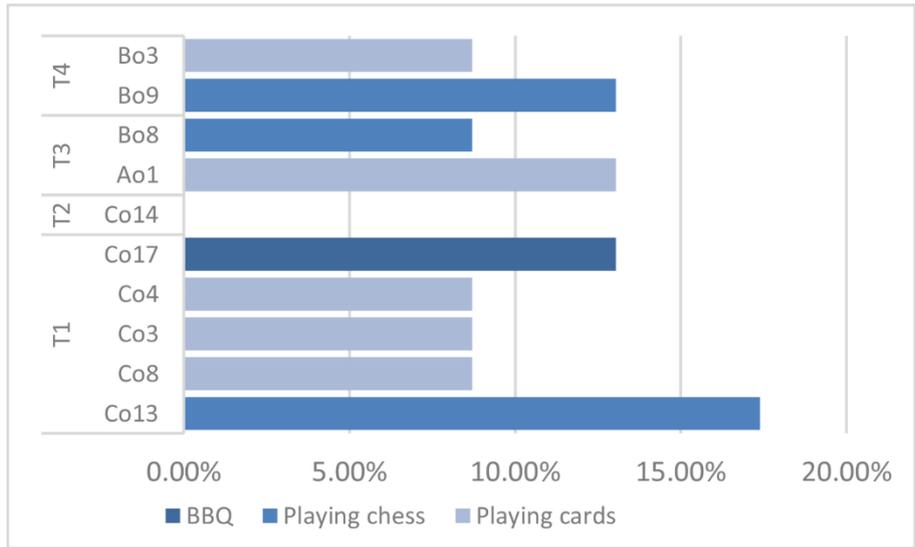
(c) certain group activities in open housing block CKB
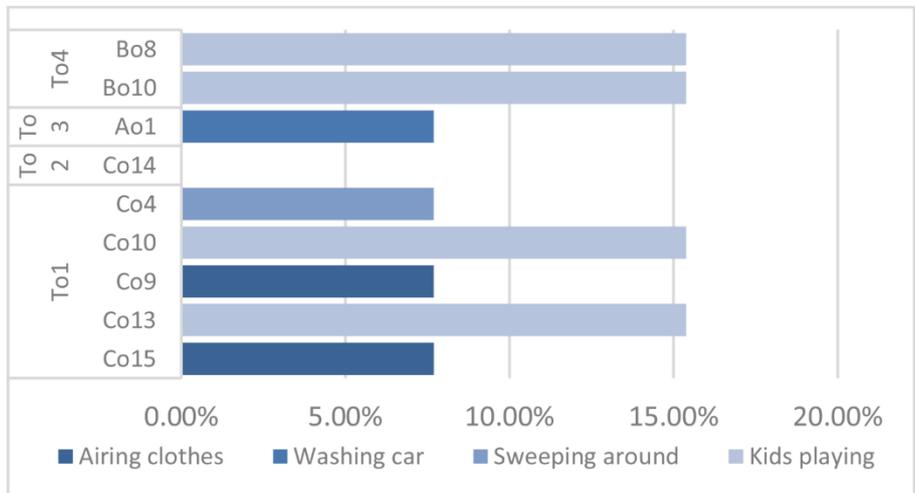
(d) other activities in open housing block CKB
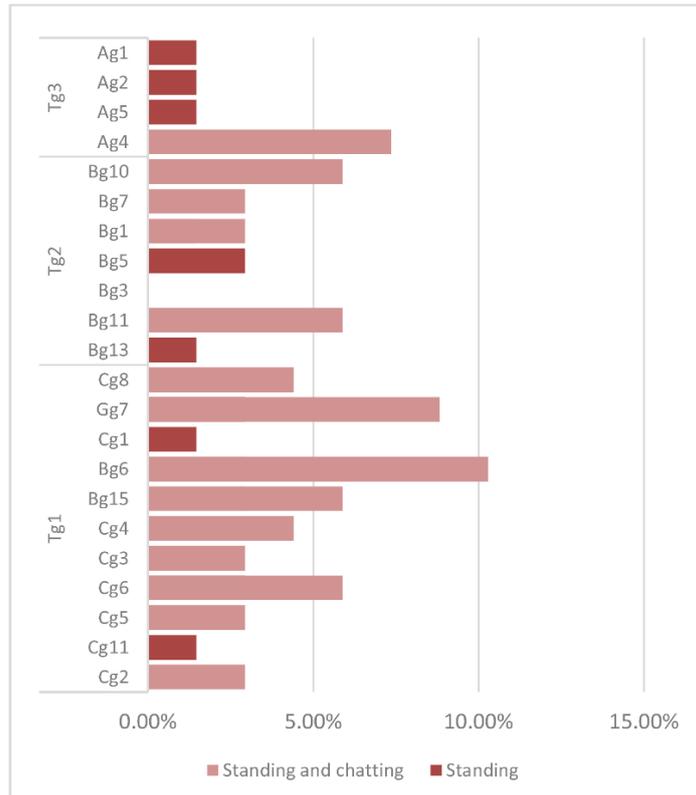
(e) standing activities gated housing block Q34
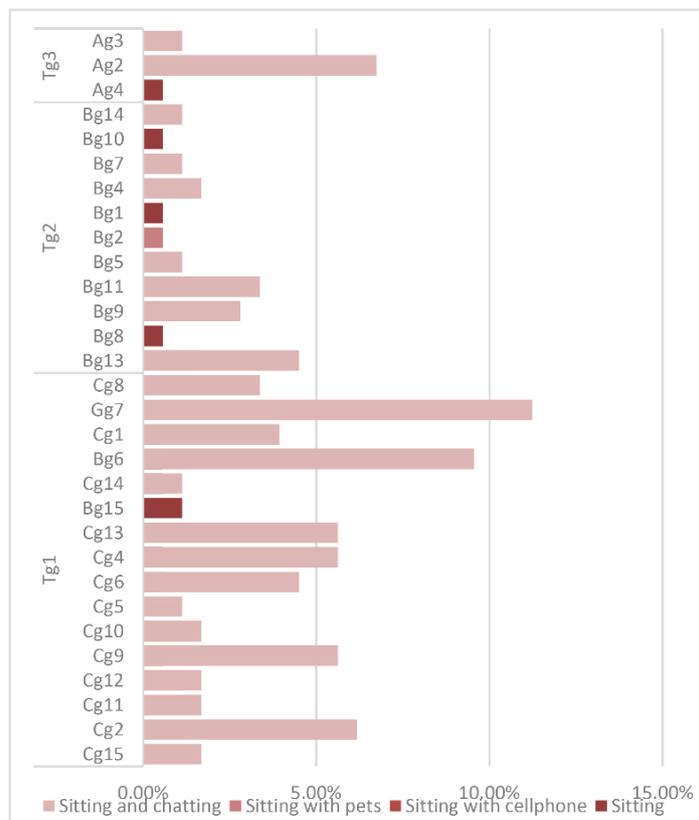
(f) sitting activities gated housing block Q34
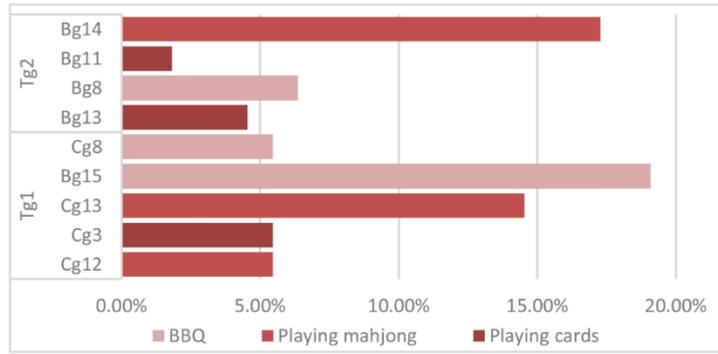
(g) certain group activities gated housing block Q34
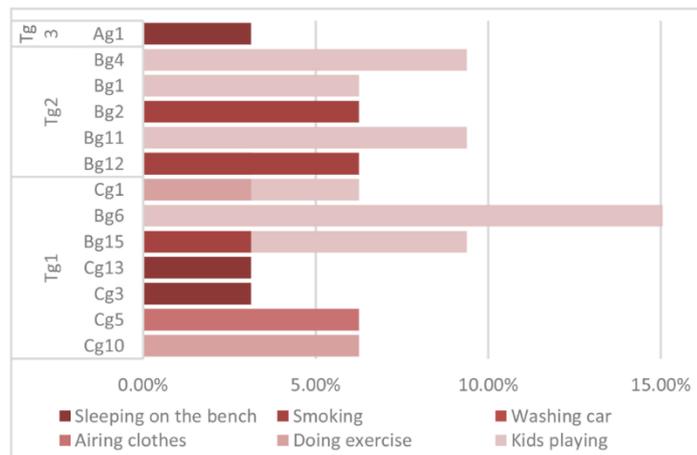
(h) other activities gated housing block Q34

Figure 6.7. Distribution of four activity categories in each space type in open housing block CKB (To1, To2, To3 and To4) and gated housing block Q34 (Tg1, Tg2 and Tg3).

In gated housing block Q34, 21 regions are recorded for the [standing activities]. Since the value of high frequency is set to be higher than the average probability of 5%, four regions in Type 1, Cg6, Bg15, Bg6 and Cg7, looks higher than this figure, especially Bg6, which is about 14%. For [sitting activities], as it is noticed in 30 areas, the frequency standard is defined at around 4%. Type 1 sees higher frequency in eight areas, especially for Cg7 area (10%). Nine regions were found to have [certain group activities], and the "high frequency" is also set around 10%. Two regions in Type 1, Cg13 and Bg15, exceed this standard. Bg15 has a relatively high value of 37%. Thirteen regions of this category have [other activities]. Using the general standards of 8%, Bg15 and Bg6 in Type 1 were picked up to be noticeable areas, and the behavior frequency in Bg6 ranks first, which is higher than 15%.

Different from the situation in CKB, remarkably, four categories of behaviors all show highest frequency of occurrence in Type 1.

6.4. Discussion

The impact of demolishing wall and changing internal roads on the environmental behaviors have not been demonstrated in previous studies yet, while many scholars have explored the impact on environmental behavior with these physical characteristics [28–32]. The importance of bounded walls and internal roads are also confirmed in some series of studies. In the case of open housing block in this paper, the removal of walls and the change of internal roads did affect the division of space types, the attraction of various space types to residents, and the characteristics of the residents' activities. By contrast with gated housing blocks, these effects are presented more clearly.

However, this article has some limitations in the comparative study. It is more accurate to discuss the influence of the transformation by comparing the statuses before and after reconstruction of the same housing block, while, due to the implementation of the policy, the settlement is often in the state of being transformed when it is publicized, and it is difficult to find it in advance and commit research. In addition, some studies have chosen longitudinal comparisons, such as drawing historical maps through interviews and then comparing them with current situation [33]. This kind of comparative study is reliable in presenting the physical features, yet it is not applicable to the study of environmental behaviors because the memory of activities is often vague and easy to change with the passage of time and changes of residential status. In this study, the crosswise comparison was finally adopted, and a fairly comparable control group was paired for the experimental open case, which is similar in area, layout, surroundings, and population. Therefore, the accuracy of this comparative research could be guaranteed to a certain extent.

6.5. Concluding remarks

This research compares open and gated housing blocks, the CKB and the Q34, from aspects of resident behaviors, space types and the distribution of residential behaviors in each space type. From these three aspects, a series of conclusions are drawn.

(1) In the staying activities, which is more related to the space, [sitting and chatting] has

the highest frequency in both open housing block CKB and gated housing block Q34, but the number in Q34 is more than twice as in CKB. As the CKB have in common with the Q34 population and area, this phenomenon is presumed to be associated with a significant difference of two housing blocks, open–closed state.

(2) After the factor analysis of space elements in two housing blocks, it is known that influencing factors in open housing block are "near unit buildings", "openness and closure of spaces" and "boundary and closure of spaces", while influencing factors in gated housing block are "near unit buildings" and "openness and closure" only. Therefore, the spatial classification will be more explicit and steadier in the latter. In the subsequent cluster analysis, the CKB and the Q34 were divided into four and three main spatial types, respectively. In particular, Co14, To2 of CKB was distinguished from other Co areas to be an independent type because dismantling boundary walls changed the elements of this region.

(3) By analyzing the distribution of residents' behavior in space types, we can see that, in CKB, the frequently occurring locations of the four main activities are scattered in the various types of To1, T3, and To4. In these types, Ao13, Bo6, and especially Co13 appear many times. These areas are located at the boundary of the residential area, the road node of the residential area and the position of the unit front road of the residential center. However, there is a more dramatic situation in Q34; all high frequency locations of activities belong to Tg1, of which Cg7, Cg15, and especially Bg6 should be paid attention. These areas are located in the front road of unit buildings, and two of them have three solid interfaces, with a strong sense of space and privacy.

The presence or absence of the enclosing walls affects the distinction of space types in housing blocks. In the case of gated housing blocks, closed space and strong private space attract various types of activities, which are rich in category and number of people. In the case of open housing blocks, closed space and strong private space still attract most kinds of activities, but the other two types of space located at the intersection road and the boundary also attract other activities.

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Chapter 7. Territorial cognition, behavior and space of residents: A comparative study of territoriality between open and gated housing blocks

This Chapter compared the territoriality of open and gated housing blocks from the view of the cognition, behavior and space through combined methods. Interview, snapshot and observation were conducted to capture the situation of these three dimensions, then they were evaluated and grouped by factor analysis and quartiles. Obtained results in the open housing block were found inferior to that in the gated case. The conclusion was drawn based on above that there are remarkable differences between the open and gated housing blocks on the intensity of residents' territorial cognition, the level and quantity of their territorial behaviors, and the distribution as well as continuity of the territorial space.

7.1. Introduction

7.1.1. Background and purpose

Connecting the self with other targets to expand personal identity is the inherent need of people, and we can perceive its significance in many aspects. It's called territoriality in the residential environment, which is closely related to physical elements in this environment. Based on a traffic-oriented guideline* issued in China in 2016 (short as "the guideline" later), the transforming existing gated housing blocks into open mode is being gradually implemented in some cities.[1,2] However, The living habits of residents were disturbed since the transforming of boundary walls and internal roads has changed the physical environment such as the outdoor space that residents have been accustomed to.[3–5] Therefore, after a gated housing block was reconstructed to be an open one due to policy reasons, without solid barriers such as boundary walls and gates, it should be figure out how did residents adjust their territorial cognition and behaviors (including the way of space occupying and the attitude toward penetration of external space and outsiders) to adapt to the different environment.

This article is the second part of a series of comparative researches. In the authors' previous study, two appropriate comparable housing blocks were selected to be an experimental group and a control group respectively because they have a lot in common except for gated-open status [3]. Those findings indicated that spatial elements and the division of spatial types were affected by the demolition of boundary walls, which is an influence in the dimension of physical features. According to this, we doubt that the territoriality, a product intertwined by physical space and residents' feeling, will also be affected by residential reconstruction in several aspects. Therefore, this study attempts to analyze the territoriality from aspects of cognition, behavior and space. Investigated residents' territorial cognition through interviews, divide the territorial degree of space based on the result of their actual territorial behaviors, and then compared the territorial space related to behaviors of two housing blocks to understand the difference on the territoriality.

*: ***The guideline***: *Mainly because of the traffic problems, the central government of the People's Republic of China released a guideline in February 2016 to address "obvious issues" and "urban ills", such as making traffic networks intensive and unclogging the urban roads by two main approaches: (a) promoting open housing blocks with small areas among newly-built residential areas; and (b) reconstructing gated housing blocks by removing bounding walls and connecting internal roads with urban roads*

7.1.2. Literature review

(1) The transformation of gated housing blocks

The author defines "gated housing blocks", a spatial concept, as a China-typical residential quarter in this series of researches [3]. Its verbatim contrasts to the "open housing blocks" which issued by the guideline and differs in both social construction and social implication from gated communities in the US based on profound differences in cultural, social, and architectural history [6]. Since the government advocated the transformation of gated housing blocks into open housing blocks or open models, some researchers have paid attention to such renovations. Kan suggested that gated housing blocks should not be denied completely, and a modest approach should be laid on the reconstruction [1]. Zhang focused on the peri-urban area, he thought gated mode is a new institutional tool of social management for those areas and the

consequences of the gated village are in general positive [2]. Sun didn't take a position for or against the opening of gates but merely asked how the movement potential of a heavily gated city would change if gates were opened [7]. Zhao discussed un-gating the gated housing block based on the spatial restructuring of a resettlement neighborhood, he points that the restructuring usually occurs through a top-down approach, and residents have little influence regarding the neighborhood planning [8].

Scholars have explored the situation of the gated housing block and its transformation into open pattern from the perspective of policy formulation, policy implementation, urban vitality and even the development of peri-urban area areas. However, less attention has been paid to the change of residents' feelings (such as territoriality) caused by this spatial transformation, even the residents are most directly involved.

(2) Territoriality

Since "territoriality" was introduced into human behavior studies by environmental psychologists in the mid-1960s, researchers have proposed ideas and developed their theories related to it. According to most scholars, territoriality in humans can be defined as a comprehensive mechanism in which people's territorial cognition and territorial behaviors are intertwined together based on their ownership of physical space [9–12]. Literature was sorted from the following three aspects:

1) Territorial cognition

Altman and Chemers [13] indicated that territorial cognition is a feeling or thought stem from occupying, controlling or personalizing a place, especially concern the cognition of affiliation and dependency on this territory. Sack's opinion supported the former theory, he stated that everyone has a sense of territory, a degree of ownership, and control over physical spaces. Taylor [14] compared territorial cognition with other concepts of similarity, such as personal space and private space, and clarified it furtherly.

2) Territorial behavior

Taylor listed four main themes of defining territorial behaviors: 1. active defense; for example, residents in gated housing blocks reinforce the main entrance or other gates of their residential quarters. 2. laying claim through the use of marks and signs; in this study, extra

covering or other personal maintenance were found on some rest benches (located in public space of the housing block) in case of rain. 3. defense and control over non-spatial and nonphysical entities, Bakker defined this behavior as "an individual exerts control, takes initiative, or accepts responsibility". 4. association to a place due to repeated usage or the passage of time. Altman [15] also mentioned behaviors such as defense response or using markers and signs to reinforce territoriality. He made a summary of that definition as: "a self/other boundary-regulation mechanism that involves personalization of or marking of a place or object and communication that is 'owned' by a person or a group" [16]. Combining with the actual situation, the territorial behavior is defined as a behavior of residents which have changed or influenced the outdoor space in this paper, such as putting personal objects in the outdoor space for temporary or a long term, reforming the outdoor space or facilities in it, or creating a new space for individuals or groups with shelters and enclosures, etc. (see detailed classification in chapter 4)

3) Territorial space and its classification

Territories were also classified according to the nature of physical space.[17] Altman has broken human territory into three main categories base on privacy and publicness of them: primary territory, secondary territory and public territory. Altman and Brown [18] complemented the meaning of primary territory. Taylor [14,19] explained Altman's theory in detail and distinguished each territory as well as the continuity flowing between them. Another classification was proposed by Newman (defensible space) in 1972 [20], which divided the territory into four degrees: private territory, semi-private territory, semi-public territory and public territory. Unfortunately, Newman didn't offer a specific definition for his territorial degree theory.

Based on Altman's classification, in addition to the home environment (primary) and urban space (public), there is only one degree, secondary territory, left for outdoor space of housing blocks, while it was found not enough to describe that complex situation after knowing residents' territorial cognition in the pilot survey. Therefore, the authors adopted Newman's theory but attempted to classify outdoor space into separate territories clearly according to residents' territorial behaviors occurred in these spaces.

7.2. Materials and Methods

7.2.1. Framework and Investigation

After reviewing the literature on theories of various aspects of territoriality, combined with the actual situation in case studies during pre-investigation in August 2017, the theoretical framework of this research was established, followed surveys and analysis were both conducted according to this structure. Finally, this paper determined the classification criteria of territoriality. An integrated survey method and combined analysis methods were applied to investigate territorial cognition, territorial behaviors, and territorial degrees of space areas as shown in Figure 7.1.
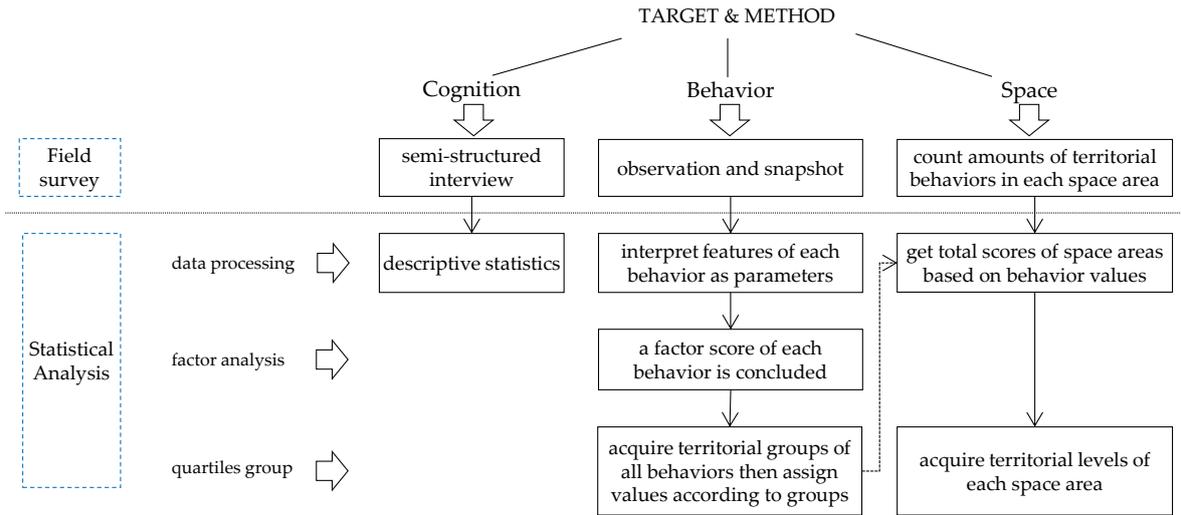
Figure 7.1. Framework.

The data of territorial cognition was conducted by a face to face interview from late August to mid-September 2018, and a total of 107 valid answers were obtained, of which 42 were from the open housing block and 65 were in gated one. Territorial behavior was collected in the same period, the behavior was identified and recorded by snapshot for later analysis. A total of 183 behaviors were recorded in open housing block and 312 times were marked in the gated group. The outdoor space was divided into various areas for analyzing territorial spaces after acquiring results of territorial behaviors in these areas.

7.2.2. Case identification

The reconstructed open housing block, CHANGKEB, is shortened to be CKB later; QICHECHANG34, the gated housing block, is abbreviated as Q34. These two cases are located in Changchun city and belong to the unique but most common residential pattern of China (residential settlements for employees of state-owned enterprises). Changchun city is the heavy industrial bases that China's first five-year plan (1953-1957) had focused on and have developed rapidly since the reform and opening up in the 1980s [3]. Changchun Bus Factory and Changchun First Automobile Factory were two key projects in this stage, and built their own residential quarters for employees in 1985(Q34) and 1988(CKB). Both of them were gated housing blocks until the CKB was reconstructed to be open mode according to the guideline 2016. The employees who lived in these two places at the beginning are basically retired because of the age. They constitute the majority of existing residents, and the other part is their children or relatives and a small number of tenants. Meanwhile, they are very similar in terms of many aspects such as location, size, and population (see details in Table 7.1). In summary, these two housing blocks are comparable in both social and cultural background as well as physical attributes. By comparing Q34 of gated housing block with reconstructed housing block CKB, it is clear to exclude other possible interfering factors and clarify the effect of changes on residential territoriality.

Table 7.1. Basic information of two housing blocks.

Open housing block: Changke B	Gated housing block: Qichechang 34
Location: Lvyuan District	Location: Lvyuan District
Area: 60,952㎡	Area: 83,430㎡
Age: completed in 1988	Age: completed in 1985
Story: 6~7	Story: 6~7
Building amount: 21	Building amount: 22
Household: 1140	Household: 1300
Population: 3100	Population: 31541
The aged: 28.4%	The aged: 29.7%
Residents: employees of Changke factory	Residents: employees of Yiqi factory

Residential land   non-residential land   greening

100   200   500m

7.3. Territorial cognition

7.3.1. Data analysis

For data collecting and analyzing of territorial cognition: The design of question structure presented in Figure 7.2 is based on the theory from the literature review and draws on Iran and Wang Fang[2,3], involving two parts: basic information and territorial cognition (TableA1). The answer was given by the Likert Five-Point Scale. SPSS was used to conduct descriptive statistics and reliability and validity analysis of the data obtained through the interview, and the Cronbach's coefficient is 0.679 and 0.819 respectively in the open and the gated case, indicating a good consistency of the questions about territorial cognition.
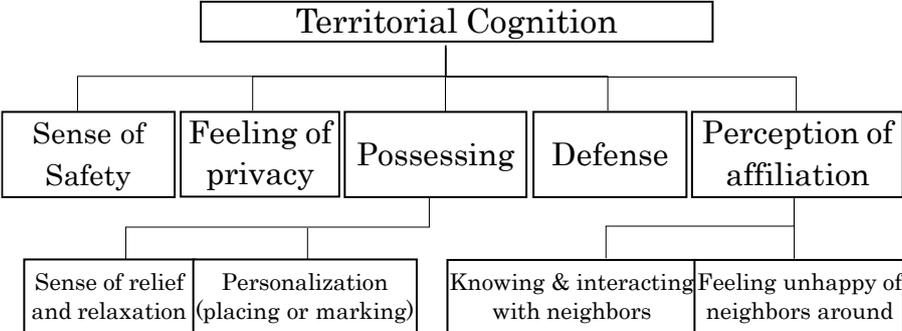
Figure 7.2. Theoretical structure of territorial cognition.

7.3.2. Results

Table7.2 (1-4) lists the basic information of the respondents in the two cases. Through the description of the sample information, it can be seen that there are a large number of elderly residents in both two housing blocks; the family composition of respondents is mainly solitary, followed by the family of couples; 76% and 78% of the residents have lived there for more than 10 years; they use outdoor space more frequently, with daily users accounting for 74% and 80% in each residential area. In summary, the main body of residents in the two housing blocks and the main body of outdoor space users are the elderly who have lived there for a long time, especially the elderly living alone. The outdoor space is used more frequently by these residents also. In terms of the above proportion, there is no significant difference between open and closed housing blocks, which also shows the similarity of respondents in the two groups. Therefore, the deviation of their territorial cognition is worth exploring.

Table 7.2. Basic information of respondents.

2-1 Age				
	age 0-17	age18-35	age 36-59	age 60 & above
open	4	1	15	22
gated	6	3	23	33

2-2 Family composition				
	alone	couple	two generations	three generations	+grandchildren
open	17	12	9	2	2
gated	29	16	10	3	7

2-3 Living period			
	less than 1 year	1~5 years	5~10 year	over 10 years
open	0	3	7	32
gated	0	8	6	51

2-4 Frequency of using outdoor space			
	once per week	several times per week	once per day	several times per day
open	8	3	14	17
gated	3	10	23	29

Besides the basic information, the interview also addressed the territorial perception of outdoor space, which is listed in Table 7.3. It can be seen that there are marked differences in "Sense of Safety", "Feeling of privacy" and "Possessing", in which the most obvious one is "Sense of Safety", which scores only 2.73 in the open housing block and 4.07 in the gated. Light differences can be found in the defensive attitude towards outsiders. When asked whether they are unhappy while outsiders come around, the score in the open case is 2.97, and the answer in the gated group is 3.27. The more similar results of the two housing blocks are their "Perception of affiliation", with only a difference of 0.1. The data implies that they have communication with their neighbors and don't have a sense of exclusion towards their

neighbors to use the outdoor space around. On the whole, major scores of territorial cognitions in the open housing block are less than 3 points, while the situation in the gated housing block is opposite, mostly higher than 3 points.

Table 7.3. Mean scores and standard deviation of territorial cognition in outdoor space.

	Open	Gated
	Mean (Std. Deviation)	Mean (Std. Deviation)
Sense of Safety	2.73 (0.87)	4.07 (0.64)
Feeling of privacy	2.80 (0.85)	3.50 (0.57)
Possessing	2.33 (0.75)	3.60 (1.01)
The sense of relief and relaxation	2.77 (0.73)	3.97 (0.76)
Personalization (placing, marking or defining)	1.90 (0.48)	3.23 (1.11)
Defense feeling unhappy of outsiders around	2.97 (0.89)	3.27 (0.63)
Perception of affiliation	2.12 (1.19)	2.22 (1.29)
Knowing and interacting with neighbors	3.17 (0.75)	3.40 (0.67)
Feeling unhappy with neighbors around	1.07 (0.25)	1.03 (0.18)

The above results are based on the sample data of two housing blocks through the interview. In order to test the overall situation, a statistical test was performed to observe the difference between the population means. After the Kolmogorov-Smirnov test, the data distribution is found not consistent with normality, hence the Independent-Samples Mann-Whitney U test, a nonparametric test method, is used. The results are shown in Table 7.4: the differences in residents' territorial cognition between housing blocks.

Table 7.4. Hypothesis test summary of residents' territorial cognation

Null Hypothesis	Test	Sig.	Decision
The distribution of Q1 is the same across categories of category of housing blocks.	Independent-Samples Mann-Whitney U Test	.000	Reject the null hypothesis.
The distribution of Q2 is the same across categories of category of housing blocks.	Independent-Samples Mann-Whitney U Test	.000	Reject the null hypothesis.
The distribution of Q3is the same across categories of category of housing blocks.	Independent-Samples Mann-Whitney U Test	.001	Reject the null hypothesis.
The distribution of Q4is the same across categories of category of housing blocks.	Independent-Samples Mann-Whitney U Test	.000	Reject the null hypothesis.
The distribution of Q5is the same across categories of category of housing blocks.	Independent-Samples Mann-Whitney U Test	.738	Retain the null hypothesis.
The distribution of Q6is the same across categories of category of housing blocks.	Independent-Samples Mann-Whitney U Test	.218	Retain the null hypothesis.
The distribution of Q7 is the same across categories of category of housing blocks.	Independent-Samples Mann-Whitney U Test	.557	Retain the null hypothesis.

*Asymptotic significances are displayed. The significance level is .05.

In Table 4, Q1 and Q2 are corresponded to "Sense of Safety" and "Feeling of privacy" respectively, and Q3 and Q4 correspond to two dimensions of Possessing". The P values of Q1, Q2, Q3 and Q4 are less than 0.05, which means that there are significant differences between the two housing blocks in terms of three cognitions above. Q6 and Q7 correspond to dimensions of "Perception of affiliation", whose P values are 0.218 and 0.557, greater than 0.05. It indicates

there is no significant difference between the two cases, which is consistent with the results in Table 3. The exception is Q5, which is inconsistent with the sample analysis results, showing that the two housing blocks have similar cognition of "defense", while in Table 7.3 they are 2.97(open) and 3.27(gated) separately. Even if the statistical significance told such a story, the author still felt a slight difference during the investigation. Of course, this might be the error of subjective feeling.

7.4. Territorial behavior

7.4.1. Data analysis

The territorial behavior is defined as the outdoor placing behavior, which is abundant in the amount and has obvious characteristics. It is considered to be able to reflect four dimensions of measuring territorial behavior in the theoretical structure (Figure 7.3).
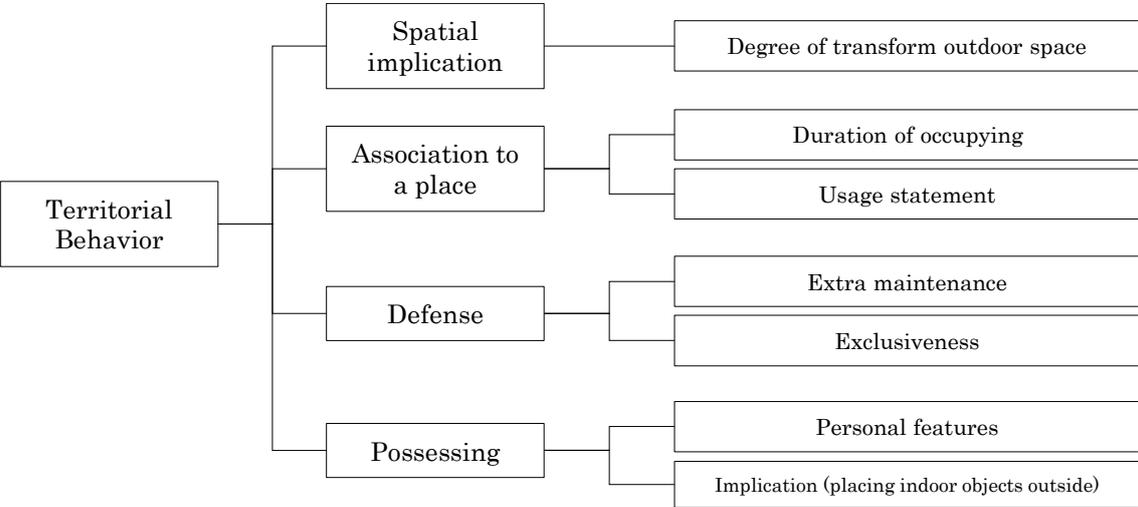
Figure 7.3. Theoretical structure of territorial behavior.

Firstly, the recording of space-occupying was conducted by snapshot and observation, then interpret the attributes of these placed objects into variables based on the theoretical structure for statistics. After that, factor analysis was used to get the comprehensive score of attribute variables, at last, divided all scores into groups by quartiles. After grouping, the corresponding territorial analysis is performed according to a theoretical basis selected by this article.

7.4.2. Results

Table 7.5. Recorded frequency of outdoor placing behavior.

Open-frequency: n=183		Gated-frequency: n= 312	
bed	1	bear	1
cabinet	1	bench	3
chair	33	chair	59
cloth	18	cloth	40
eggplant	1	plant	23
plant	7	pram	3
pram	5	sofa	5
socks	1	stool	40
sofa	6	table	15
stool	29	underwear	8
table	9	wheelchair	1
tea table	1	bedclothes	31
bbq	1	bench	14
bedclothes	7	bicycle	38
bench	1	e-bike	12
bicycle	39	motor	1
cart	4	stool	11
chair	1	table	1
e-bike	11	tent	6
motor	5		
parasol	1		
tent	1		

Table 7.5 presents the number of times all outdoor placing behaviors were recorded in the two housing blocks. A total of 183 placed objects were recorded in open housing block and 312 times were marked in the gated group. Although the area and population of the two cases are similar, the number of outdoor placing in the gated is much higher than in the other one. If 10% of the total amount is defined as a high-frequency behavior, conspicuous behaviors in the open housing block are: placing bicycles (39), placing chairs (33), placing stools (29), and placing

the clothes (18); for the gated: placing chairs (59), placing clothes (40), placing stools (40), placing bedclothes (31), and placing bicycles (38) look more obvious in frequency than others. In general, outdoor placing behaviors in the two housing blocks are similar in categories, but there are large differences in the amount, and the differences in their attribute will also be revealed in the subsequent analysis.

After the description of basic information of territorial behaviors, territorial features of placed objects were interpreted to be parameters and scored by following seven attributes of four dimensions (Figure 7.4), factor analyzing was conducted in the next procedure to calculate a comprehensive factor score of territorial behaviors and then arrange all placing behaviors according to their scores.

Spatial Implication

Degree of transform outdoor space (1piont, 2points and 3points)		
place personal objects outside	reform original facilities	create space with shelter/enclosure

Association to a place

Duration of occupying (1piont and 2points)		Usage state (1piont and 2points)	
temporary	long-term	being used	be abandoned

Defense

Extra maintenance (1piont and 2points)		Exclusiveness (1piont and 2points)	
no	have	without lock	locked

Possessing

Personal features (1piont and 2points)		Implication: place indoor objects outside (1piont, 2points)	
impersonal	high personal	outdoor	indoor

Figure 7.4. Attributes of the territorial behavior from four dimensions.

Each object placed outdoors is scored according to the definition of the theoretical structure, and this score is also regarded as a score for the territorial behavior of "place things in the outdoor space". The specific scoring method was given in Figure7.4. For example, when examining the exclusiveness of such behavior under the dimension of "defense", the object without a lock is counted 1 point and the locked object is scored 2 points. In this way, scores of each placed object can be obtained, and they were evaluated by the factor analysis to obtain a whole comprehensive factor score to represent each placed object in Table7.6(O-PO represents placed objects in the open housing block, G-PO is abbreviated of placed objects in the gated housing block). The territoriality of all placed objects will then be sorted and grouped based on this comprehensive score (Figure7.5).

All behavioral scores were equally divided into four groups by quartiles, and all behavioral data in both housing blocks were represented by a boxplot (Figure7.5). Comparing the open and gated groups, it can be seen that their minimum and lower quartile values are similar; but from the median, the gated group has higher values; the larger gap can be in the upper quartile and the maximum value. According to the quartile value, the territorial behavior is divided into four grades separately, while following two blue lines in the boxplot, it shows that some territorial behaviors classified as Level 4 and Level 3 by comprehensive factor scores in the open housing block can only be divided into level 3 and level 2 in the gated one. In addition, outlier samples 148 and 54 appear in the open group, especially the sample 54 has a much higher score than other behaviors, no matter in open or closed housing blocks. Since there is no error in the snapshot and statistics steps of these two behaviors, they are not excluded as abnormal values, but recognized as: there are also some extremely high-level behaviors in the open case, despite the overall territorial scores are lower than in the gated housing block. The specific situation will be explained in the next chapter in conjunction with the territorial space.

Table 7.6. Comprehensive factor scores of placed objects.

Placed objects in the open housing block			Placed objects in the gated housing block		
O-POn	Area	Factor Score	G-POn	Area	Factor Score
O-PO1	a2	-0.255111996	G-PO1	a5	-0.243544789
O-PO2	a2	-0.255111996	G-PO2	a10	-0.243544789
O-PO3	a2	-0.255111996	G-PO3	a10	0.169703788
O-PO4	a2	-0.191218281	G-PO4	a10	0.169703788
O-PO5	a2	-0.191218281	G-PO5	a10	-0.243544789
O-PO6	a2	-0.191218281	G-PO6	a10	-0.243544789
O-PO7	a3	0.158861145	G-PO7	a11	0.36012824
O-PO8	a5	-0.255111996	G-PO8	a11	0.36012824
O-PO9	a5	-0.255111996	G-PO9	a11	0.36012824
O-PO10	a5	-0.232541243	G-PO10	a11	0.36012824
…	…	…	…	…	…
O-PO181	e	-0.533171338	G-PO310	d	0.522491802
O-PO182	e	-0.533171338	G-PO311	d	0.522491802
O-PO183	e	-0.438588738	G-PO312	e	-0.110937498
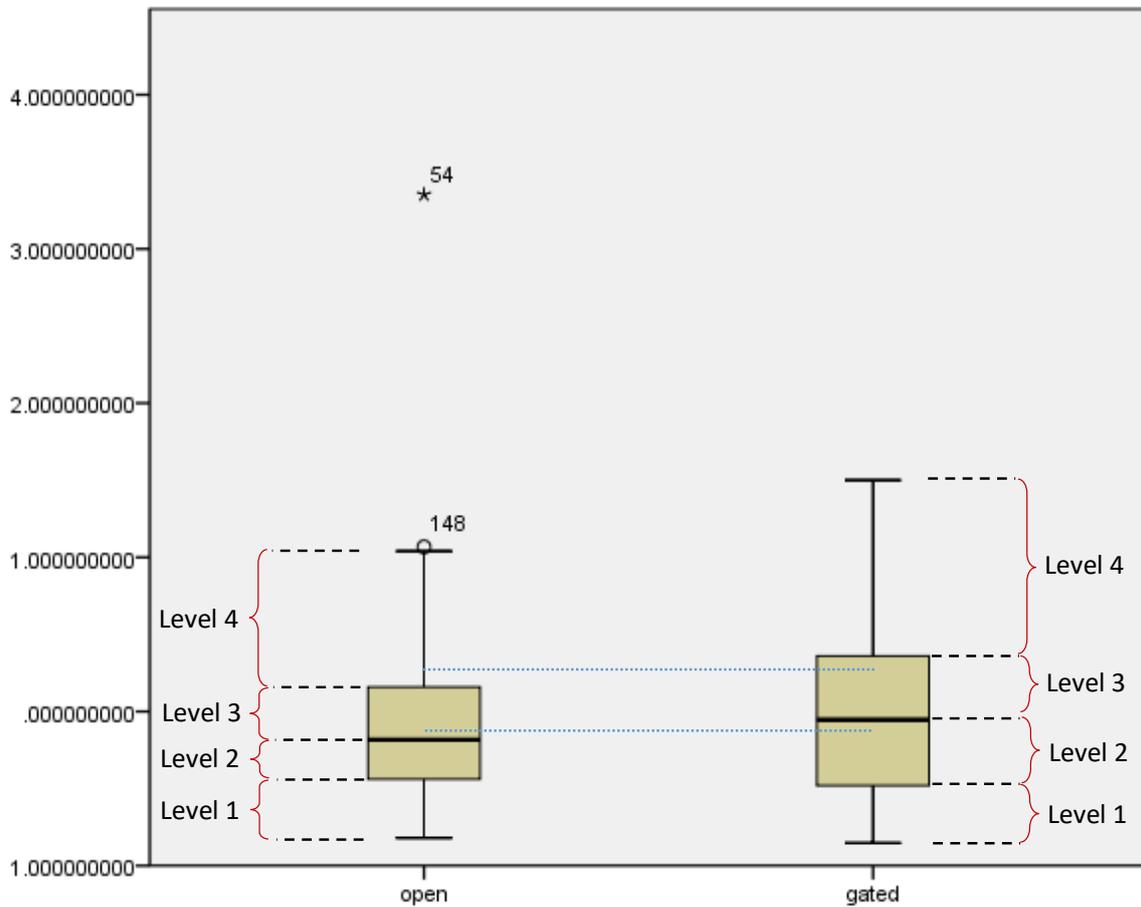
Figure 7.5. Territorial scores of all behaviors in two housing blocks.

7.5. Territorial degree of the space area

7.5.1. Data analysis

For the territorial space: Outdoor space of two housing blocks were divided to be various areas according to the location (Figure 7.6). After obtained the territorial score and grouping of placed objects, all objects in each space area are counted, and then the quartile statistics are used again to group the space areas. Again, these groups were combined with the theoretical basis (Figure 7.7). Finally, the territorial characteristics and anomaly values of placed objects and space areas are explained.
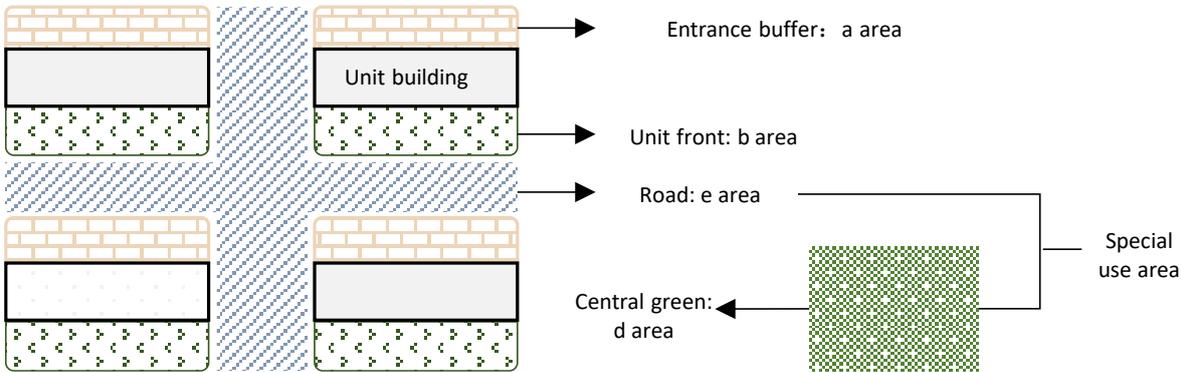
Figure 7.6. Area division according to location.
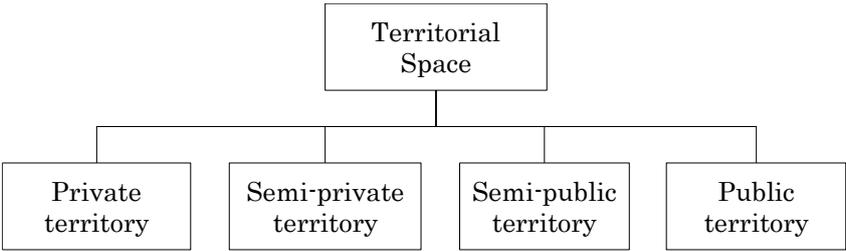
Figure 7.7. Theoretical structure of territorial space.

7.5.2. Results

TablesA2, Figure7.8 and Figure7.9 respectively show the territorial scores of each spatial area, grouping the spatial areas according to the scores, and combining the territorial theory to classify and locate the grouped spatial areas.

In TableA2, since the territorial score of a space area is derived from the sum of all territorial behaviors in this spatial region, some space areas without territorial behaviors inside were counted as 0 point (a-area of open housing block was abbreviated as ao, a-area of gated abbreviated as ag; the same goes for bo, bg, etc.). Specific operations are as follows: Eight placed objects were found in the ao5, which are O-po8~O-po15; O-po8~O-po13, the territorial behaviors of level2, were counted as 2 points; O-po14 and O-po15 are l territorial behaviors of level4, which are calculated as 4 points; a total of 20 points were obtained finally as the territorial score of ao5. If there isn't any object in a space area such as ao9, it was counted as 0point.

Figure 7.8 compares the territorial score of all the space areas in the two housing blocks by a boxplot. In both cases, 50% of the space areas were scored as 0point, and these areas are counted as level1; the upper quartile and the maximum see similar situation in two housing blocks, and these two ranges are the samples of the remaining 50% of whole space areas, which were counted as level 2 and level 3 respectively. Combined with the territorial grading theory in Figure7.7, a space area with a territorial score of 0 point can be regarded as public territory, and Level 2 and level 3 are considered to be semi-public spaces and semi-private spaces respectively as well.
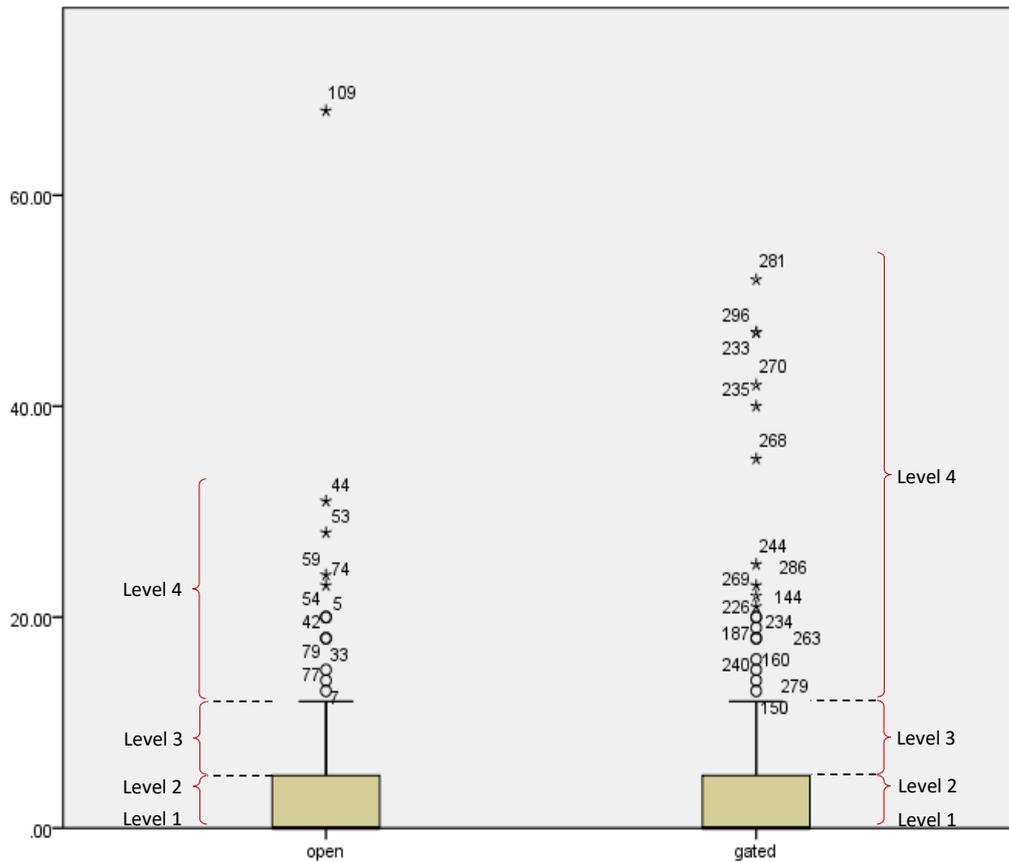
Figure 7.8. Territorial scores of all space areas in two housing blocks.

In addition to the above description, the boxplot also indicates that there are still some space areas in the two settlements are considered outliers, which were excluded because they are much higher than the maximum of the quartiles. These ungrouped areas were defined as level4; since their scores are higher than the area of level 3 and are not grouped explicitly, they are considered to be higher than the semi-private and close to the private in the territory. The Level 4 groups have 12 samples in the open housing block and 18 samples in the gated one separately. Besides this, even within the group of outliers, the credit of these data are significantly different. In the open group, only one sample 109 corresponds to the bo region and is much higher than other outliers, while the remaining outliers are relatively close and belong to the ao area. It can be seen that the high territorial space in the open housing block is dominated by ao area. In the gated group, the outliers are divided into two groups with similar amounts. The larger part, such as sample 281, 296and 233, are all bg areas, while the smaller part has both bg and ag areas but with bg areas as the majority. It indicates that although these outliers belong to the same high territorial group, the value of the bg area is still higher.

Figure 7.9 illustrates the territorial distribution of all degrees more clearly in the form of spatial positioning. The white, blue, yellow, and red represent level1, level2, level3, and level4, respectively.
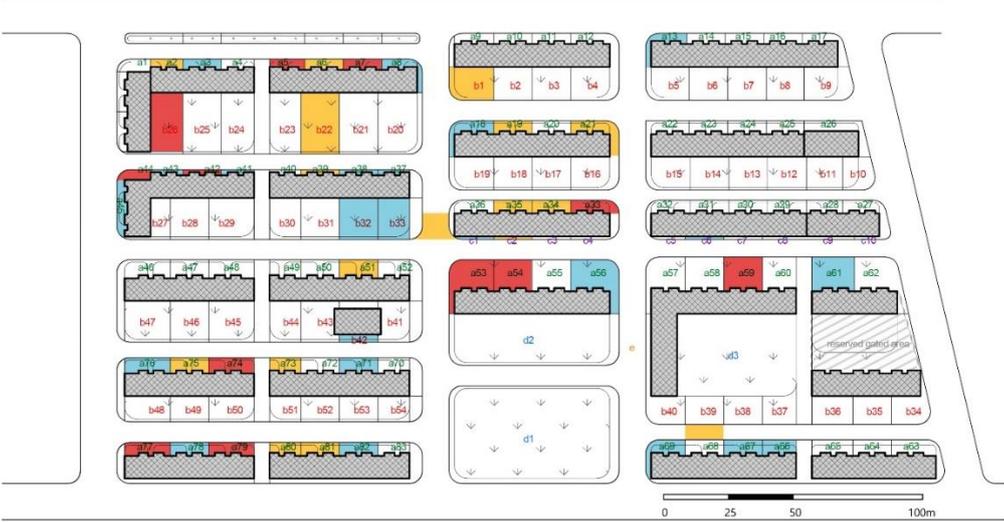
(a) the open housing block

(b) the gated housing block

Figure 7.9. Territorial distribution of two housing blocks.

In the open housing block, the highest one level4, the red area, is scattered in all parts of the outdoor space. One of 11 red areas belongs to the "b area" (unit front area), and remaining 10 belong to the "a region" (entrance buffer). It means that the entrance buffer was used more frequently as an advanced territorial space, and then comes the unit front area. However, it should be pointed that although area b has only one sample, b26, which is evaluated as a high-level territorial space, this space area has the highest territorial score (see sample 109 in Figure 8). It is located in the inner corner of an L-shaped unit building and has one more enclosure than other areas. The continuity of high territorial level can be found only in a53 and a54, which are adjacent to some commercial facilities such as retail stores, restaurants and laundromats. Perhaps these stores which are closely related to residents' lives have affected the continuity of the territoriality in the surrounding space.

In the gated group, there is a good continuity not only within red areas with the highest territorial but also between the red, yellow and blue areas. The space areas of Level 4 are distributed both in an area and b area, which has 4 samples and 13 samples respectively. In general, the territory space with the highest degree is more inclined to appear in the b area which is the unit front space. The strongest continuity can be found in two groups, they are (b15, b16, b17 and a17) and (b50, b51 and b52). The position of the former is the inner angle of an L-shaped unit building, and the latter is located in the middle of the whole residential area, both of which are less interfered by external space.

7.6. Discussion and Conclusions

After comparing the territoriality of open and gated housing blocks, differences were found in residents' territorial cognition, residents' territorial behaviors, and territorial space they used.

1) In terms of territorial cognition, residents in two housing blocks have a similar cognition point, "Perception of affiliation", which include the cognition outside of themselves and within the resident group. The authors speculate that this situation is due to the similar work-related relations between the residents in the two cases. Besides this similarity, there are obvious differences in the sense of security, privacy, possession and defense, etc. The scores in the open group are generally lower than those in gated one, which indicates that residents in the gated housing block have stronger territorial cognition.

2) Regards to territorial behaviors, there is little difference in the category of territorial behavior since these categories are derived from basic needs in residents' daily lives. While the amounts of observed territorial behaviors are quite different under the similar population bases of the two housing blocks. In the environment of the gated housing block, people conduct more territorial behaviors, and the territorial scores of these behaviors such in Level 3 and Level 4 are higher than the same levels in the open case.

3) For the territorial space, half of the space areas in both housing blocks are considered public spaces because of low territorial scores, but the gated housing block has more space areas with higher-level territorial scores, and also, the continuity of their distribution is stronger than that in the open group. It is also worth noting that most of the high-level territorial space in the open case is cling to the "entrance buffer area", while the high-level areas in the gated are mostly concentrated in "unit front". Comparing the distance of these areas from residents' own private territory, the unit building, the high-level areas in the open settlements are formed close to their private territory, while the gated housing block enable the residents to go a little further, to the "unit front", to expand their semi-private or semi-public territory.

In addition to the above conclusions, there are two areas in the open housing block need to be noted. In the case of low territoriality in the open housing block overall, the performance

of territorial behavior and space of these two areas are prominent outside from the whole. One is located in the corner of an L-shaped unit building, it is a relatively closed space even if in the open area; the other area does not have too many enclosures, while it still performs well in the territoriality, perhaps because it is close to the necessary facilities such as retail stores, laundry rooms, etc. It was proved that certain commercial establishments (liquor stores, bars, book store) and service facilities (parking facilities) may be involved in building territoriality [21]. D. Sohn also mentioned that grocery stores, restaurants, and offices have a positive role in improving neighborhood safety and territoriality [22]. These findings originally inspired from Jane Jacobs and later expanded by Oscar Newman to emphasize the spatial arrangement of buildings, street design, and diversity of land use [20,23,24], but the first two suggestions of structural adjustment(building arrangement) can only be interfered before or at the beginning of the construction. Considering the optimization of open-oriented reconstruction in future, if the removal of solid physical elements (such as walls) caused by the policy is inevitable, we should try to enhance the territoriality from the perspective of flexible facilities or non-spatial factors, such auxiliary facilities and the commercial use.

The spatial structure of residential areas might affect many aspects of living sustainability. In the daily life of residents, expanding their attributes outward and interacting with outdoor space can increase people's happiness and living standards. The main body of this study is the old residential areas, in which most of the residents are the elderly. Since the retired old people lost an important social relationship, industrial relationship, the territoriality generated by interacting with their living environment will be more important. After a traffic-oriented guideline has changed their familiar living space, how did residents transform the territoriality and how to maintain it in a more open environment is a question worthy of our consideration.

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Chapter 8.   Conclusions and future work

8.1. conclusions

The open oriented transformation of housing blocks in China has changed the residential pattern from super blocks to refined new open housing blocks, and it bring users, the residents, various influences no matter on their physical living environment or their own reaction, behaviors and cognition, as well as their interaction with the new environment. We conclude current situations, influences and improvement approaches and their relationship to show entire faces of the opening-problem more completely (Figure 8.1).

This thesis firs clarifies "what the open housing block is" from the definition of a special and specific context and from the typology way. This primary question includes three branches: 1. what kind of housing blocks have been reconstructed? 2. What methods have been used to reconstruct these housing blocks? 3. For different types of housing blocks, are the types of reconstructing methods different? The answers to these three sub-questions can be combined to reveal what is the OHB and its actual implementation. In the reconstructed cases that have been found, the scale, plot and building layout of these housing blocks and their relationship with cities are diverse. According to these different basic conditions, the methods of the open-reconstruction are also not completely similar. Five types of housing blocks and the four types of reconstruction methods were concluded and found to be intertwined, their combinations shown suitable and inappropriate patterns. This can provide a reference for the subsequent transformation and make recommendations for the guiding policy of the transformation.

The second viewpoint is that: the presence or absence of the enclosing walls affects the distinction of space types in housing blocks. In the case of gated housing blocks, closed space and strong private space attract various types of activities, which are rich in category and number of people. In the case of open housing blocks, closed space and strong private space still attract most kinds of activities, but the other two types of space located at the intersection road and the boundary also attract other activities.

The third perspective means to tell: the spatial structure of residential areas might affect many aspects of living sustainability. In the daily life of residents, expanding their attributes

outward and interacting with outdoor space can increase people's happiness and living standards. The main body of this study is the old residential areas, in which most of the residents are the elderly. Since the retired old people lost an important social relationship, industrial relationship, the territoriality generated by interacting with their living environment will be more important. After a traffic-oriented guideline has changed their familiar living space, how did residents transform the territoriality and how to maintain it in a more open environment is a question worthy of our consideration.
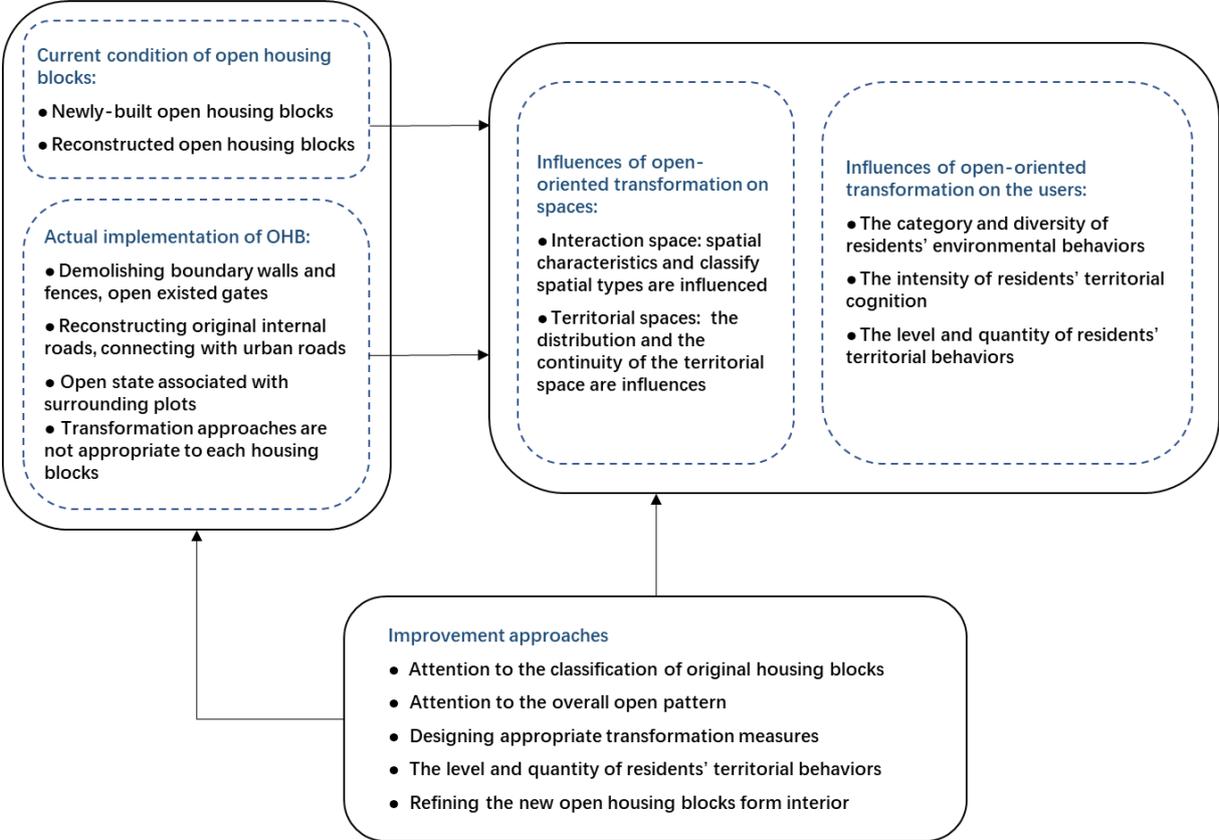
Figure 8.1. Entire structure of questions, conclusion and improvement proposals

8.2. Proposals

This research emphasizes the importance of common space that carries residents' individual behaviors by counting their characteristics. In the previous gated housing blocks, because of the existence of walls, solid borders and closed roads, this common space was well protected, which in turn provided an environment for residents' daily activities. While in the existing open housing blocks, the residents' environmental behavior has been affected to some extent after undergoing a top-down and extensive reconstruction.

It should be aware that housing blocks are the basic spatial carriers of people's lives, and their different scales and spatial combinations show the inherent laws and characteristics of the blocks themselves. In urban transformation, we should fully recognize the advantages and disadvantages of the block system in different aspects, consider the needs of people in different regions and complex economic, social, and cultural factors, and selectively carry out the design or reconstruction of open blocks. In urban construction, adaptive planning measures should be adopted to take overall planning into consideration and proceed step by step to avoid extensive construction models.

Therefore, in the proposal for subsequent reconstruction, our focus is not on the contradiction between an individual and specific environmental behavior and the implementation of the reconstruction policy, nor is it the confliction between the implementation subject, the government, and the residents. What we need to consider is how to implement and adjust the policies that can retain the common spaces that residents have long adapted to and desperately need, and then ensure that these common spaces can accommodate their personal environmental behaviors.

While only a proposal for planning is not enough to improve the open transformation. It should also be accompanied by the management system association and the public approach and education. Beyond design, we call on all sectors of society to work together supporting the authorities to build the ideal model of open transformation.

In order to achieve the above purpose, a proposal integrates design and planning with management and public approaches was presented.

8.2.1. The Proposal for design and planning

Understanding reflection: three issues that need to be clarified in the construction of open housing blocks and urban streets.

As for how to build urban street space and how to implement the OHB system, from the existing research results of urban planning academics, most of the discussion is on the planning and design techniques and strategies. The author believes that depends on a clear understanding of the following three topics: "Whether the use of OHB system is specific to the certain functional areas", "whether the OHB and its internal roads are sufficient conditions for urban street construction", and "why most new town development still tends to adopt the large scale and gated pattern".

Determine the prerequisites by government:

- Whether the use of OHB system is specific to the certain functional areas
- whether the OHB and its internal roads are sufficient conditions for urban street construction

Management system association ↔ Public approach &education

Handbook of open-oriented planning and transformation

Support to Government:

Representatives of public welfare Enterprises;
Developers;
Owners' representatives;
other multi-stakeholders
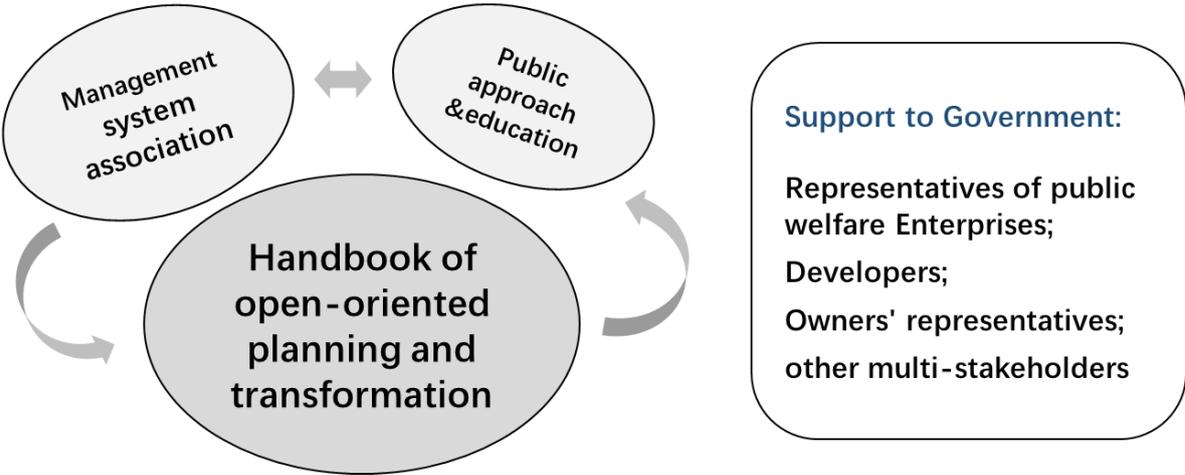
Figure 8.2. recommendations and proposals of Open housing blocks

According to the comprehensive conclusions, three approaches including design and planning regulation, managements and education work together to achieve more potential effective (Figure 8.2). Hence, the suggestions and proposals were designed based on these three approaches. The first proposal aims at developing the handbooks of housing blocks transformation and planning based on Environment Behavior Study. On one hand, the second one focuses on designing the handbooks of open housing blocks management. On another hand,

establishing the various associations and neighborhood information systems is considered the third proposal. These three proposals are related, hence, it may much more effective when operating together and overlap assisting.

The implementation from government is traffic oriented, while the contents towards housing blocks, especially towards the existing gated housing blocks, may bring unexpected impacts on residents' environment behaviors. Thus, the improvement needs to focus on increasing the latter during the process of urban design and planning (Figure 8.3).
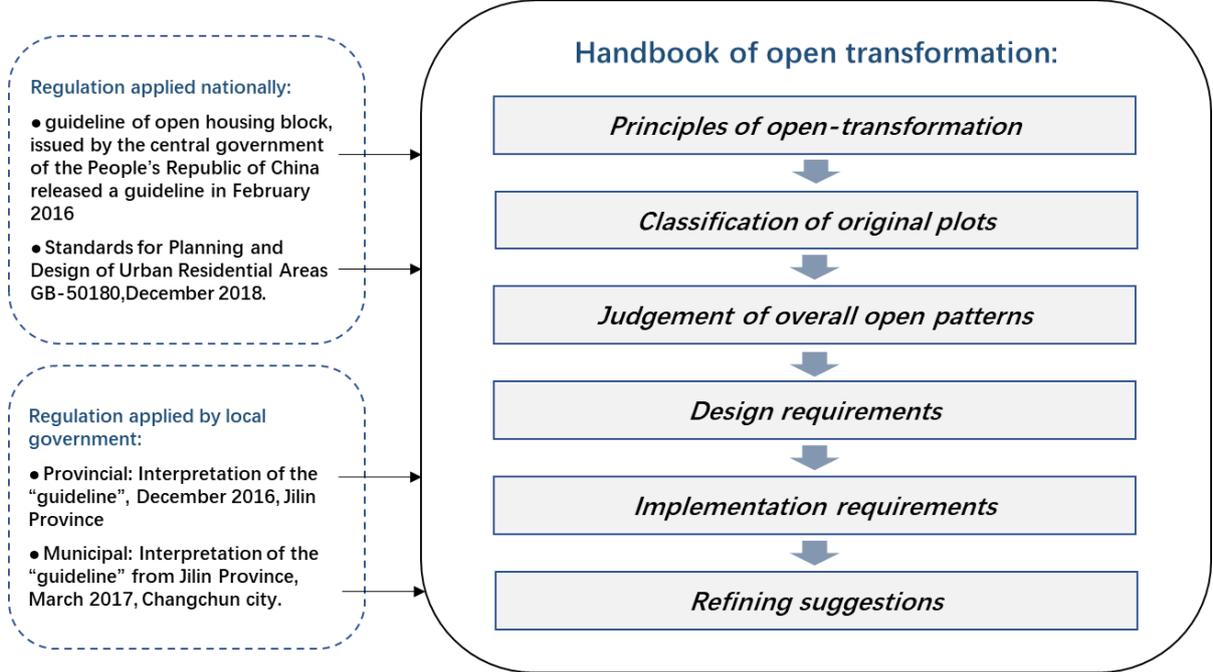
Figure 8.3. Main Contents of open transformation Handbook and its initialization

This handbook proposes a spatial transformation approach based on protecting and enhancing environmental behavior. The execution process is: classifying the original plots or block conditions before the transformation, then determining the overall open mode of the housing block (Figure 8.4). There are many subdivisions in the choice of the overall open model, such as whether to implement a "external open & inner gated" mode, whether to consider the relationship with surrounding plots or homogeneous blocks for an interconnected opening. Thereafter, different transformation plans are implemented according to the overall open mode and various basic conditions. When carrying out the transformation, appropriate measures shall be selected according to the basic conditions such as plot shape, building layout, road organization, etc., for example, the wall shall be removed completely or partly, the internal road

and the urban trunks shall be connected for vehicle, or only be used for pedestrian by limiting the width and manufacturing the height difference. After the initial reconstruction, the internal facilities of new open housing blocks should be refined further.

Chapter 1. Principles of open-transformation Section1 definitions Section2 scope of regulation Section3 confliction judgment **Chapter 2. Classification of original plots** Section1 scale of the plot Section2 shape of the plot Section3 building layout Section4 road arrangement **Chapter 3. Judgement of overall open patterns** Section1 external open and inner gated Section2 interconnection with surrounding blocks	**Chapter 4. Design requirements** Section1 maintain diverse environmental behaviors Section2 noninterference of spatial types Section3 sense of enclosure **Chapter 5. Implementation requirements** Section1 boundary demolition Section2 road reconstruction Section3 association opening **Chapter 6. Refining suggestions** Section1 … Section2 …

Figure 8.4. Example of the structure of handbook

These design recommendations aim to navigates designers and authorities in development strategy of housing block transformation. It aims to turn the total traffic-oriented open transformation into a resident & traffic-oriented transformation. The Figures below shows the imagery picture of four main execution steps and the relationship between each chapter that may provide better navigation and clarification for using this handbook

(1) The first procedure is to distinguish the necessity of open transformation on a housing block. The necessity could be verified according to internal and external factors of traffic demand (Figure 8.5). The internal one means residents' traffic demands from inside to outside, and the latter means vehicle or people outside want to pass through a housing block. The outside transportation needs can be defined by the authorities, while the inside demands should be investigated according to residents' situations.
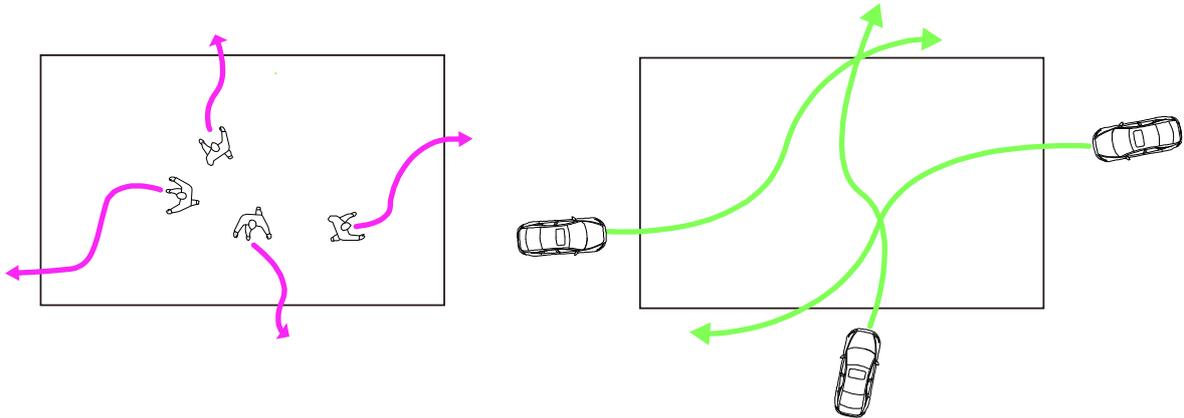
Figure 8.5. traffic demand from inside and outside

(2) The second procedure is to determine openness according to types of basic conditions (scale, inner structure, etc.) (Figure8.6). Chapter5 has given classifying methods of how to identify the type of a housing block, it can be followed directly. It also picked up three kinds of openness. They are radical openness, moderate openness, and special openness respectively. The appropriate openness can be selected according to the results of type selection in the previous step.
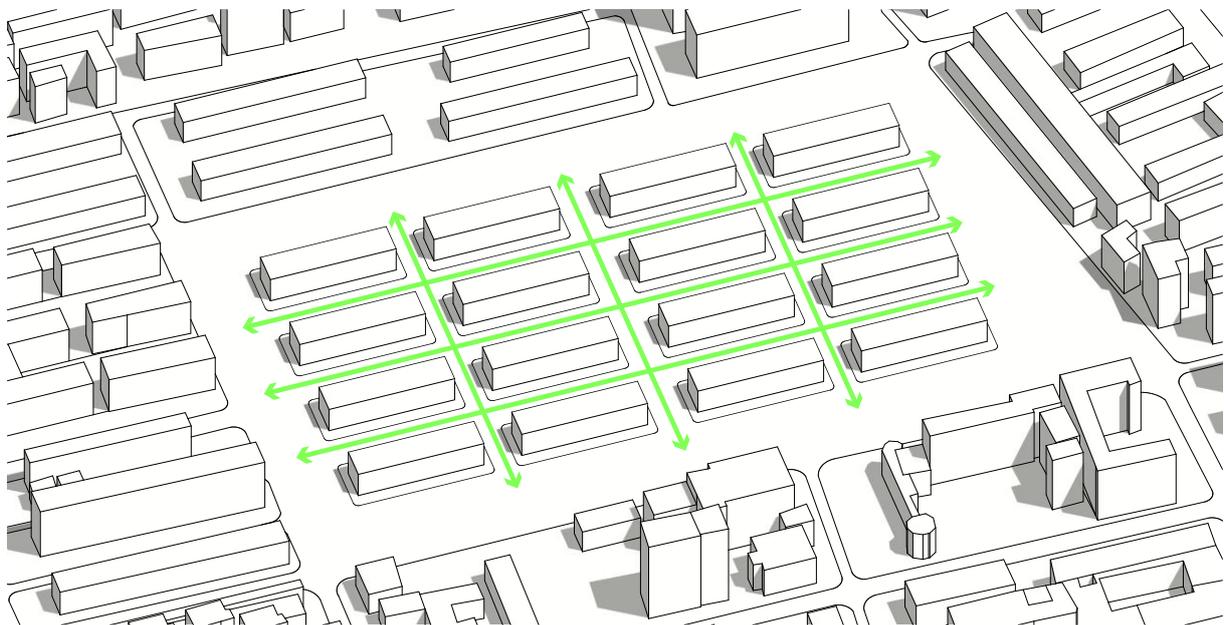
(a) radical openness

There are some tips for excluding or prioritizing this open model:

Exclusion in selection	Priority in selection
1. not closely related to urban streets	1. has a close relationship with urban roads
2. has complicated internal road and building organization	2. the layout of internal buildings and roads is simple and clear
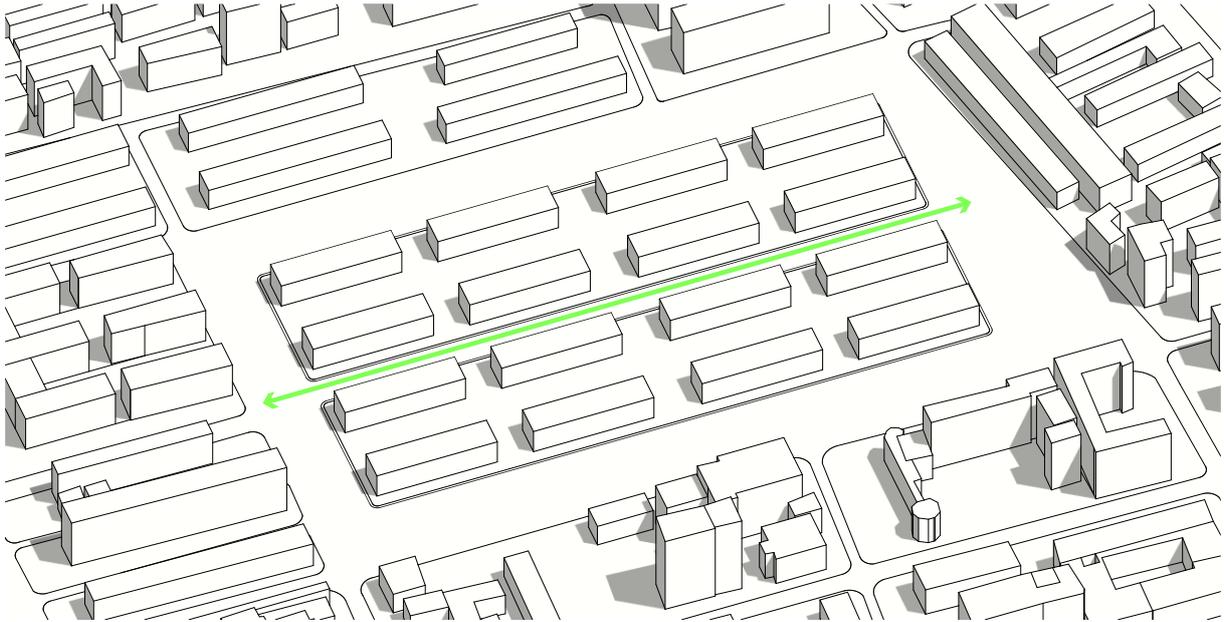
132

(b) moderate openness
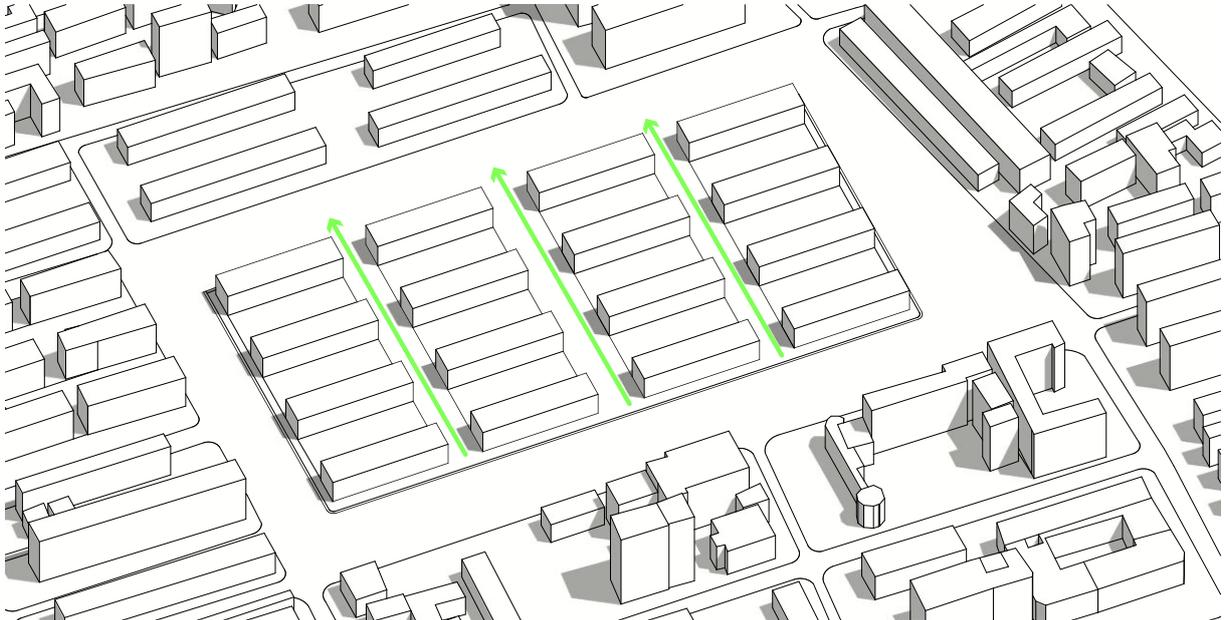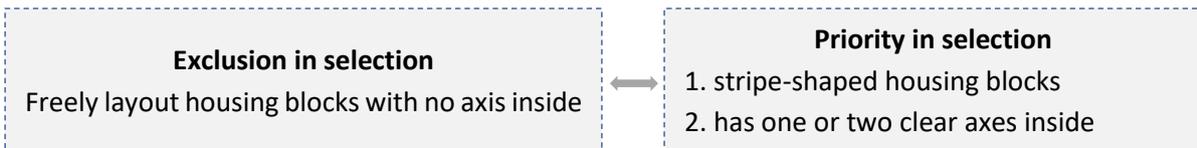
There are some tips for excluding or prioritizing this open model:

Exclusion in selection		Priority in selection
Freely layout housing blocks with no axis inside	⟷	1. stripe-shaped housing blocks 2. has one or two clear axes inside

(c) moderate openness

There are some tips for excluding or prioritizing this open model:

Exclusion in selection		Priority in selection
1. stripe-shaped housing blocks 2. surroundings aren't suitable to inter-connect	⟷	Requires an inside to out opening rather than a straight-through opening

(d) special openness

There are some tips for excluding or prioritizing this open model:

Exclusion in selection	Priority in selection
Areas with greater traffic demand. stripe-shaped housing blocks	Housing blocks with specific social and economic factors
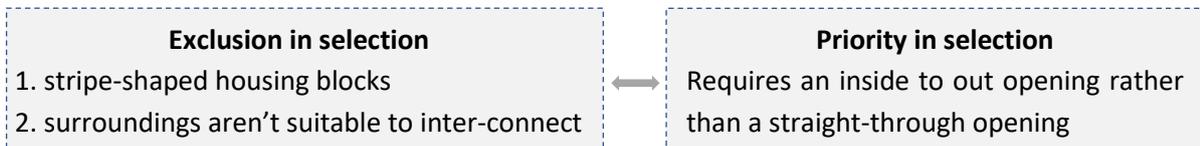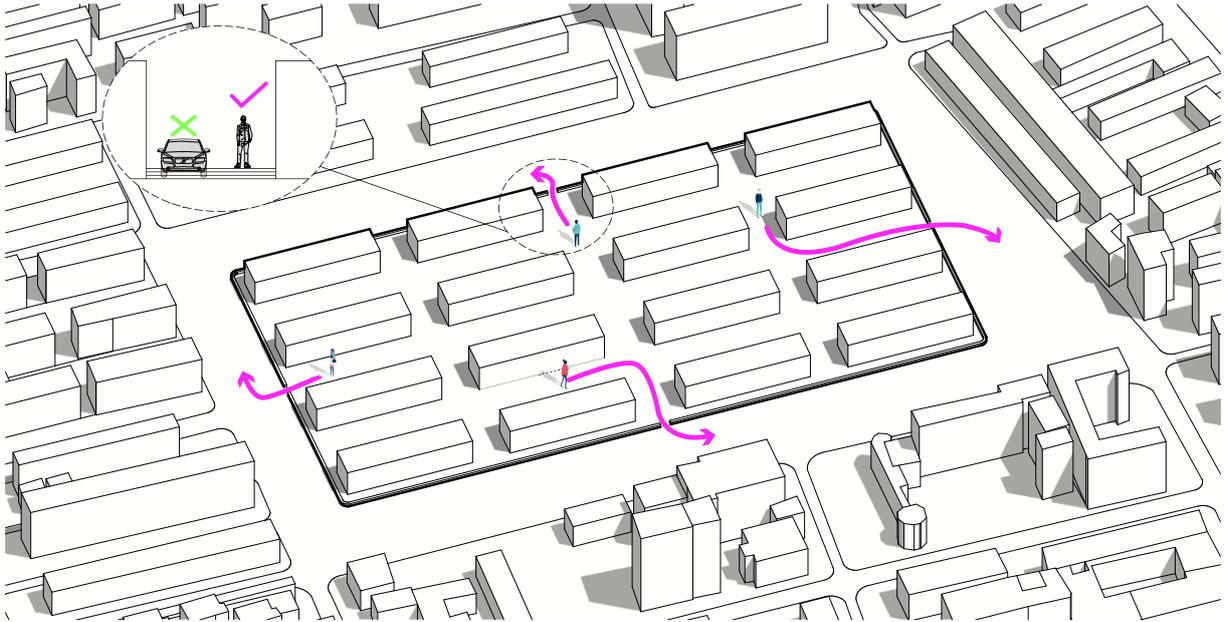
Figure 8.6. Openness of transformation

(3) The third procedure is to maintain diverse environmental behaviors. As many staying activities are highly related to a spatial factor-boundary, and open transformation has demolished the boundary walls, it's necessary to create new "boundaries" without sacrificing overall openness. This pattern was named "large open + small gated". According to the spatial characteristics of the unit building, tiny-scale gated units are created inside the residential area. These small closed groups retain the characteristics of some boundaries, providing a place for environmental behaviors that rely on the sense of enclosure (Figure 8.7).
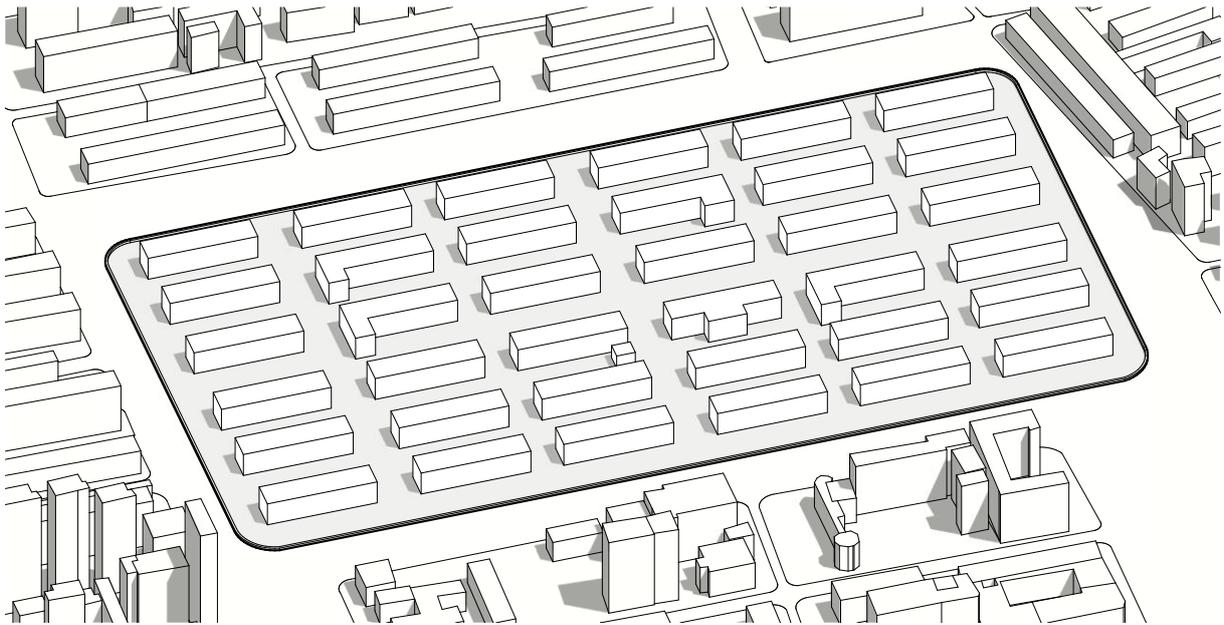
(a) Original gated pattern
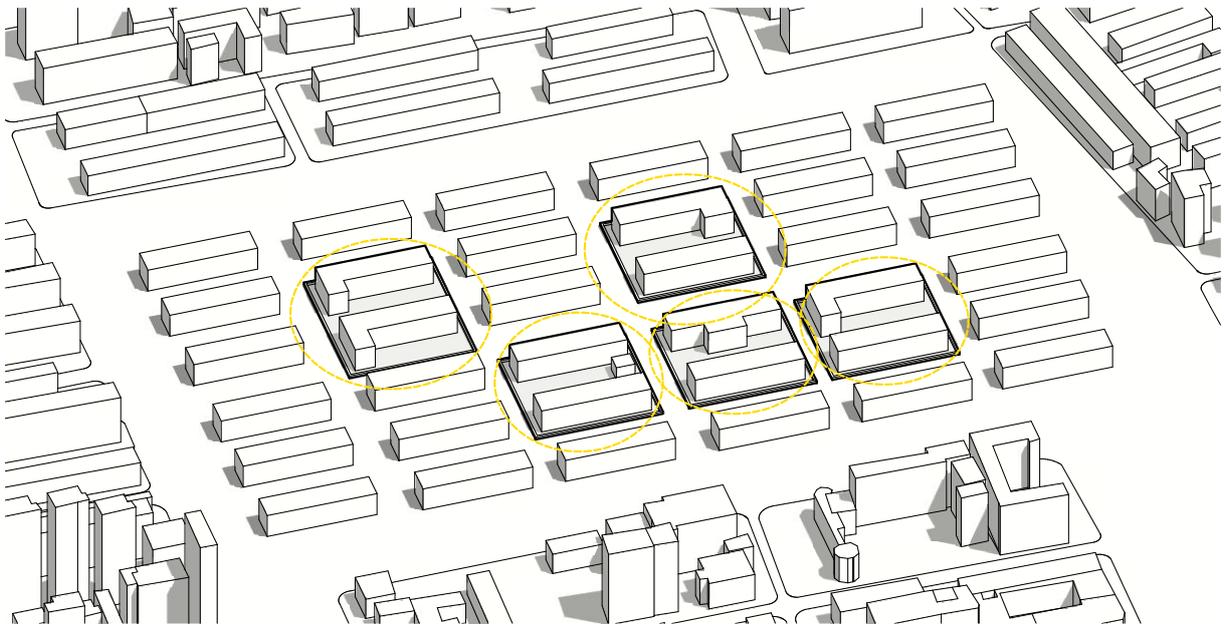
(b) "large open + small gated" pattern

Figure 8.7. Refining open pattern for maintaining diverse environmental behaviors.

(4) The fourth procedure is to encourage residents expanding their territory by enrich the layer of outdoor space. In the reconstructed open housing block, residents only expand their territory to the "entrance buffer zone" which cling to their private territory (Figure 8.8), while people in gated housing blocks generally expand their territory even cross the road. In open settlements, we can improve the space across the road to be more conducive to activities and enrich the space layers between unit buildings. In this way, residents are encouraged and attracted to cross the "river" for activities on the other "bank" (Figure 8.9).
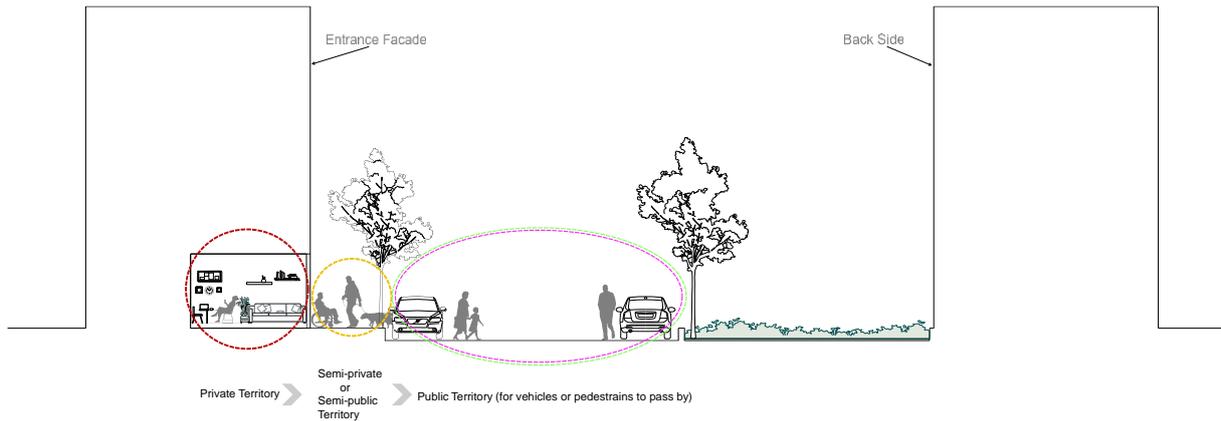
Figure 8.8. Residents' territorial space in existing open housing blocks
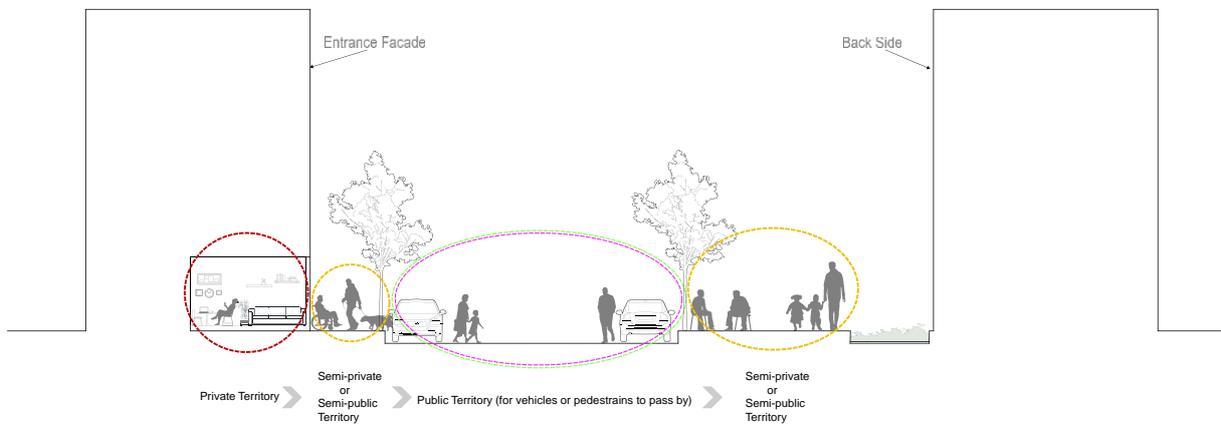
Figure 8.9. Residents' territorial space in ideal open housing blocks

8.2.2. The Proposal for management

In the open housing blocks' design, the organic coordination of planning measures and safety management should be considered comprehensively. Especially the design of public space should pay attention to its accessibility and closely integrate with intelligent monitoring facilities to avoid the formation of gray space and safety corners.

First of all, we should pay attention to the safety management of the neighborhood itself and the society, formulate and implement a strict legal system to ensure the safety of the urban environment, establish a block property security management mode based on single-family houses, and set up access control and security warning for single buildings. In the monitoring facility, the property company set up a security patrol team to conduct night patrols on a block basis.

Secondly, with the block or community as the basic unit, the government department representatives, representatives of public welfare enterprises, developers, owners'

representatives and other multi-stakeholders will be established to establish a diversified non-profit organization management organization. With the support of national or local government community development funds, social welfare agencies, and enterprises and individuals, or through the use of crowdfunding to obtain safety management development funds, establish a strict and precise fund management system to achieve good community governance.

In addition of above suggestions, the management should also pay attention to public participation, advocate democracy and legal system, attaching importance to the improvement of citizens' overall moral literacy, clarify the social nature of resource sharing, strengthen the safety supervision role of "street eye", and provide a social foundation for the systematic and intelligent management of street safety management.

8.2.3. The Proposal for public approach and education for residents

Cooperation between government and social organizations to create communication channels of OHB system policy. In promulgating and promoting the new policy of block system, the government should work with social organizations to promote policies and relevant information to people. For example, the combine public media of government organizations with the self-media of social intermediary organizations and entrust them to carry out policy publicity and opinion research on various platforms, so as to more effectively disseminate policies, and enable the public to get more full, timely and effective real-time feedback on policy opinions or suggestions. At the same time, the government should also timely push the introduction of policies and relevant information on traditional media such as radio and television, and timely link with the neighborhood committee and the owner committee to form a policy publicity system for cooperation between the government, the neighborhood committee, the owner committee and other social organizations.

Coordination of policy propaganda and typical demonstration to eliminate public confusion and doubts about OHB system policy.

As most urban residents are more accustomed to and satisfied with the original residential mode of GHB, it is hard for they to understand the relevant policies and specific implementation of open housing blocks, and they will have some senses of non-support or resistance to the new guideline. These ideological misunderstandings need special attention and effective guidance

from policy makers. Therefore, when the government propagandizes and promotes the block system, it needs to cooperate with the neighborhood committee and community public welfare organizations to carry out the propaganda and promotion on the ground, let residents gradually understand and accept the concept of the block system community, and dispel their confusion and doubts. At the same time, government departments at all levels and non-governmental public institutions should set an example, take the lead in opening up government agencies, enterprises, institutions and communities where public institutions are located. It will benefit to form a social consensus and lay a foundation for the smooth implementation of the future OHB system. It is also conducive to enhancing the public's sense of identity with the government and facilitating the implementation of the further open-planning in the future.

8.3. Recommendations for future work

Questions about Further Opening: Sharing Space and Facilities

After a few years of implementation of the 2016 "guideline", scholars' views on open housing blocks have been further extended. They believe that the construction and development of open residential areas in China should not only remove the physical space wall, but also focus on psychological activities of residents towards urban public life, and moderately open resources of social space to reconstruct their concept of public life.

In 2018, the new national standard, "Standards for Planning and Design of Urban Residential Areas", issued by Ministry of and Urban-Rural Development supported this idea. In the new Standard, the organizational structure and constituent units of urban residential area were re-divided.

The new structure is based on residents' fundamental living needs of and walking range arriving at public service facilities, taking the reasonable service radius and operation scale of the main supporting facilities into account. With the basic spatial organization of 2-4 hectares of residential neighborhoods, the new hierarchical organizational structure was formed. (residential neighborhoods→ 5 minutes life circle→ 10 minutes life circle→ 15 minutes life cycle).

Traditional Hierarchical Organization

New Hierarchical Organization

The concept of openness is forced to develop from "demolition of the wall" to the sharing of public space and facilities. In this trend and situation, both the permeability of residential space and the activities of residents might be affected. To learn how the further opening implemented and to understand the impact of further opening up on residents' lives should be the subsequent topics.

Appendices

A.1. Field survey and questionnaires

A.1.1. Survey Condition Setting and Pre-survey

1. Site and case study: China, Jilin Province, Changchun city, Lvyuan District

    Case study: XXX housing blocks, Control group: XXX housing blocks

2. Survey time: several periods of weekday, several periods of weekend
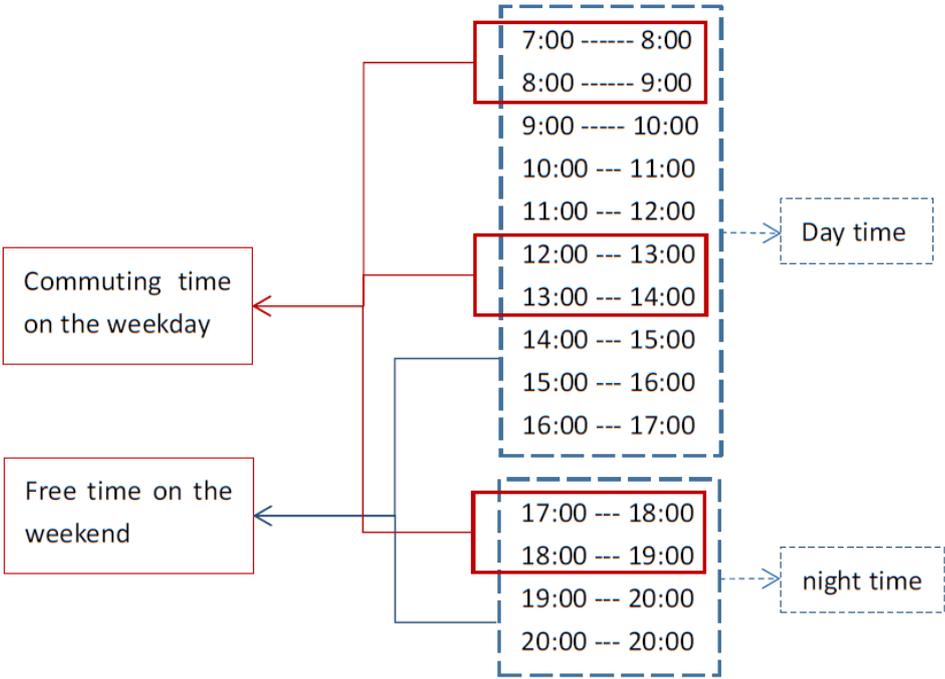
Figure A. 1. Time schedule for field survey

3. Respondents: Residents in the housing blocks
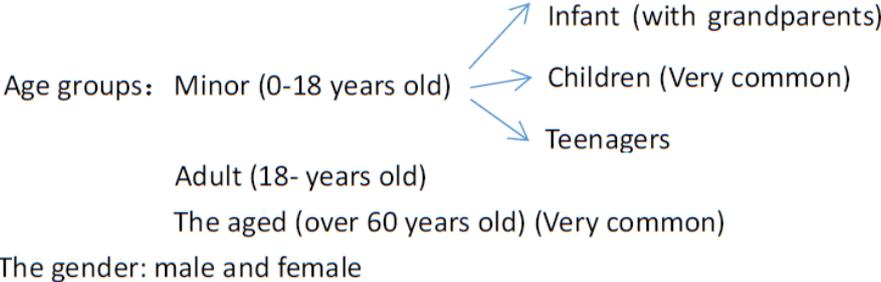
Figure A. 2. Object classification

4. Sample size

   Number of residents * 5% to 10% (as appropriate, select 100~300)

5. Secondary data collecting from the neighborhood committees

   Age structure, occupation and quantity of residents

   Information of residential building and environment, master plan (before and after the reconstruction)

6. Observation：Physical features of environment, human behaviors

Note: Step 1、2、3、4、5、6 for making questionnaires

     Step 5、6 for drawing base map(behavior mapping)

A.1.2. Investigation procedure: questionnaire and behavior mapping

(1) Questionnaire: question-and-answer (face to face)

    ✓ Aims to know the features of residents' daily activities.

    ✓ Randomly invite residents to be respondents. Since they generally don't have conditions to answer independent, this way is adopted.

    ✓ The investigator selects the appropriate periods between weekdays and weekends, and invited residents to answer questions until the number of samples was reached.

    ✓ The investigators also need to take into account the diversity (age, gender) of samples in the process of randomly selecting respondents.

    ✓ If need historic info: ask for depth interview after questionnaires.

(2) Behavior mapping: Space-centered mapping

    ✓ Drawing a base map of that housing blocks, marking the location of the outdoor space clearly.

    ✓ Listing all outdoor activities in daily life according to the observation in pre-survey stage.

    ✓ Classifying outdoor activities by attributes. (from various dimensions)

Sort by number

Individual activities
|
Activities in pairs
|
Activities in groups

By active state

Stationary activities
|
Dynamic activities

By contacting

Necessary activities
|
Spontaneous activities
|
Social activities

By territoriality

First territorial activities
|
Secondary territorial activities
|
Public territorial activities

By lasting time

Momentary activities (less than 1 minutes)
|
Short time activities (1~15 minutes)
|
Long duration activities (More than 15 minutes)

✓ Compiling simple, highly differentiated behavioral symbols (refer to the above classification dimensions) the symbols should be convenient to record momentarily and classify.

✓ Taking base map, pen and camera to the site, conducting snapshot and record on the map, then classifying

A.1.3. Questionnaire sample

Greeting. Excuse me, are you the resident here? I come from XX University, I am investigating residents' outdoor activities for my research now. I hope I could know something about residents' daily activities. The content is for academic use only, and also your privacy will be protected by anonymous form. Could you do me a favor to answer several questions in two minutes?

Topic 1: Basic information

1.1 gender：　　　A male　　　B female

1.2 occupation: ＿＿＿＿＿＿＿＿＿＿＿＿＿＿

1.3 age group：　A under 18　　B 18-60　　C over 60　　specific age＿＿＿＿＿

1.4 Did you live here before the reconstruction?　　A yes　　　B no

1.5 How long have you lived here?

A less than 1 year, B 1-5 years, C 5-10 years, D more than 10 years

1.6 Do you live with your family?

A by oneself   B live in couple   C two generation   D three generation   E inter generation?

Topic 2: Questions about daily activities (general)

2.1 Do you usually have outdoor activities in the housing blocks? What's the frequency?

No / Yes, A several times a day   B once a day   C several times a week

D once a week   E several times a month

2.2 What time do you usually have outdoor activities?

A only weekend   B only weekday   C both of them

2.3 How about the specific period?

A early morning   B morning   C afternoon   D evening

2.4 Where do you usually have outdoor activities?

Design options A, B, C, D, E, F, G according to the general layout

2.5 Rank your favorite 3 or 5 activity spaces and explain the reasons briefly.

_____ somewhere, reasons _____

_____ somewhere, reasons _____

_____ somewhere, reasons _____

_____ somewhere, reasons _____

_____ somewhere, reasons _____

2.6 What do you think of outdoor spaces in this housing blocks after reconstruction?

A added a lot of activity spaces   B increased activity spaces   C did not feel the change

D less activity spaces   E much less

2.7 After the reconstruction, how about your outdoor activities in this housing blocks?

A has greatly promoted outdoor activities

B has promoted outdoor activities to some extent   C hasn't affected outdoor activities

D less than previous   E outdoor activities have become much less

2.8 What's the positive impact of residential reconstruction on your daily life?

_____

2.9 What's the negative impact of residential reconstruction on your daily life?

2.10 As present situation, which aspect do you think should be improved? Why?

_____

Topic 3: about road spaces

3.1 Do you usually have outdoor activities on the road space in this housing block?

　　No / Yes, A several times a day　B once a day　C several times a week

　　　　　　D once a week　E several times a month

3.2 Do you agree that road spaces should also be activity space besides traffic function?

　　A　Agree　　　B　Disagree

3.3 Are you satisfied with the traffic status of road space? (traffic safety, parking, driving) if not,

what is the specific opinion?

　　A very satisfied　　B satisfied　　C normal　　D dissatisfied　　E very dissatisfied

　　Specific comments_____

3.4 Are you satisfied with the current situation of activities in road spaces? (area, number, etc.)

what is the specific opinion?

　　A very satisfied　　B satisfied　　C normally　　D dissatisfied　　E very dissatisfied

　　Specific comments_____

3.5 What activities do you and your family usually have in the road space? (multiple choice)

　　A sitting for leisure　　　　B Playing games　　　　　　C jogging

　　D sight viewing　　　　　　E chatting with neighbors　　F doing exercise

　　G walking　　　　　　　　H playing card games　　　　I staying

　　J walking dogs　　　　　　K other activities _____

3.6 How do you think the existing road spaces should be improved? (multiple choice, no more

than 5)

　　A less parking on the road　　B more traffic safety facilities

　　C more standardized traffic organization　　D more activity spaces

　　E more spaces to stay　　　　F more sitting places　　　G more walking space

　　H more playing spaces　　　　I more rest facilities　　　J more exercise equipment

　　K more sun shading facilities　L more landscape　　　　M other comments_____

Topic 4: about territorial cognition

4.1 Do you feel relaxed in this place?

A very relaxed　B relaxed　C generally　D not relaxed,　E not relaxed at all

4.2 Do you feel relaxed in this place?

A very safe　B safe　C generally　D not safe,　E not safe at all

4.3 How do you think about the privacy of this place？(If your home is 5, urban space is 1, please evaluate)

　　　　5　　　　4　　　　3　　　2　　　1

Your Home　　　　　　　　　　　　　*Urban Space*

4.4 Would you put your stuff here? (for example, benches, clothes drying, potted plant, etc.)

A yes, often　B yes　C yes, occasionally　D not　E definitely not

4.5 Have you ever seen strangers in this place?

A yes, often　B yes　C yes, occasionally　D never seen

4.6 Do you mind strangers to come here?

A strongly mind　B mind　C generally　D don't mind　E don't mind at all

4.7 Have you known and communicated with your neighbors?

A doesn't know / haven't seen　B occasionally, but has no communication

C known and has some communication　D very familiar / regular communication

4.8 Do you mind your neighbors to stay here?

A strongly mind　B mind　C generally　D don't mind　E don't mind at all

4.9 Is there anything changed about your sense of security, relaxation, privacy? If yes, please give specific comments

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A.2. Territorial cognition

Table A. 1. Interview questions about the territorial cognation part

Dimensions	Interview questions
Sense of Safety	Do you feel safe in this environment?
Feeling of privacy	What do you think about the privacy of this place?
Possessing	Do you feel relaxed or relieved here?
	Do you think this place has your personal characteristics?
Defense	Do you feel unhappy when some outsiders hang out around here?
Perception of affiliation	Do you know your neighbors and interact with them?
	Do you feel unhappy when your neighbors hang out around here?

*The answer was given by the Likert Five-Point Scale.

Table A. 2. Territorial score of space areas in the open and gated housing blocks.

Open housing block: Changke B									
Area	Score	Area	Score	Area	Score	Area	Score	Area	Score
ao1	6	ao28	0	ao55	0	ao82	2	bo26	68
ao2	12	ao29	0	ao56	2	ao83	0	bo27	0
ao3	4	ao30	0	ao57	0	bo1	9	bo28	0
ao4	0	ao31	0	ao58	0	bo2	0	bo29	0
ao5	20	ao32	0	ao59	24	bo3	0	bo30	0
ao6	10	ao33	18	ao60	0	bo4	0	bo31	0
ao7	14	ao34	8	ao61	5	bo5	0	bo32	5
ao8	3	ao35	6	ao62	0	bo6	0	bo33	3
ao9	0	ao36	0	ao63	0	bo7	0	bo34	0
ao10	0	ao37	3	ao64	0	bo8	0	bo35	0
ao11	0	ao38	1	ao65	0	bo9	0	bo36	0
ao12	0	ao39	9	ao66	3	bo10	0	bo37	0
ao13	2	ao40	0	ao67	4	bo11	0	bo38	0

Area	Score	Area	Score	Area	Score	Area	Score	Area	Score
ao14	0	ao41	4	ao68	0	bo12	0	bo39	0
ao15	0	ao42	18	ao69	4	bo13	0	bo40	0
ao16	0	ao43	1	ao70	0	bo14	0	bo41	0
ao17	0	ao44	31	ao71	2	bo15	0	bo42	4
ao18	3	ao45	4	ao72	0	bo16	0	co1	5
ao19	7	ao46	0	ao73	8	bo17	0	co2	8
ao20	0	ao47	0	ao74	23	bo18	0	co3	0
ao21	9	ao48	0	ao75	6	bo19	0	co4	0
ao22	0	ao49	0	ao76	5	bo20	0	co5	0
ao23	0	ao50	0	ao77	13	bo21	0	co6	5
ao24	0	ao51	6	ao78	2	bo22	8	do	0
ao25	0	ao52	0	ao79	15	bo23	0	eo	6
ao26	0	ao53	28	ao80	6	bo24	0		
ao27	0	ao54	20	ao81	7	bo25	0		

gated housing block: Qichechang 34

Area	Score	Area	Score	Area	Score	Area	Score	Area	Score
ag1	0	ag34	0	ag67	0	bg15	47	bg48	0
ag2	0	ag35	0	ag68	0	bg16	18	bg49	8
ag3	0	ag36	0	ag69	4	bg17	40	bg50	35
ag4	0	ag37	6	ag70	0	bg18	2	bg52	42
ag5	2	ag38	0	ag71	0	bg19	0	bg53	3
ag6	0	ag39	0	ag72	0	bg20	8	bg54	12
ag7	0	ag40	0	ag73	0	bg21	3	bg55	0
ag8	0	ag41	0	ag74	4	bg22	14	bg56	0
ag9	0	ag42	0	ag75	0	bg23	0	bg57	3
ag10	12	ag43	2	ag76	0	bg24	3	bg58	10
ag11	20	ag44	0	ag77	0	bg25	7	bg59	0
ag12	0	ag45	0	ag78	2	bg26	25	bg60	0

ag13	0	ag46	0	ag79	0	bg27	12	bg61	15
ag14	0	ag47	0	ag80	2	bg28	2	bg62	0
ag15	0	ag48	2	ag81	0	bg29	0	bg63	52
ag16	0	ag49	0	ag82	0	bg30	1	bg64	0
ag17	13	ag50	0	ag83	0	bg31	0	bg65	9
ag18	2	ag51	3	ag84	0	bg32	0	bg66	0
ag19	0	ag52	0	ag85	0	bg33	0	bg67	2
ag20	0	ag53	0	bg1	0	bg34	2	bg68	23
ag21	0	ag54	20	bg2	9	bg35	3	bg69	4
ag22	0	ag55	0	bg3	4	bg36	8	cg1	2
ag23	0	ag56	2	bg4	6	bg37	3	cg2	0
ag24	0	ag57	5	bg5	4	bg38	6	cg3	2
ag25	0	ag58	0	bg6	4	bg39	8	cg4	0
ag26	6	ag59	0	bg7	5	bg40	0	cg5	0
ag27	16	ag60	0	bg8	21	bg41	10	cg6	0
ag28	0	ag61	0	bg9	1	bg42	9	cg7	0
ag29	0	ag62	0	bg10	2	bg43	5	cg8	0
ag30	0	ag63	0	bg11	2	bg44	11	dgx	47
ag31	0	ag64	0	bg12	0	bg45	18	eg	2
ag32	4	ag65	0	bg13	7	bg46	10		
ag33	12	ag66	0	bg14	0	bg47	19		

Achievements

Journal publications:

1. **J. Huang,** S. Mori, R. Nomura, "Comparing Characteristics of Environmental Behaviors and Spatial Types in Open and Gated Housing Blocks: A Case Study of Changchun, China," *Sustainability* 2018, 10(6), 1835; https://doi.org/10.3390/su10061835.

2. **J. Huang,** S. Mori, Nomura, R. "Territorial Cognition, Behavior, and Space of Residents: A Comparative Study of Territoriality between Open and Gated Housing Blocks; a Case Study of Changchun, China." *Sustainability* 2019, 11(8), 2332; https://doi.org/10.3390/su11082332

3. Do, D.T.; **J. Huang**; Cheng, Y.; Truong, T.C.T. "Da Nang Green Space System Planning: An Ecology Landscape Approach," *Sustainability* 2018, 10(10), 3506; https://doi.org/10.3390/su10103506

Symposium proceeding:

1. **J. Huang,** S. Mori, Nomura, R., "The Influence of Open-Oriented Residential Transformation on Environmental Behaviors and Spatial Types: A Case Study of Changchun, China," *Proceedings of the 13th International Symposium for Environment-Behavior Studies*, Wuhan, China, (2018.11, Oral presentation)

2. **J. Huang,** S. Mori, R. Nomura, Hokkaido University. 7th International Doctoral Symposium, "Future Design of the Urban Built Environment", Hokkaido University, Sapporo, Japan, Nov. 19-21, 2018

Awards:

Selected as scholarship student supported from China Scholarship Council, China (2016-2019).