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Optimisation of Urban Village Boundaries from the Perspective of "Socio-Spatial": A Case Study of Shipai Village in Guangzhou

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Abstract

Urban villages are a unique phenomenon that emerged during China's rapid urbanization process, bearing complex social, economic, and cultural significance. Their boundaries are not only demarcation lines between different domains but also crucial spaces where social, spatial, and material interactions occur. These boundaries are characterized by connectivity, transition, flexibility, and mediation, playing a key role in facilitating the flow of information and social interactions across different areas. Over time, the boundaries of urban villages have been shaped by various factors, including clan integration, urban land acquisition, and market consolidation, resulting in complex spatial forms. As urbanization progresses, these boundaries have increasingly been compressed, often displaying irregular and intricate characteristics. Despite the high degree of population diversity and social vitality in these boundary areas, they suffer from low spatial perception ratings, frequent traffic flow intersections, and a lack of essential public facilities and social spaces. Consequently, many boundary spaces are underutilized, leading to an overall low quality of space. As vital areas connecting cities and villages, these low-quality boundary spaces not only hinder effective interaction between urban villages and cities but also fail to meet the diverse needs of people for a better quality of life. Therefore, improving the quality of urban village boundary spaces is crucial for promoting the integrated development of cities and urban villages, enhancing social interaction, and increasing community vitality.

Unlike previous research, which primarily focused on the spatial elements and forms of urban villages, this paper introduces a "socio-spatial" perspective to conduct an in-depth analysis of boundary spaces across four dimensions: production, psychological, living, and cultural. By collecting and synthesizing the spatial evolution of boundaries and their social development dynamics, this study summarizes the mechanisms of space production and identifies current issues, while also analyzing, optimizing, and adjusting functional configurations. Through cognitive mapping surveys, the study examines the spatial perception characteristics of different groups and categorizes spaces based on cognitive differences, developing corresponding spatial intention optimization strategies. The paper employs a combination of UML activity analysis, observational notes, and place self-assessment methods to conduct a detailed analysis of four boundary types: shared urban streets, internal urban village streets, node plazas, and wall boundaries. It identifies disconnections between social behavior and spatial places, unsuitable activity scenarios, and space issues that fail to meet human-centered needs, proposing targeted place renewal recommendations. Furthermore, the

research explores the current status of traditional culture, regional culture, and living culture, and summarizes cultural renewal strategies for these spaces.

Overall, this study conducts a comprehensive analysis of the "socio-spatial" relationship in boundary spaces through four dimensions of analysis and design research, proposing strategies to activate boundary space vitality and restore social control over these areas. The aim is to strengthen the "society-people-space" connection between cities and urban villages, providing effective methods for the targeted renewal of urban villages. By focusing on urban village boundaries as the starting point for renewal, this research offers a foundational reference for promoting the integration, coexistence, and sustainable development of cities and urban villages, as well as for advancing the construction of a better quality of life for residents.

Keywords: urban village； boundary； social integration； public space； social space； urban design

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Chapter1 Introduction

1.1 Background

In recent years, the Chinese government has attached great importance to urban renewal and the transformation of urban villages, and has successively introduced a series of policies and measures. These policies include providing financial support, simplifying the approval process, and encouraging the participation of private capital, with the aim of promoting the smooth implementation of urban renewal. Through policy support, many urban villages have been able to improve their infrastructure and environment, and the quality of life of residents has improved. However, there are also many challenges in the implementation of the policy, such as insufficient funds and coordination of residents' interests. Effective policy support is not only a guarantee for promoting the renewal of urban villages, but also a key factor to ensure the coordinated development of urban and rural areas.

What's more, modern urban design is gradually shifting from object-centric to human-centered, emphasizing meeting the actual needs of residents and improving the quality of life. This design concept is particularly important in the renewal of urban villages. As a relatively backward area in the city, urban villages have diverse and complex residents' needs, including the improvement of living conditions, the improvement of public services, and the optimization of community environment. Through human-centered design, we are able to better meet the needs of our residents and improve their well-being and sense of belonging. People-oriented urban design not only focuses on the beauty and function of space, but also pays more attention to social harmony and sustainable development.

However, the real social problems and poor spatial quality of urban villages need to be optimized and improved urgently. Urban villages usually face prominent social problems and poor spatial quality. For example, urban villages tend to be densely populated, have poor infrastructure, and poor environmental sanitation, making social management difficult. At the same time, most of the residents of urban villages are low-income groups, facing challenges in employment, education, and medical care. These problems not only affect the quality of life of residents, but also restrict the development and transformation of urban villages. Through scientific planning and design, optimizing the spatial layout of urban villages, improving infrastructure, and enhancing public services can effectively solve these problems and promote the sustainable development of urban villages.

At the level of applied methodologies, organically combining the knowledge, theories and methods of geography, sociology, economics, architecture, environmental science and other

disciplines, we will jointly study and solve space-related problems. This multidisciplinary approach not only contributes to a comprehensive understanding of the physical properties and social connotations of space, but also deepens the knowledge and understanding of space at multiple levels, thereby promoting the scientific and effective planning, design and management of space. Through the combination of multiple disciplines, it is possible to dig deep into and understand the cultural and historical background behind the space, analyze the social relations and interaction patterns of people in the space, and consider the socio-economic activities in a comprehensive manner. At the same time, multidisciplinary interdisciplinary research can analyze the overall spatial structure and functional zoning of the region from the macro level, pay attention to the detailed design and use of specific spatial units from the micro level, and innovatively apply interdisciplinary methods and technologies, such as big data analysis and artificial intelligence, to improve the scientific and intelligent level of spatial planning and management. It not only promotes the innovation and development of space research, but also provides a solid theoretical and methodological foundation for scientific, rational and efficient spatial planning, design and management.

Therefore, it is of great significance and solid practical foundation to recognize and transform urban villages from the "socio-spatial" dimension. Understanding and transforming urban villages from the perspective of the border can help optimize the urban-rural interface and enhance the vitality of the border, while at the same time promoting the interaction and symbiosis of cities and villages on both sides of the border.

1.2 Concept Definition

1.2.1 Boundary space

Boundary refers to the boundary or dividing line, which represents the boundary between different things. The definition of border in the Modern Chinese Dictionary is: the boundary between regions and regions, mostly referring to national borders. In the fields of architecture and urban planning and design, scholars have studied boundaries as objects[0] In 1959, Kevin Lynch mentioned in Urban Imagery that the definition of boundary space is a linear system other than urban roads, which is a material element between two areas as a field. Jan Gale argues that boundaries are flexible, between non-private and non-fully public, and are part of a continuum between the two; Arming-van Yeck proposed the theory of "mediation", which proposes that the intermediary space exists with two different attribute spaces, and that the separated things are reconnected through the transition and design of the mediation. In his theory of the boundary effect, Dirk de Jones proposed that when individuals are at the border,

they will have two ambivalences: the desire to interact and the desire to maintain private space that is not violated. Wu Liangyong summarized the characteristics of boundary space in Architecture in a Broad Sense, and believed that boundary space is a transitional space, a connecting space, and a medium space[0] In general, boundaries usually appear in the form of "lines", representing the demarcation of different things, and are the characteristics of connectivity, transition, flexibility, and mediatorship of the material elements between two regions as the separation of domains. Boundaries are intermediaries between different regions, connecting or dividing different functions or communities; The interface is flexible, facilitating or hindering social interaction; The organization of space includes both informal and formal, which is conducive to flexible and multifunctional use; Ecological and social sustainability needs to be considered due to the overall environmental impact (Figure 1–1). At the same time, boundaries are places for people's daily behavior, perception, use, and interaction; It has the potential to influence people's identity and promote social integration. Finally, boundaries are the imprints of the evolution of time and space, which can generate cultural attachments across time and space (Figure 1–2).

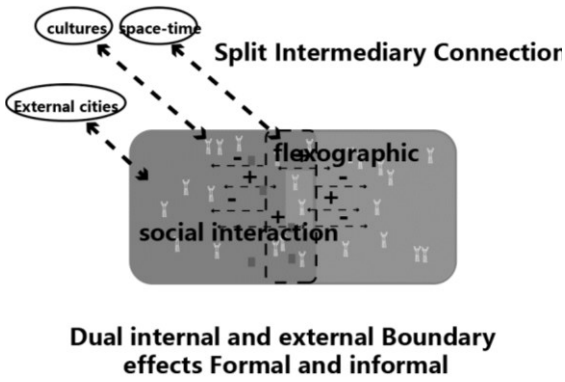


Figure 1–1 Spatial role of boundaries
(Source: Author's own drawing)

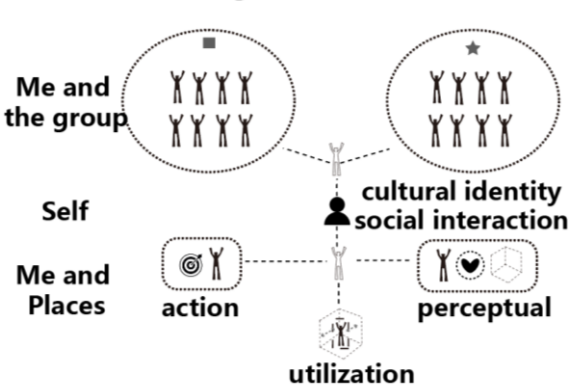


Figure 1–2 The social implications of boundaries
(Source: Author's own drawing)

Boundaries are the starting point of public space and the core of public space research. Kevin Swaites said that boundaries are at the heart of urban design research, which is conducive to understanding the behavioral interaction of people and responding to the problems of sustainable social development. Zimmer says that boundaries are the integration of social, spatial, and material dimensions in different domains; Wu Liangyong summarized in "Generalized Architecture" that boundaries are connected, transitional, flexible, and intermediary. Studying and improving the border status between different regions is conducive to promoting information exchange and social exchanges between different fields. Therefore, the optimization study and updated design of the boundary are of great significance.

1.2.2 Urban Village Boundary Space

The overall structure of urban villages is located between the city and the traditional natural villages, and in the process of rapid urban expansion and sprawl, it is gradually incorporated into the urban scope, forming a dual structure that not only has urban characteristics but also retains the rural style[1]. The boundary space of an urban village refers to the area where the edge of its land is in direct contact with the outside of the city. These boundaries can be divided according to several aspects: first, the boundaries based on geographical matter, that is, the physical boundaries in contact with the urban road system; secondly, the boundaries based on social networks and community classifications reflect the boundaries of social relations with the surrounding society. In addition, it includes spatial perception boundaries based on individual life experiences and perceptions. In this paper, we choose to define the boundary of "social space" based on the land use scope of village collectives and urban administrative divisions. This definition not only includes the tenure attributes of the land in the historical evolution, but also has a clear geographical division, usually in the form of streets, squares or fences. In terms of spatial form, the marginal buildings or enclosures at the junction between the urban village and the surrounding urban land and its surrounding areas, including roadways, sidewalks, green belts, building setbacks, and red-line open spaces, constitute typical manifestations of the boundary space of urban villages (Figure 1–3).

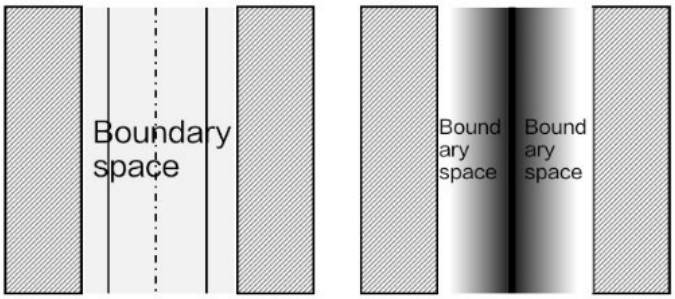


Figure 1–3 Spatial definition of boundary
(Source: Author's own drawing)

1.2.3 "Socio-spatial" relations

The concept of "social space" was first proposed in the 18th century by the French scholar Durkheim. The understanding of the "social-spatial" relationship has undergone a transformation from the mechanical reflection of the spatial image to the understanding of the "socio-spatial unity", and the space is not a copy of the society, but the space is the society. The "social-spatial" relationship was first proposed by Lefebvre in 1974 in "Space Production", in which he believed that social space is not only a material and spiritual space, but also a social

product. and divides social space into spatial practice, spatial representation, and representation space[2]. The "socio-spatial" relationship used in this paper is mainly based on Edward's 2011Sawyer's classification in The Spatiality of Social Life: Toward a Transformational Theoretical Reconstruction[4]. Based on the physical space, this paper compares and analyzes the production, life, psychology and cultural dimensions of the boundary space, and discovers the fracture between society and space, so as to guide and apply the practice of urban renewal.

1.3 Research Questions

It is a complex and challenging task to make use of the diverse population, high social vitality and positive production status and social operation system at the boundary of urban villages, combine the existing space of urban villages, optimize the environmental disadvantages and social isolation status of urban villages, design border spaces that meet the needs of diverse people, develop sustainably and promote crowd interaction, and create a beautiful urban-rural symbiotic habitat. As a rural-urban interface, urban villages attract residents from diverse backgrounds, bringing with them a rich culture, lifestyle and social vitality. However, the border areas of urban villages often suffer from problems such as poor environmental quality, poor infrastructure, and social isolation, resulting in poor living conditions and insufficient community cohesion. Therefore, it is necessary to make full use of the existing spatial resources and social operation mechanisms of urban villages through scientific and reasonable planning and design, so as to transform the border areas into public spaces that meet the needs of diverse people. These spaces should not only provide infrastructure and services, but also promote communication and interaction among residents and enhance community cohesion. At the same time, the design process should focus on sustainable development, use eco-friendly methods to improve environmental quality, create a harmonious and symbiotic urban-rural transition zone, and provide residents with a safe, comfortable and beautiful living environment. Through such efforts, the boundary space of urban villages will no longer be an obstacle to development, but an important link for urban-rural symbiosis.

1.4 Research Value

(1) Theoretical value: Introduce the perspective of "society-space" relationship and deepen the concept of "society-person-space" urban design renewal. Through this perspective, the organic combination of urban space design and social needs is realized, and the sustainability and social justice of urban development are promoted.

(2) Methodological value: Through systematic interaction and self-evaluation, the research quantifies the activities of the population, and accurately identifies and locates the breaking points and bottlenecks of social space. This scientific method provides accurate data support for urban planning and design, which helps to optimize the layout and functional configuration of urban space to meet people's diverse space use needs.

(3) Practical value: Treat the boundary space as a "cohabitation ground" and actively promote the interaction and integration between communities on both sides of the border; By optimizing the quality of boundary space and building a good spatial perception and urban intention, the quality of life of residents and community cohesion can be improved. With the help of the boundary demonstration effect, the overall upgrading of roads inside urban village and alleys and public spaces in urban villages will be promoted, and the integration and symbiosis between urban villages and surrounding cities will be promoted.

1.5 Research Framework

This paper focuses on the optimization of urban village boundaries, using Shipai Village in Guangzhou as a case study to explore how a "socio-spatial" perspective can be applied to understand and improve the unique interface between urban and village areas. The paper is divided into five main sections(Figure 1–4).

The first section is the introduction, which presents the research background, clarifies the importance of optimizing urban village boundaries, and defines key concepts such as "urban village" and "socio-spatial." The research questions are then outlined. Additionally, this section briefly introduces the research methods employed, including literature review, case analysis, cognitive mapping, and social activity analysis, while also providing an overview of the structure of the entire paper.

The second section is the research foundation. In this section, the paper examines the existing theoretical frameworks regarding urban village boundaries, particularly those related to socio-spatial dimensions. It also discusses the selection of Shipai Village as the research object and its significance. The section on data collection and analysis describes the fieldwork conducted, with a focus on social activity analysis and place self-assessment, emphasizing how these methods support the evaluation of boundary quality and usage.

The third section involves the four-dimensional analysis and characteristics of boundary space. This section delves into the boundary space of Shipai Village from four dimensions: production, psychological, living, and cultural. The production dimension explores the interaction between various production activities and boundary functions and their impact on

vitality. The psychological dimension examines residents' perceptions and cognitive experiences of the boundary space, offering suggestions to enhance the sense of place. The living dimension analyzes the daily usage of boundary spaces through activity mapping, proposing targeted design improvements. The cultural dimension provides an in-depth exploration of Shipai Village's cultural background and examines issues in the current cultural expression of the boundary, proposing specific measures to revitalize cultural sites.

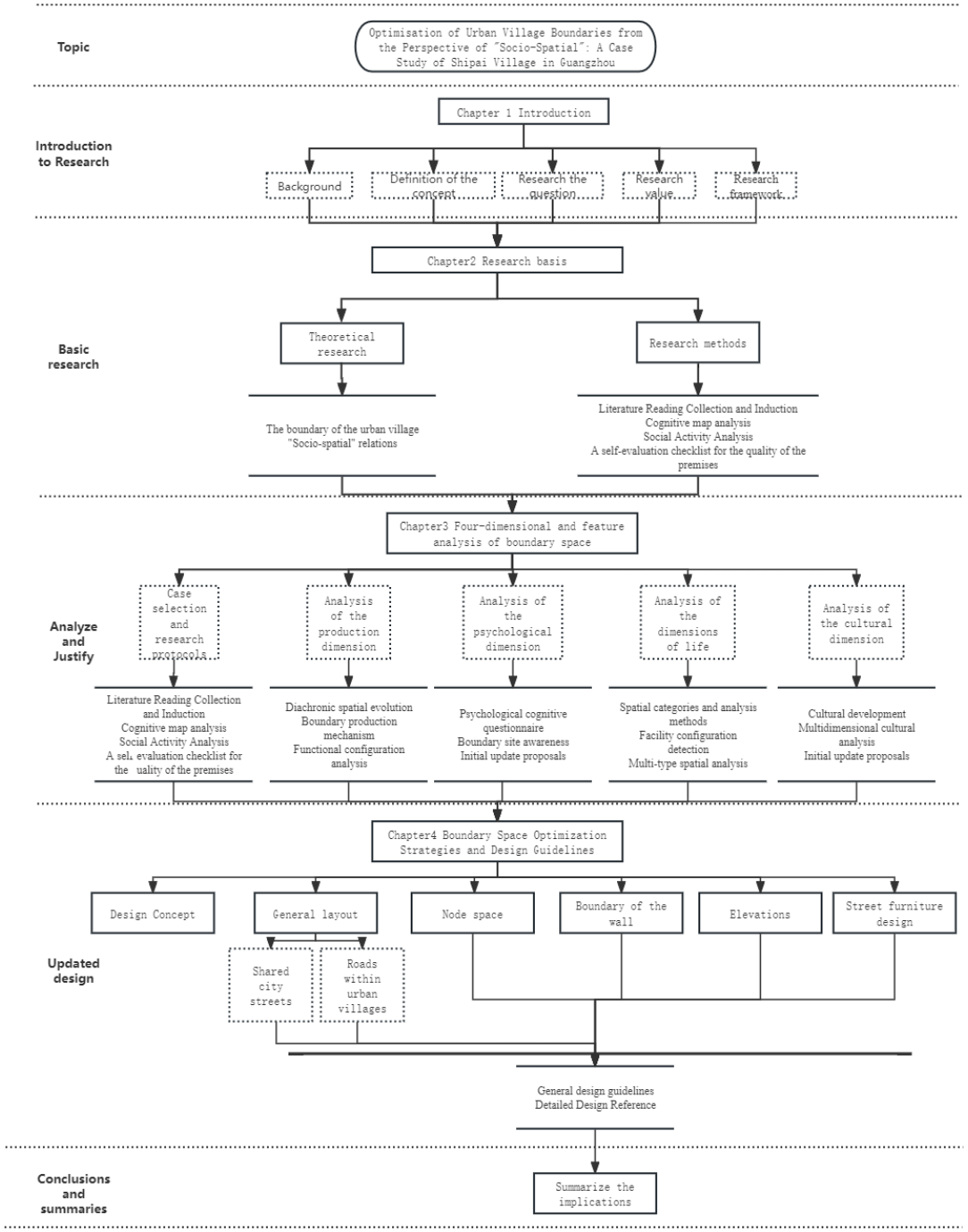


Figure 1–4 Thesis Research Framework
(Source: Author's own drawing)

The fourth section presents boundary space optimization strategies and design guidelines. In this section, the paper proposes an overall design concept for optimizing boundary spaces, offering detailed design guidelines, including general layout, node space design, boundary walls, building facades, and street furniture design. These design suggestions aim to enhance the coordination between urban villages and surrounding urban spaces through more refined spatial planning, thereby promoting overall regional development.

The final section, conclusions and prospects, summarizes the main research findings and discusses the importance of optimizing boundary spaces to facilitate urban-rural integration. It also offers insights intos future research directions, recommending the integration of big data and in-depth social research methods to further refine boundary space design and optimization strategies.

Chapter2 Research Basis

2.1 Theoretical Research

2.1.1 The Urban Village Boundary

2.1.1.1 Boundary

（1） Relevant Research Abroad

Boundary studies first originated in the West. Under the guidance of the concept of public and private, the study of the relationship between public and private is attached great importance to the construction of urban space in the West. As a means of defining public and private space, boundaries have become an important part of Western urban life[5]. Through the study of "rooms" and "squares", Sit found that they all have a common feature, that is, they have a complete enclosed boundary, forming a closed cohesive space, and the square and room seem to be an external space and an internal space, but they both have a boundary Characteristics of "inner" [0] The new urbanism further proposes that the design of urban public space should be carried out from the perspective of squares and streets. With the advent of modernist planning ideas, many scholars put forward the idea of "transparency"[6]. Modernist architects pursued the integration between architecture and external space, believing that the boundary should be blurred and ambiguous, and Venturi proposed that "architecture arises from the intersection of indoor and outdoor functions and spaces[5]. Focusing on the "transitiveness" of borders, we will fully explore the complex relationship between inside and outside. Aldo van Eyck, a Dutch architect who is one of the representatives of postmodernism, once put forward the famous theory of "fuzzy space", and he believed that the interface between interior and exterior, public and private space is the most important thing in space design[7]. Following Van Eyck, Hermann Herzberg argued that the ambiguity and transition of boundary spaces are essential to spatial design. American scholar Kevin Lynch summarized the five elements of roads, boundaries, areas, nodes and landmarks as the physical form of urban imagery, and mentioned that another important role of boundaries is that they can "connect" some ordinary areas together. With the deepening of the research on spatial relations, the Japanese architect Yoshinori Ashihara discovered the difference between the boundary in Eastern and Western cities, and proposed that different societies and cultures in the East and the West have certain differences in their cognition of spatial relations. For example, the boundaries of Eastern cities are profoundly influenced by history and culture; It reflects social structure and identity, and also serves as a demarcation of social boundaries; Oriental cities use boundaries to divide different functional areas, and the location and form are affected by the functional areas[7]. Jane

Jacobs, reflecting on the problems of urban planning, argues the dangers of the "junction vacuum", "where a single use and another form a junction that often becomes a destructive block in the city[9]. For example, along the railway tracks, university campuses, expressways, large factories in cities, etc., the boundaries of these areas are often lifeless, often meaning "this road is impassable", which raises the importance of mixing land and functions and breaking the boundary vacuum zone. When exploring the impact of boundaries on urban social life, Danish architect Jan Gale studied the relationship between people and space, and proposed that in his book "Communication and Space", the concept of "flexible boundary" was mentioned for the first time between non-completely private and non-completely public, and explained that the particularity of its space has the effect of promoting or hindering people's activities, emphasizing that when designing boundary space, it is necessary to fully consider the communication activities with people and establish dense and effective continuity[11]. Christopher Alexander believes that borders play an important role in stimulating the vitality of people, often resulting in high vitality. In his book The Language of Architectural Patterns, he summarizes many experiences with boundary effects and boundary areas in public spaces, as well as the guidance of boundaries for concrete design[11]. For example, borders should be of moderate height and thickness to provide adequate privacy and security, while also remaining open and interactive; The materials, colors and textures of the boundaries should be in harmony with the surrounding environment to create a harmonious spatial atmosphere; The shape and layout of the boundary should be in line with people's behavior and activity needs, promote communication and interaction, etc. Roger Transic, a well-known American urban design scholar, believes that boundaries are of great significance to the transmission of the meaning of places, and boundaries are not only the separators of space, but more importantly, they carry the meaning and emotions of places. The design and layout of boundaries can influence people's perception and understanding of place, creating a unique spatial atmosphere and identity. Therefore, effective ways to connect spaces should be carefully sought in the design, and diversity and inclusion should be emphasized in the design of boundaries to accommodate the needs of different groups of people and activities[11]. Japanese scholar Hirai-imai believes that the boundary carries a cultural dimension that transcends the boundaries between the past and the present, and is a reflection of the landscape of memory. Through the method of spatial narrative, the cultural attachment psychology of local residents behind the urbanization of boundary space and the nostalgia for traditional street landscape are analyzed[14]. According to Swaites, "the transitional nature of marginal spaces has to do with social interactions, the

qualities that attract and carry people's stay activities". At the same time, as a morphological element, it plays an important role in encouraging and maintaining the vitality of the urban domain" and emphasized the importance of paying attention to the public experience and participation in the relationship between the marginal areas in urban design, so as to enhance community consensus and create a sense of place for "we"[15].

The research categories of urban villages in foreign countries mainly focus on urban growth boundaries, green space boundaries, campus boundaries, urban-rural boundaries, urban agglomeration boundaries, etc., and at the same time, the research on heterogeneous spatial boundaries such as wasteland urban interfaces has been expanded. At the methodological level, computer technology promotes the ability to identify spatial boundaries and broadens the breadth of understanding. For example, an evolutionary model is established, cellular automata (CA) is introduced to study the evolution process of geospatial systems, and the boundary geographic location and its dynamic changes are summarized and extracted, and the parameters are optimized by combining genetic algorithm (GA) to make the simulation more consistent with reality[16][17] Using tracking technology (GPS), real-time measurement technology and dynamic emotion, combined with the methods of cognition and evaluation of spatial affective interaction, the affective map of the city based on geographical location was created and compared with actual activities to identify the discontinuity location in the affective stimulus area, affective boundary and affective space. At the level of quantitative indicators of traditional urban blocks, the cross-sectional morphology of buildings, the characteristics of individual buildings, and the spatial configuration of buildings are evaluated, and the decision tree method is used to evaluate urban indicators, expanding the traditional two-dimensional quantity to three-dimensional, and improving the potential of distinguishing different types of urban forms and functions[18]. Crowd activity data such as POI and crowd check-in are used to depict the gathering intensity, closeness, and connection of people's daily activities, so as to divide the boundary range of social activities[19]. The role of spatial structure, composition, and marginal effects on the existence of social activities and development has been further understood through digital tools[20][21].

（2） Domestic Related Research

In China's traditional planning thought, the construction of the central space has always been emphasized, and the boundary is only used as a way of enclosure, which has not attracted the attention of planning. In the boundary space, people tend to gather at the edge to obtain a sense of safety, comfort, and pleasure, and often expand the edge domain with the edge as the

center. In modern times, China's urban planning began to be impacted by Western thoughts, and a modern urban planning system was gradually formed, and the study of boundaries was also carried out based on Western research theories.

The earliest research scale on the boundary is macroscopic, mainly out of the thinking of the boundaries of urban development, focusing on urban and rural development and regional development, mainly discussing the macro urban boundary regional economy, functional connection and the identification of urban space growth boundary, academician Wu Liangyong of Tsinghua University put forward the concept of urban fringe area in the "Generalized Architecture", that is, the handover and transition area between the city and the countryside and summarized its characteristics, that the boundary space is the transition space, the connecting space, Media space. Professor Xing Zhong of Chongqing University proposed that the marginal effect is an important mechanism of marginal areas in "Marginal Areas and Marginal Effects: A Broad Perspective of Urban and Rural Ecological Planning", and summarized and described them from three spatial levels: watersheds, urban areas and buildings. Professor Jiang Difei of Central South University analyzed and discussed the three characteristics of boundary vitality effect in his book "Theory of Urban Form Vitality"[7]. Professor Jiang Difei believes that one of the ways to create urban vitality is to pay attention to the boundary design of urban public space, and proposes to make full use of the boundary effect to activate the boundary, create a flexible boundary space, and obtain the vitality of the boundary, so as to create a vibrant urban space. In 2009, in the article "The Morphological Composition of Marginal Space in External Space". Xiang Lanlin and Zhu Keqin classified and analyzed the behavior and perception of space from the planar and vertical elements of marginal space, and believed that different compositional forms have different characteristics, spatial behaviors and perceptual effects, and emphasized that the research on marginal space and spatial morphological composition should be strengthened in design[22]. In his 2011 essay "Ethical Reflections on the Design of Urban Space Boundaries", Fang Xiaofeng argued that boundaries are the starting point for understanding space. Boundaries are the necessary form of spatial limitations, and the properties of space are determined by the nature of the elements that define space. These elements that define the space form different boundaries. Taking the meaning of boundaries as the starting point, this paper analyzes and summarizes the role of urban space boundaries and the construction of urban imagery, and emphasizes that the boundaries between urban space and private space should consider the urban perspective, and give priority to the design and construction from the dimensions of public and openness[22]. In 2016, Zhang Yan proposed in "Research on the

Placemaking of Architectural Boundary Space" that boundary space, as the connection between architecture and environment, is the key to alleviate the contradiction between architecture and environment, promote the organic combination of the two, and provide people with a carrier of social activities. Combined with the theory of place, it is proposed that the boundary space should be based on "place", pay attention to the transparency, continuity, and scene of the design form, give full play to the functions of place integration, media catalysis, and transition transformation, and pay attention to the needs of human perception, behavior, and psychology[7].

The research on boundary space in China mainly focuses on the following aspects: the identification and boundary division of urban and rural fringes, the delineation and control of urban growth boundaries, the optimal design of urban settlement boundary space, the optimal design of school-city boundary space, the open design of park and green space edges, the boundary form of rural settlements and villages, and the study of individual building boundary space. The relevant theories include "symbiosis concept, flexible concept, sharing and openness, behavioral needs, interaction theory, urban perception, space production, daily life, intermediary space, and industry-city integration". In the early years, morphological types were mainly used in the research methods, and in recent years, quantitative tools have been introduced, which have expanded the understanding of the identification and mechanism of boundary space. For example, Qin et al. combined spatial syntax and network analysis to compare and delineate urban service boundaries[23]; Zhao Zongtao studied the spatiotemporal changes of urban space through GIS spatial analysis, found the problems existing in urban expansion, and used the constraint method to set relevant indicators to delineate the urban growth boundary[24]. Zhou et al. used the SD semantic method to collect people's perception of boundary space and proposed optimization strategies for boundary problems[25]. Zhang Xia et al. used big data comprehensive OD analysis to obtain the boundary opening demand, compare the behavior characteristics of the population and the permeability of the space, find the areas with insufficient vitality and high open demand, and propose optimization strategies[26] .

（3） A Review of the Study

As a special space, the border has attracted wide attention at home and abroad. It is found that the boundary space is not only the physical element of the two regions, but also has a transitional, connected and intermediate regional effect, which is an important anchor point of urban vitality and an important component of urban intention.

Domestic scholars generally believe that the boundary space has transition, connectivity and media, and the basic mechanism of the edge space is the edge effect, and the flexibility and

interactivity, public and openness, and the perception, behavior and psychology of the user are the design dimensions that need to be considered in the form of space. At present, the research has expanded from the early urban macro scale to the penetration of building sites and daily life, and the intervention of quantitative methods can help identify the temporal and spatial changes of marginal space, social group behaviors and needs, etc., and improve the understanding and precise optimization ability of boundary space.

Compared with China, foreign countries have a longer research time on boundary space and have a deep research foundation. In the context of interdisciplinary and cross-border research, a relatively complete boundary recognition technology is constructed, which improves the research on the association between boundary space and social activities and social differences, and supplements the correlation between spatial boundaries and social activities at the level of population perception. At the same time, the spatio-temporal memory and cultural connotation of the boundary space have been further strengthened.

In general, the boundaries of different things have multiple connotations such as social, psychological, spatial, and cultural. The boundary study based on physical space integrates multiple concepts to facilitate the communication and transmission between things, and has multiple positive effects in resolving social contradictions, alleviating psychological pressure, and enhancing cultural integration. On the one hand, China's future border space research should strengthen the study and reinforcement of foreign border space research systems. On the other hand, in today's human-oriented urbanization society, it is necessary to promote and develop people-centered values in space practice design, optimize the multiple interaction between boundary space and people, improve the unreasonable status quo of space, enhance the close integration of space with people's daily life, and provide positive support for the sustainable development of people and society. On the other hand, as an important part of the city, the boundary space is of great practical significance for building a good urban image, promoting urban development and building a better living environment.

2.1.1.2 The Urban Village Boundary

（1） Overview

"Urban villages" is a very common phenomenon and a hot topic throughout the Pearl River Delta region. As a contradiction in space, the narrow and dark streets are lined with a strong atmosphere of popularity and commerce. It is both a relic of an ancient history and a new living body in the process of rapid urbanization; The complex of society is not a living community composed of strangers or a community of acquaintances, but a society of mutual acquaintance

Table 2-1 Characteristics and biases of urban villages compared with traditional villages and cities (Source: Self-drawn by the author)

category	Traditional villages	Urban Village	city
Agrarian system	Village collective	Village collective	State-owned
Management System	The cost shall be borne by the village collective	The cost shall be borne by the village collective	The cost is allocated by the State treasury
Social subject	Clan-based networks	Clan-based networks	A modern legal person or economic organization
Economic organization	Collective	From the "village unit system" of the joint-stock cooperative system to the "group company system" of the fixed shareholding system	market economy
Hukou system	Village Registration (Psychology is a village membership)	Village Register + Register (Changed to household registration and retains village registration)	Household registration (The reality is the household register)
Social networks	Society of acquaintances (Villagers rely on village collectives)	"An island in the sea"	Stranger Society
administration	Village Collective Company	The formal "separation of government and enterprises" and the actual "shadow cabinet"	Sub-district offices
Social class	Stratified according to social power	Hierarchical status with or without domicile There is a stratification of social power with village registration There is no stratification of economic power without village registration The knowledge level of migrant workers is stratified	Stratified according to economic power Stratified by level of knowledge
Retrofit participation	Villagers are the mainstay	Governments, real estate developers and "villagers"	Government and real estate developers
The image of the city	A natural extension of a rural settlement or a rural settlement into a city	Man-made "cement giants"	city
	Aesthetics of harmony between man and nature	The environment is filled with space	Ecological, clean and comfortable aesthetics
State of Survival	comfortable	Worse	comfortable
Core industries	Agriculture or industry and commerce are the mainstay	Deindustrialization (The main source of income is property)	The tertiary industry is the mainstay
lifestyle	Agricultural life	modernization	modernization

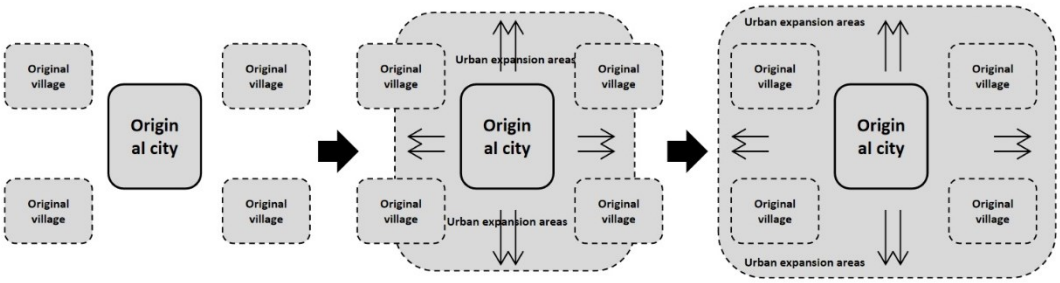
formed by blood, kinship, clan and geographical relations [1]. There are three main types of urban villages. The first is a village in a prosperous urban area that has no agricultural land at

all; the second is the villages located in the periphery of the urban area and a small amount of agricultural land; The third is villages in the suburbs with more agricultural land [2]. In this paper, the first type is mainly studied, which is the type of urban village (Table 2-1).

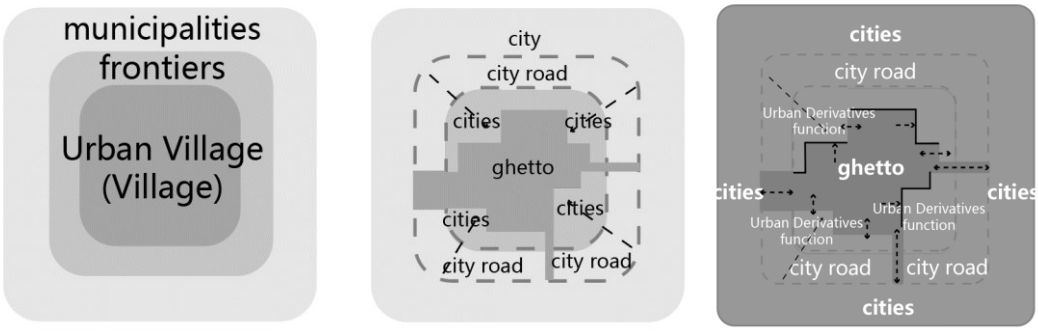
"Urban village" is a transitional social space between traditional villages and cities, and in the course of historical development, urban villages have actively adapted to the city and served urban production in terms of economy and production. At present, most urban villages mainly provide low-cost housing for migrants, and have both service industries and a small number of industrial functions. In terms of system, based on the land and management system of traditional villages, combined with the market economy and street management system of cities, a unique village economic and administrative system has been established. At the same time, the villagers' dual household registration status, internal multi-class, and multi-subject participation have social particularities. In terms of industry and lifestyle, urban villages abandon backward living traditions and take the initiative to move closer to cities. Urban villages are the first stop for many outsiders to come to the city, and they are also the homes that villagers have guarded for generations, and their existence reflects the inclusiveness and necessity of the city. However, due to the spontaneous construction of urban villages in the process of urbanization, the urban image, environment and internal living conditions are poor and have not been significantly improved, and at the same time, they are intervened by diverse groups of people and classes, and social isolation occurs within the self-protection consciousness of the internal society, including the new citizens, the new citizens and the villagers, the new citizens and the city, and the city and the villagers.

The boundaries of urban villages are based on the geographical demarcation of cities and villages; urban display surfaces, entrances and exits of the countryside; It is also an important part of the transition between urban and rural areas. As a place for diverse groups of people to live together and gather together, it undertakes a close productive connection and daily life between the countryside and the city. The renovation and renewal of urban village boundaries is not only conducive to the improvement of the common spatial quality of cities and villages, and the people's sense of spatial participation and happiness, but also conducive to improving the social isolation phenomenon of urban villages and promoting social integration. The difficulties in the renewal of the boundary of urban villages can be mainly attributed to the following three aspects. On the one hand, it comes from the complexity of spatial form and the limited nature of public space resources, which is the result of the gradual development of urban villages in urbanization and the historical land demarcation game and interest trade-off between

urban and rural areas in the evolution. on the other hand, from the plurality of social subjects and their types of activities; Finally, in terms of the trade-off of interests of spatial renewal, it is necessary to meet the different interests and values of multiple subjects in order to facilitate the further promotion and implementation of the planning scheme (Figure 2–1).



a) Urban sprawl and the formation of urban villages



b) The boundaries of urban villages are "mutually coupled" with cities

Figure 2–1 Boundary diagram of urban villages and cities
(Source: Author's own drawing)

（2） Related Research

Urban villages are one of the transitional spatial types of cities and villages, and they often face great resistance in the practice of transformation because it involves the relatively large difficulty of transforming the rights and interests of many participants. As the fringe zone of cities and villages, the boundary space of urban villages condenses the connotation of "transitional" and is an important basis for "integration, coordination and symbiosis". First of all, compared with the internal space of urban villages, the boundary space of urban villages belongs to the category of urban renewal, and it is also the place where urban villages actively choose and integrate in the urban process, so the resistance to spatial renewal is relatively small. Secondly, the actors of boundary space involve urban society and village society, and the transformation of boundary space plays an important role in strengthening social communication, enhancing social identity between subjects, and promoting social integration. At the same time, the boundary space of the existing urban village has been treated as general in the previous design, and the space hinders social interaction to varying degrees, and the active

social mode is blocked and restricted by many problems of space, and at the level of neutral or negative social interaction, it is often given a rough spatial partition, which cuts off all possibilities of social interaction. Therefore, the boundary reconstruction research of urban villages has practical feasibility and the participation and promotion of multiple subjects. Its research and transformation practice is of great significance to promote the development of urban villages, create a better urban intention, build a coordinated development situation between urban and rural areas, and meet people's yearning for a better life.

How to realize the integration, coordination and symbiosis between urban villages and cities is the core issue of boundary research. As a type of spatial form, many scholars have analyzed and interpreted the form of the boundary space of urban villages, deeply understood and recognized the social connotation of space, and identified the problems existing in spatial planning to propose spatial strategies to promote social integration[27]-[29]. Secondly, many scholars have understood the behavioral context and analyzed the social interaction behavior patterns behind the space to examine the form, function and efficacy of the boundary space in providing human experience and feelings[31]. At the same time, in order to improve the vitality efficiency of boundary space, many scholars have quantitatively analyzed and evaluated the vitality of space, so as to identify the vitality space to be improved and propose optimization strategies[1][26][32].

In general, the boundary research of urban villages is mainly based on the overall goal of optimizing and promoting social integration as the overall goal of urban village development, and the spatial analysis and optimization practice are carried out, and the three main characteristics are presented. Combined with quantitative methods, the index construction of the degree of integration, openness and interaction of boundary space is carried out, and the size of relevant indicators of each part of boundary space is quantitatively understood. At the same time, some studies have shifted from morphology to the analysis method of social behavior, based on the mechanism of social behavior, to understand and test the supply capacity of boundary space. In addition, "context" has gradually become an important carrier for understanding boundary space as a social-spatial association.

Table 2-2 Research on the boundaries of urban villages
(Source: Self-drawn by the author)

Name (Year)	Outline of Research

Li Yun (2007)	By organizing the internal ecological and public space, cooperating with the organization of the public space in the village, and setting up more open and semi-open spaces in the marginal areas, the strategy of infiltrating the internal and external spaces is promoted, the external boundaries of the urban and rural areas are blurred, and the urban villages and the city are infiltrated and integrated from the perspective of urban design operation [[27]
Xu Mei (2016)	Based on the theory of symbolic interaction, this paper analyzes the process of reconstructing the spatial environment of landless residents in urban villages. In the process of adapting to social development, the original living and production methods of the villagers have changed. This change in the objective environment is first embodied in the "situation definition", and then, under the new understanding, they deconstruct the traditional behavior patterns of the past, and gradually construct behavior patterns that adapt to the new situation, so as to adapt to and promote the development and change of society. At present, villagers in urban villages choose to maintain their interests rather than family affection when dealing with their interactions with outsiders, which is driven by consensus based on community identity and self-protection mechanism[31]
Yan Zhang, S. A. (2016).	It is proposed that as the connection between urban space and architectural space, "architectural boundary space" is the key point of space to alleviate and enhance people's sense of belonging. The place theory is introduced to sort out the mechanism of boundary space, and the optimization strategy is proposed from the three levels of placemaking, including the form, function, and experience of boundary space[7]
Li J. (2018).	By quantitatively extracting the overall characteristics of the vitality of the living streets in Gangxia Village, the vitality evaluation system was constructed, and the characteristics of the street vitality were summarized and the formation and maintenance mechanism were explored through the investigation and analysis of the physical space, functional scenarios, and behavioral characteristics[33]
Jiang Meiying (2019)	By observing, describing, and summarizing the boundary space of characteristic urban villages in Shenzhen, the spaces are classified into connected, isolated and defensive, and enhanced according to their functional effects[29]
Zhang, Xia (2020).	The vitality of the campus boundary space is specific to the level of use vitality, and the cumulative stay time of the space users is used to quantify the use vitality. The behavioral trajectory analysis was included in the study of boundary openness, and the comparative analysis of OD cost before and after boundary opening was proposed to study the opening demand of the boundary, realize the quantitative analysis of the opening demand, find out the areas that urgently need to be opened, and optimize the space of the street section with opening conditions[26]
Hou Yue(2020)	Based on the CPTED theory, the evaluation index of environmental safety in the boundary landscape design of urban villages was constructed and practiced in the form of cases, and the concept of crime prevention was integrated into the street construction of urban villages to improve the level of urban safety[34]
Tu Ting (2020)	Based on the analysis and research of the vitality elements of the boundary space of urban villages, the dynamic components of the boundary space of urban villages are analyzed according to the current situation of the boundary space of urban villages. Through the two dimensions of temporality and interactivity, the evaluation factors of spatial vitality are expounded [1]

Sun Qi (2022)	From the perspective of village boundary theory, it is obvious that the process of boundary evolution and social space reorganization in peasant concentrated residential areas under the change of order and reconstruction has obvious administrative dominance characteristics. As a result, it is difficult to effectively establish regional linkages and shape boundaries based on economic, governance, and social integration. Therefore, the transformation of action logic should be actively guided from multiple dimensions such as behavioral rules, value system, and social psychology[31]
Zhao Yuanye (2022)	Starting from the four types of boundary morphology, namely isolation, interaction, permeability, and openness, the block analysis unit is constructed, the typological rules of boundary space are summarized, and the optimization strategy of adaptive boundaries is created through hierarchical classification[28]
Li Yang (2022)	Taking the spatial vitality of urban village residents and non-urban village residents as the research object, the geographical distribution characteristics of urban and rural vitality were analyzed. Based on the interpretation of the use function of the space and the type of social activities, this paper deeply understands the role of the urban village space in providing support mechanisms for residents' daily life[32]
Zhang Cong (2022)	This paper analyzes the interaction mode of the school and the village, analyzes the spatial function layout, transportation organization and cooperation mode of the school-city boundary through the case analysis method, summarizes the differences in the behavior, space and activities of the interactive subjects, and proposes a feasible optimization strategy for the interactive space based on field research and spatial requirements[33]
Wu Hao (2023)	By studying the relationship between the built-up environment and the use perception and spatial vitality of social integration in the marginal space of urban villages, the indicators and suggested values of the built-up environment have an impact on social integration and are used in the research on the optimization strategy of the marginal space of urban villages[35]

2.1.2 "Socio-spatial" relations

In the 19th century, Emile Durkheim was the first to write in The Theory of the Division of Labor in Society: "The parts of space are not homogeneous. The image of space is nothing more than a specific form of social organization". In 1938, Wolf further proposed the importance of space as a social phenomenon. By the 1960s, scholars began to focus on the socially constructed meaning of space. In 1961, Jane Jacobs proposed the diversity of urban space and the complexity of human activities, laying an important theoretical foundation for modern urban planning[9].

In the 1970s, Lefebvre proposed the theory of space production, arguing that space is not only a physical existence, but also co-produced through social practices, power relations and economic activities. His theory emphasizes the threefold nature of space: material space, representational space, and living space. This theory has greatly influenced subsequent

sociospatial research. At the same time, Foucault also explores the relationship between power and space, pointing out that space is an important place for power to operate.

In the 1980s, the focus of research shifted to the dynamic relationship between space and social interaction. Scholars have begun to focus on how space reacts to social structures by influencing human behavior and social relationships. In the 1990s, research deepened, and the affective and cognitive dimensions of space were emphasized. Harvey proposed the concept of "space justice", emphasizing the importance of equitable distribution of space resources for social justice.

Since the 2000s, the study of "socio-spatial" relations has ushered in a trend of diversification and interdisciplinarity. Scholars have begun to explore the complexity of spatial and social interactions from cultural, historical, and psychological perspectives. In his writings, Sawyer proposed the concept of "third space", emphasizing that space as a site of social practice contains not only physical and psychological dimensions, but also cultural and social practice dimensions[36].

Contemporary social space research focuses on humanistic perception and experience, public space and public life, disadvantaged groups, informal and other special spatial organizations, and considers the impact of green infrastructure and social sustainability and the epidemic on social space. Continuously improve the ability to understand social space, and develop spatial models such as big data to further understand the relationship between space and society. The study of socio-spatial relations covers multiple levels and dimensions. The following are the main research contents and methods:

(1) Spatial production and power relations: the study of how space is produced and reproduced through power relations and social practices. Lefèvre's production of space points out the threefoldness of space: material space, representational space, and living space[2]. The role of power relations in the production of space reveals the deep connection between space and social power structure.

(2) Spatial perception and cognition: The perception and cognition of space by individuals and groups are studied through cognitive mapping and psychological mapping. For example, Kevin Lynch analyzes the cognitive structure of urban space by proposing five elements: paths, boundaries, nodes, landmarks, and areas in Urban Imagery. Understanding how people form their cognition and emotions about space through perceiving and experiencing space is an important way to understand the meaning of space.

(3) Space and social behavior: study how spatial configuration and design affect human behavior and social interaction. Through observation and interviews, this paper analyzes how

public spaces promote or inhibit social interaction and community cohesion. For example, William White's Urban Street Life reveals the impact of public space design on people's behavior through extensive field observations.

(4) Cultural and historical perspective: study space from the perspective of culture and history, and explore how space carries and inherits cultural memory and historical heritage. Emphasize the important role of space in cultural identity and social memory. For example, in The Information Age, Castel explores spatial change in the networked society, emphasizing the role of culture and technology in shaping space.

In 2012, Harvey's "Rebel City" emphasized that urban people regain urban power, that is, the rights and interests of residents to control the social production of space and participate in the use and production of urban space[38]. In 2018, Bourdini's "The Origin of Social Space and the Occupation of Physical Space" Social space and the occupation of physical space - The structure of social space is manifested in the form of spatial opposition in various contexts, and the occupied physical space functions as a spontaneous metaphor for social order. Habits create habitats, and the relationship between "space possession" and "dwelling", and between "the power of urban people" and "daily life"[39]. In 2009, Ali. Maidanipur's "Investigation and Research on Urban Space Design-Social-Spatial Process" proposes that urban space is a social-spatial whole, and urban design is a social-spatial development process. Through the study of the "social-spatial" relationship, it is of great significance to optimize the layout of urban space, improve the quality and functionality of public space, promote the sustainable development of the city, improve the quality of life of residents and community cohesion, and promote the sustainability of social development and spatial coordination.

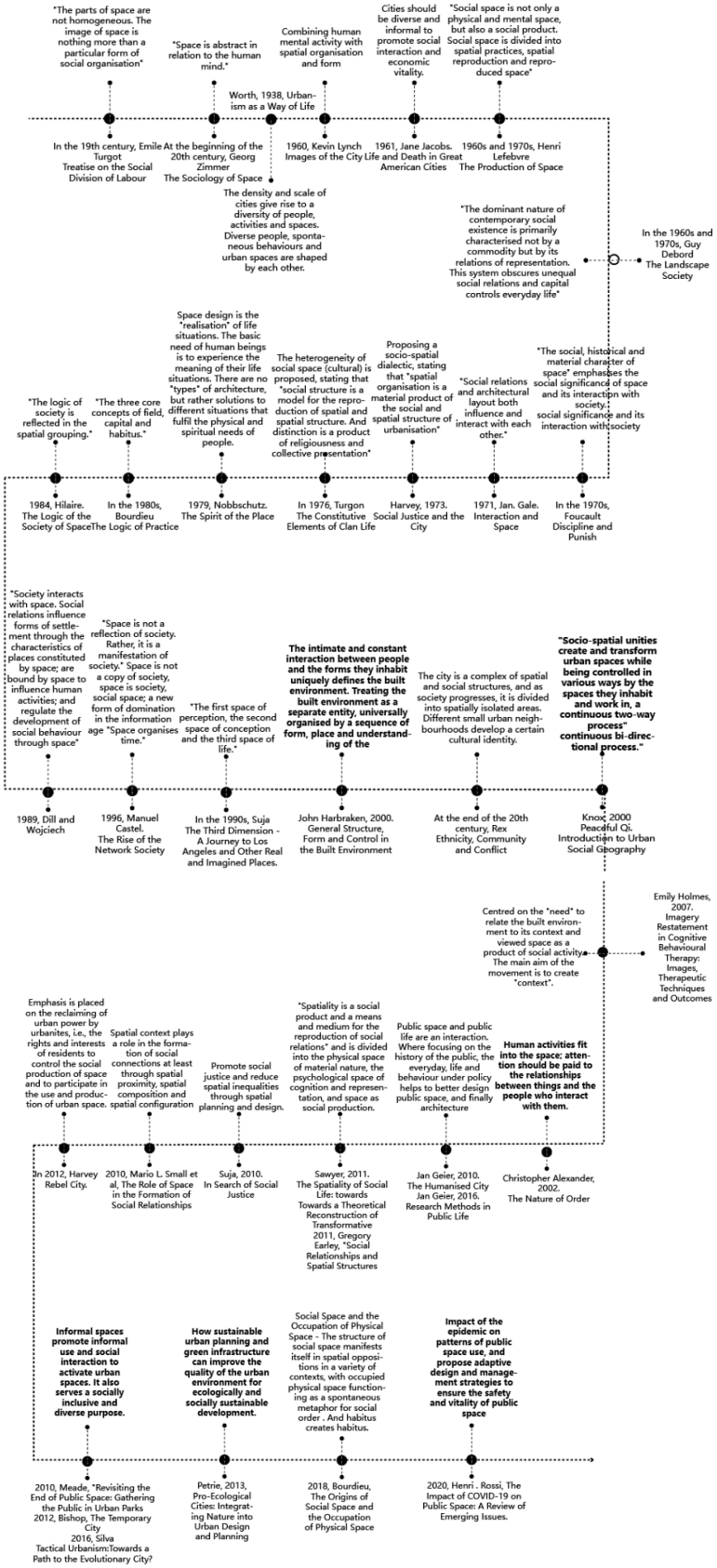


Figure 2–2 Socio-spatial relationship over time
(Source: Author's own drawing)

In the 60s and 70s of the 20th century, Henri Lefebvre's "Space Production" "Social space is not only a material and spiritual space, but also a social product. and divides social space into spatial practice, spatial representation, and representation space". Among them, spatial practice refers to the hidden social space in social practice; Spatial representation is a kind of conceptual space, which identifies life and perceives space with the conceived space, which is a dominant mode of production of space. The reproduction space is an experience space for residents and users. In the 90s of the 20th century, Suja's "Third Space: A Journey to Los Angeles and Other Real and Imagined Places" divided social space into "the first space of perception, the second space of conception, and the third space of life"[4]. The essence is based on Lefebvre's triadic socio-spatial dialectic, which strengthens the human dimension and classifies it into a trinity of perception, conception and life[2]. In 2011, Sawyer's "The Spatial Dimension of Social Life: Towards a Transformational Theoretical Reconstruction" argues that social space is composed of "the physical space of material nature, the psychological space of cognition and appearance, and the space of social production", which understands space as a multidimensional and complex social phenomenon[4](Figure 2–2).

(1) Physical space of material nature: including natural environment, artificial environment, spatial layout, etc. It refers to the physical space composed of the natural environment and human activities, that is, the actual space, which is similar to Lefebvre's concept of "reproduced space". It is the most intuitive form of space in our daily life. It has a direct impact on people's quality of life, ease of transportation, and environmental sustainability. In urban renewal, the transformation and optimization of physical space is an important means to improve urban functions and the quality of life of residents.

(2) Cognitive and representational psychological space: refers to people's perception, understanding and representation of space. It involves the subjective experience and psychological perception of space by individuals and groups. It includes three concepts: spatial perception, spatial representation, and mental map. Among them, spatial perception refers to people's direct experience of space through the senses (vision, hearing, touch, etc.); Mental maps refer to the cognitive picture of space formed by an individual or group in their minds, including the concepts of landmarks, paths, and areas. Mental space reflects how people perceive and feel space, including emotional and psychological associations. For example, a city's landmark may not only be a physical presence, but may also carry historical memory and cultural significance. In urban planning, taking into account the psychological feelings and

cultural identity of residents can help to create urban spaces with a more human touch and cultural heritage.

(3) Space as social production: It refers to the fact that space is not only a material and psychological existence, but also a product of social relations and power relations. It emphasizes that space is co-produced through multiple factors such as social practices, economic activities, and political power. It includes three parts: social practice, economic activity, and power relations. Social practice is people's daily activities and interactions in a space, such as work, leisure, education, etc.; Economic activity refers to how economic activities such as commerce, industry and services affect and shape spatial distribution; Power relations: power struggles and interest games between different social groups (governments, businesses, residents, etc.), how to control and manage space through policies, regulations, and planning. The spatial theory of social production reveals that space is not just a passive background, but an active socially constructed process. The production and use of space is profoundly influenced by social structures, economic systems, and power relations. Understanding this helps us to take a more holistic view of the various complex factors in urban renewal and spatial planning, so as to develop more just and effective policies and strategies.

Overall, Sawyer's socio-spatial theory provides a multi-layered analytical framework by combining the three dimensions of material, psychological, and social. This theory helps us to understand more deeply the importance of space in social life, and how to achieve more effective urban renewal and social transformation by taking these factors into account. After combing, psychological space mainly contains the dimensions of psychological feelings and cultural identity, and social production includes multiple dimensions of daily life, economic production and power relations. Therefore, this paper takes physical space as the basic basis and integration object, and classifies spatial research into production dimension, psychological dimension, life dimension, and cultural dimension for comprehensive analysis.

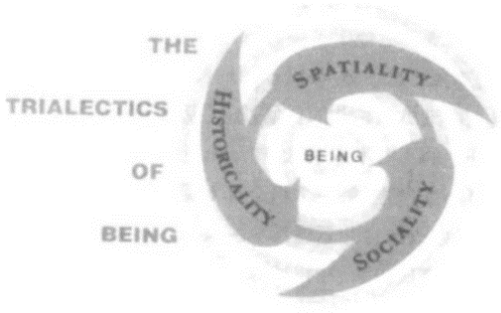
Just as the essence of social space research is the life of returning to society, the daily life and social behavior of people are important dimensions of social space research**.**

In 1979, Neuberschutz mentioned in The Spirit of Place that spatial design is the "embodiment" of life situations. The basic human need is to experience the meaning of the situation in which he lives[39].

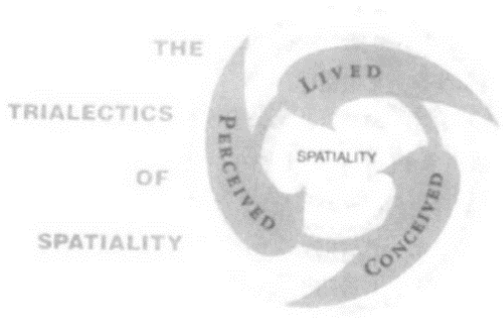
In 2000, John Habraken's Ordinary Structure, Form, and Control in the Built Environment mentions that "the intimate and constant interaction between people and the forms they inhabit uniquely defines the built environment." It also emphasizes the importance of living space as a

social space research. In the text, he treats the built environment as a separate entity, universally organized by form, place, and order of understanding"[40].

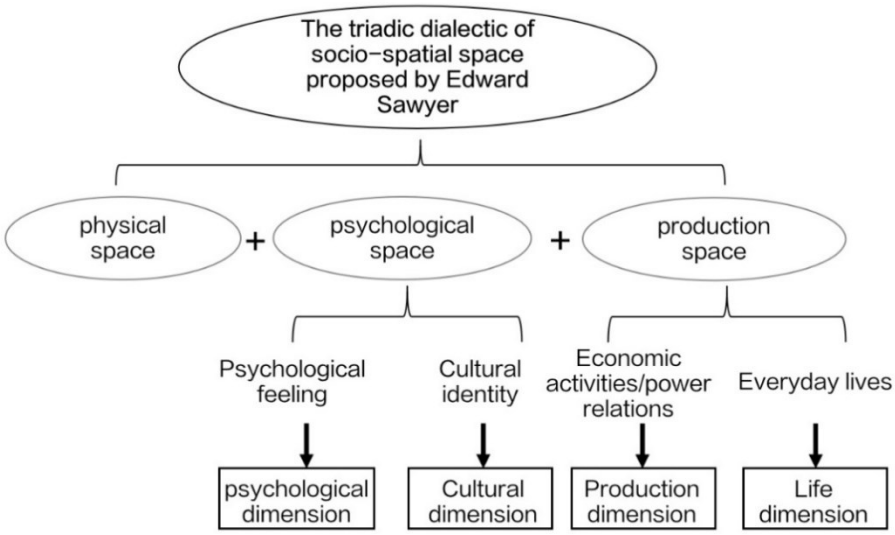
In 2012, the famous sociologist Harvey proposed in "Rebel City" that urban people regain urban power, that is, the rights and interests of residents to control the social production of space and participate in the use and production of urban space[38].



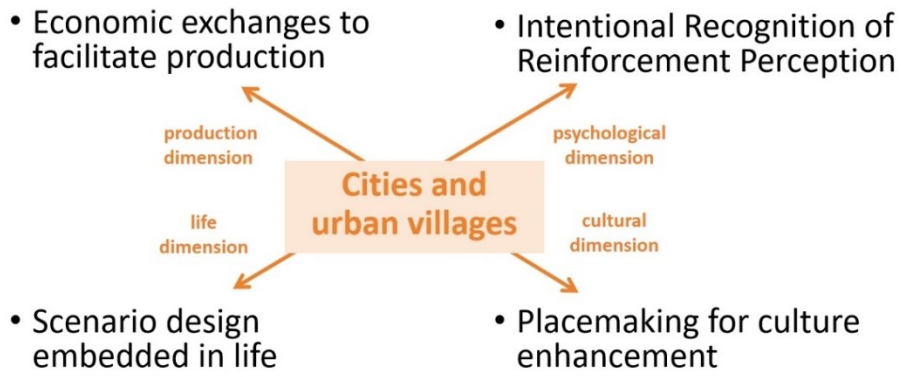
a) The triadic dialectic of ontology



b) The triadic dialectic of spatial epistemology



c) The dimension of spatial research from the perspective of socio-spatial relations



d) Applied urban village boundary studies

Figure 2–3 The theoretical framework of urban village from the perspective of "society-space"

In 2016, Jan Gale, in his Research Methods of Public Life, proposed that public space and public life are interactive. Focusing on the history, daily life, and life and behavior of the public can help to better design public spaces, and finally architecture[41].

At the same time, the boundary is a special kind of social space, which is composed of a mixture of diverse groups of people and cultures, and the essence of studying the boundary of space is to promote the life and production of the border. Among them, culture is an important dimension of cognition.

In 1976, Durkheim's "Constituent Elements of Clan Life" proposed the heterogeneity (culturality) of social space, pointing out that "social structure is a model for the reproduction of spatial structure and spatial structure." Distinction is the product of religious and collective presentations".

At the end of the 20th century, J. Rex regarded the city as a synthesis of spatial structure and social structure, and with the progress of society, the city would gradually divide into spatially isolated areas. Different types of residents live in different small urban communities, which in turn form certain cultural characteristics.

In 1990, Japanese scholar Yoshinobu Ashihara discovered the difference between the boundaries of cities in the East and the West, and proposed that different societies and cultures in the East and the West have certain differences in their perceptions of spatial relations.

In 2013, the Japanese scholar Heijin argued that the boundary space carries a cultural dimension and is "a reflection of the landscape of memory". Through the method of spatial narrative, the cultural attachment psychology of local residents behind the urbanization of boundary space and the nostalgia for the traditional street landscape are analyzed.

In 2016, Soini recognized that culture plays an important role in space and classified three categories by function by summarizing historical documents: an independent capital placed in the economic, social and material environment, an intermediary of life as the conditions for the development of the economy, environment and society, and a symbol that integrates and promotes the sustainable development of society, environment and society. Therefore, the boundary is the "common field" of the life of diverse people, and understanding the cultural characteristics of different fields, such as the social culture of historical development, contemporary culture, local and regional cultural characteristics, etc., is helpful to deeply optimize the boundary, enhance the social identity of the boundary space optimization, and improve the participation in social activities.

To sum up, this paper uses Sawyer's socio-spatial triadic dialectic to divide the study of boundary space into the production dimension, psychological dimension, life dimension, and

cultural dimension of reality for a comprehensive analysis[36]. To comprehensively understand the physical space connotation of the boundary social space, from the perspective of the socio-spatial relationship, to discover the fractures of the social space, and apply the methods of urban design to restore and activate the vitality of the border, and promote the renewal and regeneration of urban villages (Figure 2–3).

2.2 Research methods

2.2.1 Literature Review and Induction

By systematically reading the relevant literature at home and abroad, summarizing the research and development process, summarizing and sorting out the current theoretical status, the theoretical model of the boundary of urban villages was deduced in detail. In order to have a more comprehensive understanding and recognition of the socio-spatial development of the research object, local documents, county chronicles, street diachronic maps and other materials were used, combined with the event records in the village chronicles. This comprehensive analysis method is helpful to reveal the reasons and core problems of the formation of the boundary social space of urban villages, and provides a solid foundation for further research. In addition, through literature reading, learning and borrowing cutting-edge research methods, and translating and applying these methods, in order to enhance the scientific and rigorous research and provide strong support for the depth and breadth of research. This method not only helps to clarify the theoretical context of the research, but also provides specific practical guidance for the research to ensure that the research is systematic and comprehensive.

2.2.2 Cognitive Mapping Analysis

A research method that reveals the spatial structure, function, and interaction patterns of individuals or groups by collecting and analyzing their subjective perception and cognition of a specific space. Through interviews, observations, and questionnaires, data were systematically collected and cognitive maps were drawn to reflect the importance and connections between spatial elements such as landmarks, paths, and areas. Capture residents' subjective spatial perception and behavior patterns, the actual needs of boundary space, and specific suggestions for urban renewal and space optimization. Through the analysis and drawing of cognitive maps, we can gain an in-depth understanding of residents' comprehensive feedback on boundary geography, social interaction and individual perception, so as to provide scientific basis and operational guidance for improving the quality and function of urban village boundary space.

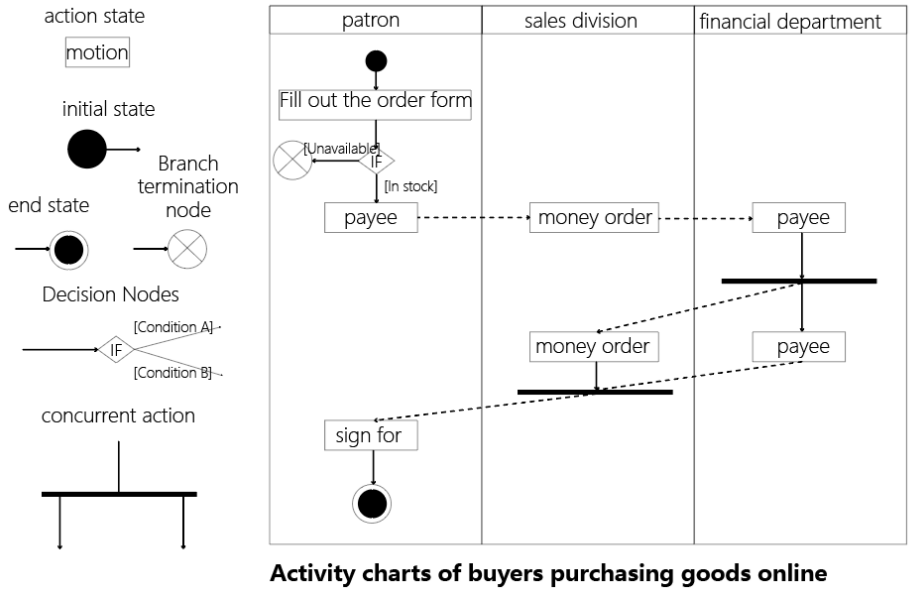
2.2.3 Social Activity Analysis

2.2.3.1 UML Activity Diagram Analysis

Common activity analysis methods in architecture include observation, annotation, questionnaire interviews, video recordings, experiments, etc., to understand and evaluate how people use and interact with architectural spaces through the behavior and activities of people in the space. In recent years, big data and GIS have been able to observe the activity characteristics of the crowd by accurately obtaining the travel access data of the crowd and recording the real-time behavior activities. This article uses the UML Activity Analysis Method (Unified Modeling Language), a general method used to describe the control flow from one activity to another. An activity diagram connects the activities of the system and is a detailed flow diagram. This paper uses UML diagram to analyze the necessity of crowd activities, describes the process of activity scenes and the space they need, and applies them to the spatial traceability of user needs. Compared with traditional analysis, more emphasis is placed on the correlation between different activities. Microscale analysis is often used for contextual analysis of specific behaviors compared to big data analysis (Appendix 6).

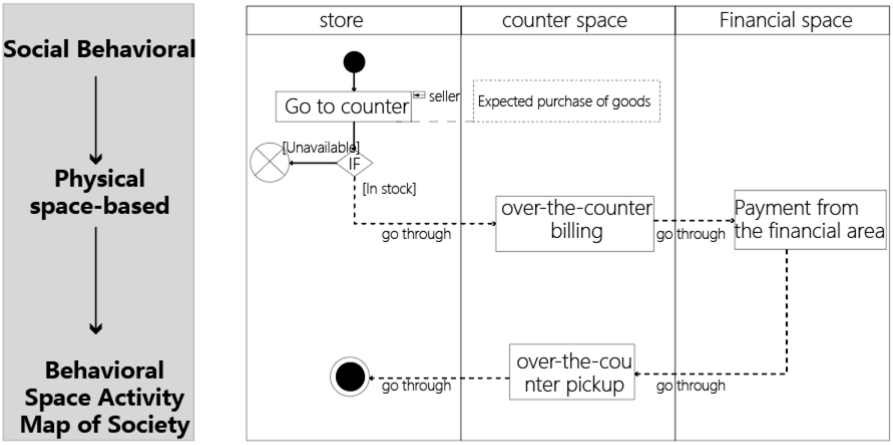
At present, UML analysis is widely used in product analysis, system interaction, software engineering, art interaction design, medical psychology, military work warfare and other fields to study the relationship between users and design systems. In fact, the architectural space is regarded as a space design system, and UML analysis is used to study the relationship between user behavior and the use of space system, that is, social behavior and space, so as to realize the system interaction analysis in the field of architectural planning.

In this paper, UML is used to analyze the necessity activities of streets and their spatial associations. Specifically, by treating the composition of the spatial system as different "classes", and the "behavioral space" as an "action" in the activity diagram, the "behavioral space" is matched to the "classes" (i.e., "swim lanes") of the street, so as to realize the translation of the real space scene. By comparing the "social space" with the real space design during the activity, the unreasonable settings in the original design were discovered, and the application space was optimized through research and re-planning (Figure 2–4).



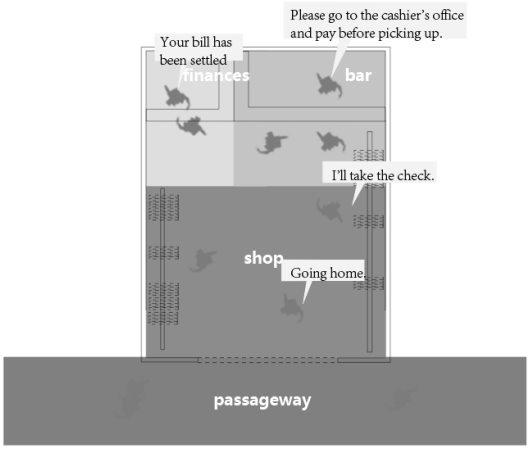
Activity charts of buyers purchasing goods online

a) A diagram of the activity of purchasing goods using the app



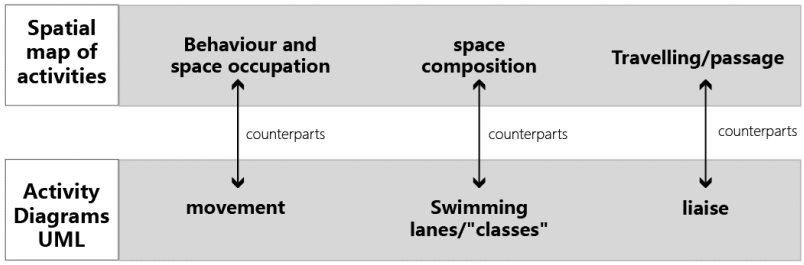
Spatial activity map of buyers purchasing goods

b) A diagram of the activity of purchasing goods in a physical store



Physical space context

c) The actual space scene of purchasing goods in a physical store



d) A diagram of the activity of purchasing goods in a physical store

Figure 2–4 framework for analyzing behavioral spaces using a UML activity diagram
(Source: Author's own drawing)

2.2.3.2 Map Marking

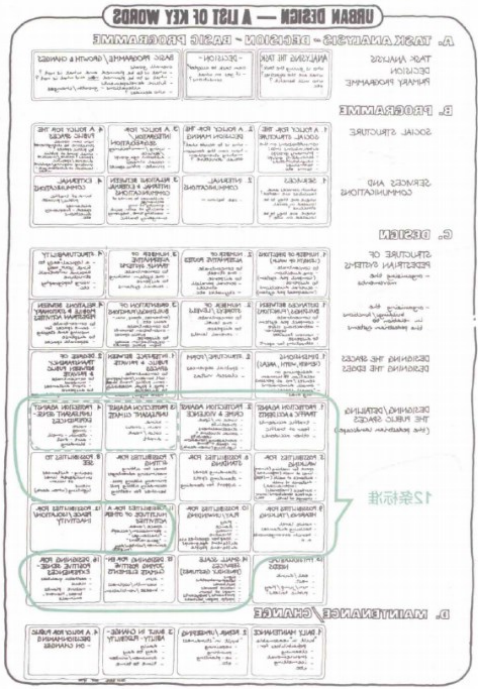
Map notation refers to marking the type and number of activities that took place and the location of the activities on a map of the area under study. This method is also known as the Map Marking Behavior Method. Including actions, people, places of stay, marking the location of people in the same place in different time periods, or even longer time spans. The marked maps can be superimposed one by one, so that the static pattern of the place will gradually become clear. Marks the location status of people in the same place over different time periods, or even longer time spans. Marked maps can be stacked one by one, so that a static pattern of a place is gradually revealed.

In this paper, the "socio-spatial interaction state" of node plaza is evaluated and analyzed by using the map marking method to study the activity behavior of node space, and to understand the characteristics of crowd activities, spatial distribution, and place preference based on the types of people who know each other and the reasons for crowd action. In practice, all-weather observation of key places is divided into two types: weekdays and weekends, 9:00-12:00, 12:00-15:00, 15:00-18:00, and 18:00-21:00.

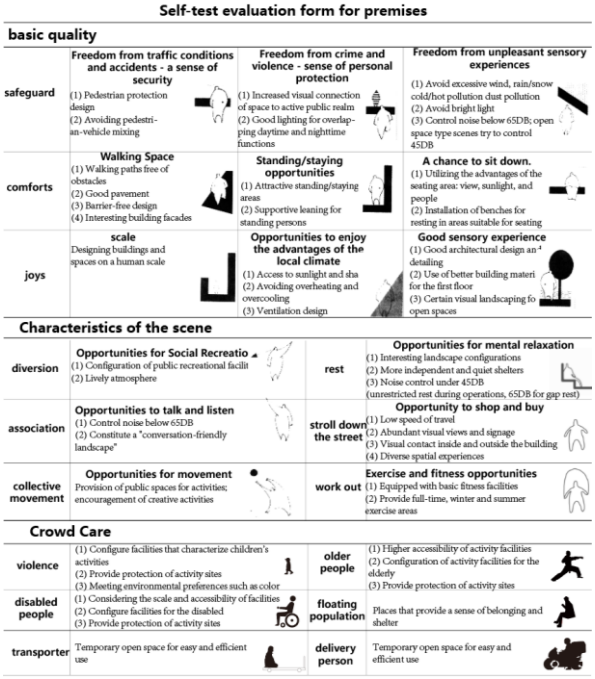
2.2.4 Self-Evaluation Checklist for Premises Quality

The main purpose of this paper's research is to transform a widely criticized space into a pleasurable public place. In order to achieve this goal and implement human-centered spatial design, this paper cites Danish architect Jan Gale's theory of "human place" and applies his 12 criteria to evaluate the quality of public space. These standards cover aspects such as accessibility, safety, comfort, and functionality of the space, and are designed to enhance the overall experience of the space. In addition, this paper emphasizes that the characteristics of specific scenarios and the needs of vulnerable groups must be taken into account in the assessment process. The need for scene characteristics involves the uniqueness and actual use of the space, while the care design for the disadvantaged groups focuses on the inclusiveness and accessibility of the space. Through the comprehensive analysis and evaluation of these two

parts, it is ensured that the space design not only has high-quality human features, but also meets the needs of various groups of people.



a) 12 criteria for the quality of public space



b) Evaluation of intervention scenario needs and crowd care

Figure 2–5 Site quality self-assessment form
(Source: Figure 2–5a, Jan Gale, Methods of Public Life Research; Figure 2–5b Drawn by the author))

Under the requirements of high-quality humanized places, this paper will give special consideration to the use of scenes and human care to ensure that the design scheme is not only theoretically feasible, but also can significantly improve the use experience of the space and enhance the happiness and satisfaction of residents in practical applications. Through such systematic reviews and improvements, we aim to provide scientific evidence and practical guidance for the optimization of public spaces (Figure 2–5).

2.3 Chapter Summary

The core goal of the study of "society-space" is to reveal the relationship between society and space, and to identify the problems in space that do not meet the needs of society. The boundary of villages in cities has great potential in the process of urban renewal. By introducing Sawyer's classification method of social space, this paper divides social space into four dimensions: production, culture, psychology and life, and comprehensively explores the complex relationship between "society and space".

First, through literature collection and summary, this paper combs the evolution process of the boundary in the historical development, and deeply excavates the development power of

the boundary and its cultural foundation. Secondly, the cognitive map method is used to collect and analyze the crowd's perceptual intention to the environment, and reveal the image and function of the boundary space in the eyes of the crowd. At the same time, through the statistics of the use frequency of each scenic spot, the update priority is classified and sorted, the boundary intention is optimized in a multi-point and accurate way, and the boundary space with a unique sense of place is created.

In terms of research methodology, the analysis of social activities and the analysis of place self-evaluation are the focus of this paper. Through these methods, the activity patterns of the crowd are deeply analyzed, the activity needs of the crowd are collected and organized, and they are compared with the availability and humanization of the place. Finally, through the comprehensive application of this four-dimensional framework and a variety of research methods, this paper aims to deeply study the boundaries of urban villages, explore the paths and strategies of collaborative coexistence between urban villages and cities, and provide theoretical and practical support for the integration and sustainable development of urban villages and cities.

Chapter3 Four-Dimensional and Feature Analysis of Boundary Space

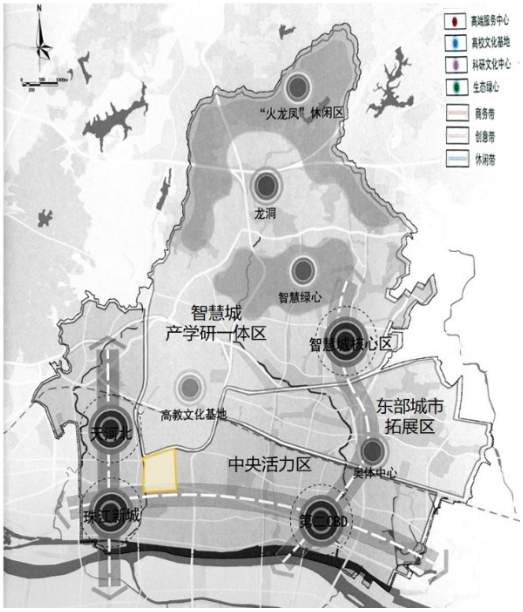
3.1 Case Selection and Research Program

In this paper, a case study is used to explore the characteristics and optimization strategies of boundary space in Shipai Village, Guangzhou, a typical urban village. In this study, the "socio-spatial" perspective is introduced, and the boundary social space is subdivided into four dimensions: production, psychology, life and culture, and the contradictions and conflicts between society and space in the existing boundaries are systematically analyzed. On this basis, preliminary optimization suggestions are put forward to improve the function and quality of boundary space, and promote the coordination and integration between urban villages and the surrounding urban environment.

3.1.1 Research Subjects Overview

Located in Tianhe District, Guangzhou City, Guangdong Province, Shipai Village is the largest urban village in Guangzhou, and belongs to the administrative service sector of Guangzhou's Central Vitality District. Since the urban expansion in the 90s of the 20th century, traditional agricultural settlements have gradually been incorporated into the urban system and have become a well-known floating population gathering area in Guangzhou. Morphologically, the village contrasts with its surroundings, with high-rise buildings surrounding the 730-year-old rural settlement. With the development and upgrading of cities and the increasingly intensifying social contradictions, its transformation has received extensive attention from the academic community. Therefore, the selection of Shipai Village as the research object of urban villages in the central area of the city is representative (Figure 3-1).

The difficulty of urban renewal of urban villages lies in the particularity of the society and space of urban villages, not only the complexity of their social composition, property rights and institutions; The space is also extremely concentrated, compact, and limited. In the process of practical transformation and updating, there are many practical constraints such as rights and interests, property rights issues, economy, and politics, and the process of renovation and transformation is slow. According to the Notice on Several Measures to Deepen Urban Renewal and Promote High-quality Development issued by Tianhe District in October 2020, Shipai Village will be retained and a community micro-transformation strategy will be adopted. Based on the dimension of urban design, this paper studies the renewal of Shipai Village with the marginal space, the core object of urban design. On the one hand, the marginal space mainly



a) Urban Villages and Urban Development Positioning

b) Urban villages and urban functional blocks

c) The relationship between urban villages and cities

Figure 3-1 Diagram of the overall relationship between urban villages and cities
(Source: Author's own drawing)

belongs to the urban space, and the operability potential is good. On the other hand, the marginal space is the starting point of the combination of urban villages and cities, the shared boundary, the part of social integration and symbiosis, the important constituent elements of urban intentions, and the core space of interaction between cities and urban villages. In this paper, we will synthesize the existing research results in the understanding of marginal space, carry out research on urban design renewal and optimization from the perspective of "social-space" relationship, try to identify and repair the "fractures" of social space, and carry out site renewal design and spatial system optimization and upgrading based on the needs of urban villages and urban development, living environment and social groups (Appendix 2). It is committed to fully strengthening and giving full play to the connectivity, transition, and transformation functions of urban boundary space, and promoting and supporting the synergistic, integrated, and symbiotic development of urban villages and cities with urban village boundaries as the core (Figure 3-2).

Crowded, cluttered | There are no seats | Fragmented | Dark

Figure 3-2 Map of the current status of the boundaries of urban villages
(Source: Author's own drawing)

3.1.2 Research Program

Through an in-depth study and analysis of the four dimensions of the boundary space between cities and urban villages, this paper aims to activate the social space of the border and promote the optimization and improvement of its function and value (Figure 3-3).

In the analysis of the production dimension, this paper collects extensive data, sorts out and summarizes the production dynamics of boundary space in the diachronic evolution, discusses the mechanism of boundary production and its stakeholders, analyzes the existing functional configuration, and puts forward preliminary update suggestions based on these analyses, aiming to enhance the productivity and economic vitality of boundary space.

In the analysis of the psychological dimension, this paper uses the cognitive map method to investigate the boundary space, classifies different nodes according to high, medium and low intentions, and focuses on the optimization and development of non-intentional areas, with the ultimate goal of creating and strengthening the "sense of place" of Shipai Village and enhancing the psychological identity of residents and visitors to the boundary space.

In the analysis of the life dimension, this paper classifies the boundary space types such as urban common streets, roads inside urban village, node squares and fences in Shipai Village in detail through UML activity analysis, place self-evaluation method and observation annotation method. By illustrating the behavioral spaces in these scenes and comparing them with the existing spaces, the fractures and weak points in the spaces were identified, and a preliminary design scheme to improve the quality of life was proposed.

In the analysis of the cultural dimension, this paper also systematically summarizes the current situation and problems of traditional culture, regional culture and life culture in the boundary cultural space of Shipai Village through data collection. On this basis, this paper proposes a place-shaping strategy for cultural space, aiming to enhance the cultural charm and cohesion of the boundary space by integrating and activating cultural places.

In summary, based on the perspective of "socio-spatial", this study comprehensively analyzes and explores the boundary of Shipai Village, and proposes strategies to enhance the production commonality and reciprocity ability of the boundary between the city and the urban village, strengthen the perceptual intention of the population, embed the scene design in people's lives, and integrate and activate cultural places. These research results provide effective methods and practical paths for promoting the symbiosis, integration and sustainable development of cities and urban villages.

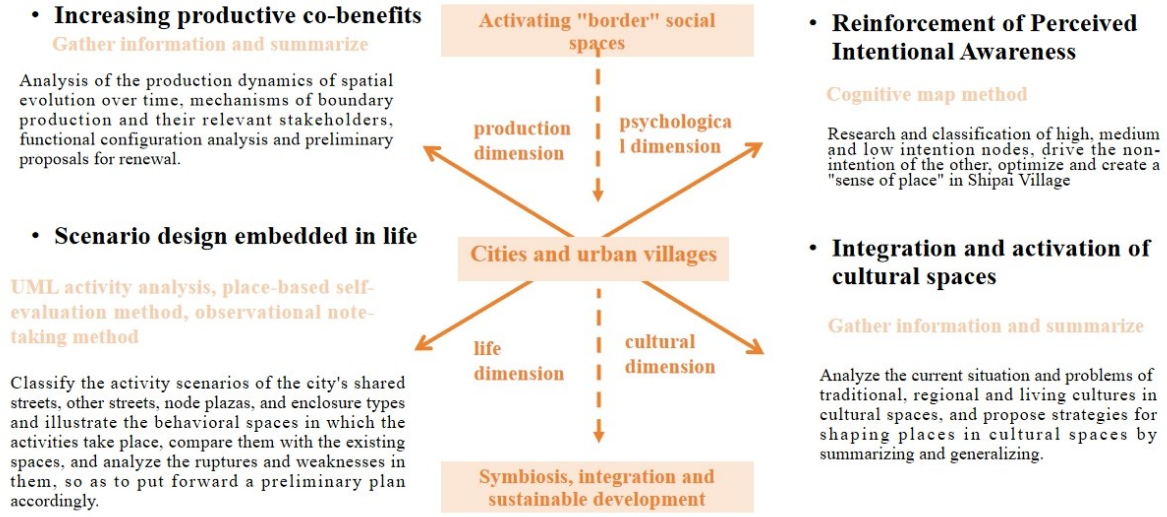


Figure 3-3 an update strategy based on four dimensions
(Source: Author's own drawing)

3.2 Production Dimension Analysis

As an important part of social space, production space is dedicated to economic production activities, which has a profound impact on the economic foundation, social relations, power structure and spatial transformation of society. Through planning and construction, technological innovation, resource management and policy guidance, Productive Space aims not only to promote economic growth, but also to promote social equity and sustainable development. This part of the study will comprehensively examine the various stages of spatial evolution over time and gain insight into the social dynamics behind these spatial evolutions. At the same time, the role of stakeholders and actors is combined to explore the social action mechanism behind production activities. The research will also analyze the interaction of functional layout configuration on the boundary space, identify the unreasonable layout mode in it, and propose corresponding adjustment or regulation strategies to optimize the overall function and benefit of the production space.

3.2.1 Diachronic Spatial Evolution

3.2.1.1 Adjustment of Internal Socio-Spatial Layout, Organization and Local Space

There are a total of 100 surnames in Shipai Village, except for the five surnames of Dong, Chi, Pan, Chen, and Xian, most of the others are married women's surnames. For many years, the main members of the leadership team of the Shipai Village Committee and the current Sanjun Group are composed of these three surnames. The earliest Dong family in the village came from the Central Plains (Anhui) and moved south to escape the civil war in the late Tang Dynasty (618-907), crossed through Anhui Province, and Jiangxi Province settled in Guangzhou in the late Southern Song Dynasty (1273). Two hundred years later, in order to escape the flood, their descendants came to Shipai Village (higher ground) to build their homes. The Pan clan originated in North China (Henan) and originally lived in the countryside near the village of Shipai. Over time, the Pan family grew stronger, and in order to expand their residence, they gradually moved and built residences, eventually settling on the north side of the West Dedong family settlement in Shipai Village. Since then, Shipai Village has had its prototype and the name "Shipai". The Chi clan originated in North China (Shanxi) and moved to Shipai Village at the end of the Yuan Dynasty. Despite being one of the latest families, they grew rapidly and today become one of the largest families in Shipai Village. One of the important reasons is their long-term marriage relationship with the Dong family.

Although urban villages have grown rapidly along the vertical interface since 1990, the social distribution reflected at the geographical level is basically isomorphic to ethnic relations. By retrospectively displaying the clan affiliation of each house (Fig. From the symbiotic pattern of "three ethnic groups" that still exists before the founding of the People's Republic of China, each ethnic group is independent in the region, has its own well-preserved ancestral hall, and is built near the entrance and exit of the village, leading and guarding the village. But at the local level, the space shows differences. First of all, the fusion of the family. The Xi family moved to the northeast of the village, and they themselves moved due to the land acquisition of Jinan University in 1965, and then the compensation land of Dongshipai Village was built into a public vegetable market in 1985 under the leadership of the village's leading clan, the Chi family. At the same time, the integration of various families grows in scattered points in the space, especially the relationship between Chi and Pan, and the boundary level of the two families shows that the common center is used as the occlusion point for infiltration and integration. Second, the imbalance between the families gradually emerged, for example, the Chi family occupied a larger space and had a stronger infiltration relationship with all directions than

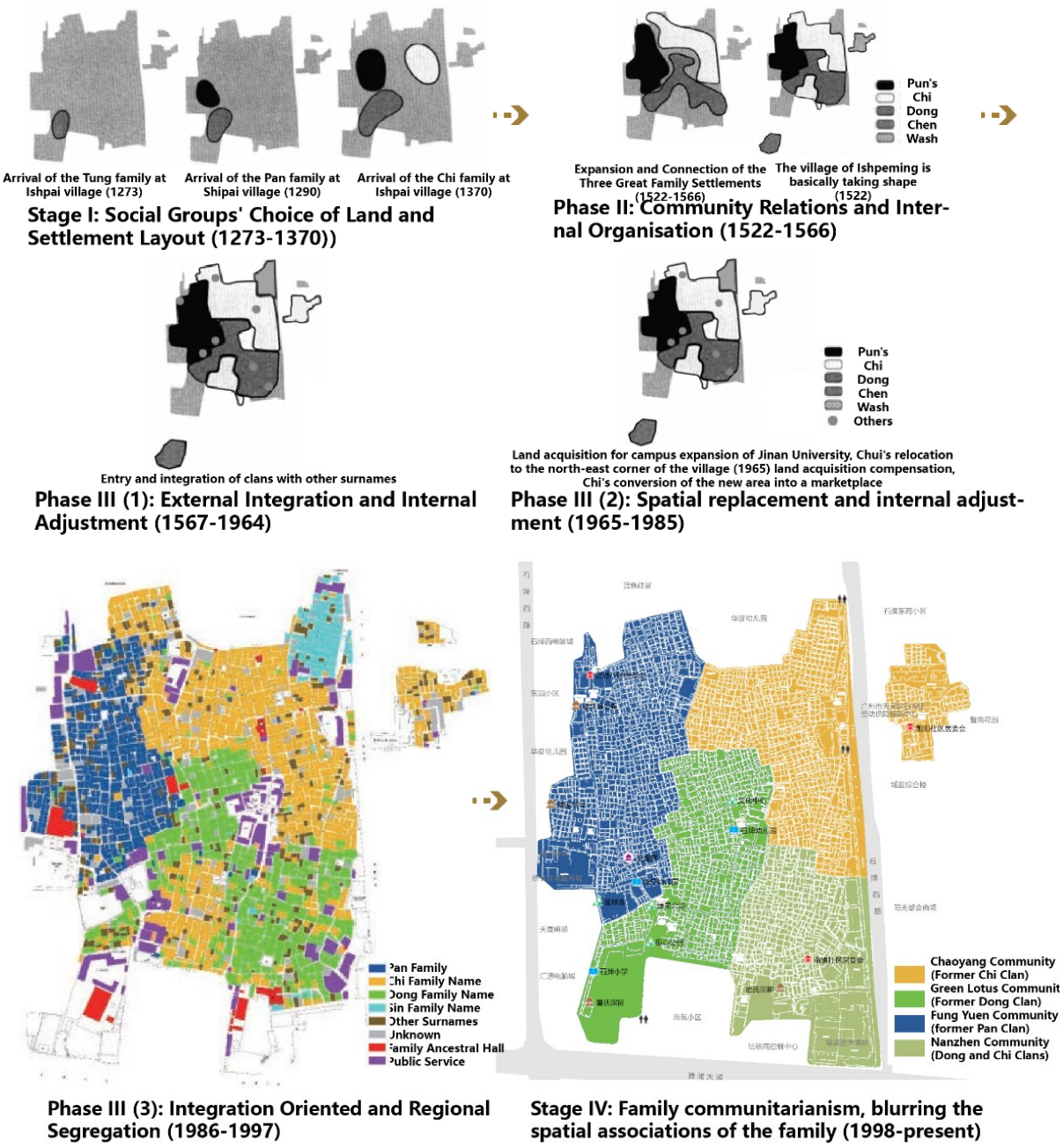


Figure 3-4 Internal social and spatial layout, organization, and adjustment
(Source: The author is based on Huang Quanle: "Rural City: The Spatial History of Guangzhou Shipai from the Perspective of Typology and Morphology (1978-2008)" and the Shipai Village Committee of Tianhe District, Guangzhou, edited by the Shipai Village Committee).

before the founding of the People's Republic of China. At the same time, in terms of the proximity to the streets, some of the streets of Chi's are directly adjacent to the city, while Dong's is mainly connected through the entrance passage, and Pan's is connected to the outside world through the commercial inner street. Historically, it can be seen that the various ethnic groups have had different interactions with the outside world as special uses (Appendix 3). For example, the Dong ancestral hall was used for the army, the Chi clan was used for productive

purposes, and the Pan clan was used as the location of the Nationalist Provisional Government, which had different external connectivity properties. At the edge of the urban village, the village expands outward along the road, expanding its own territory from the perspective of land use. Although this growth shows a land game and trade-off between clan and urban development, they have given up some of their agricultural land but have succeeded in retaining the core boundaries of the village. With the changes of the times and the external environment, the villagers chose to adapt to the new production and lifestyle, established close community relations internally, and at the same time adopted a harmonious relationship model with the external periphery, constructing their own social and spatial roles in the integration with the surrounding environment (Figure 3-4).

3.2.1.2 The Land Acquisition Game: The Evolution of Diversified and High-Density Social Factors and Boundary Irregularities and Their Forms

Since 1920, the tranquility of the original agricultural settlement has been broken and it has gradually developed towards urbanization. The external changes of urban villages are mainly related to the continuous expropriation of cultivated land by cities for more efficient and high-interest urbanization. According to the summary and comparison of relevant literature, it is mainly divided into three stages. From the end of the Qing Dynasty to the Republic of China (1911-1949), the Guangzhou-Kowloon Railway was completed and opened to traffic, and the railway set up a Shipai station at the top of Shipai Gangding, a move that opened a new chapter in the suburban connection between Shipai Village and the city. Subsequently, the construction of highways, airports, and universities made the transportation links between urban villages and cities closer, and the area was implanted with a cluster of modern university education. In the second stage, from 1950 to 1985, with the further development of urban functions, as an educational cluster, Shipai Village was positioned as an educational cluster to bring a large number of people, and the urban planning replaced the original farmland with functions that were more in line with the overall planning positioning, such as the construction of many universities, middle schools, scientific research institutions and related service facilities. The third stage was from 1950 to 1985, when the degree of urbanization in the Shipai area increased, the suburbs gradually developed into the urban center, the commercial, financial, administrative and other industries were introduced, the population was centrally concentrated, and the situation of land resources was increasingly tense, forcing the transformation of urban villages, including the transformation of functions from traditional residence to mixed residence, such as the further widening of roads and municipal facilities to meet the increasing traffic and

temporary shelter in response to the increase in foreign population. Urban villages have become a transitional function of urban development, with inclusive urban connotations, and play an intermediary role between the upper and lower classes of the city (Figure 3-5).

From the level of the boundary of the urban village and the integration of the city, in order to avoid flood disasters, the starting point of the development of the city begins in the north of the village, and gradually establishes contact with the village with the construction of stations and roads. The connection between Shipai East Road and the school village is mainly based on the history of Jinan University's many constructions, and undertakes the comprehensive role of the multi-dimensional connotation of "school-city-urban village-village". The history of the development of Shipai West Road has always had political influences. It served as the provisional government of the Kuomintang and the Shipai District Government, and was surrounded by related administrative and maritime functions. With the change of the nature of the administrative center, urban villages have independently introduced technology-based functions such as e-commerce to activate the vitality of the border. In the 21st century, with the further development of Zhujiang New Town in the southern part of the urban village, more commercial headquarters are planned, bringing together high-level people in the city, adding new social groups to the surrounding urban villages, but the current expressway of Huangpu Avenue seems to have opened the connection between the two.

On the whole, Shipai Village has always been in the development of a collective force to stand in the role of quasi-urban services, to assume the role of the transition, intermediary and transformation of the high and low classes of the city, with the collective enterprise as the agent of space production, by identifying the demand gap of the urban population for space investment and transformation, in the economy, construction level to use their existing resources to lead the urban village and the city to actively integrate. At the level of expropriation of cultivated land, urban development has brought a large number of floating populations, and modern lifestyles have been integrated into the lives of villagers. Through the diachronic analysis, the passive development and active transformation of urban villages are revealed, in which urban villages are valued and urban spatial production is carried out by the villagers as a whole. In the new plan, the change of the ancestral hall, the construction of a new torii, the demolition of some buildings, and the opening to the south can be seen in the openness of the residents of the urban village and their active determination to integrate with the city.

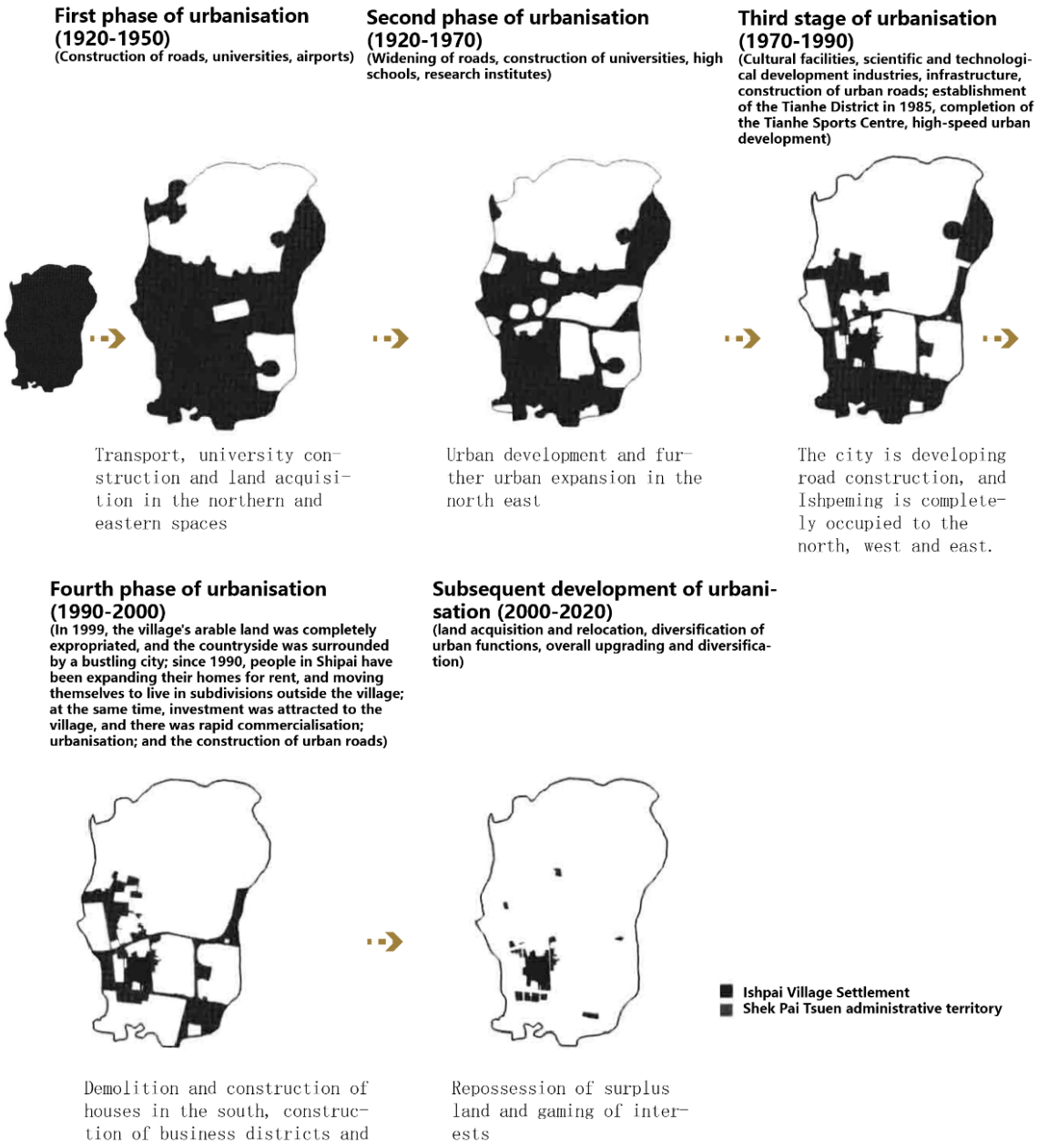


Figure 3-5 The land acquisition game and the social internal factors of pluralism and high density
(Source: The author is based on Huang Quanle: "Rural City: The Spatial History of Guangzhou Shipai from the Perspective of Typology and Morphology (1978-2008)" and the Shipai Village Committee of Tianhe District, Guangzhou, edited by the Shipai Village Committee).

3.2.1.3 Urban-Rural Integration: the Relationship between Peripheral Construction and Boundary Function

In the 70s and before, the expansion of cities was mainly manifested in the entry of colleges and universities, while the villages were dominated by village-built properties, small industries and small businesses. As a result, the spatial pattern of urban villages took shape in the early days, and urban education and industrial resources began to gradually penetrate into rural areas. In the 1950s, the construction of the Zhongshan Highway and the establishment of a series of colleges and universities (such as Normal University and School of Educational

Administration) marked the beginning of the initial integration of urban and rural areas. During this period, the spatial layout mainly reflected the introduction of educational and administrative functions, which had an initial impact on the boundary space.

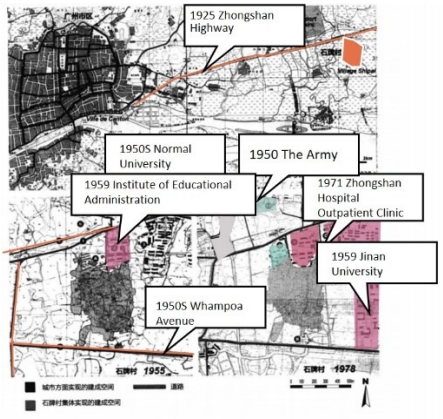
In the 1980s, the development of government administration and rural services led to significant changes in the boundary space of urban villages. With the relocation of government offices and the military, the administrative and service functions of urban villages have been enhanced. Service industries and farmers' markets have also begun to develop within the villages to meet the needs of the growing population. For example, between 1989 and 1993, the construction of the Shipai Hotel is a typical example of this period. The emergence of facilities such as the athletes' village and the hotels along the street of the Sixth National Games has further promoted the diversification and integration of the functions of the urban-rural border.

In the 1990s, with the urbanization of commerce and the development of rural collective commerce, the commercial function of the boundary space of urban villages was rapidly enhanced. Urban functions such as cultural facilities and commercial markets have continuously penetrated into the villages, forming a situation in which commercial cities and rural collective businesses coexist. For example, the establishment of Pacific Computer City in 1993 led to the development of surrounding businesses and became a catalyst for the regional economy. At this stage, the boundary space not only carries traditional rural commercial activities, but also absorbs modern commercial elements, making the spatial functions more diverse and complex.

In the first decade of the 21st century, the boundary space of urban villages has entered a stage of comprehensive improvement. Commercial, business and entertainment facilities have been introduced in the city, and the technology industry and educational functions of the village have also been significantly improved. In 2010, the construction of a series of infrastructure, such as Xicun Primary School, 2015 Shipai Primary School Building and 2016 Wokou Road, marked a new stage of development for urban-rural integration. At this time, the boundary space is not only more functional, but also greatly improved in terms of environmental quality and facility level.

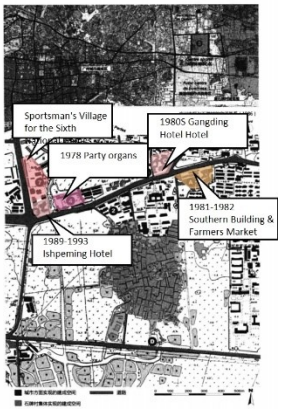
At the current stage, the boundary space of urban villages is exploring a new model of symbiotic integration. The functional layout of the city's northern commerce, southern commerce, surrounding residences and schools makes the boundary space present a high degree of diversity and complexity. The interior of the village is dominated by housing rental industry, service industry and small business, forming a complex that integrates multiple functions. At this stage, the boundary space is not only a transition zone between urban and rural areas, but

also a multi-functional area integrating residential, commercial, educational, and service areas, reflecting the in-depth development of urban-rural integration and the optimization and improvement of spatial functions (Figure 3-6).



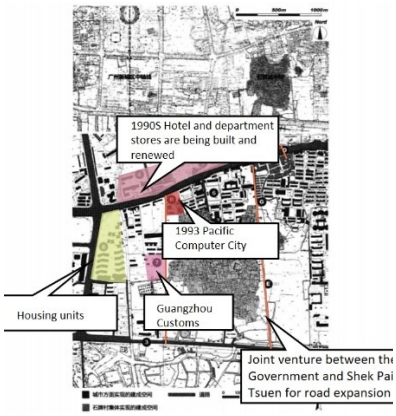
In the 70s and before - the development of industry and commerce in the suburbs and in the countryside

, the entry of cities - universities; Village-built property (small industry, small business)



In the 80s — institutions and rural services

Cities - government agencies, military; Villages - service industries, farmers' markets



90's — commercial urban and rural collective commerce

Cities - cultural facilities, commercial infrastructure; Villages - computer city, commerce

The 21st century is the stage of comprehensive border improvement

Urban - commercial, business, entertainment facilities; Villages - science and technology industry, education

Today - symbiotic integration of urban settlements

- commercial in the north, business in the south, residential in the vicinity, schools Village-Housing rental industry, services, and small businesses are the mainstay

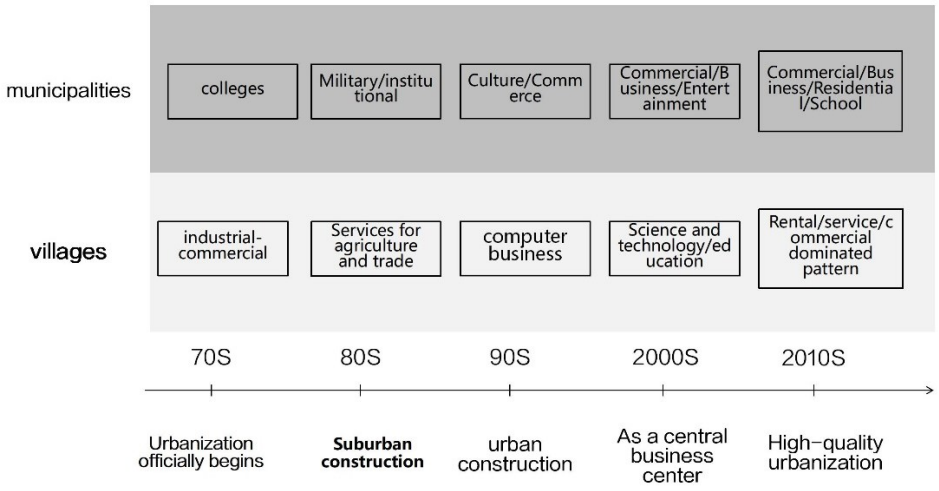


Figure 3-6 Urban villages and the development of urbanization
(Source: Author's own drawing)

3.2.1.4 Brief Summary

In this study, the connotation and evolution dynamics of the boundary space of urban villages in different periods were analyzed in detail (Appendix 3-4), and the boundary evolution dynamics of Shipai Village were divided into four different stages(Figure 3-7).

Stage 1: From 1273 to 1920, family settlements and blood relations dominated, and the space reflected social relations

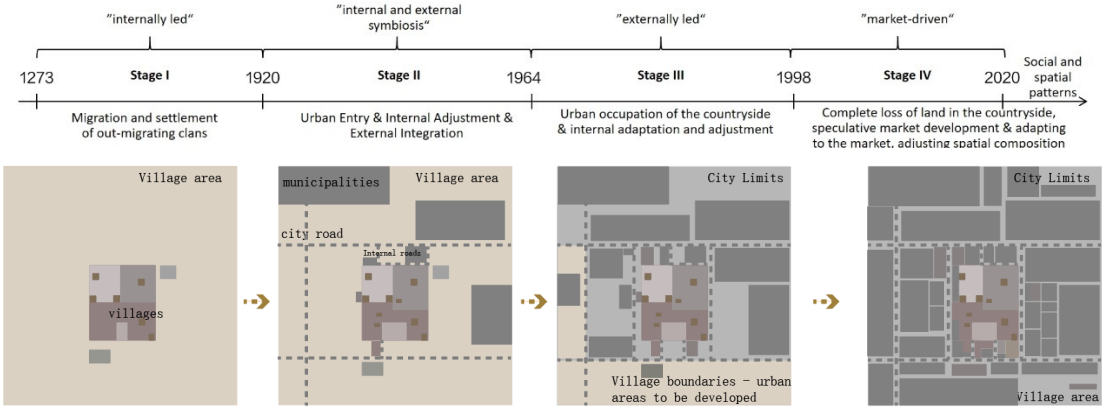
During this period, the spatial pattern of urban villages was mainly dominated by family settlements and blood relations. The spatial layout of the village closely revolves around the social structure and relationship of the family, and the use and distribution of space deeply reflect the social relationship and interaction between family members. This form of social organization centered on kinship makes the village space show a high degree of cohesion and stability.

Stage 2: 1921-1964, Adjustment of Social Relations and Migration of Clans to Join, Urban Development

With the addition of the relocated clans and the advancement of urban development, the social relations within the urban villages began to adjust. The introduction of new members breaks the original dominant pattern of kinship, leading to the reconfiguration of the internal spatial pattern and the change of boundaries. During this period, the space of urban villages began to gradually adapt to the needs of new social relations and urban development, showing more diversified and dynamic characteristics.

Stage 3: From 1965 to 1998, urbanization and territorial encroachment led to a sharp increase in population

In the context of rapid urbanization, urban villages have experienced large-scale land grabbing and population growth. The space inside the village is gradually eroded by the external urban development, and the rapid population growth makes the internal space more dense and complex. Boundary space has not only become an important area of population agglomeration, but also participates in the production of urban space, forming a unique spatial form and function.



The family relationship of "three main and five surnames is integrated" forms a spatial pattern of "the main clan occupies the main body of the village, and the outward migration point is scattered around or interspersed within".

The city enters, and the village integrates multiple surnames; Cities gradually encroach on the boundaries of villages and infiltrate the periphery of villages, and the boundaries between cities and villages begin to change.

Cities and villages develop each other, cities occupy village land, villages introduce industries, and collective companies are established to participate in urban production; The city gradually occupies a spatial dominance, and the boundary acts as a link to strengthen the connection between the village and the city.

The city occupies the countryside, the last piece of urban vacant land is built, the surrounding area is built into a high-end business place, and the industry and service industry in the urban village develop together, showing the characteristics of market speculative development, looking for a role position that is in line with the urban function, and presenting a diversified functional pattern.

Figure 3-7 Evolution of socio-spatial development in urban villages
(Source: Author's own drawing)

Stage 4: 1999-2020, market-oriented economic development and urban intervention in villages

In the 21st century, speculative commercial development and the intervention of urban planning have become the main driving forces for the spatial evolution of urban village boundaries. Through a series of optimization measures, the city government and developers have replaced and adjusted the local space of the urban village, improving the environment and function of the boundary space. During this period, the boundary space of urban villages gradually developed in the direction of modernization and multi-functionalization, reflecting the dual driving force of commercial interests and urban planning.

In summary, the connotation and evolution dynamics of urban village boundary space are different in different periods, from the early blood relationship dominance, to the adjustment of

social relations and urbanization development in the middle stage, and then to commercial speculation and urban intervention in the later stage, each stage has a profound impact on the formation and evolution of space. This study not only reveals the complexity and dynamics of the boundary space of urban villages, but also provides valuable historical experience and theoretical reference for future spatial optimization (Figure 3-7).

3.2.2 Boundary Production Mechanism

3.2.2.1 Modes of Production and Social Relations

Different subjects in urban villages embody the multi-level interaction of boundary space through different roles and functions. The superstructure includes the government, investors, neighborhood offices, village committees and village collectives. The government is responsible for formulating policies and plans, communicating and coordinating with village committees through the neighborhood office, and influencing the development and utilization of boundary space. The investor promotes commercial development and infrastructure construction, and the village committee, as the representative body of the village collective, manages the affairs of the village and cooperates with the higher-level government and the neighborhood office. Village collectives are the core players in production, directly participating in and influencing the use and management of boundary space.

The social awareness section, which includes administrators, merchants, migrants, villagers, other practitioners, and other residents of the city, showcases their activities and interactions in the boundary space. Executives are responsible for policy implementation and management, merchants influence the economic development of the space through business activities, and mobile people increase the complexity and diversity of the space. As indigenous people, the lives and activities of villagers are directly affected by spatial changes. Other practitioners are from all walks of life and have different functional needs for space, and the activities and needs of other residents of the city also affect the planning and management of boundary spaces.

The multi-layered interaction between the superstructure and social consciousness. The government and neighborhood offices influence the decision-making of village committees and village collectives through policies and planning, and the village committees communicate these decisions to specific residents and businesses. The interaction between the various roles, such as business licensing and regulation between merchants and administrators, and daily life and consumption between merchants and villagers, demonstrates the diversity and complexity of the boundary space. Through these multi-level interactions, the status quo and function of

the boundary space are formed, revealing the influence of policy, economy, society and other aspects. This understanding can help to better plan and manage the boundary space of urban villages, improving its overall quality and functionality (Figure 3–8).

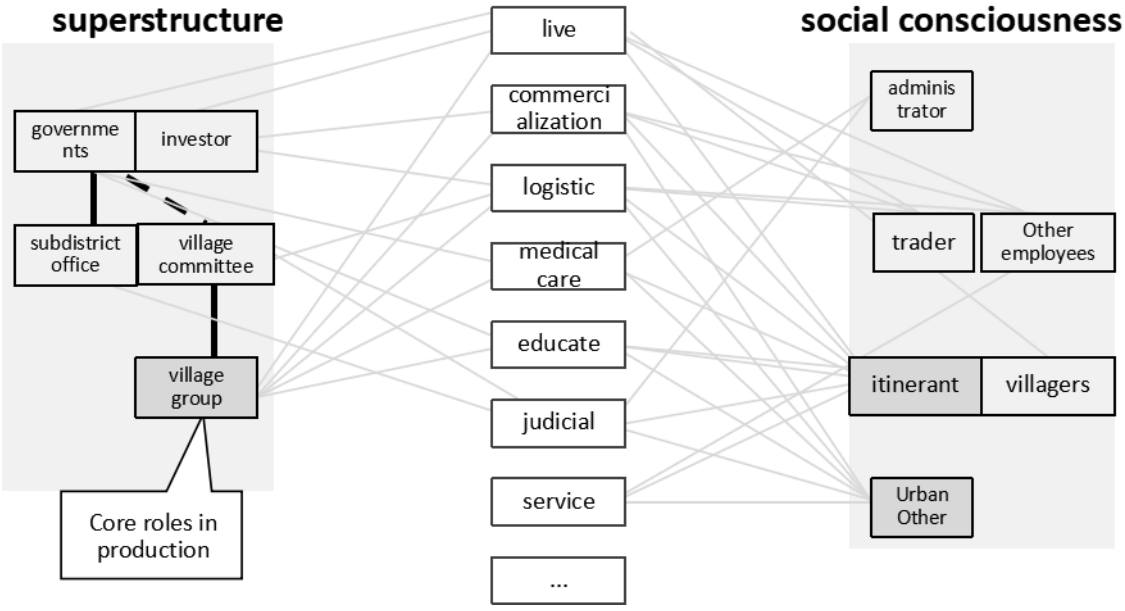


Figure 3–8 Illustration of boundary production methods and social relations
(Source: Author's own drawing)

3.2.2.2 Mechanisms of Actors based on Common Interests

At present, the renewal is mainly carried out from the top down with the support of the village group and the government. Future urban renewal should be based on common interests, attract more participants, and create a comprehensive development of "high efficiency, precise investment, quality of life, and cultural belonging". Action-driven mechanisms based on the common good reveal the interactions between various stakeholders and the common goals they pursue. The diagram below illustrates how the government, investors, village collectives, merchants, villagers, migrants and other parties interact with each other driven by common interests.

The government promotes the development of urban villages through policies and planning, with the goal of achieving political benefits. Investors hope to make commercial profits by participating in development and construction. As the main managers of urban villages, the village collectives not only protect the interests of the villagers but also enhance the commercial benefits of the village collectives through cooperation with investors and the government.

Social awareness plays a key role in these interactions, reflecting the expectations of residents, businesses, migrants, and others in terms of public spaces and living environments.

These groups want access to transportation, a high-quality living environment and humanized public spaces. This expectation drives the formation and spread of social awareness, influencing decisions and actions on all sides.

The common good is at the heart of these interactions. The government hopes to improve the performance of the government through the development of urban villages, the investors want to obtain commercial returns, and the village collectives and villagers want to improve the living environment and increase their income. Through the integration of these interests, a mechanism of action based on the common good is formed (Figure 3–9).

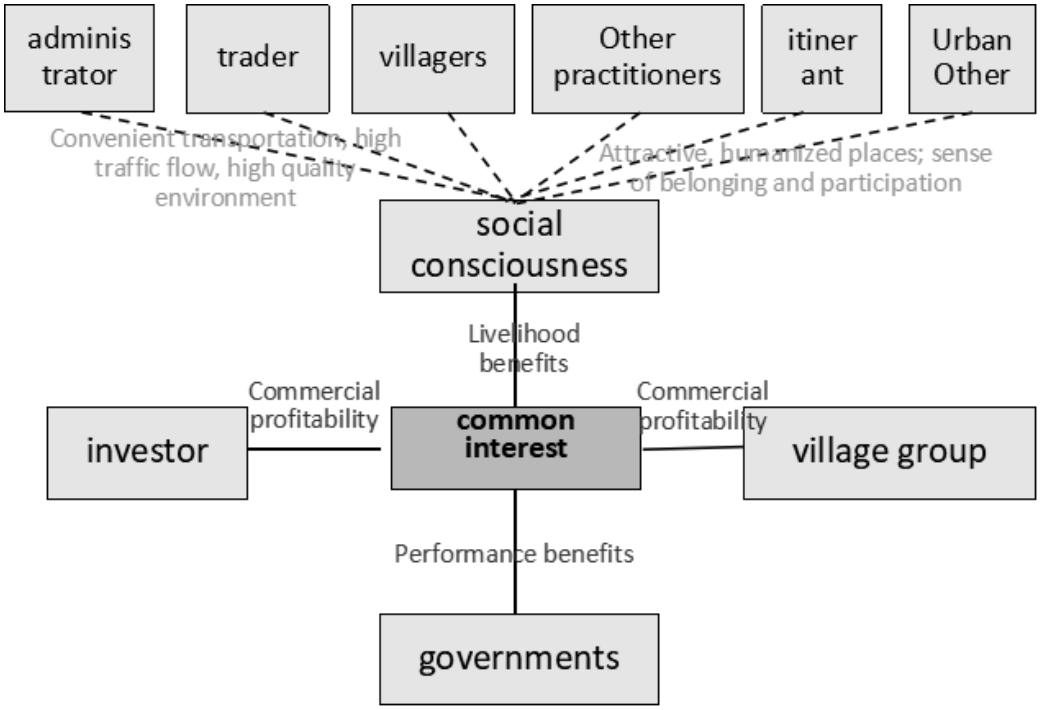


Figure 3–9 Actor mechanism based on the "common good".
(Source: Author's own drawing)

Under this mechanism, the interests of all parties have achieved a win-win effect through the adjustment and integration of social consciousness. The policy guidance of the government and the capital investment of the investors, combined with the actual needs of the village collectives and the villagers, have promoted the overall development of urban villages and the optimization of boundary space, so as to achieve the unity of living benefits, commercial benefits and political performance benefits. This action mechanism based on common interests not only promotes the development and upgrading of urban villages, but also provides a scientific basis and practical guidance for the optimization of public space.

3.2.3 Functional Configuration Analysis

3.2.3.1 The Interaction between the Mode of Production and Society

The modes of production of urban villages and cities can be mainly divided into commerce, logistics, medical care, education, administration, residence, services, and administrative activities. Urban villages and cities are connected through production relations, and the mode of production organizes the economic and living relations between cities and villages, the characteristics of social space, and promotes material transmission and cultural integration. By expressing the contact methods of production relations with "symbols", these connections are divided into two types: bidirectional and unidirectional (Figure 3–10).

(1) Two-way contact

Commercial activities: Commercial activities between urban villages and cities are two-way, with urban residents spending in urban villages and merchants in urban villages supplying goods and services to cities. This reciprocal economic interaction promotes economic development and resource sharing between the two places.

Healthcare: There is also a two-way connection between urban village residents and urban residents in terms of medical resources, with medical facilities in urban villages serving local and urban residents, and urban medical resources are also open to urban villages. This connectivity helps to improve the overall level of health care.

Education: The two-way connection of educational resources, urban villages provide land for the city to build educational buildings, students in urban villages can study in them, and educational resources are also open to the city.

(2) One-way contact

Logistics: Urban villages mainly focus on outgoing logistics, and provide products to cities through production and freight.

Administration: Residents of urban villages need to go to the city to handle administrative affairs, which is a one-way export relationship, which represents the city's administrative management and service support for urban villages. Although this relationship contributes to the unity of management, it may also increase the travel burden of urban village residents.

Residence: Urban residents rent in urban villages, which is a one-way internal transportation relationship, reflecting the shift of urban housing pressure to urban villages. Although this model can alleviate the pressure on urban residents, it may also lead to an increase in population density in urban villages, bringing pressure on the environment and resources.

Service: Although the one-way transmission of services provided by urban villages to the city improves the functional public nature of urban villages, its spatial interaction is poor, and the spatial quality in reality is also low, which is not conducive to the establishment of good urban image and feeling.

(3) the advantages and disadvantages of one-way and two-way connection and its boundary characteristics

The two-way connection has the benefit of both sides, the "reciprocity" of sharing resources and services, and frequent exchanges and cooperation, which enhances the "interactivity" of the connection between the two places, and helps to promote the optimal allocation of economic and social resources, resource sharing and strengthen the social and economic ties between urban villages and cities. For the boundary space, there may be a lot of pressure on the space, and corresponding activity support is needed to meet the occurrence of the interactive space.

One-way connection resources and services flow from one place to another, and the relationship is single; One party has a dependency on the other's resources or services. Although management is relatively simple, resources and services can be pooled, and efficiency can be improved, the dependence of one party on the other may lead to an imbalance between supply and demand. One-way flows can lead to the concentration of pressure on resources or services in one place, affecting sustainability. For the boundary space, the degree of interaction may be less, and the boundary lacks stay and interaction, so the derivative function of one-way function can be considered to tap the possibility of interaction and increase the vitality of the border.

The two-way and one-way connections between urban villages and cities reflect the close relationship between the two places in terms of production mode and social interaction. Two-way linkages promote reciprocity and economic exchanges, and optimize resource allocation, but they require effective coordination and management. One-way contact simplifies the management process, but it can increase the resource pressure and dependency risk on one party. Understanding and optimizing these relationships can help achieve a coordinated development of urban villages and cities, and promote sustainable economic and social integration (Figure 3–10).

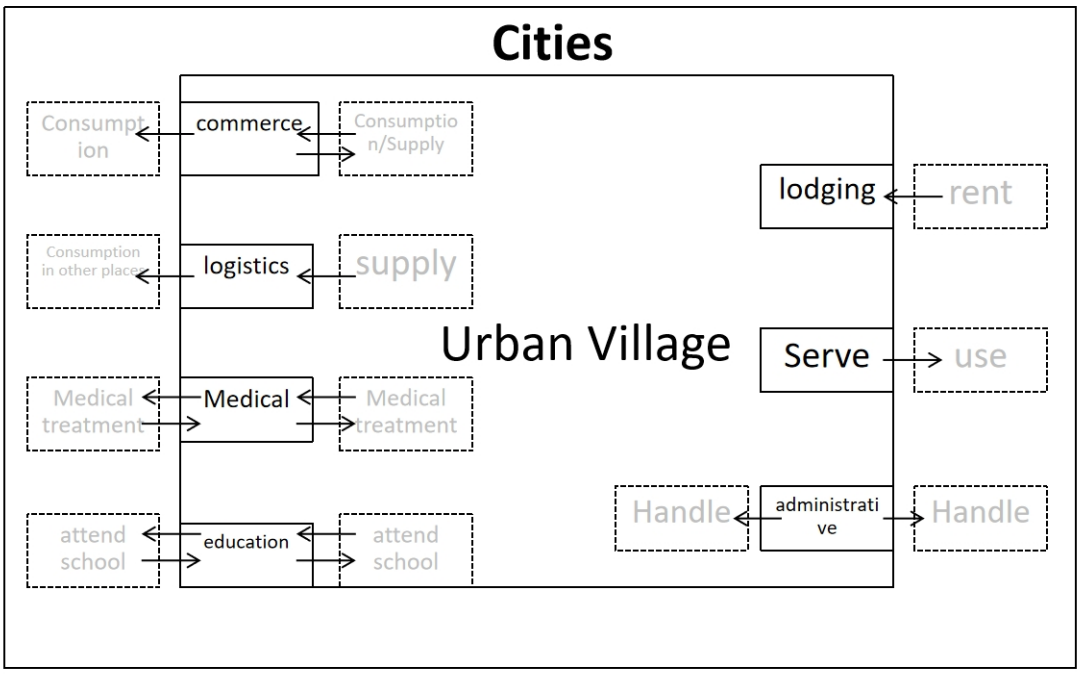


Figure 3–10 Production interaction between urban villages and cities
(Source: Author's own drawing)

3.2.3.2 Analysis and Optimization Recommendations from a Production Perspective

The boundary production mode of Shipai Village is mainly commercial, which is distributed around the village, and the commercial function makes the urban village and the surrounding city have a positive interaction. The transportation functions are mainly distributed in the western part of the base, mainly one-way production directly facing the street, and in the daily period, transportation production occupies more public space, and several transportation functions make regional traffic congestion; Medical care is distributed in the north and southeast corners of the base, and the daily flow of people is large, and the demand is large in public gathering places; There are few services, and there are three main spaces; The administration is mainly distributed in the eastern part of the base, and the external service production is relatively public. There is a customs bureau in the western part of the construction, which is mainly office in nature; The distribution of education and commerce is relatively scattered, and educational resources are shared between urban villages and cities, which has the characteristics of two-way interaction. Business activities are primarily focused on in-house operations, serving as office space or residential hotel leases for some groups of people (Figures Figure 3–10). Integrate production methods and interaction patterns and reflect them in the current situation to the street segment (Figure 3–11).

(1) The boundary section of the top of the post: the production is inactivated, the production function space is lacking, and the daily interaction of the boundary space is poor. It

is suggested to open the boundary to promote information exchange and spatial interaction between regions, and consider setting up temporary production functions to activate spatial nodes. For example, creativity, food, etc., can be inserted to create new production models and activate the vitality of the place.

(2) Shipai West Road Section: The production mode is mainly one-way, and the interaction of the boundary space is poor, so it is recommended to consider the "derivative" function of the production space, create the intersection of production and public life, and carry out interactive design; At the same time, the excessive concentration of transportation functions leads to greater regional pressure on public spaces, resulting in regional congestion and other phenomena. It is recommended to relocate the entrances and exits of production and set up corresponding use spaces to alleviate or avoid overpressure in public spaces, encroaching on public spaces and affecting the daily lives of other users. At the same time, individual discrete traffic functions are recommended to be integrated, designed and planned as a whole to reduce the sense of spatial chaos. For example, the transportation function of Shipai West Garden can be integrated to realize the regeneration of living and production, and the functional optimization of public space. At the same time, the derivative nature and spatial vitality of the boundary are considered to improve the existing spatial environment.

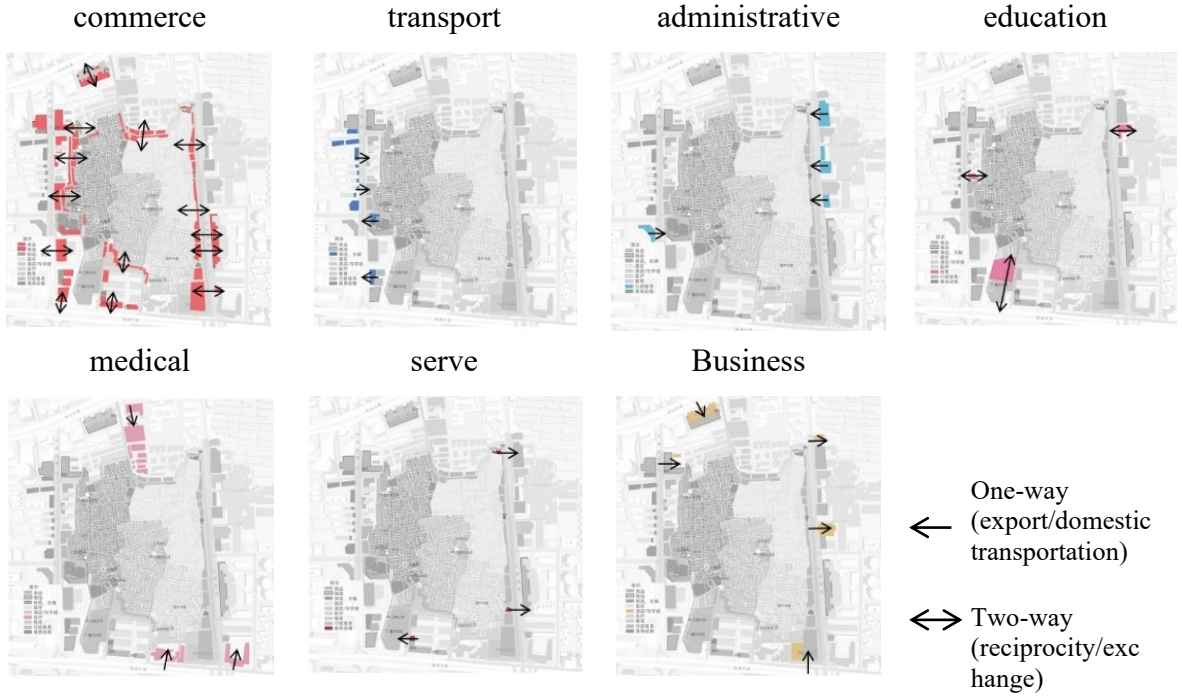


Figure 3–11 Illustration of the distribution of boundary production patterns and spatial interactions (Source: Author's own drawing)

(3) Shipai East Road Section: Mainly commercial, the urban village and the city have strong spatial interaction. However, the interactivity of the boundary space is weak, so it is

recommended to integrate the interaction design into the boundary system, so that the production interaction can be transformed into social interaction, which is conducive to social interaction and creates a boundary area of social symbiosis.

(4) The southern section of Shipai: the production of some spaces is one-way, and it is recommended to set up an interactive integrated design. At the same time, the integration of the hospital should take into account the location of its site on the street, or how to accommodate diverse crowd activities in the street design to support the infrastructure of cultural production. Rectification is recommended to improve social interaction and activate street boundaries (Figure 3–12).

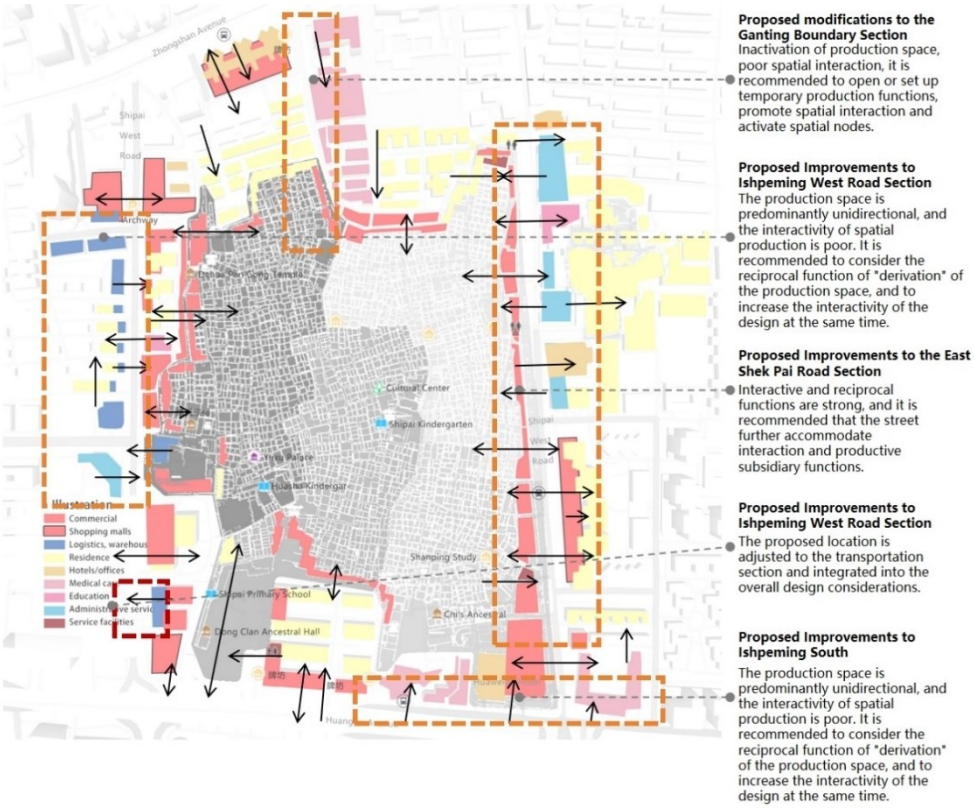


Figure 3–12 Recommendations for lower bounds optimization in the production dimension
(Source: Author's own drawing)

3.3 Psychological Dimension Analysis

The psychological dimension refers to the comprehensive response of individuals and collectives to the cognition, perception, emotion, and symbolism of space, covering people's subjective experience and cultural identity of space. This dimension involves not only the psychological response to the physical space, but also the understanding of the symbolism of the space, the sense of belonging, and the identity of the space. Through cultural education,

spatial design and social activities, the goal of the psychological dimension is to enhance social cohesion and spatial identity.

This part of the study mainly uses psychological cognitive questionnaires to understand the spatial cognition of people living in the boundary area, including the scope, node, center, marker and overall spatial evaluation of the boundary. The study focuses on the in-depth data collection of nodes, and analyzes the awareness of different nodes in the public mind by collecting the access frequency of each node. Based on the results of these hierarchical divisions, this study puts forward suggestions for spatial renewal in the psychological dimension, aiming to strengthen the sense of place at the border, improve the perception of the boundary space of the population, and further establish and deepen the emotional connection between the node and the crowd.

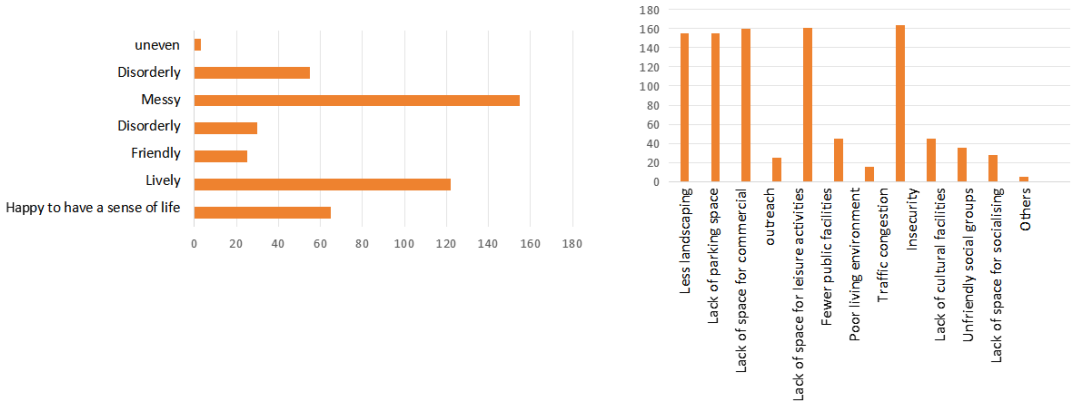
3.3.1 Psychological Cognitive Questionnaire

In order to fully understand the social cognition of Shipai Village and its borders, we designed and implemented a detailed questionnaire survey. The main purpose of this survey is to collect residents' perceptions and opinions on the boundary space, so as to provide a scientific basis for the planning and improvement of the boundary of urban villages. The questionnaire is designed into four parts, which aims to capture the opinions and suggestions of the respondents in a comprehensive manner; Basic information of the respondents, covering age, occupation type, etc., to ensure the diversity and representativeness of the sample. This part of the information is helpful to analyze the cognitive differences of different groups on boundary space. The overall feeling aims to understand the respondents' overall perception of the boundary space of Shipai Village, including safety, comfort, noise, etc. Through this part, it is possible to assess the overall satisfaction of the respondents with the boundary space; Specific perceptions and suggestions were made to ask respondents to mark out the boundaries they were familiar with, and to describe the characteristics and problems of these areas. This section

a) Category of personnel b) Type of occupation

Figure 3–13 Population categories investigated
(Source: Author's own drawing)

can provide a detailed understanding of residents' specific views and experiences on different boundary areas, and provide detailed references for optimizing the design. Problem identification aims to identify the main problems at the boundary of Shipai Village, such as garbage accumulation, lack of public facilities, and chaotic commercial expansion, etc., and collect respondents' suggestions for improvement of these problems. This component will be used directly to develop improvement measures and planning options to ensure that practical problems are addressed and the overall quality of the boundary space is improved. Through this systematic questionnaire survey, we were able to gain an in-depth understanding of the social cognition of Shipai Village and its boundaries, and comprehensively collect residents' feedback and suggestions, which provided a solid foundation for the scientific planning and improvement of the boundary space (Figure 3–13).



a) General feelings b) Environmental issues

Figure 3–14 Crowd impressions of the environment
(Source: Author's own drawing)

A total of 200 questionnaires were distributed in this survey, and 164 valid questionnaires were successfully recovered, with an effective recovery rate of 82.00%. The survey population included different age groups and occupational types to ensure that the data was comprehensive and representative. The age of the survey population is mainly 27-45 years old, of which 23% of the respondents are migrants/migrant workers, 24% residents, and 20% business personnel, which is basically similar to the actual population composition of the village. The survey results preliminarily show that the respondents' feelings about the boundary space are mainly concentrated in the aspects of "noisy", "full of life" and "lively", accounting for the highest proportions respectively. In addition, there is a subset of respondents who consider the boundary space to be "dirty" and "intimate". In addition, there are several environmental problems at the boundary of Shipai Village, such as the lack of landscape, public facilities, leisure activities,

parking facilities, and traffic congestion, which affect the quality of life of residents and the environmental impression of the boundary space (Figure 3–14).

3.3.2 Boundary Site Awareness

3.3.2.1 Cognitive Center

Statistics on respondents' cognitive centers and their frequency. According to the frequency from high to low, including Shipai Primary School, Gangding Business District, Shipai East Business District, Pan's Ancestral Hall and Shipai Street Office. The intention frequencies were 138, 75, 35, 35, and 13, respectively.

According to the functional categories of the center, there are four categories: education, business, culture, and administration. Compared with the traditional intention center, the centrality of the ancestral hall of the dominant clan, that is, the ancestral hall of the Pan family, still exists, while the centrality of other ancestral halls is weaker. At the same time, the vitality of business has become a more important indicator of cognitive centrality. The spatial quality of Luhe Street, where Shipai Primary School is located is high (Figure 3–15).

3.3.2.2 Boundary Extent

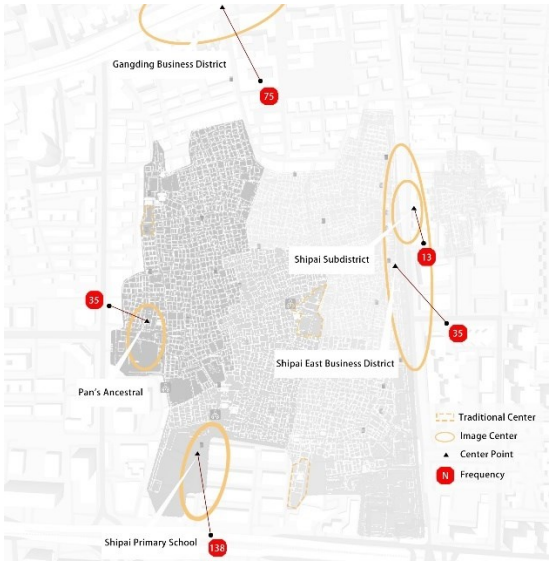


Figure 3–15 Boundary's center of intent
(Source: Author's own drawing)

Figure 3–16 Realistic vs. mental boundaries
(Source: Author's own drawing)

Comparing the land use boundary with the psychological boundary, it is found that the psychological boundary of urban villages is more inclined to the division of social boundaries of urban villages. Specifically, the psychological boundaries of Shipai Village consider the sense of belonging to the community and the spatial division of participation in operation and investment. In the minds of the residents of Shipai Village, the psychological boundaries of

Shipai Village as they perceive them far exceed the actual boundaries of Shipai Village (Figure 3–16).

3.3.2.3 Frequency of Place Cognition

In the statistical cognitive map, the total frequency of all occurrences is 1985 times, involving 39 locations. Classification is based on location frequency of less than 20 percent, 20 to 40 percent, 40 percent to 60 percent, and 60 percent or more (Figure 3–17).

60% or more of the high-frequency locations include Gangding Subway Station (161 times), Zhongshan Hospital (155 times), Shipai Primary School (145 times), Pan's Ancestral Hall (115 times) and Shipai North Archway; The types are transportation hubs, large public buildings, school street sections, and cultural buildings; The impression of the city that reflects the subway station and its commercial and urban public services is more important for people to construct the impression of the village cognition and location. However, the level of understanding of urban villages such as culture is weak.

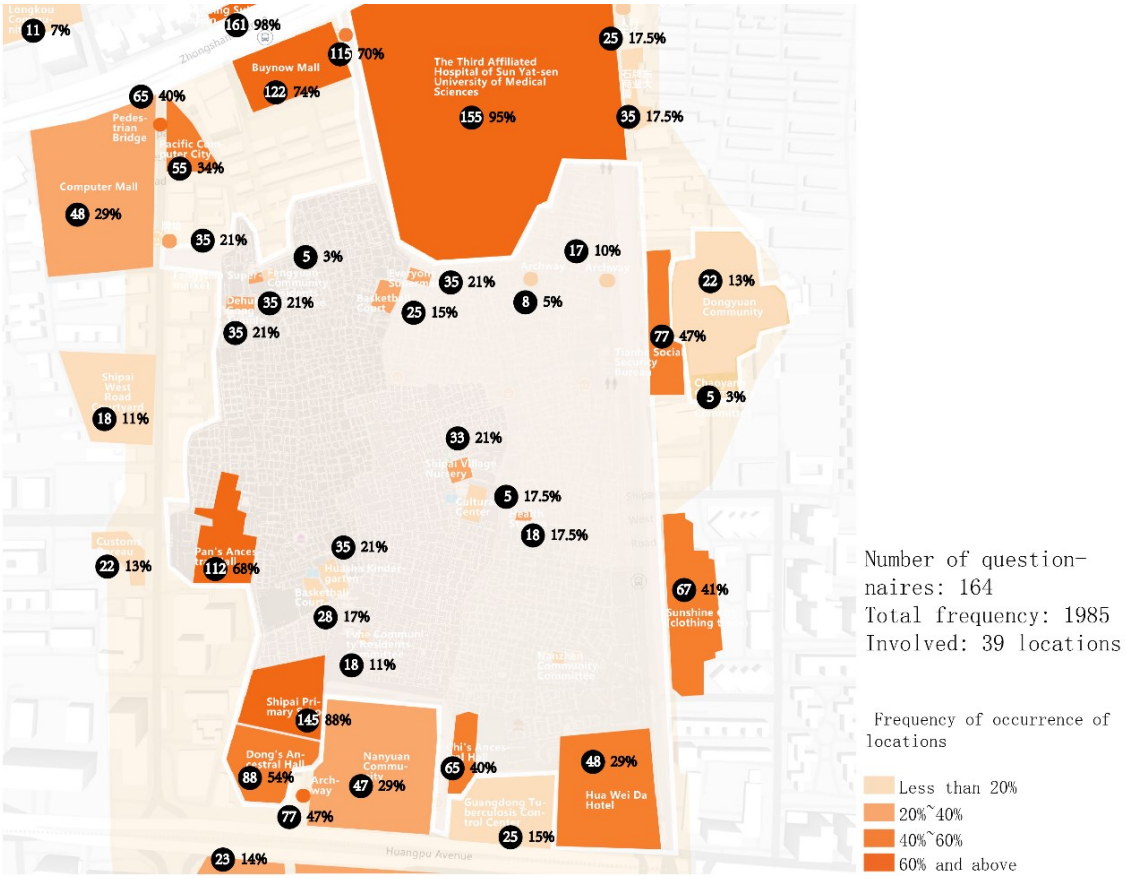


Figure 3–17 Intentional location frequency
(Source: Author's own drawing)

Medium- and high-frequency locations with a frequency of 40%-50% include Dong's ancestral hall (88 times), Shipainan archway (77 times), Tianhe Social Security Bureau (67

times), Sunshine Metropolis Service Trade City (65 times), and Chi's ancestral hall (55 times). The types of these sites are cultural buildings, administrative buildings, large-scale commercial buildings, and landmark buildings; Public buildings that reflect these characteristics play an important role in the intention of the boundary. 20%-40% of low-frequency locations, computer city, Nanyuan community; The frequency is 29%. Less than 20% of the low-frequency locations are mainly internal buildings in villages and other community buildings.

In general, the frequency of place cognition reflects that landmarks and markers play an important role in the construction intention of people, cultural buildings play a certain important role, and good street quality.

3.3.3 Initial Update Proposals

In order to optimize and create a "sense of place" in Shipai Village, we should make full use of intentional nodes to drive the improvement of other non-intentional nodes. The specific strategy is as follows (Figure 3–18).

High-intent areas (more than 60%) reinforce existing intent and further optimize the environment to enhance the attractiveness and functionality of the area. By increasing greenery, beautifying public spaces and upgrading infrastructure, these high-intent areas will become the highlights and iconic areas of Shipai Village.

Medium-interest areas (40-60%) focus on optimizing the environment, creating unique features and enhancing the attractiveness of the area. By introducing cultural elements, setting up themed landscapes, or adding community activities, these areas can be enhanced to enhance the experience of residents and visitors, and gradually become new intentional nodes.

Low intent areas (less than 40%), tap the potential, and activate these areas appropriately. Through infrastructure improvements, increased service facilities and environmental quality, the interest and engagement of residents and visitors will be gradually stimulated. Consider introducing innovative usage models or community projects to enliven these areas and become new community highlights.

It is specifically mapped to the real physical space of the urban village. The Gangding node proposes to integrate multi-functional functions such as transportation, commerce, and medical care to create a distinctive urban TOD image; It is recommended to optimize the business environment of the computer city node, and comprehensively consider the characteristics of the science and technology node in combination with the computer high-tech industry. The nodes of the Social Security Bureau provide rest, activities, etc., as better public services and office spaces; There are few intentional buildings in the village, so it is

recommended to optimize the central nodes, tap the cultural accumulation, provide public services, and create the characteristics of the public center in the village. Shipai West Road proposes to integrate the ancestral hall and the entrance square to create an overall cultural impression, update the streets and squares, and create cultural landmarks; Luhe Street proposes to make use of cultural characteristics and integrate schools, ancestral halls, residential areas, commercial and other functions to provide more public services and cultural services. enhance the connotation of the street; It is recommended to set up a dwell node and use other elements to empower and activate the node.

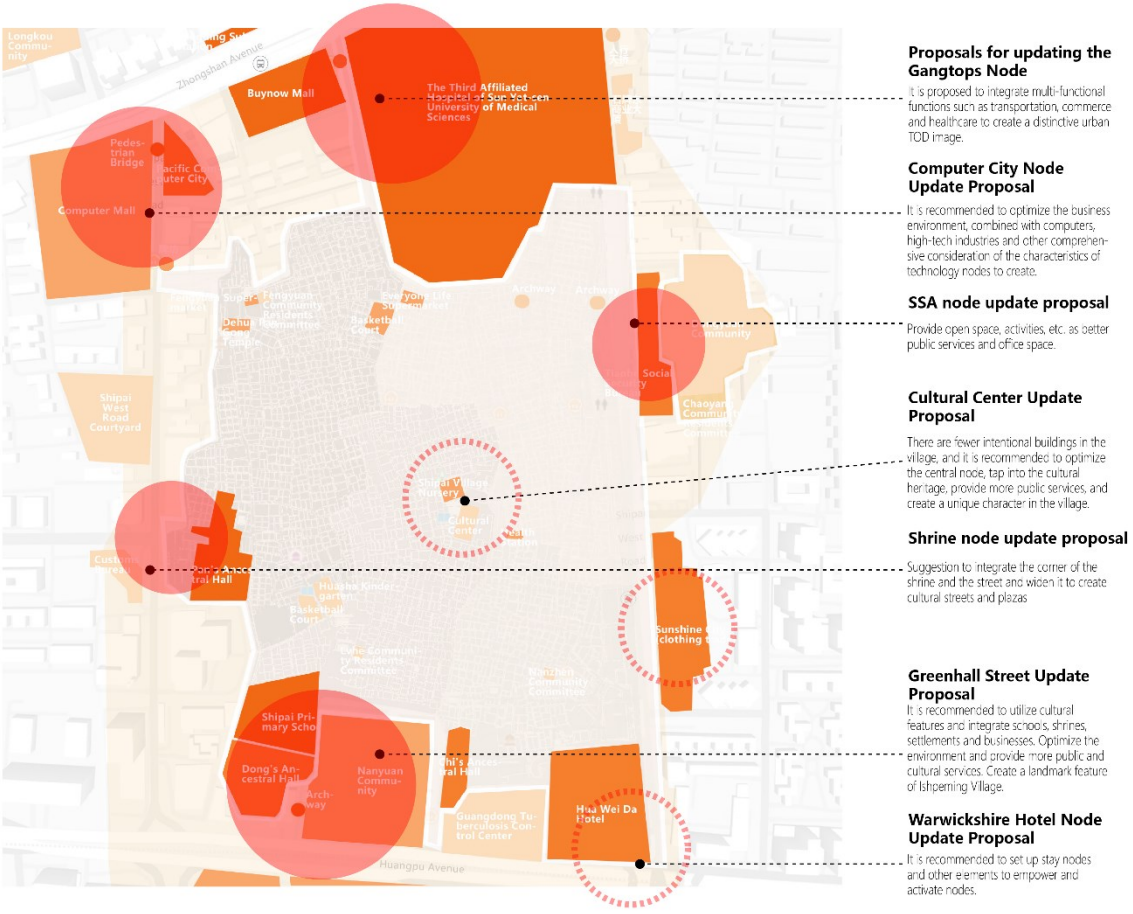


Figure 3–18 Cognitive map integration and optimization recommendations
(Source: Author's own drawing)

3.4 Life Dimensions Analysis

The life dimension refers to the use of space and activities that are closely related to daily life and social practices, including daily behaviors such as residence, leisure, consumption, and transportation. This dimension reflects how people carry out their daily activities in the space, and how these activities shape and affect the structure and function of social spaces. The analysis of the life dimension covers the use of space in people's daily lives, which affects the

multi-functional, interactive and dynamic nature of social space. Through spatial planning, public facility construction and community activities, the goal of the living dimension is to optimize the efficiency of social space, improve the quality of life of residents, and promote social harmony and sustainable development.

This paper focuses on the analysis of the life dimension, considering that the boundary space is mainly dominated by public communication, commercial activities and social practices, so the UML activity analysis method, a research method of system interaction, is introduced to study the interaction between crowd activities and spatial systems in the boundary space. By analyzing the contradictions between the spatial system and crowd activities, the key problems of unmet needs in the existing layout are revealed. In addition, the activities of nodes are mostly related to daily life and public leisure, so the study adopts Yangel's public space research method, through observation notation and node counting method, etc., to deeply study the actual living conditions of the population on the spot, and dig out the activity rules and potential needs.

Finally, this part comprehensively uses the site self-evaluation method to evaluate the degree of support for crowd activities in the boundary living space, aiming to improve the humanized quality of the boundary space and promote the high-quality renewal and optimization of the boundary space, so as to better serve the daily life of residents and promote the harmony and sustainable development of society.

3.4.1 Spatial Categories and Analysis Methods

3.4.1.1 People & Events

The categories of people at the boundary of urban villages are divided into three categories: local residents, floating residents, and urban residents according to the categories inside and outside urban villages. Different participants play a certain role in the production relationship and production mode, and after investigation and summary, the necessary activities are divided into five main categories: buying and selling, distribution, logistics, logistics, and commuting to and from school. The social scene was divided into three main categories: socialization, entertainment, and group activities. Selective activities are divided into two main categories: rest and fitness.

(1) Space Type

The boundary space types of urban villages can be divided into three main types: streets, squares, and fences. Since some streets in urban villages are shared with the city, the corresponding urban street renewal guidelines should be followed. Therefore, the classification

is listed separately, and the study objects include four types of boundary space such as shared streets with the city, roads inside urban village, node squares, and fences (Figure 3–19).

In Shipai Village, Shipai East Road, part of Shipai South Road, and Shipai West Road coincide with the boundaries of urban villages, and are classified as shared streets with the city; Roads inside urban village are classified according to spatial shapes, such as two walls, one wall, etc.; The type of wall mainly refers to the form in which different areas are separated by "walls", two of which are located in the south of Shipai Village, and the other one is used to separate Shipai East Garden from the outside world; The enlarged nodes of the boundary mainly include two squares, the Green Lotus Square and the square in front of the Pan Ancestral Hall.

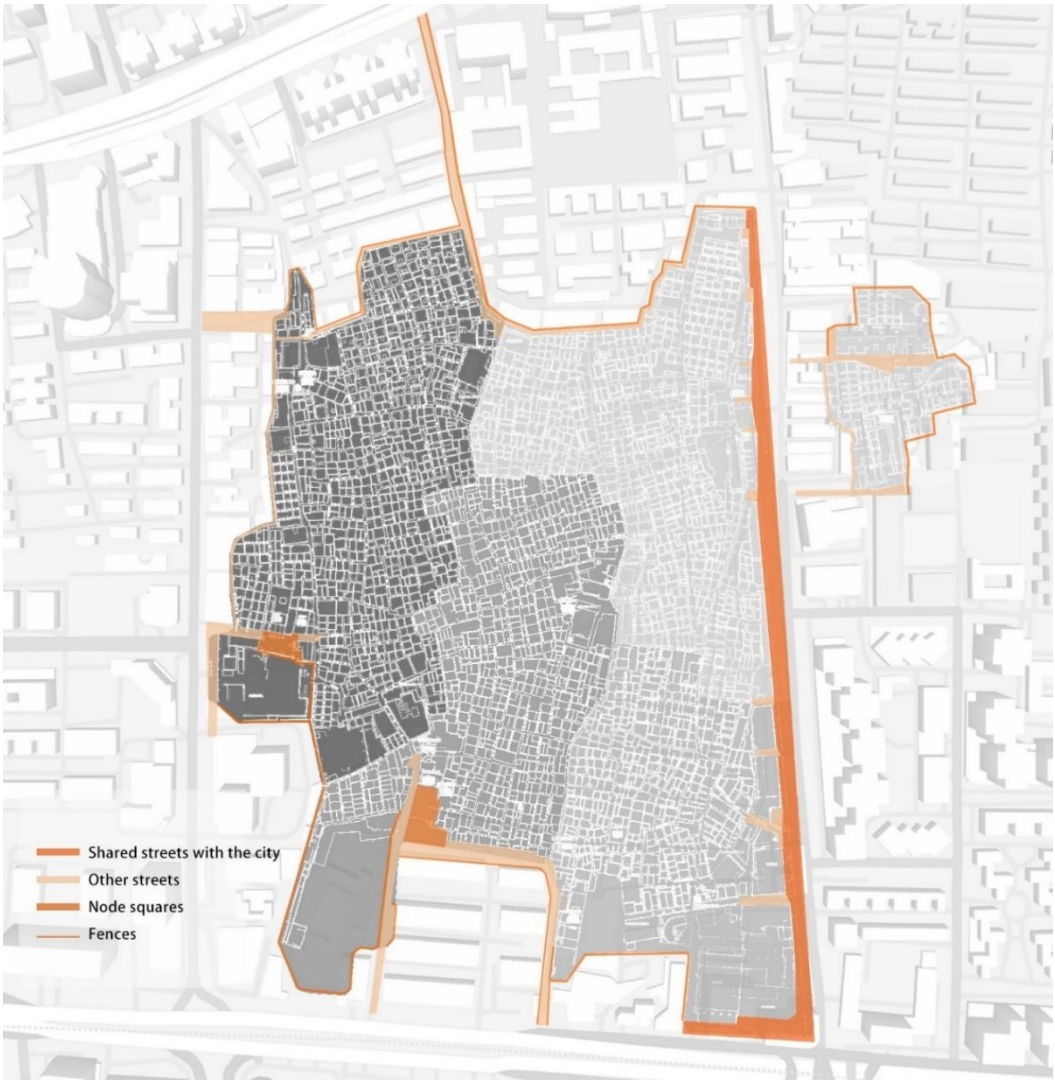


Figure 3–19 Types of boundary spaces
(Source: Author's own drawing)

(2) Analytical Framework

The research process of activity analysis consists of several key steps, starting with the preparation phase, which focuses on the configuration detection of the facility and the spatial

scale measurement of behavior. Then, in the first step, we will observe and record the current situation of space use to understand the usage and behavior patterns of different areas. In the second step, the activity analysis diagram is made according to the observed status quo, and the data is further refined and visualized, and the UML activity analysis method is used for necessary production activities such as streets, and the observation annotation method is used to analyze the activity for the node space. The third step is to analyze the matching of behavior and space by combining site self-assessment and interviews, and identify which areas need to be optimized. The last step is to update the design based on the residents' scale feelings and needs, so as to ensure that the new design can better meet the needs of residents and improve the use of space. Through such a systematic process, a comprehensive and in-depth understanding of space usage and behavioral characteristics can be obtained, providing a scientific basis for improving and optimizing public spaces (Figure 3–20).

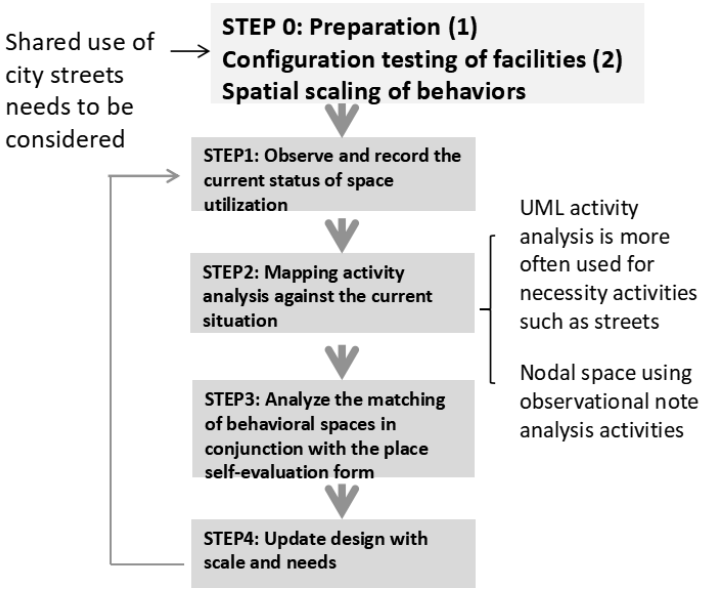


Figure 3–20 Illustration of the analytical framework for the boundary life dimension
(Source: Author's own drawing)

Observational recording is a data collection method that systematically records behaviors and activities, and is an important basic tool for activity analysis research. It not only provides insight into behavioral patterns, but also supports theoretical construction, optimization of spatial design, and evaluation and improvement of existing spatial layouts. In the study of life dimension, observation records are of great significance for in-depth understanding and recognition of people's daily life, and are the main source and basis of analysis of social activity data in this study.

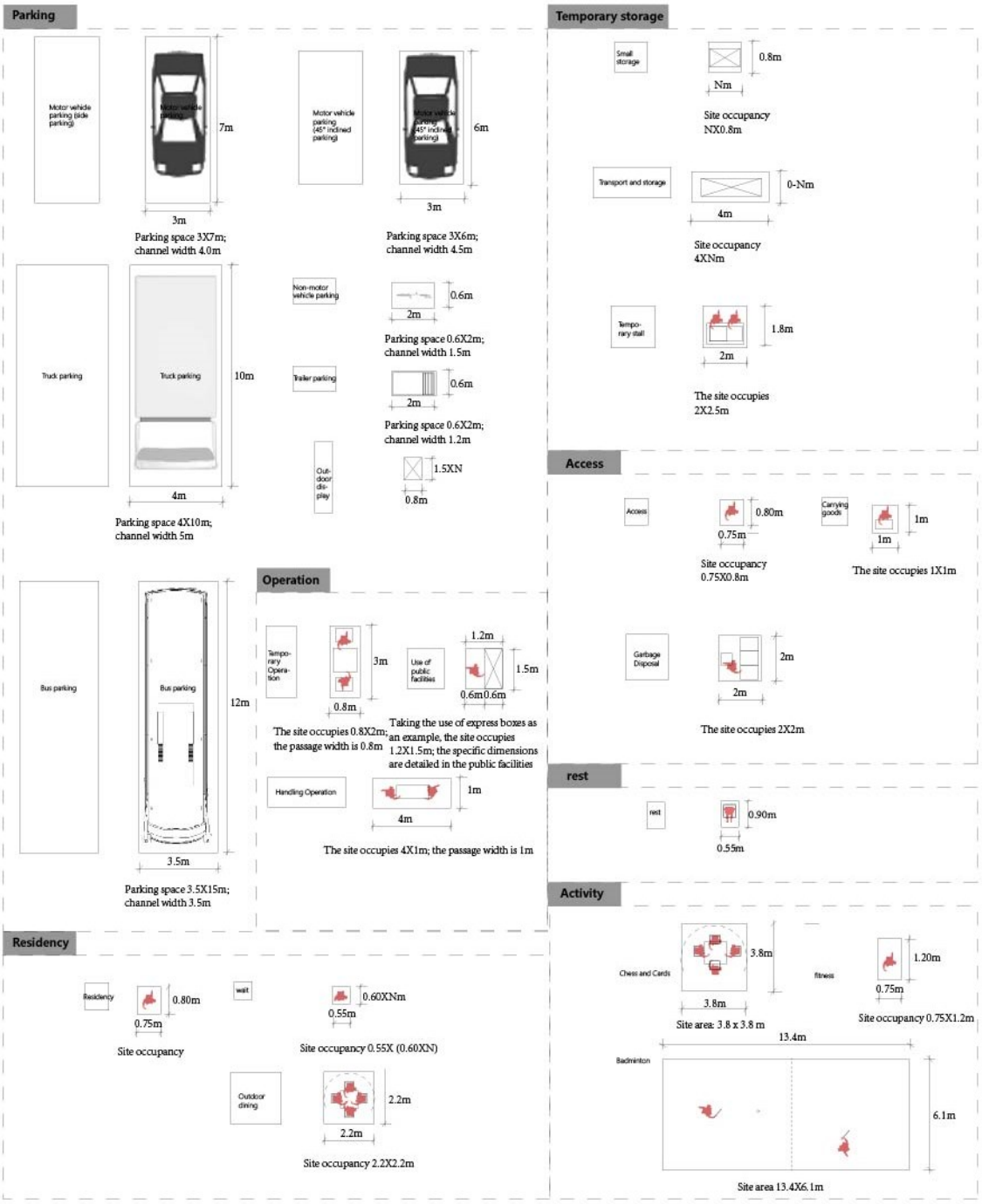


Figure 3–21 Scales of the behavioral space
(Source: Author's own drawing)

The study of social activities covers the different types of participants and their activities in different settings, as well as how these participants use the space. Therefore, it is particularly important to classify the types of participants in the scene and the classification of activity scenes. In the activity analysis of the boundary of Shipai Village, the main participants include local residents, migrant residents and urban residents, who play different social roles in different life scenarios. For example, local residents may play multiple roles at the same time as

merchants, buyers, parents, porters, etc. in the social practice of the border. The same character may take on multiple roles in different scenes, but the focus of this paper is on the scene and its activities itself, so the role changes of the same character in different scenes are not discussed in depth.

The core concepts of activity analysis include activity scenarios, activity timing, activity types, and activity scales. In the existing research, there are many discussions on the types of activities, but this paper combines the types of activities with the scale of activities, and uses UML activity analysis to quantify and graphically express the relationship between various behaviors in activities, including the correlation between behaviors and behaviors, behaviors and spaces, groups of people, and people and spaces. In this way, this paper aims to provide a comprehensive and detailed framework for activity analysis, which provides strong support for optimizing the design of spaces and improving the functionality of boundary spaces.

In summary, according to the diagram, the detailed scale quantification of various behavioral spaces provides a reliable quantitative basis for the study of "social-spatial" relationship. These quantitative data can help analyze the use of different spaces, behavioral patterns, and crowd activities to better understand spatial properties and social interactions (Figure 3–21). Quantitative data is used to perform a detailed analysis of different types of spaces to evaluate their efficiency, comfort and functionality. These quantitative research bases provide necessary data support for further research on "socio-spatial relationship", which is helpful to understand the impact of different spatial configurations on social behavior, optimize spatial design, and improve the efficiency of public space use and the quality of life of residents.

3.4.2 Facility Configuration Detection

Urban villages have the dual attributes of urban and rural areas, so boundary studies should not only reflect the cultural and development characteristics of villages, but also follow the regulations on the allocation of relevant urban facilities. In the facility configuration testing of Shipai Village, five guidelines such as the "Operational Guidelines for Urban Renewal in Guangzhou to Achieve the Balance between Industry and City and Job-Housing Balance" and the relevant provisions of the "Guidelines for All Elements of Guangzhou Municipal Roads (2019 Edition)" were mainly referenced, and the actual situation on site was tested and optimized. The purpose of this research method is to ensure that the boundary area of Shipai Village can meet the urban planning standards while retaining its unique culture and development context, so as to achieve effective connection and functional optimization of urban and rural space.

3.4.2.1 Parking Space Accounting

At present, there are only 35 above-ground parking spaces in the Shipai East parking lot, which is far from meeting the daily parking needs (Table 3-1). In addition to the Shipai East parking lot, the parking demand in Shipai Village mainly relies on the temporary use of surrounding office buildings, shopping malls and other parking facilities. These parking spaces are unevenly distributed and mostly temporary, resulting in chaotic parking and difficulty in meeting the growing demand. There are 7,200 above-ground non-motorized parking spaces mainly distributed on both sides of urban roads and community entrances and exits, but this number still cannot meet the parking demand of a large number of non-motorized vehicles, especially during peak hours.

According to the current situation, Shipai Village needs to add 15,109 parking spaces for motor vehicles and 58,060 parking spaces for non-motor vehicles. Based on the standard area of each parking space, an additional 407,935 square meters of motor vehicle parking space is required, including 105,735 square meters of outdoor parking area and 302,200 square meters of indoor parking area. In addition, an additional 116,120 square meters of parking space is required for non-motorized vehicle parking spaces. With the popularity of electric vehicles, an additional 151 charging stations for motor vehicles and 58 charging stations for non-electric vehicles will need to be added to meet the needs of future development.

These data clearly show that the existing parking facilities in Shipai Village are far from meeting the current and future needs, and there is an urgent need to significantly increase the number of parking spaces through systematic planning and large-scale construction. It is recommended to add parking spaces for motor vehicles and non-motor vehicles on the ground and underground, and rationally arrange charging piles to ensure the efficient use of new facilities. At the same time, the allocation of existing parking resources should be optimized, the space utilization rate should be improved, and the future development needs should be incorporated into the planning vision, so as to effectively alleviate the parking pressure, improve the travel convenience of residents, improve the overall environmental order of the community, and create a more livable living space in urban villages.

Table 3-1 Parking space planning indicators

type	motor vehicle	Non-motorized vehicles
Low-cost housing	0.3 parking spaces/household	0.2 parking spaces/household
Catering	0.1 parking space/100㎡	/
hotel	0.3 parking spaces/room	1.0 parking spaces/room

Source: "Operational Guidelines for Urban Renewal in Guangzhou to Achieve Industry-City Integration and Job-Housing Balance" and "Guidelines for All Elements of Municipal Roads in Guangzhou" (2019 Edition).

3.4.2.2 Accounting for Public Facilities

The current situation of Shipai Village describes that there is only one Green Lotus Park, a basketball court and an activity center in the fitness area, and the number and distribution of fitness venues are obviously insufficient, which cannot meet the daily exercise needs of residents. Although Shipai Village has a lot of green space, most of these green spaces are clan in nature, which limits their public use. At present, the degree of publicization of community parks is not high, and it needs to be enhanced by integrating more people into activities. At present, there are only three public toilets located at the entrance of Luhe Community and Shipai East Road, and the number is seriously insufficient. Especially in the western and northern areas of Shipai Village, the lack of public toilets has caused many inconveniences for residents and visitors. The configuration of garbage stations and garbage drop stations can basically meet the existing demand, but it is still necessary to pay attention to the possible increase in demand in the future, and adjust and expand accordingly in a timely manner (Table 3-2).

Table 3-2 Utilities planning indicators

type	Set the requirements
Fitness area	Fitness area: covering 500m, 200-500㎡/place
Community parks	Covering 1KM, 500-20000㎡/place
Public restrooms	300-500m a
Garbage station	200-300m each, 50-100㎡/place

Source: "Operational Guidelines for Urban Renewal in Guangzhou to Achieve Industry-City Integration and Job-Housing Balance" and "Guidelines for All Elements of Municipal Roads in Guangzhou" (2019 Edition).

Therefore, it is proposed to add public toilets in the west and north of Shipai Village, especially in the vicinity of main roads and densely populated areas, so as to meet the basic hygiene needs of residents and visitors and improve the level of public services in the region. In view of the problem of insufficient parking spaces in Shipai Village, it is recommended to renovate and expand the nearby parking lots, and adopt a multi-storey parking lot design to meet the growing parking demand and alleviate the regional traffic pressure. According to the diversified fitness needs of residents, it is recommended to add more fitness places on the basis of existing fitness facilities, such as outdoor fitness equipment areas, running tracks, etc., and add fitness facilities in local locations in the community to make fitness activities more convenient and diversified; It is suggested that the existing clan green space should be transformed into a public space, and more public activity spaces and facilities should be integrated, such as children's play areas, leisure seats, public artworks, etc., so as to attract more people from different backgrounds to use them and enhance the inclusiveness and publicness of the community. With the popularization of electric vehicle use, it is recommended to add

electric vehicle charging piles next to existing parking spaces to facilitate the charging needs of residents and visitors and support green travel.

The implementation of these suggestions will effectively improve the public service facilities of Shipai Village, improve the quality of life of residents, and promote the harmonious development and functional optimization of the community. Through reasonable planning and construction, the boundary space of Shipai Village can be made more comfortable, convenient and livable (Figure 3–22).

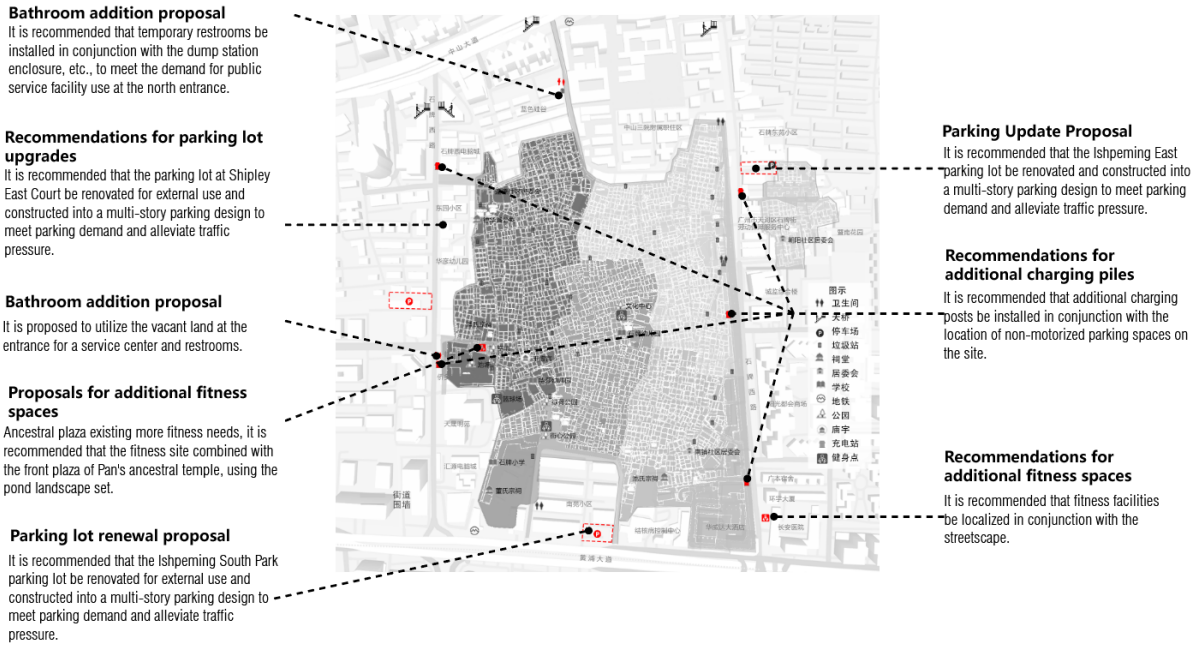


Figure 3–22 Recommendations for facility configuration optimization based on metrics
(Source: Author's own drawing)

3.4.3 Multi-type Spatial Analysis

Due to the large number of boundary types and scenes, the length of each type would be limited if it were to be expanded in detail. The boundary space of urban villages is divided into four categories: shared urban streets, internal streets of urban villages, node squares and fence boundaries, which are classified according to different spatial components. For street types, the UML activity analysis method combined with the site self-evaluation method was mainly used to optimize the organization of street functions and related activity behaviors. For the node square and the boundary of the fence, the activities in the scene and the availability of the place were analyzed through the on-site life scene survey and the site self-evaluation method. Therefore, in this section, we will select a typical site from each space type for a detailed analysis, and the other findings and details are placed in the appendix at the end of the article (Appendices 7-8).

3.4.3.1 Shared City Streets

Shared urban streets are the boundary areas shared between cities and urban villages, which have the characteristics of intertwined functions, dense flow of people, cultural integration, spatial diversity and frequent social interaction.

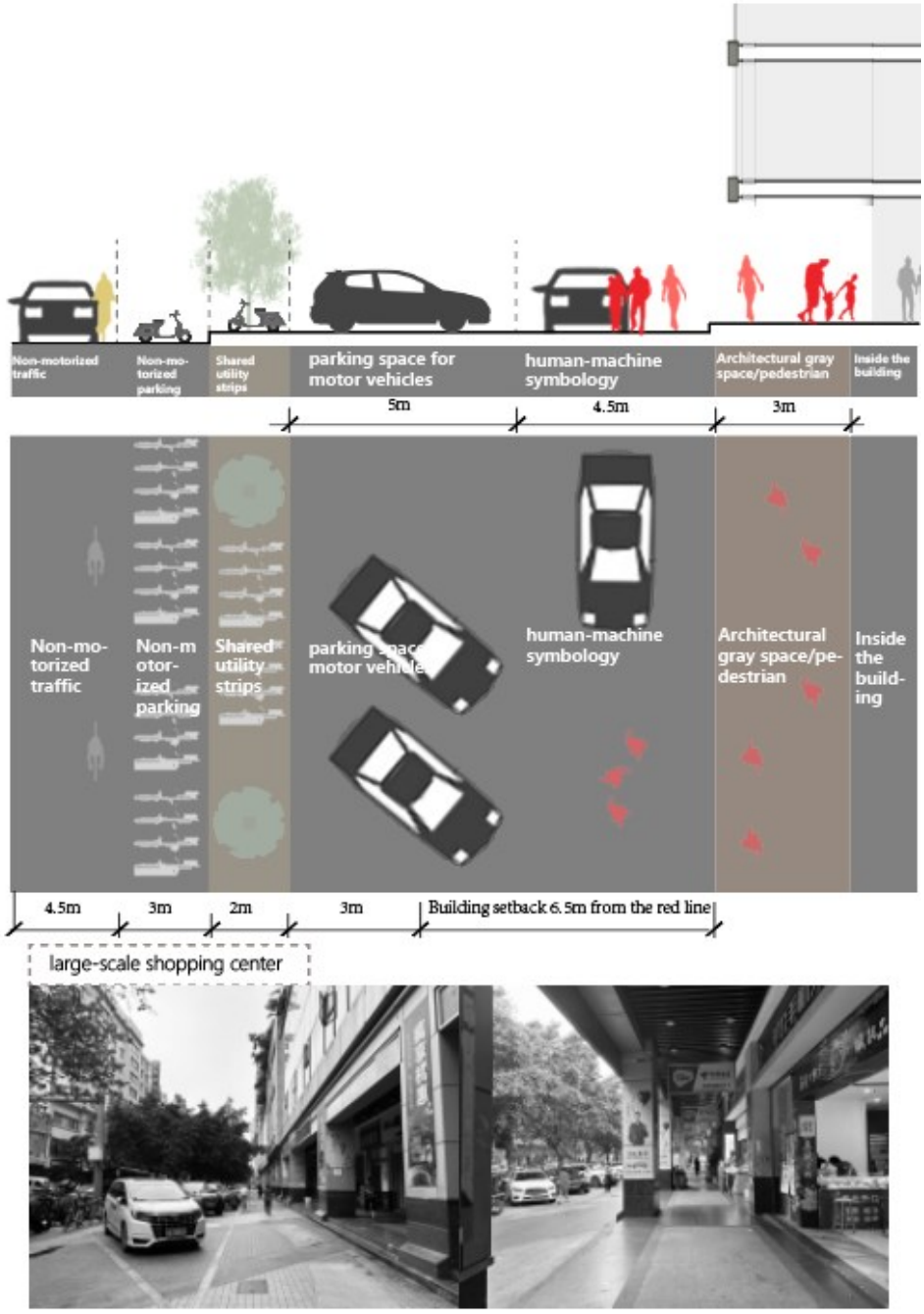


Figure 3–23 Shared city street-space type 2 status quo diagram
(Source: author's own drawing)

(1) Observe and Record the Current situation of space use

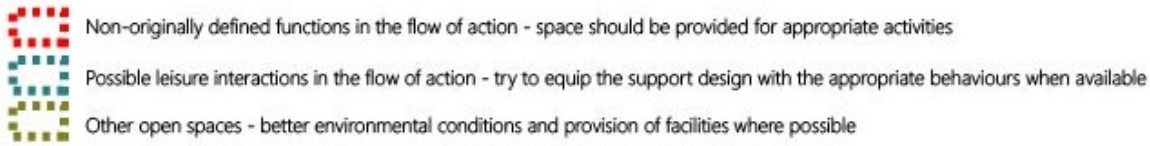
Take the study of boundary activities before large businesses that share city streets as an example. The composition of urban streets includes non-motorized lanes, motorized common

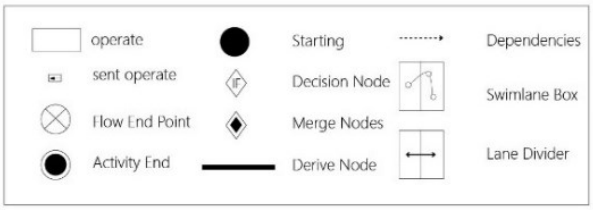
lanes, non-motorized parking lanes, shared utility belts, motorized parking spaces, sidewalks, and building gray spaces. The original space is occupied by parking, there is less pedestrian space, and the flow of people and vehicles is mixed; Due to the proximity to parking facilities, the shopping experience is affected (Figure 3–23).

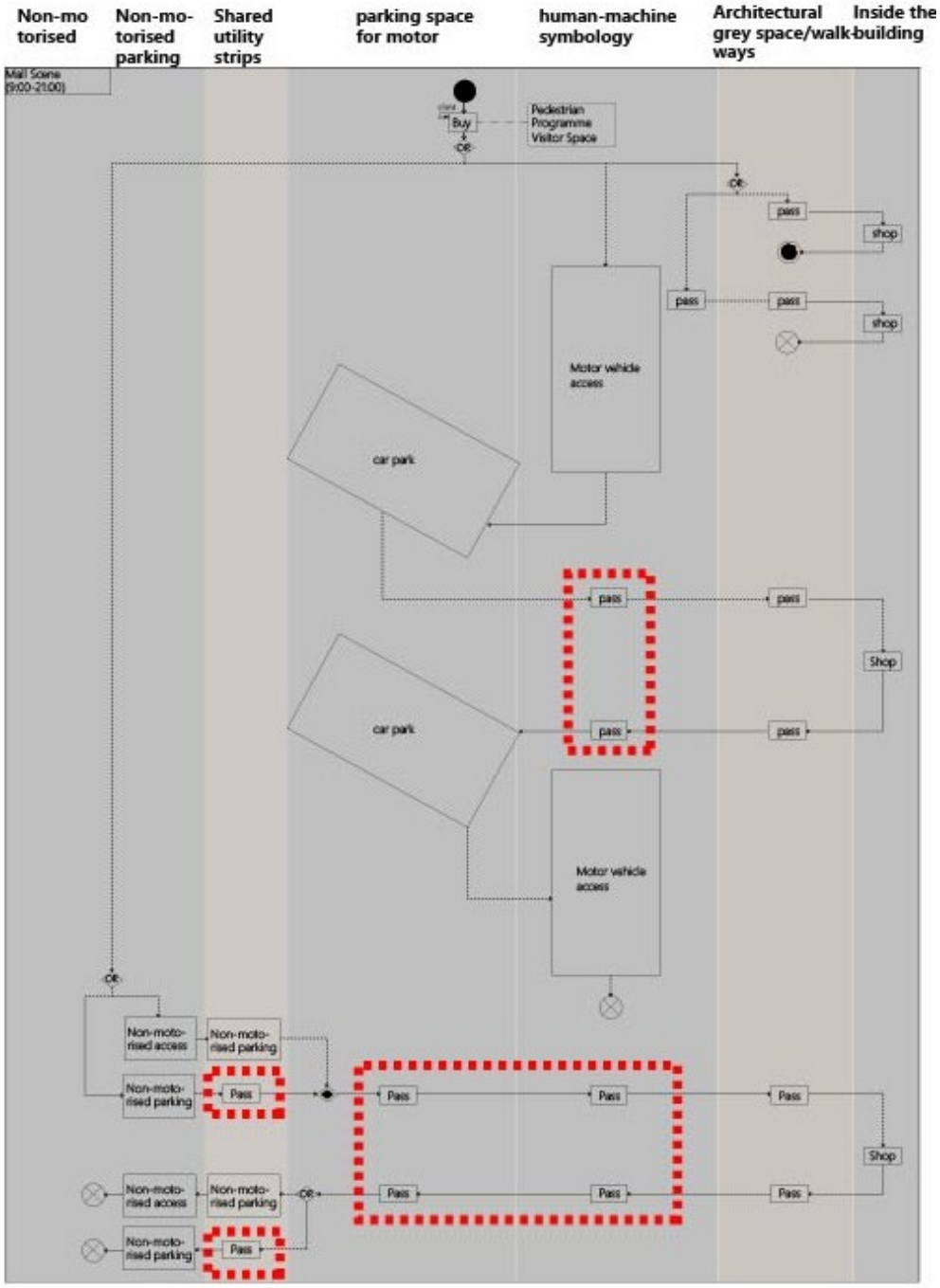
(2) Draw an activity analysis diagram based on the current situation (UML analysis method).

Scene classification is carried out according to the current situation activities, involving the sales and shopper's purchase scenes led by merchants during the business hours of the mall from 9:00 to 21:00, including non-dinner time from 10:00 to 10:30; 14:30-16:30 Delivery people rest scene, 14:30-16:30 Merchants have no work gap near the rest scene. Use the behavior space as a "block" to match the active behavior to the composition of the space. Compared with the actual use function of physics, red, blue and green are used to express the non-originally defined functions in the action process, the rest and other leisure interactions that may occur in the action process, and the social space segmentation problem of space type research is obtained, and the corresponding activity space for the non-original defined functions is comprehensively considered. Possible recreation and interaction - conditional and appropriate support design for corresponding behaviors; Other recreation and interaction – with the best possible environmental conditions and facilities (Figure 3–24).

Use UML activity diagrams to analyze the needs of shopping and sales scenarios and leisure and communication scenarios in shopping malls. For example, the traffic and safety guarantee needs of non-motorized vehicles, motor vehicle users and delivery people in the existing space system in public facility belts, motor vehicle parking spaces and sidewalks are analyzed. explore the need for rest for delivery workers in non-motorized vehicle parking areas; Consider the needs of businesses to set up temporary stalls and temporary rest and exchange activities under the gray space of the building. The fracture between the boundary space and the daily behavior of society is discovered, and the spatial rights and interests of people in the behavioral space are optimized and enhanced.




operate
sent operate
Flow End Point
Activity End
Starting
Decision Node
Merge Nodes
Derive Node
Dependencies
Swimlane Box
Lane Divider


Non-motorised
Non-motorised parking
Shared utility strips
parking space for motor
human-machine symbology
Architectural grey space/walk-ways
Inside the building
Mall Soins (9:00-21:00)
Buy
Pedestrian Programme Visitor Space
pass
shop
Motor vehicle access
car park
Shop
Non-motorised access
Non-motorised parking
Pass

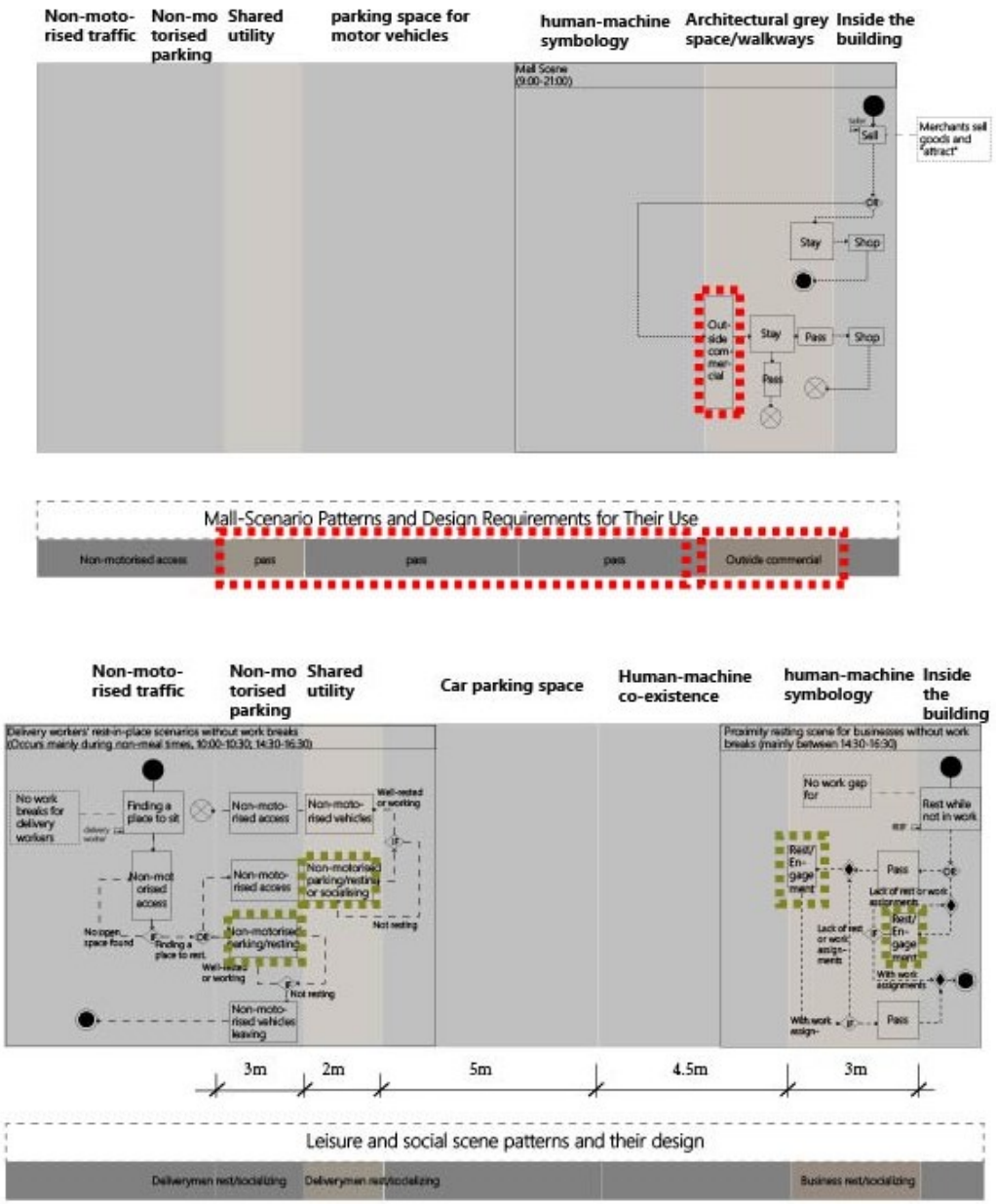


Figure 3–24 Shared city streets-spatial type 2 activity analysis diagram
(Source: author's own drawing)

(3) Combined with the site self-assessment form to analyze the behavior space problem

Through the activity analysis method, we can understand the activity scene of the space. At the same time, the 12 humanized place standards proposed by Jan Gale are used and the humane consideration of the characteristics of the scene and the disadvantaged groups is added. By detecting the humanized quality space and the actual material space, it is found that the boundary section lacks pedestrian protection design, and there is a problem of mixed traffic between people and vehicles. At the level of scene characteristics, there is a lack of supporting

design of facilities for rest and stay, the sensory experience is poor, and the shopping experience is relatively monotonous. At the same time, the needs of vulnerable groups, such as delivery workers, are undertaken (Figure 3–25).

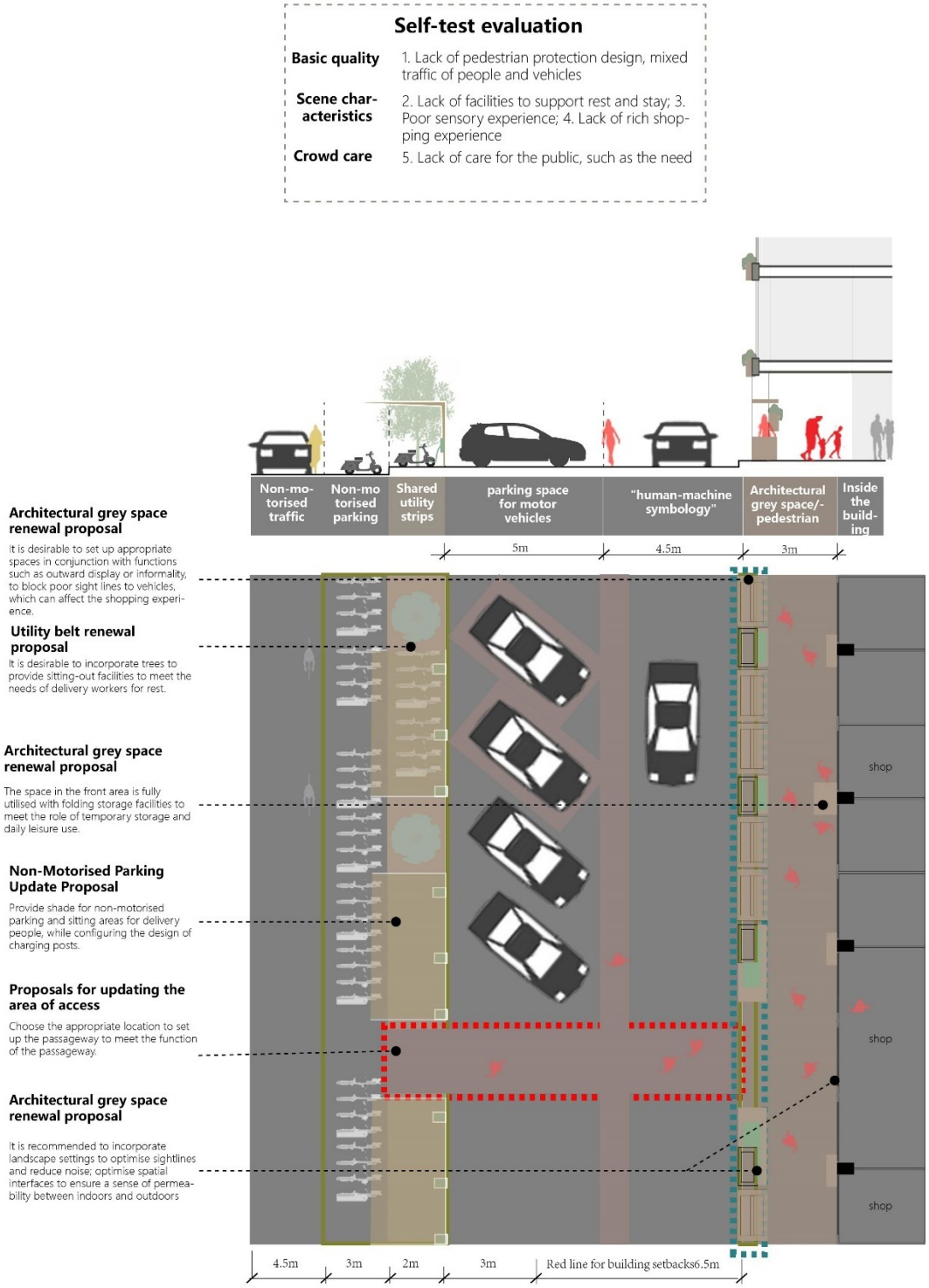


Figure 3–25 Shared city streets-spatial type 2 optimization recommendations
(Source: author's own drawing)

Therefore, the fractures are reinforced accordingly. In order to avoid affecting the shopping experience, the architectural gray space is recommended to combine external or informal functions to set up a space that blocks the poor line of sight between the vehicle and the vehicle ; In order to meet the rest of the delivery staff, it is recommended to combine trees and configure rest facilities when designing public facilities; It is suggested that the gray space of the building should make full use of the front area and set up folding storage facilities to meet the needs of temporary storage and daily rest. Barrier-free passages and barrier-free parking spaces are set up in the man-machine co-board area; Select a suitable location to set up a passage channel to meet the channel function; Set up shaded places for non-motor vehicle parking and the rest of delivery people, and configure charging pile design at the same time; It is recommended to combine the landscape setting to optimize the line of sight and reduce the noise. Optimize the space interface, ensure the transparency of indoor and outdoor, and optimize the shopping experience.

3.4.3.2 Streets Inside the Urban Village

Streets within an urban village are a network of roads located within an urban village, which are often narrow, complex, and irregularly laid out. They mainly serve the daily life and business activities of the villagers, and have a high degree of social interaction function and community atmosphere. These streets tend to be full of people and high commercial activity, but due to poor planning, the infrastructure is relatively rudimentary, and the use of space is inefficient.

(1) Observe and record the current situation of space use

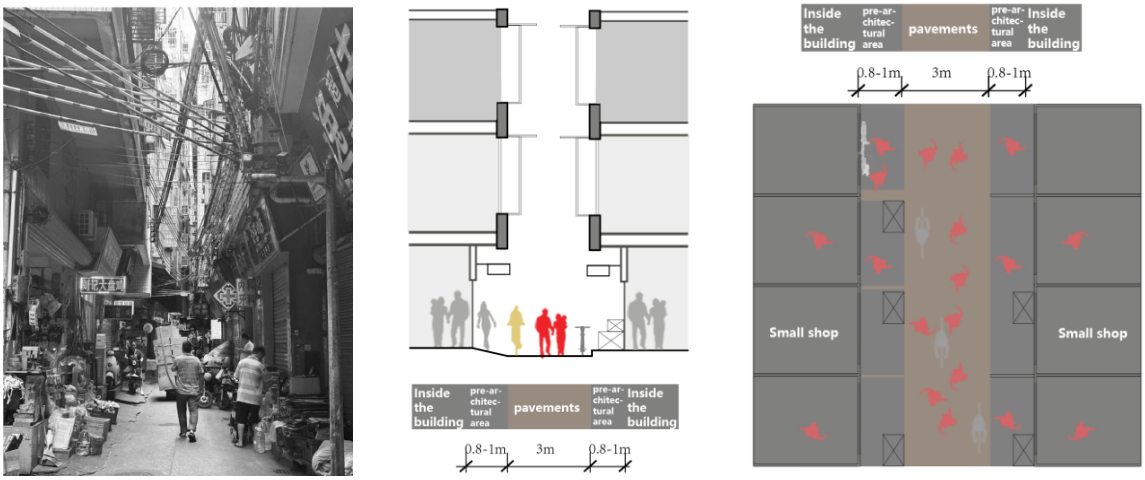


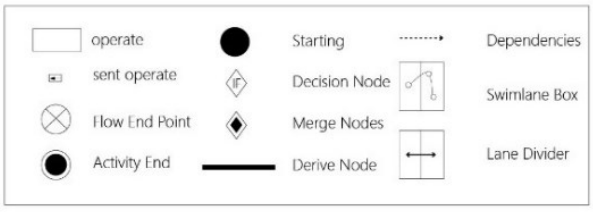
Figure 3–26 Roads inside urban village-space use status
(Source: author's own drawing)

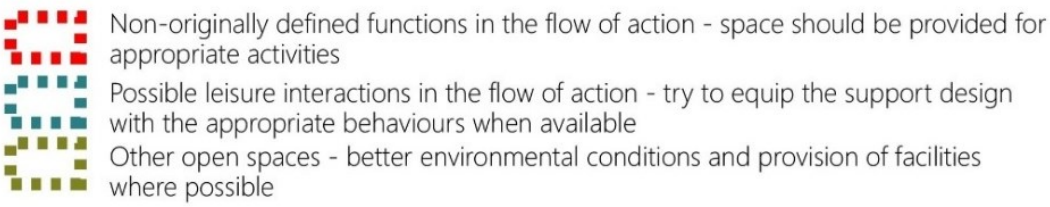
The roads inside urban village in the boundary type of urban villages that are not shared with urban streets are mainly the streets and alleys inside the village, which are smaller and narrower, and are mainly characterized by multi-functional use. The typical urban village streets and alleys without walls and bilateral buildings are selected as an example. The street space is mainly composed of the front area of the building and the sidewalk, and there is a contradiction between crowd activities and cramped space, and the quality of the street space is low (Figure 3–26).

(2) Draw an activity analysis diagram based on the current situation (UML analysis method).

According to the current situation, draw a UML activity map, and divide the activity into a merchant-led sales scene from 7:30 to 22:00; Pick-up and delivery scenes of delivery people during store business hours; 8:30-22:00 Trolley transportation scene; 9:30-10:30, 14:30-16:30, 22:00-23:30 store logistics scenes; other construction use cases; non-motorized vehicle use scenarios; 09:00-22:00 Rental scene led by villagers; other scenes of rest or socialization; It occurs during off-dinner or off-peak hours, mainly gathering at 9:00-10:30; 14:30-16:30 The approaching rest scene of the merchant without work gap. Through activity analysis, it is found that the front area of the building lacks the consideration of temporary storage, garbage disposal and trolley parking, which leads to the impact of external sales, rest and waiting, and communication functions. Activity support for non-motorized parking and residency interactions on sidewalks (Figure 3–27).

Match the behavioral space to the spatial system, give the behavioral spatial parameters, take the physical space as the foundation, compare and excavate the problems and fracture points between the social space, trace the behavioral space, and update and design suggestions accordingly.





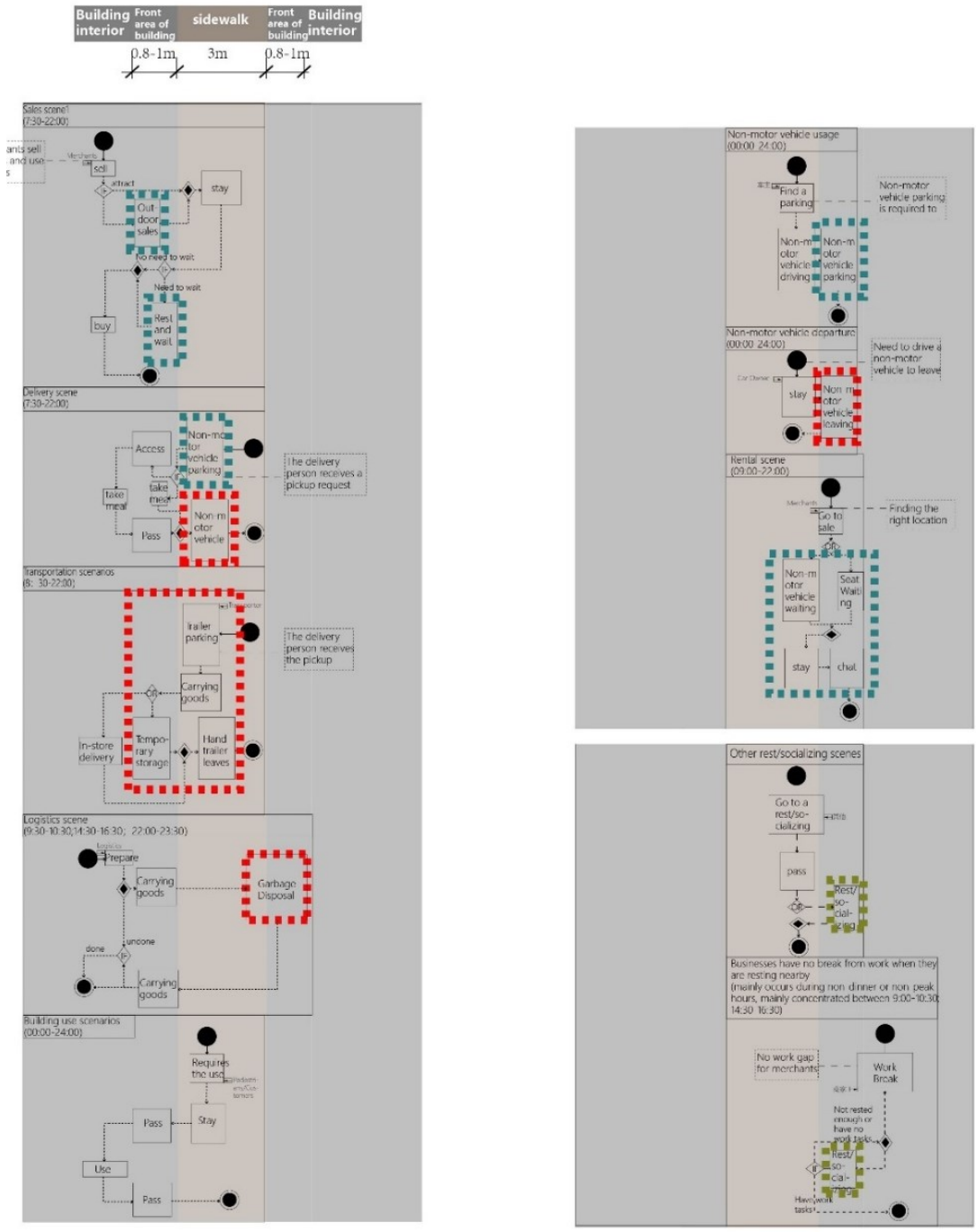


Figure 3–27 Analysis of other street-spatial activity
(Source: author's own drawing)

(3) Analysis of behavioral space problems combined with the site self-assessment form

Combined with the self-inspection and evaluation of the site, the pedestrian and vehicle mixing in the street section is serious, and the safety of pedestrians is difficult to guarantee; Poor lighting in some areas; Poor light and humidity; noisy; There are many obstacles in the travel path and there is a lack of barrier-free design; lack of seating opportunities and

consideration of the design of the relevant dwelling spaces; poor sensory experience; It needs to be further combined with humanized design. Lack of basic scene needs for social entertainment, relaxation, transportation, and listening; Lack of population care requires further integration, research, and design optimization (Figure 3–28).

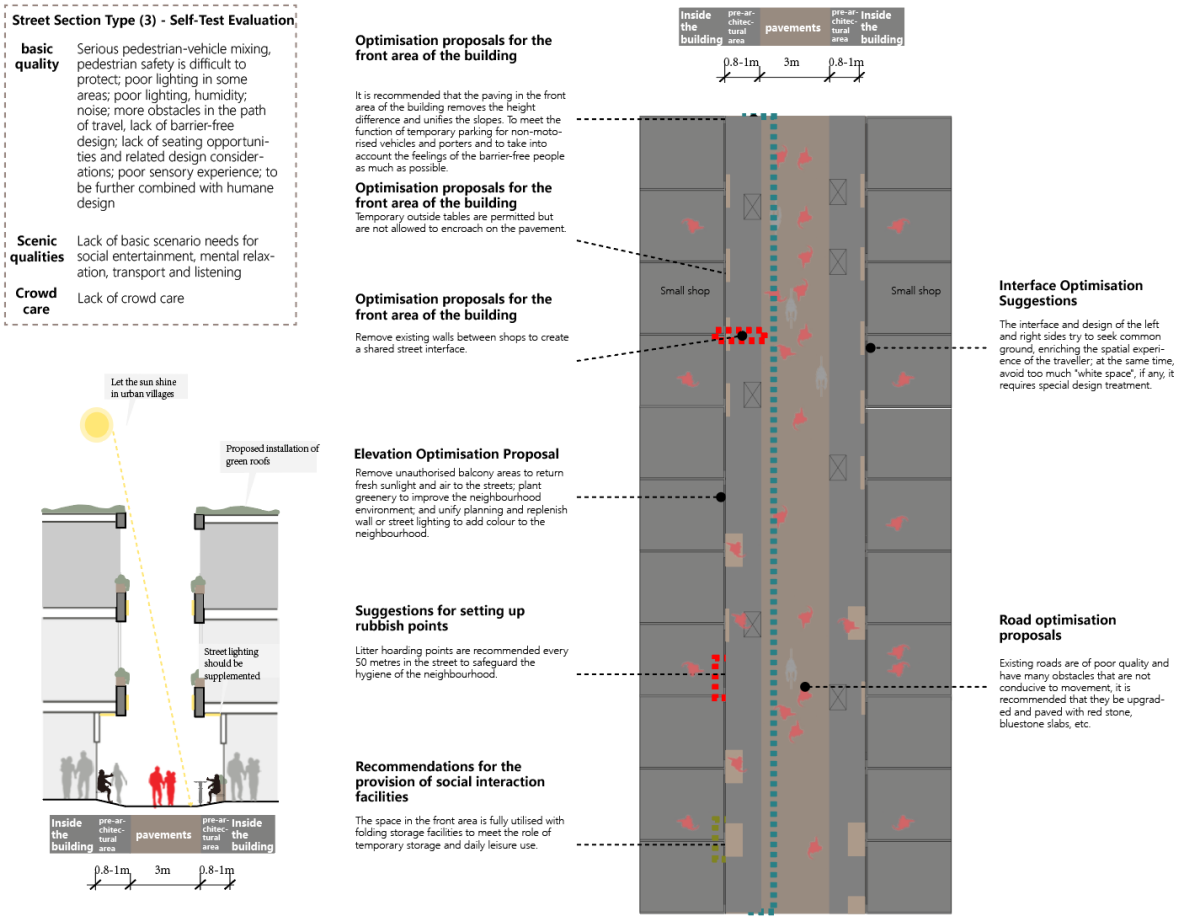


Figure 3–28 Roads inside urban village-optimization recommendations
(Source: author's own drawing)

Therefore, combined with the social behavior space and the afforability of the place, the renewal suggestions of the street section are proposed. It is suggested that the paving in the front area of the building should remove the height difference and transform the slope surface in a unified manner. Meet the function of temporary parking of non-motorized vehicles and trucks, and consider the feelings of barrier-free people as much as possible; Temporary outside tables are permitted, but encroachment on sidewalks is not permitted; Remove the existing walls between the shops and create a shared street interface; Demolition of illegally built balcony areas, and return the streets to fresh sunlight and air; planting green to improve the neighborhood environment; Unified planning, adding wall or street lamps to add color to the block; It is recommended to set up a garbage storage point every 50 meters on the street to ensure the hygiene of the block; Make full use of the space in the front area and set up folding

storage facilities to meet the role of temporary storage and daily rest; The boundaries and designs of the left and right sides of the building try to seek common ground while reserving differences, so as to enrich the spatial experience of pedestrians; At the same time, avoid too much "white space", if there is a need for special design treatment; The existing road quality is poor, there are many obstacles, which is not conducive to traffic, it is recommended to renovate, pave red stone, bluestone slabs, etc.

3.4.3.3 Square Node

In addition to the productive functions that roads provide for people's lives, the boundaries also contain several nodal spaces that provide people with the function of staying and resting, and become important places for the daily activities and social interaction of the community.

（1） Observe and record the current situation of space use

Luhe Square is located in the south of Shipai Village, after the community renewal in 2010, the quality of the streets and alleys is higher than that of other urban villages, and it is used as a daily pick-up and drop-off for students and children's activities in Shipai Primary School. A

Perspective 1

Perspective 2

Figure 3–29 Illustration of the observation annotation of Green Lotus Square
(Source: author's own drawing)

place for residents to rest, recreation, and fitness activities. In this part, we select weekends and weekdays for all-day survey, conduct all-weather observation, and collect four time periods of 9:00-12:00, 12:00-15:00, 15:00-18:00, and 18:00-21:00 for data collection and plot for comparison of results. The main contents of the records include the type of crowd, the activity of the crowd, the place of use, and the length of stay (Figure 3–29).

Through the observation and notation method, the current situation of space use of the place presents the following characteristics: the frequency of visits is higher from 9:00 to 12:00 in the morning on weekdays, the number of visits from 12:00 to 15:00 at noon is gradually decreasing, the highest frequency of visits from 15:00 to 18:00 in the afternoon reaches 77, and the number of visits from 18:00 to 21:00 is the lowest. While there is a slight difference in weekend visits, with lower visits in the morning and higher visits in the afternoon. This is mainly due to the fact that weekday morning makeshift trucks are less or no longer available on weekends and are presented in community parks, which are mainly used for recreation and recreation (Figure 3–30).

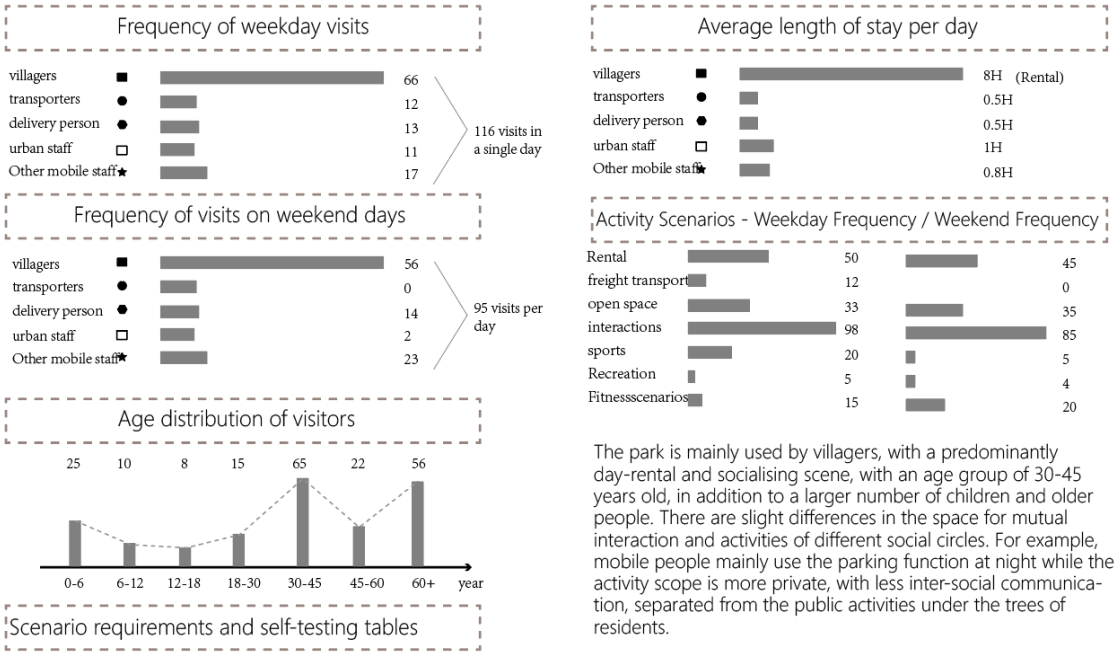


Figure 3–30 Visitors and their activity characteristics
(Source: author's own drawing)

The crowd interview category is mainly villagers on weekdays and weekends, and the age is mainly 36-45 years old, 60 years old and above, and children 0-12 years old. The villagers stayed for the longest time, more than 8 hours, and their activities were special, with both daily interactions and the work attributes of renting, while other participants included transportation, delivery, mobile personnel, and urban personnel but stayed between 0.5H and 1H, mainly for temporary rest. The activity scene is mainly social, mainly for the function of renting a house,

followed by the use of recreation, sports and fitness, freight and entertainment (Figure 3–31).

Figure 3–31 Activity records on weekdays and weekends
(Source: author's own drawing)

（2）Drawing an activity analysis diagram based on the current situation (observation annotation method)

The frequency of visits by people at the event venue throughout the day is recorded, and the stay time of more than 5 minutes is counted as one time. From 9:00 a.m. to 12:00 p.m. on weekdays, renters gather under trees, other residents gather in pavilions to rest, and trucks occupy the open space in the square. 12:00-15:00, the delivery staff choose to take a temporary rest around the square in the pavilion, or drive the electric frequency car around the square to take a temporary rest, 15:00-18:00 is the peak period of the use of the venue, the renters gather under the tree, children, the elderly and other people in the open space of the square to carry out activities, the pavilion as a place of rest, gathering diverse people. 18:00-21:00 The floating crowd participates in the use of the square, mainly for the functional purpose of rest and fitness. Overall, there are no trucks on weekends. On weekend mornings, people mainly gather inside the pavilion or around the corridor for rest and other activities; From 12:00 noon to 18:00 at night, the vitality of renting houses is high, mainly gathered under trees; In the evening, the floating crowd visits the premises near the pavilion for recreation, fitness, and other activities (Figure 3–32).

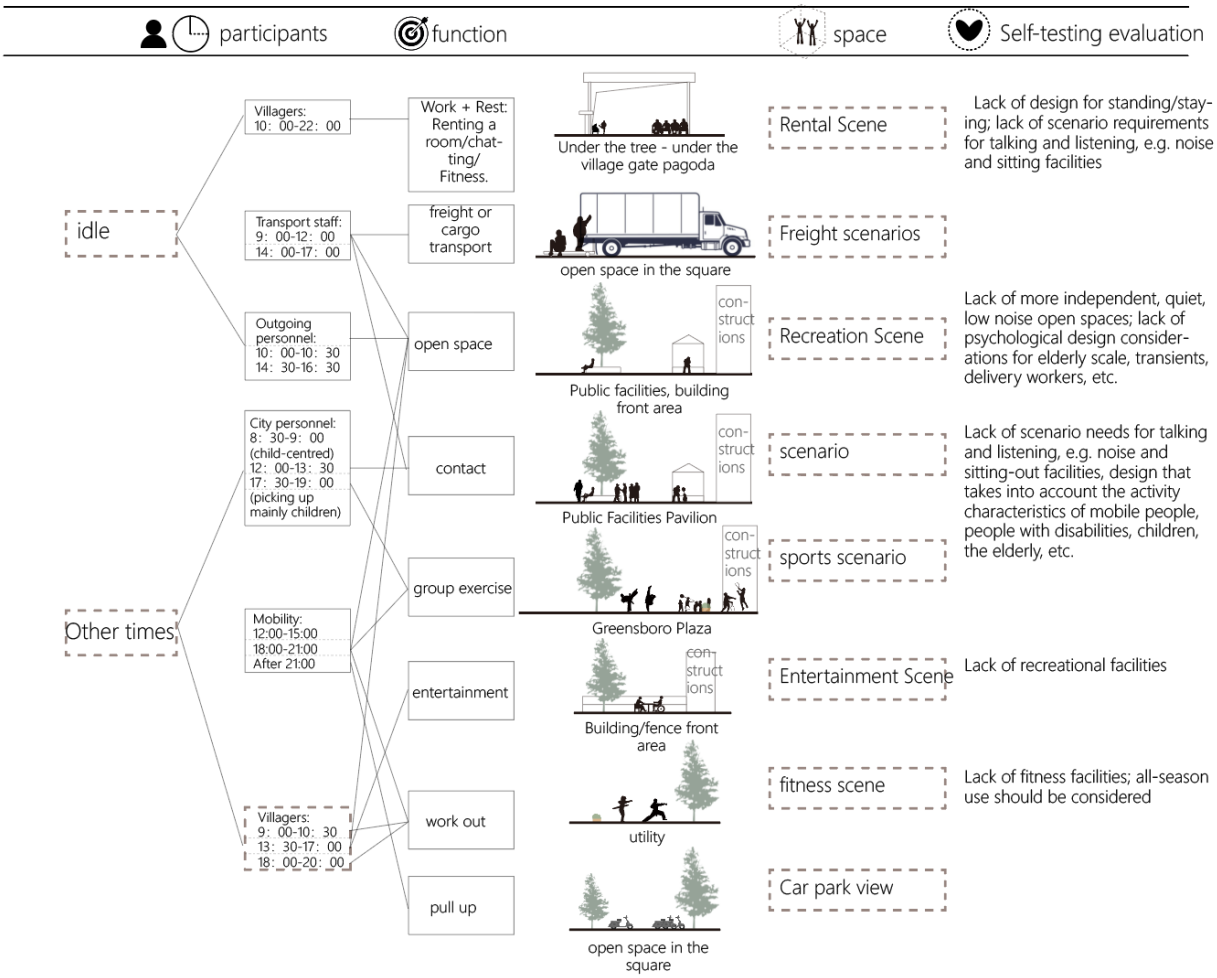
It was observed that there was a certain regularity in the activities of the crowd in the Green Lotus Square on weekdays and weekends: the villagers who rented houses mainly gathered under the trees, the floating crowd mainly visited at night, the urban crowd used the rest function of the pavilion higher, the children mainly used the open space in the square in the afternoon on weekdays, and the vitality near the corridor at night was low.

（3）Combined with the self-evaluation form of the place, the behavior space problem was analyzed

Through the self-evaluation of place, the affordability of social activities, humanized design and consideration of disadvantaged groups in the space are analyzed (Table 3-3). It was found that the rental scene under the tree at the entrance of the village lacked the design of standing and staying, and lacked the need for talking and listening, such as noise and rest facilities. There is a lack of resting places for public facilities and corridors that are more independent, quiet and low-noise; There is a lack of psychological design for the scale of the elderly, mobile people, delivery people, etc. Pavilions and public facilities in places of interaction lack the needs of talking and listening scenes, such as noise and rest facilities, and are designed to take into account the characteristics of activities such as mobile people, people with disabilities, children, and the elderly. The recreation scene in the front of the fence lacks

recreational facilities; The fitness scene of public facilities lacks fitness facilities; The use of the four seasons should be taken into account.

Table 3-3 Self-test side evaluation table of the activity scene and its place(Source: self-drawn by the author)



Therefore, based on the self-evaluation and activity analysis, the following optimization suggestions were put forward for the Green Lotus Park: for the villagers who have rented houses for a long time, they should set up seats against the wall along the wall, and carry out a comprehensive design in combination with the renovation of the wall, and appropriately set up the eaves to shelter from the wind and rain; Interactive seating is added to provide a place to rest and socialize with the treescape; The interface of the fence is designed with the integration of culture and leisure functions, and the light source is added at the bottom of the fence to enhance the brightness of the site. adding entertainment tables and chairs in the pavilion for the elderly and residents; Enhance the interaction between the landscape and activities near the landscape sketches, consider the preferences of children, and set up tree landscape design to optimize the landscape; Improve the fitness facilities under the east corridor to provide more fitness activity space to meet the fitness needs of the floating population (Figure 3–32).

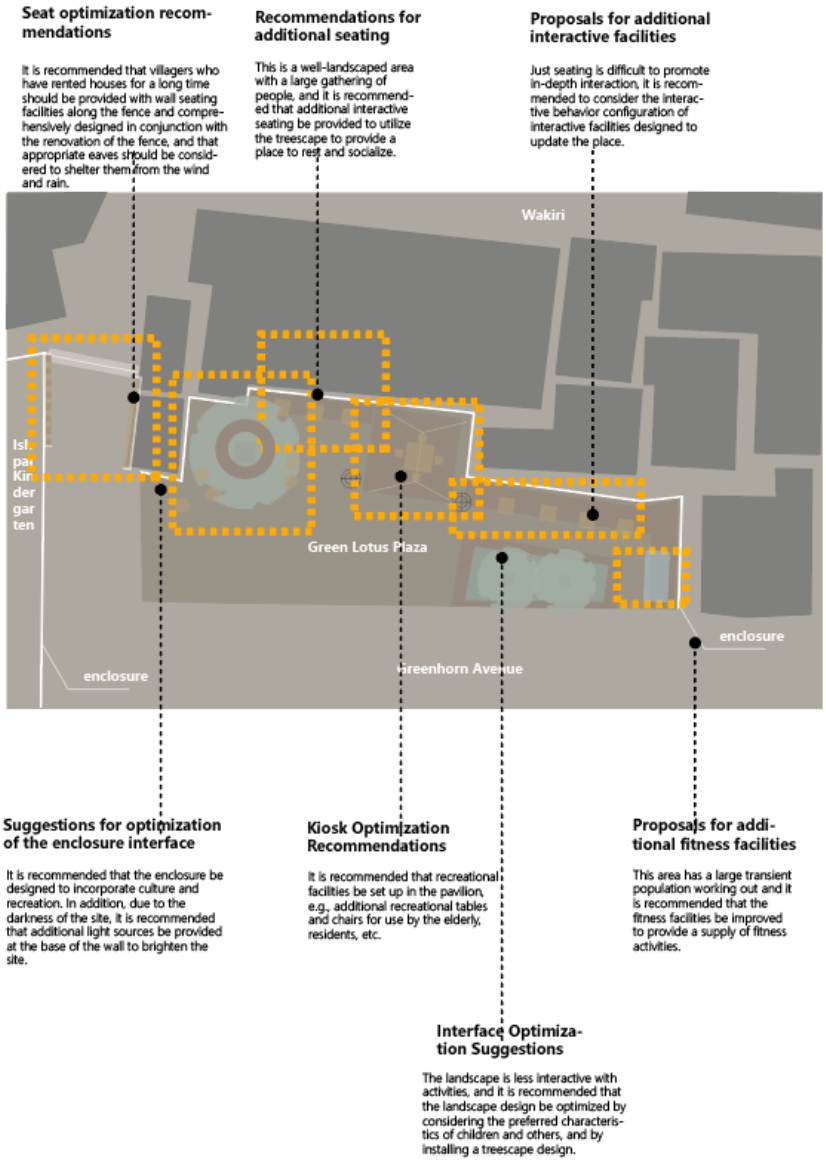


Figure 3–32 Green lotus plaza update proposal
(Source: author's own drawing)

3.4.3.4 Wall

The type of wall in an urban village is often used to clearly demarcate different social areas, which is a direct way of spatial separation. These walls protect and define spaces by separating cities from villages, communities or functional areas. However, there are often many spaces on both sides of the fence that can be integrated and integrated, and these spaces have great development potential and important social value. When properly planned and designed, these walled boundaries can be transformed into bonds that promote community integration and enhance social interaction, thereby enhancing the overall function and social vitality of the area.

(1) Observe and record the current situation of space use

There are three main boundaries of pure walls in Shipai Village. First, it is the demarcation of Tiansheng Ming Garden, Computer City and Pan's Ancestral Hall, Shipai Primary School, Basketball Court, Dong's Ancestral Hall, and Jinan University Stomatological Hospital; second, the demarcation of the Guangdong Provincial Tuberculosis Control Center and the Chi Ancestral Hall, the logistics area of the Huawei Hotel, and the Huawei Hotel; Third, the demarcation of Shipai East Garden and Tianhe District Shipai Street Party Member Service Center, Wanli Shopping Center, Jinan University-Affiliated Primary School, and Jinan Garden. From the point of view of the relationship between the boundary and the surrounding buildings, the fence divides the complex continuous functions in a direct way, avoiding the interference between different areas. However, this approach is often too one-size-fits-all and ignores the possibility of reciprocity between regions (Figure 3–33).

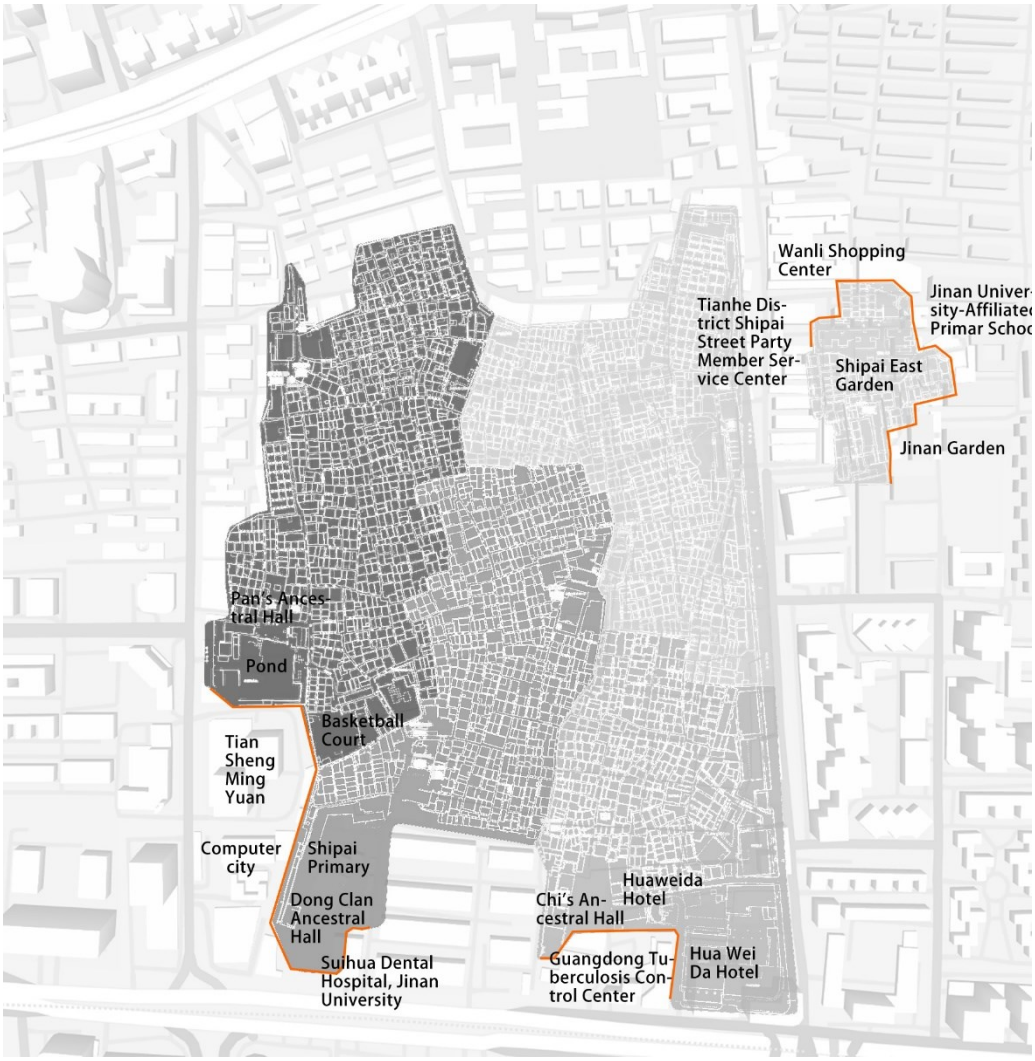


Figure 3–33 Overall distribution of fence types
(Source: Author's own drawing)

(2) Drawing an activity analysis diagram based on the current situation (observation annotation method)

The southwest corner of Shipai Village was selected as the research object, and the people, activity types and activity time of the boundary were recorded by one-day observation annotation. There are abundant types of public spaces on both sides of the border, including ponds, fitness parks, basketball courts, Shipai Primary School, subway squares and other public elements, but there is no direct connection between public spaces at present. The analysis of the spatial interface on both sides of the boundary can be divided into positive interfaces on both sides, positive interfaces on one side and negative interfaces on both sides, and negative interfaces on both sides. The possibility of integration can be considered for the positive interface on both sides; The positive and negative interface can be partially considered as needed to improve or infiltrate the possibility to alleviate the negative space; The negative interface on both sides can be optimized by considering comprehensive function rectification.

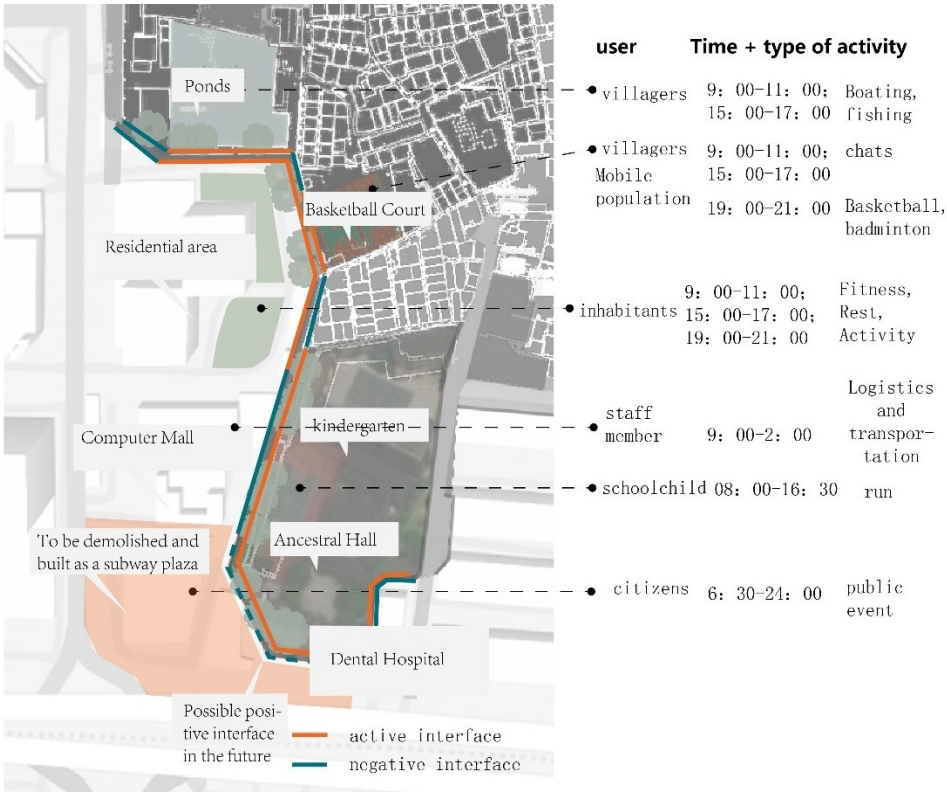


Figure 3–34 Fence and its crowd movements
(Source: Author's own drawing)

For social activities, the border brings together the use of diverse people, including residents, workers, citizens, villagers, migrants, students, urban personnel, etc. Activity types include boating, fishing, ball games, fitness, rest, activities, logistics transportation, public

activities, running, and other functions. Have a diverse and dynamic spatial foundation (Figure 3–34).

(3) Analyze the behavior space problem based on the site self-assessment form

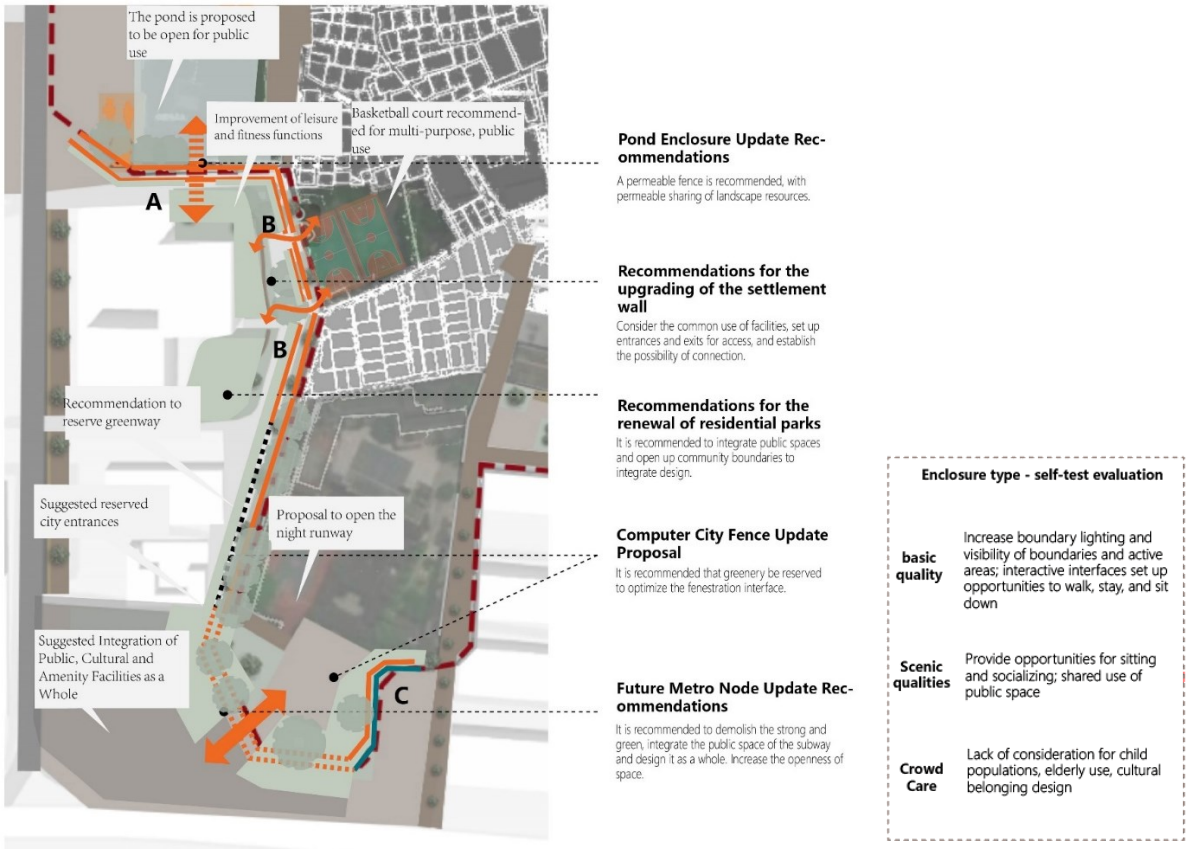


Figure 3–35 Proposed update for the fence
(Source: Author's own drawing)

Self-evaluation analysis was carried out on spatial quality, humanization and scene affordability. Boundary space needs to increase the visibility of boundary lighting and boundary and active areas; The interactive interface sets the opportunity to walk, stay and sit; Provide opportunities for rest and socialization; shared use of public space; There is a lack of consideration for the use of children and the elderly, and the design of a sense of cultural belonging.

Considering the possibility of integrating the advantageous resources of the border, it is suggested that the overall greening of the boundary should be optimized, and the feasibility of establishing a public connection between the two ancestral halls in the later stage should be considered. To sum up, it is suggested that the boundary of the fence in Shipai South: the pond fence is recommended to be set up with a permeable fence to infiltrate and share landscape resources; The residential fence considers the common use of facilities, sets up entrances and exits, and establishes the possibility of connection, and at the same time, it is recommended to

integrate public space and open community boundaries to integrate design. It is recommended to reserve greening facilities for the fence wall of the computer city to optimize the interface of the fence; In the future, it is recommended to demolish the wall and fill the greenery, integrate the subway public space, and design the overall design. Increase the openness of the space (Figure 3–35).

3.5 Cultural Dimension Analysis

Culture has a profound impact on social space, not only shaping its structure and function, but also giving it a unique meaning and purpose. Culture is an important source of identity for residents and users in social space. Through an in-depth analysis of the context of cultural development and the reality of multi-dimensional culture, it is suggested that cultural factors should be fully considered in spatial design and planning to achieve higher social cohesion, inclusiveness and accumulation of social capital, so as to promote the sustainable development of society.

3.5.1 Cultural Development

From the end of the Yuan Dynasty and the beginning of the Ming Dynasty to the present day, the social, cultural and spatial aspects of the village have undergone significant changes. In the early days, the village was dominated by agriculture, and animal husbandry, fishing, and the market economy gradually developed. After the unification of the Qing Dynasty, the construction of villages entered the period of school and neighboring area construction, and the economy was still dominated by agriculture. During the Republican period, due to the construction and destruction of the government, the commercial and military activities of the villages began to be active.

After the founding of the People's Republic of China, the land reform and the agricultural cooperative movement led to the diversification of economic activities in the villages, and the gradual development of industry and individual economy. After the reform and opening up, the villages ushered in the rise of high-tech industries, housing rental, trade and service industries, and the collective economy was further consolidated. In the 21st century, villages have begun to carry out urban-rural integration planning and related policy implementation, which has promoted the development of urban-rural construction.

The current village space carries a variety of historical cultures. In the long history, it has accumulated a rich history and culture, including clan culture, military culture, industrial culture and commercial culture. In the late Yuan and early Ming dynasties, the villages were dominated by clan culture and temple culture, during the Qing Dynasty, military culture was the main

culture, after the founding of the People's Republic of China, it was the era of industrial culture and red culture, and after the reform and opening up, commercial culture began to emerge (Figure 3–36).

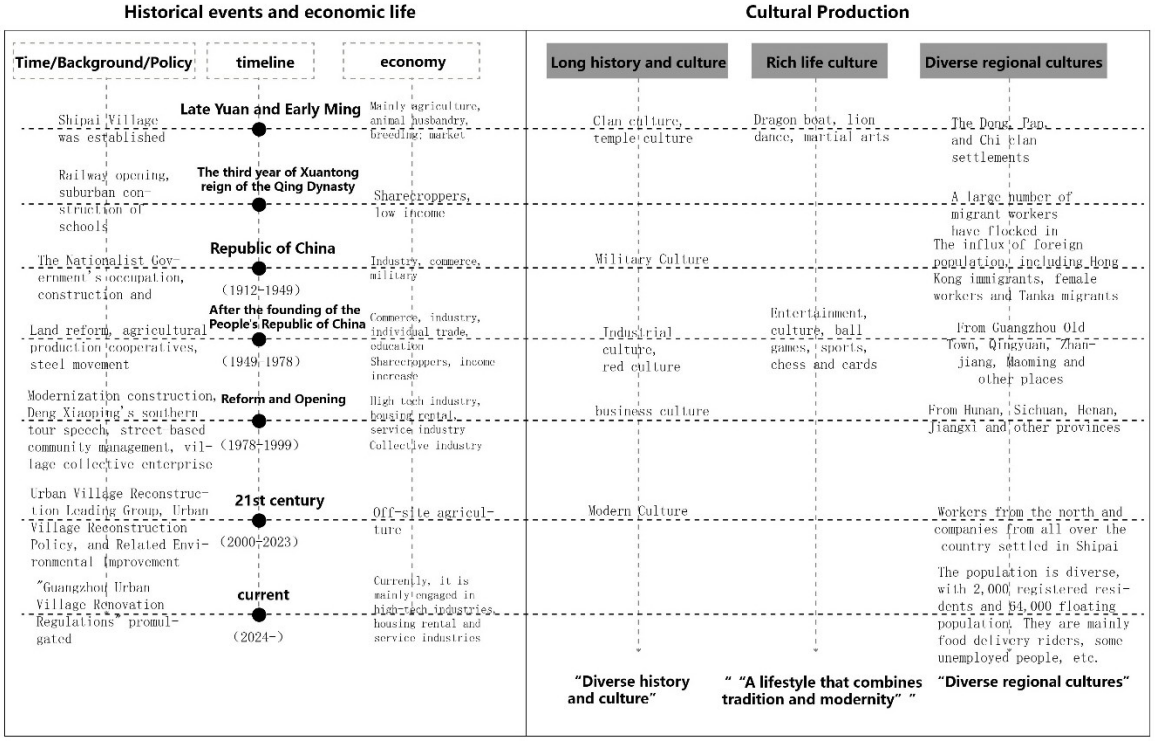


Figure 3–36 Historical economic context and cultural production
(Source: Author's own drawing)

It is a combination of traditional and modern living culture. The culture of life is also evolving and enriching over time. In the early days, traditional entertainment and cultural activities such as dragon boats, lion dances, and martial arts were the mainstay, and after the founding of the People's Republic of China, recreational activities and sports gradually became an important part of life. After the reform and opening up, modern culture and commercial culture were intertwined, making village life more diverse.

It is a fusion of diverse regional cultures. The composition of the population and the regional culture are also constantly changing and merging. In the early days, the villages were mostly populated by local residents, but over time, the number of immigrants gradually increased. At the end of the Qing Dynasty and the beginning of the Republic of China, immigrants, women and wage workers gradually moved in from Hong Kong, and after the founding of the People's Republic of China, urbanization and school construction attracted more immigrants. After the reform and opening up, the wave of migrant workers and immigrants from the south brought floating people from all over the country and enriched the regional culture of the villages. In modern times, the village has become a community with a diverse

population and culture, and the participation of migrant workers and migrants has made the village a place where diverse regional cultures meet.

3.5.2 Multidimensional Cultural Analysis

By combing the historical background and cultural development of Shipai Village, corresponding to the current situation of contemporary cultural space, the boundary social space of the cultural dimension is divided into four aspects: traditional culture, street façade style, multi-regional culture, and life activity culture.

First of all, at the level of traditional culture, the spatial development of Shipai Village records a rich history, including clan culture, temple culture, military culture, industrial culture, red revolution culture, and commercial and modern civilization. However, with the change of the times, most of the traditional buildings have been demolished in contemporary times, and many cultural buildings have been given new functions, resulting in the gradual neglect of traditional culture. The weakening of the cultural foundation has caused the village to gradually lose its unique historical value and social cohesion. At the same time, due to the ownership of building use rights, many traditional buildings are limited to the internal use of villages, and it is difficult for outsiders to contact and understand these cultures, which further limits the transmission and sharing of culture, and weakens the role of cultural space as a social network and communication space (Figure 3–37).

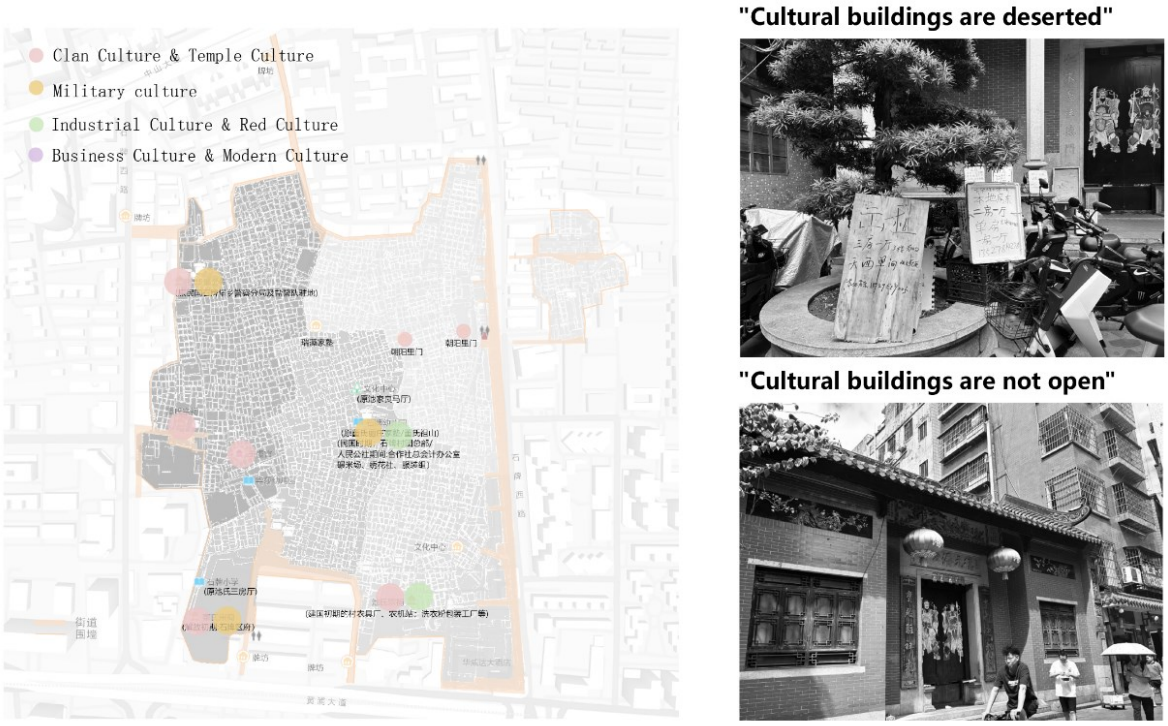


Figure 3–37 Proposed renewal of traditional culture
(Source: Author's own drawing)

Figure 3–38 Proposed renewal of traditional culture
(Source: Author's own drawing)

Figure 3–39 Proposed updates to the street façade
(Source: Author's own drawing)

Secondly, Shipai Village is a place where people from diverse regions gather. Taking the gathering of regional cuisine as an example, although the cuisine presents certain aggregation characteristics in a specific area, it lacks characteristics in architectural form and the layout is relatively scattered. Some of the shop signs are too large or too conspicuous, which affects the overall harmony of the street façade. This spatial arrangement not only affects the cultural atmosphere of the community, but also weakens its function as a space for social interaction. Respecting the regional culture of diverse groups of people and giving them corresponding

spatial rights and interests are issues that need to be considered in depth in the future to better promote social interaction and cultural exchange (Figure 3–38).

In addition, in the context of gradual development and rapid urbanization, the street façade style of Shipai Village is not uniform enough. For this purpose, it can be updated by developing a plan for the renovation of the façade in a cultural style by category. Taking Luhe Street as an example, the street has been initially renovated in combination with the local style, and the subsequent renovation can be used as a template. On the first floor of the inner street, traditional elements can be used to enrich the façade experience and strengthen the shaping of social interaction space. In the important entrance section, it is recommended that the façade be renovated as a whole to enhance the cultural atmosphere and communication function of the community; In the outer street, it is recommended to remove oversized signs, unify the façade design, and integrate traditional cultural elements to enhance the cultural atmosphere of the community and strengthen the role of the street as a social network and communication space (Figure 3–39).

3.5.3 Initial Update Proposals

To sum up, the cultural revitalization of Shipai Village needs to comprehensively consider its profound traditional culture and diverse group composition, and reconnect the relationship between culture and space by reorganizing the architectural style, creating intentional nodes, and organizing the combination of intangible cultural activities and daily life. This renewal strategy is not only of great significance to Shipai Village itself, but also demonstrates its uniqueness and representativeness in the renewal of urban villages in Guangzhou.

First of all, the historical relics of Shipai Village, such as clan culture, temple culture, and industrial and military cultural sites, make it unique among the urban villages in Guangzhou. By preserving these cultural relics and designing and promoting exhibition installations and exhibition halls, cultural memory can be effectively passed on and the relevance of culture and people can be enhanced. This approach not only preserves the historical culture, but also creates a new connection between culture and modern life.

Secondly, as a meeting point of diverse cultures, especially in terms of food culture, Shipai Village shows its unique richness. Through the unified planning and transformation of the northern cuisine and foreign cuisine gathering area in the northwest corner, highlighting the regional characteristics and combining modern culture, a unique cultural node can be created. Similar renovation in the western part of the village can further enrich the cultural diversity of

Shipai Village, reflecting its cultural integration characteristics among urban villages in Guangzhou.

Finally, activity participation is an important means in the cultural renewal of Shipai Village, through the organization of daily traditional cultural activities, combined with modern forms of entertainment, Shipai Village can not only enhance the cohesion and sense of belonging of the community, but also show its innovation in cultural renewal. This model not only preserves traditional culture, but also promotes social interaction and spatial vitality of the community (Figure 3–40).

Through these renewal strategies of "socio-spatial" interaction, Shipai Village not only realizes the organic combination of history and modernity, but also further establishes its unique position in the renewal of urban villages in Guangzhou, becoming an important demonstration and representative in this process.

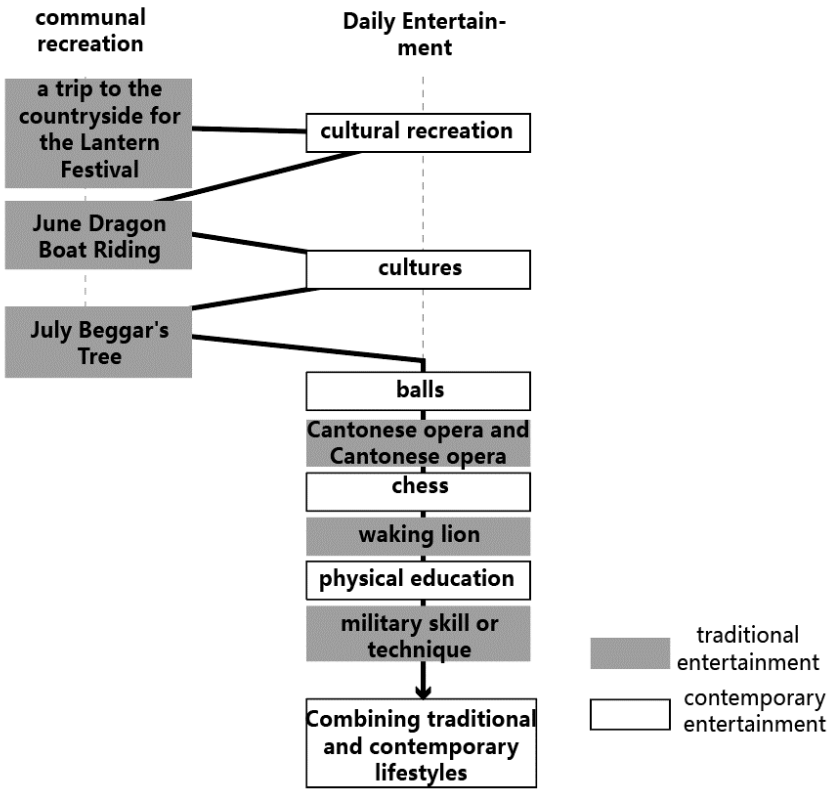


Figure 3–40 Strategies for updating the culture of life
(Source: author's own drawing)

3.6 Chapter Summary

Focusing on the multidimensional characteristics of social space, this chapter subdivides it into four main parts: production, psychology, life and culture, and conducts in-depth analysis and research. By taking Shipai Village as a specific case, this paper explores the problems

exposed by the boundaries of urban villages in these dimensions. In the production dimension, how space affects economic activities and the livelihoods of residents is analyzed. In the psychological dimension, the effects of spatial pattern on residents' psychological state, social identity and sense of belonging were studied. In terms of life, the matching degree between the spatial configuration and the daily life needs of residents was investigated. In the cultural dimension, this paper analyzes how the space carries and transmits the cultural characteristics and historical memory of the community.

Through these multi-dimensional analyses, many problems exist in the boundaries of the urban villages of Shipai Village, especially the specific manifestations of the failure to effectively meet the needs of residents and the requirements of social development at the production, psychological, life and cultural levels. These problems are not only related to the irrationality of space use, but also related to the quality of life of residents and the long-term development of the community. On this basis, this chapter systematically identifies and records these problems in detail, and clarifies the specific location of the problems. These research results provide an important basic reference for subsequent spatial design and renewal, aiming to guide further design optimization to better meet the needs of residents, improve social well-being, and promote the sustainable development of the community.

Chapter4 Boundary Space Optimization Strategies and Design Guidelines

4.1 Design Concept

"Boundaries" not only serve the function of separation but also act as spaces of symbiosis and integration, embodying shared spatial characteristics and becoming important venues for social interaction. In the past, the renewal of boundary spaces often focused on enhancing spatial quality, while neglecting the integral role of boundaries in the "social-spatial" relationship. This design takes the "social-spatial" relationship between urban villages and city boundaries as its core, aiming to identify the fractures between society and space, thoroughly analyze their causes, and propose solutions to restore these relationships. The design concept revolves around the idea of a "Coexistence Field," treating boundary spaces as a link between urban villages and the city. The focus is on creating a vibrant "industrial belt," distinctive "points of interest," a symbiotic "living alley," and a diverse "cultural line," thereby enhancing the spatial rights of residents in boundary areas, promoting social interaction, strengthening a sense of belonging, and fostering the symbiosis, integration, and sustainable development of the city and its urban villages (Figure 4–1).

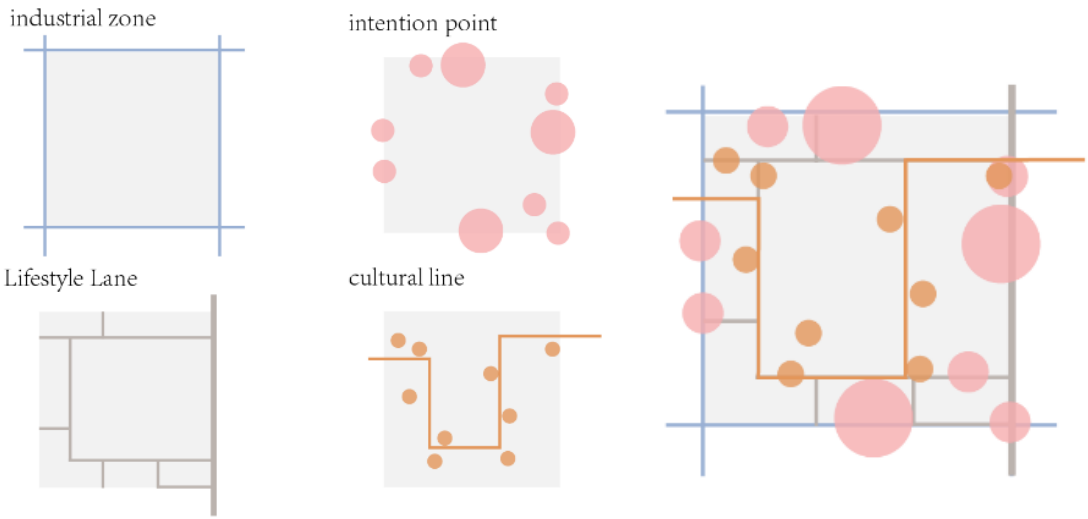


Figure 4–1 Four-dimensional concept of border repair
(Source: Author's own drawing)

The "industrial belt" concept, rooted in the production dimension, forms the foundation of boundary economic vitality. By emphasizing essential activities, it creates a dynamic relationship of interaction between both sides of the boundary, focusing on the flexibility of spatial transitions and the participation of people. This approach empowers boundary activation with economic production at its core. The "points of interest" are based on the psychological

dimension and aim to optimize boundary nodes, enhancing people's positive perceptions of boundaries by creating spaces with a strong sense of place through specific, distinctive solutions. The "living alley" is crucial to the "social-spatial" renewal, focusing on the optimization of space usage by integrating design into daily routines, based on in-depth studies of people's everyday activities. This approach creates human-centered spaces, increases residents' well-being, and ensures the inclusivity of the space. Lastly, the "cultural line" draws from the cultural consciousness dimension, constructing a dialogue between the village's past and present, showcasing its essence and sense of regional identity. Through the linear arrangement of cultural spaces and the organization of cultural activities, this approach weaves Shipaicun's cultural imprint, establishing a distinctive cultural brand.

Overall, this article seeks to shape the "social-spatial" relationship through four dimensions—production, psychology, lifestyle, and culture—aiming to build a more harmonious relationship between the city and urban villages. By creating a shared space for coexistence, it promotes the integration and symbiosis between urban villages and the city, ultimately achieving sustainable development.

4.2 General Layout

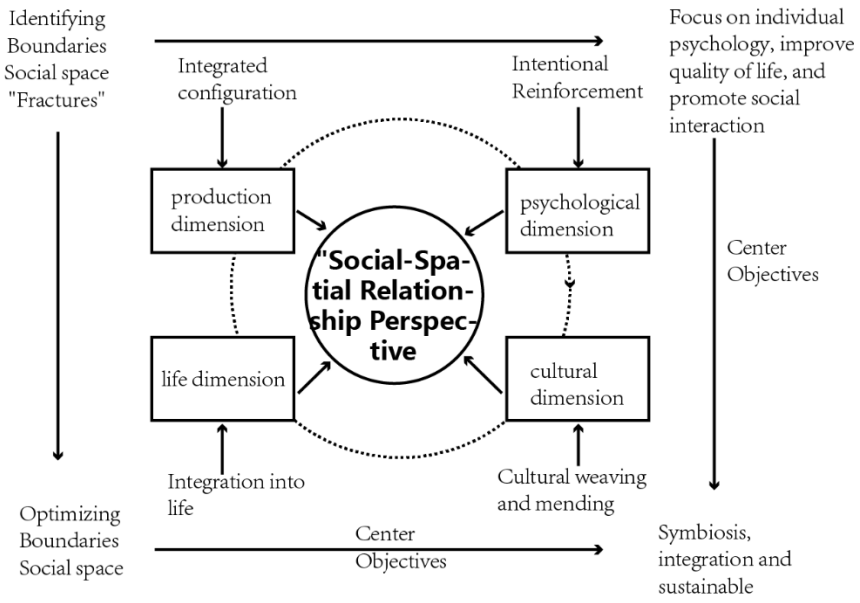


Figure 4–2 Four-dimensional boundary repair strategy
(Source: Author's own drawing)

From the perspective of "socio-spatial" relationship, this paper studies the boundaries of urban villages and explores their physical space from the dimensions of production, life, psychology and culture. It is found that there is a rupture of social space at the boundary of urban villages, and through strategies such as enhancing reciprocity of production,

strengthening perceptual intention, designing life scenes, and integrating cultural places, we can promote the symbiosis, integration, and sustainable development of urban villages and cities, and create boundary symbiosis scenes that reflect reciprocity, symbiosis, high quality, and a sense of culture (Figure 4–2).

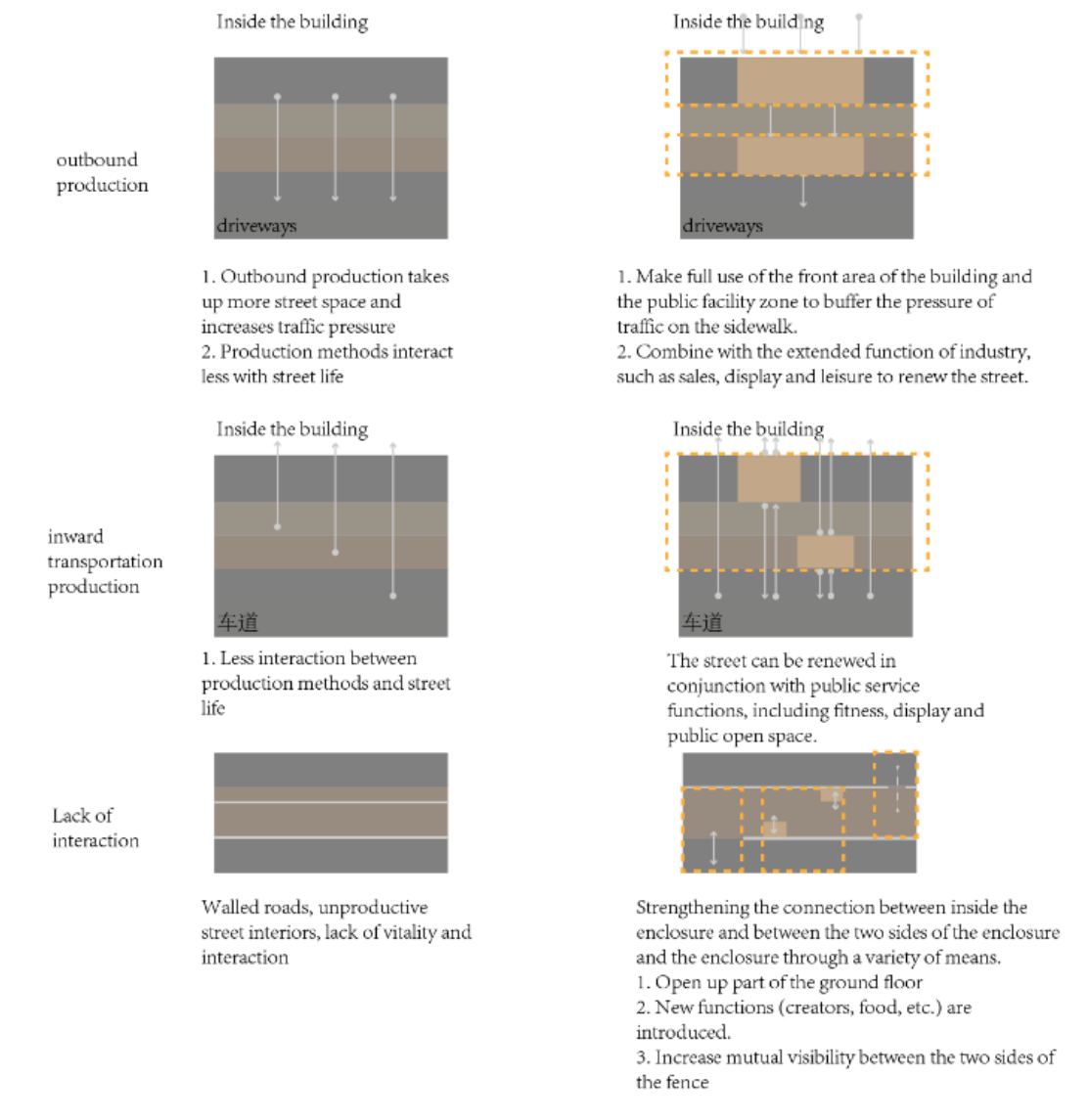


Figure 4–3 Update strategy for how you interact with production
(Source: Author's own drawing)

First of all, in the aspect of production dimension should promote economic exchanges of border production. analyze the mode of production and social relations and implement them in physical space, understand social interactions at the border in the production perspective and analyze the relationship between production methods and society and translate it into physical space, understand the social interactions at the border from a production perspective and identify potential spatial problems (Figure 4–3). By alleviating the spatial deactivation or

overpressure associated with unidirectional production and increasing the reciprocal symbiotic relationship of production. Production in Shipai Village is mainly service-oriented, and the core participants include the village committee, migrants and other people in the city. Through productive functions, these social groups create links between the boundaries of the urban village and the outside world, activating the interaction between the urban village and the external environment. However, the interaction between the government, administration, merchants, villagers and other practitioners is more limited. Therefore, in the process of regeneration, it is possible to promote the regeneration and interaction of streets through the actor-driven mechanism of "common interest", with the public interest as the core principle. Ideally, the interaction mode of the street should include active interaction between the two sides of the street and the participation of non-productive people, thus enhancing the vitality of the street. The spatial production mode of Ishpeming Village can be categorized into three types: two-way interaction, one-way interaction and lack of interaction. Among them, one-way interaction can be subdivided into two forms: outward and inward transportation. Two-way interaction is a more ideal mode of production and interaction, which ensures positive interaction while appropriately dispersing the pressure of pedestrian flow. Depending on the actual spatial situation of the street, production-derived functions or public service functions can be set up to create a more participatory street space. Unidirectional interaction patterns may lead to the concentration of resource or service pressure on one side, affecting its sustainability. For example, an industrial model with a focus on outward transportation (e.g., e-logistics, etc.) occupies more street space, which may lead to higher traffic pressure during peak hours, with strong traffic connections but a lack of vibrancy in street life. The in-transit production mode, where production activities are mainly carried out inside buildings, has less interaction with street life. For street segments that lack interaction, the main focus is on access and there is insufficient spatial interaction. If the street segment is short, the interest of passage can be increased by means of spatial visual design, etc. If the street is long or the main passage, it is recommended to supplement the production function to enhance spatial interaction and the sense of place of the street. Through these measures, the overall vitality and sustainability of the street can be enhanced (Figure 4–4).

a) Before updating

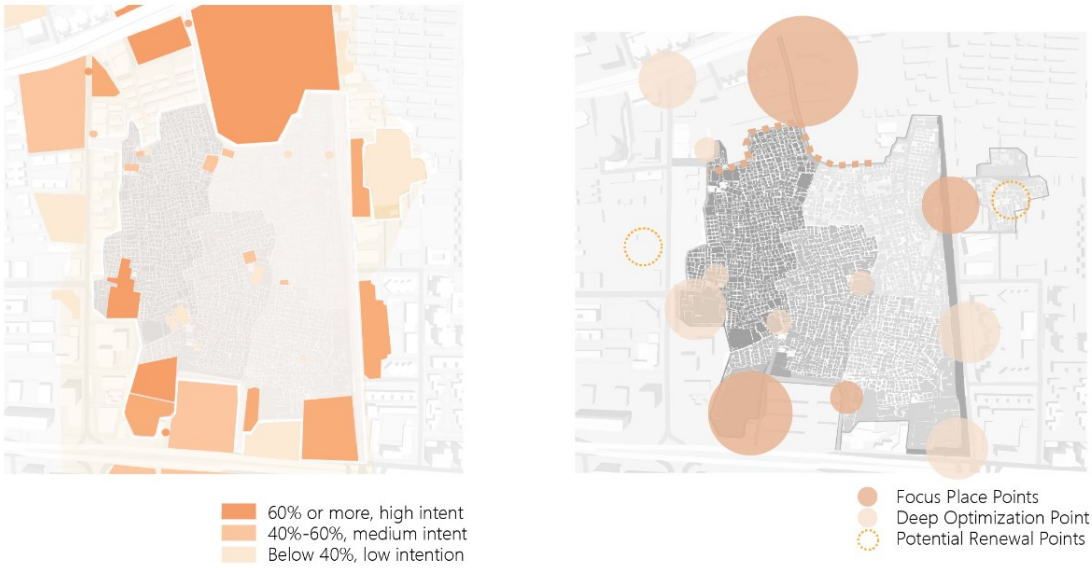
b) After updating

c) Update the master plan scheme

Figure 4–4 Before and after the update of the production dimension and its update master plane scheme (Source: Author's own drawing)

Secondly, in terms of the psychological dimension, the focus is on strengthening boundary perception through intentional cognition. Through the survey questionnaire to collect the spatial cognition data of places, it is found that people's psychological boundaries and cognitive centers are often different from the traditional impression and actual spatial layout. Combined with the

cognitive mapping method, participants were instructed to draw intention maps, classify and grade different places, and record the preferences of the population for high-intention, medium-intention, and low-intention areas. For high-intent areas, it is recommended to further optimize the environment and highlight the features to make it a highlight and landmark area of the urban village. For example, Gangding Subway Station, Zhongshan Hospital, Shipai Primary School, Pan's Ancestral Hall and Shipaibei Archway, etc., can strengthen the characteristics of these nodes by integrating the surrounding environment. For medium-term areas, such as Dong's ancestral hall, Shipainan archway, Tianhe Social Security Bureau, Sunshine Metropolis Service Trade City and Chi's ancestral hall, these are mainly cultural, administrative, large-scale commercial and landmark buildings, with high frequency of daily use and great vitality. In the future, the attractiveness of these areas can be enhanced by optimizing the environment, introducing more public service functions or theme design, so that they can gradually develop into new intentional nodes. For low-intent areas, such as Computer City and Nanyuan Community, these areas can become more active by tapping into potential or introducing new industries, combined with environmental improvement and functional enhancement. In general, through "multi-dimensional, multi-point, and multi-level" strengthening, optimizing and renovating the intended place, it aims to activate the boundary of Shipai Village and form a distinctive and impressive boundary image (Figure 4–5).

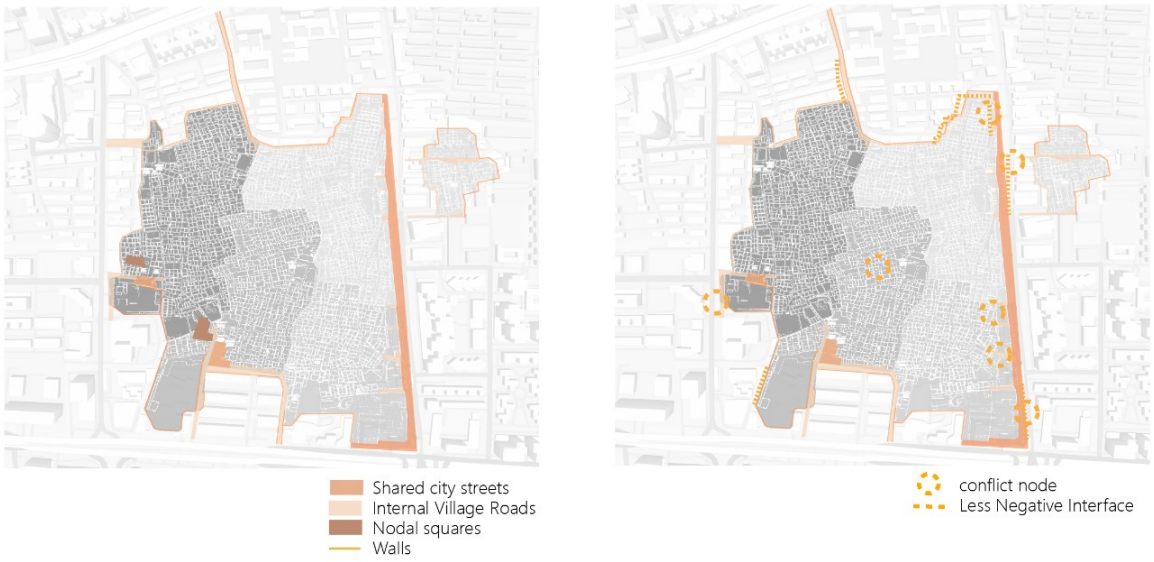


a) Intended locations and their distribution b) The intent update policy

Figure 4–5 Intentional place update strategy for the psychological dimension
(Source: Author's own drawing)

Third, in the dimension of life, scene design should be embedded in boundary life. Borders serve as places where people gather, and different areas provide important spaces for daily life and social interactions. Boundary space can be divided into four types: shared city streets, inner streets of urban villages, node squares and fences (Figure 4–6). In street analysis, the focus is on optimizing the types of spaces and exploring the interactions of people in the use of these spaces through detailed quantitative analysis using UML activity analysis, place self-assessment forms, and observational annotation. After discovering the breaking points between behavior and space, unsuitable scenes, and problems that do not conform to humanized design, corresponding updates and improvement plans are proposed. In view of the actual space of Shipai Village, some contradictions that do not conform to the overall plan can be adjusted according to the actual situation. For example, the road at the northern end of Shipai East Road is relatively narrow, which is difficult to meet the functional needs of the front area of the building, so the open space can be combined with the public facility belt to play a multi-functional design role of the space. In addition, for some areas not included in the spatial type

Street type	Usage Functions	Research methodology
Shared use of city streets	People on city streets use	Urban Street Design Technical Indicators UML activity analysis + place self-evaluation
Village internal road	Multi-functional use	UML activity analysis + venue self-evaluation
nodal plaza	Gatherings and leisure activities	Observational notation method + site self-evaluation
enclosure	go through	Observational notation method + site self-evaluation



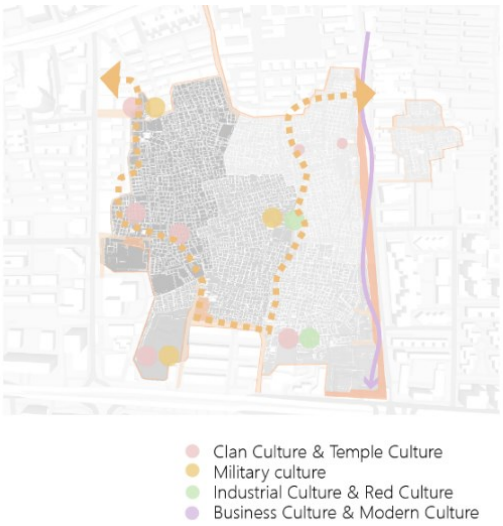
a) The type of boundary space b) Special update points (other than type)

Figure 4–6 The type of boundary of the life dimension
(Source: Author's own drawing)

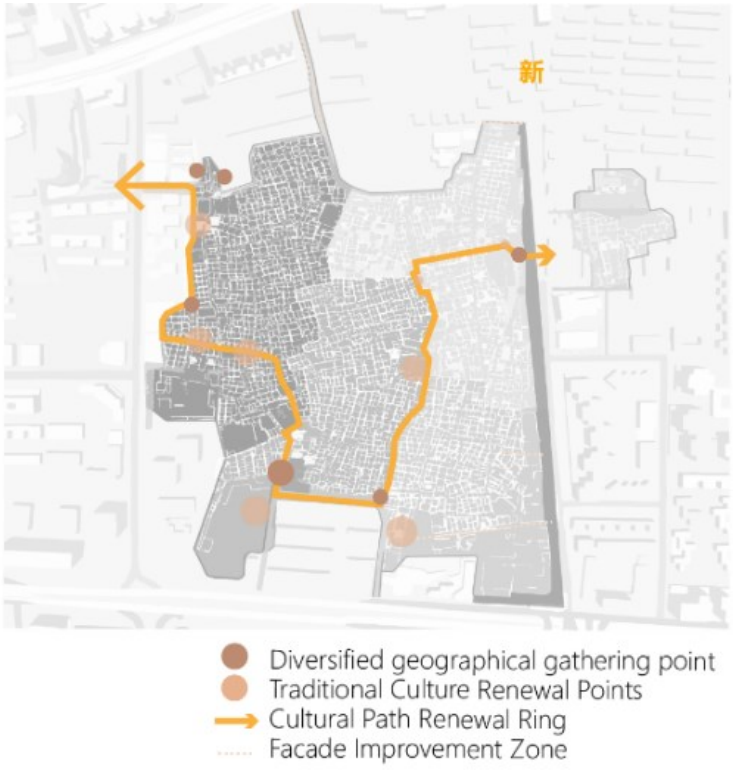
study, such as the west side of Guangzhou Chang'an Hospital, although there is no functional entrance, there is great spatial potential, and these boundary spaces can be optimized by configuring public functions and facilities. For the types of node squares and fences, which are mainly non-productive activities, the study uses observation annotation and place self-evaluation methods to gain an in-depth understanding of different activities on weekdays, weekends and all-weather, and puts forward optimization suggestions for activity needs and site availability. The negative interface and potential interface are analyzed by similar methods, including the life analysis and space renewal design of the entrance node of Shipai West Road, the activity center node, the square in front of the administrative center, and the front area of Guang'an Hospital, so as to optimize the quality of the boundary space and provide a better living and resting place for the people.

Finally, planning should pay more attention to the shaping of border cultural places. Shipai Village has a history of more than 730 years since its establishment in the late Yuan Dynasty and early Ming Dynasty, and has accumulated a rich cultural heritage, including clan culture, temple culture, military culture, industrial culture, commercial culture and modern culture. Shipai Village was first formed by the three major families of Dong, Pan and Chi, and a large number of foreign people moved in since the Qing Dynasty, and gradually became a floating population gathering place in the 90s of the 20th century. As a result, the cultural structure of Shipai Village presents a pluralistic nature, including geopolitical culture and traditional culture, which are organized and inherited in the daily life of the current population. At the level of traditional culture, after the on-site investigation of the cultural sites of Shipai Village, it was found that except for the ancestral halls of the Pan, Dong and Chi clans, which still retain certain sacrificial functions, most of the other cultural buildings have been rebuilt or abandoned, and people's awareness of traditional culture is relatively weak, and the use of these buildings has strong exclusivity and is mainly used by the villagers. It is suggested that the representative buildings such as temple culture, military culture, industrial culture, and modern culture should be renovated and renovated in a unified manner, and the cultural route should be planned to create an overall cultural impression. For example, cultural exhibitions, cultural check-ins and other activities can be planned to inherit and promote the Shipai culture (Figure 4–7).

a) Traditional architecture



b) Regional architecture



c) Update the plan

Figure 4–7 Boundary update strategy for the cultural dimension
(Source: Author's own drawing)

At the level of regional culture, through the gathering of industries such as gastronomy and the distribution of regional population, the gathering places are marked and the cultural venues where people gather are divided. On the basis of the existing spatial nodes, the "regional or multicultural" nodes are supplemented to enrich the diversified creation of cultural spaces. Finally, the design takes the "cultural line" as the main strategy for cultural renewal, which

includes focusing on the protection of historical buildings and traditional cultural heritage, and organizing various cultural activities to inherit and promote local culture. Incorporate local characteristics to design unique cultural identities and landscapes to enhance the cultural identity and attractiveness of the community; Through the creation of communication platforms and interactive spaces, we can enhance understanding and interaction between different groups and enhance the cultural atmosphere of the region.

In this study, the "socio-spatial" relationship of the boundary was systematically analyzed, the "socio-spatial" fractures were scientifically identified and repaired, and the function of the boundary space was optimized by upgrading and transforming the key nodes. The renovation project involves a land area of 72,500 square meters, and plans to add 4 fitness venues, 2 community parks, 1 public toilet and 12 garbage stations. In addition, 2 urban shared street segments, 15 other street segments and 9 important nodes will be renewed. The aim of the project is to carry out an overall transformation and comprehensive renewal of the economic, social, environmental and cultural aspects of the border. Specific renewal strategies will be discussed for different types of spaces, and corresponding guidance plans will be proposed to ensure the practical application of renewal measures and the effectiveness of urban design. Through this systematic analysis and transformation, the project aims to improve the overall quality of the boundary space, promote the harmonious development of the area and the overall progress of the community.The optimization of urban village boundaries from the perspective of "social-spatial" relationship aims to activate and enhance the vitality of the boundary through the multi-level and multi-dimensional relationship of social space, and promote the symbiosis, integration and sustainable development of urban villages and cities. Optimizing the boundary space of urban villages requires comprehensive consideration of various factors to ensure that they are functional, inclusive and humane. To sum up, this paper proposes four design principles of "common development, local characteristics, humanistic care, and inclusiveness and diversity", which aim to guide the urban renewal decision-making and design of urban village boundaries.

（1）The principle of common development

The principle of co-development emphasizes the synergistic progress and resource sharing between urban villages and cities. Through integrated planning and policy coordination, the sharing of public resources and infrastructure will be realized, and the sustainable development of boundary space will be promoted. The concept of co-development requires not only the unity and improvement of physical infrastructure, but also the coordination and coherence of social

management and community building. Through the principle of co-development, the boundary space can become a link between urban villages and cities, promoting the simultaneous development and mutual benefit of the two.

（2）The principle of local identity

Emphasis is placed on preserving the unique cultural and natural landscapes that highlight the boundary spaces. By respecting and protecting the local historical and cultural heritage, the original community style is maintained, and the residents' sense of cultural identity and belonging is enhanced. The local character is not only reflected in the architectural style and the design of public facilities, but also in cultural activities and community interaction. Through the principle of local characteristics, the boundary space can become a window to showcase local culture and traditions, and enhance the charm and attractiveness of the overall space.

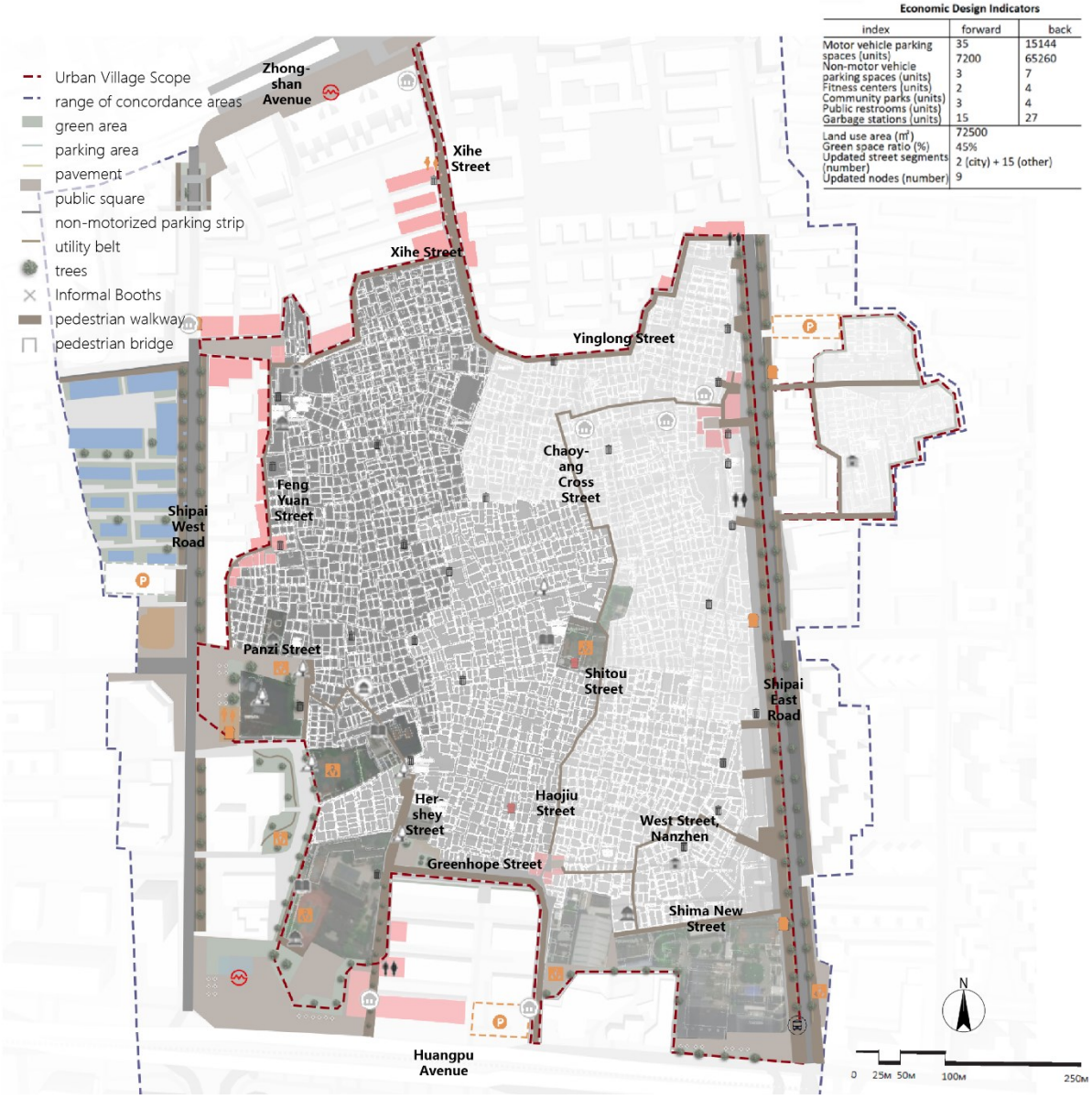
（3）The principle of humanistic care

The principle of humanistic care emphasizes people-centeredness, focusing on the needs and experiences of residents. When optimizing the boundary space, it is necessary to take into account the needs of different groups and create a safe, comfortable and convenient living environment. Humanistic care includes improving the quality of the living environment, improving public service facilities, and increasing greening and leisure space. Through the principle of humanistic care, the boundary space can become a place full of humanity and care, improving the well-being and quality of life of residents.

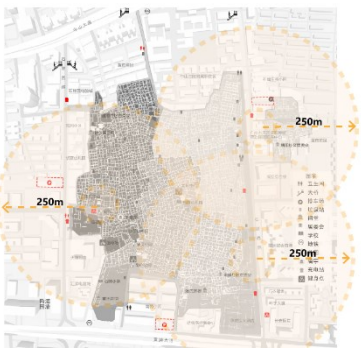
（4）1nclusion and diversity

The principle of inclusiveness and pluralism advocates social inclusion and equitable development, emphasizing care and support for different social groups. Optimizing boundary spaces requires ensuring that all residents have equal access to public resources and services. The concept of inclusion and diversity involves not only the accessibility of physical spaces and the configuration of multi-purpose facilities, but also the inclusion of social policies and community activities. Through the principle of inclusion and diversity, the boundary space can become a pluralistic and symbiotic community, promote social integration and enhance community cohesion.

The above four optimization principles are used to comprehensively optimize the four dimensions of production, psychology, life and culture of the boundary, aiming to improve the overall quality and function of the boundary space of urban villages, promote the coordinated development and social integration of urban villages and cities, and realize the harmonious



a) Update the master plan



b) greening c) wall d) Public facilities

Figure 4 - 8 The total plan of the boundary update
(Source: Author's own drawing)

coexistence and sustainable development of space. These optimization principles provide a clear direction and guidance for the improvement of boundary space, ensure that "people" are always the core in the optimization process, establish a close "social-spatial" relationship, respect the diversity of society and the uniqueness of culture, and promote the overall progress of space.

Finally, the concept and strategy of renewal are synthesized, and specific renewal schemes are proposed. The plan takes into account the layout of the basic design, including greenery, transportation, and public facilities (Figure 4－8).。 For example, through various measures such as green squares, street greening and three-dimensional greening, the level of greening at the boundary will be improved to promote green and sustainable development; Optimize traffic breakpoints, reconstruct or reserve traffic paths at boundaries to ensure smooth traffic; Create a 250-metre public infrastructure circle to improve accessibility and convenience. In general, this study introduces the "socio-spatial" perspective into the optimal design of border urban renewal, promotes the modernization and transformation of urban villages through systematic and scientific methods, and promotes the deep integration and sustainable development of urban villages and cities.

4.3 Street Type

According to the ownership of property rights, the street types of Shipai Village can be divided into two types: shared urban streets and internal streets in urban villages. According to the differences in the composition of internal space, it is further subdivided into two types of shared urban streets and four types of internal streets of urban villages. According to the different functions on both sides of the street, the common urban street type can be divided into three types of space use scenarios: the boundary section adjacent to shops, the boundary section adjacent to kindergartens or bus stops, and the boundary section adjacent to transportation space. The types of streets in urban villages are divided into four forms: two walls, one wall, no wall on both sides, and greening in the middle of one wall. In the planning and design process, general guidelines should be formulated according to these space types, and detailed design references should be provided when implemented into specific street sections, so as to ensure that the functions and use scenarios of each type of street are optimized and improved, so as to promote the harmonious development of the overall street space of Shipai Village.

4.3.1 Shared City Streets

4.3.1.1 Overall Design Guidelines

Space Type 1 is the main type of shared urban street, excluding motorized lanes, and the unilateral width of the pedestrian street segment is 6 to 7.5 meters. This type of street consists of four parts: a front building area, a sidewalk, a utility strip and a non-motorized parking strip. Peripheral function usage scenarios include formal and informal business activities, pick-up and drop-off of children, transportation, and other scenarios (Figure 4–9).

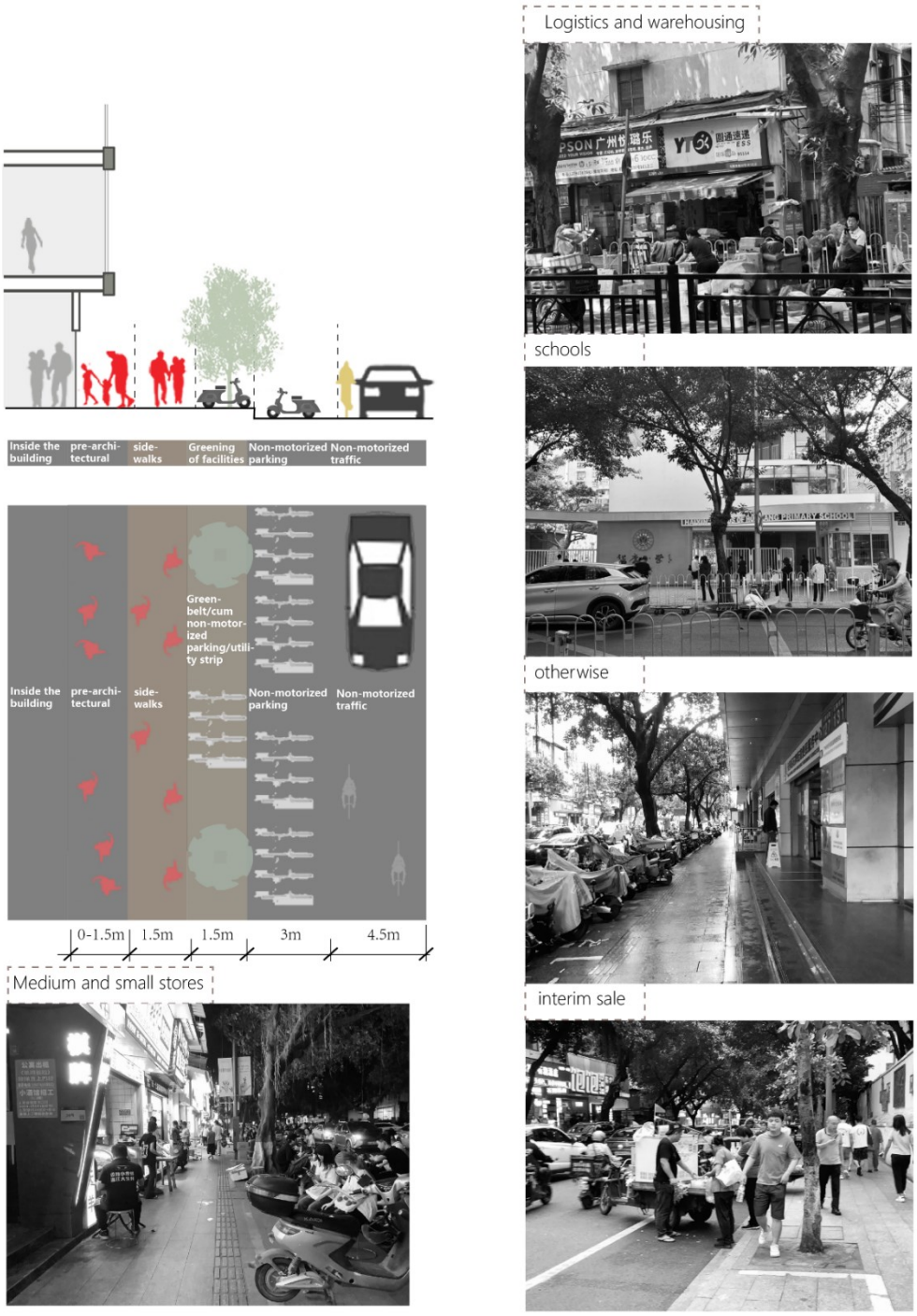


Figure 4–9 Shared city streets-spatial type 1 status
(Source: author's own drawing)

（1） Space type 1 - adjacent to commercial or other boundary segments

The commercial functions are mainly distributed in the east side of Shipai West Road, the north side of Huangpu Avenue and the west side of Shipai East Road. Combined with the daily use needs and scenario availability of these areas, it is recommended to focus on optimizing the design of the front area of the building and the integration of public facilities and non-motor vehicle parking belts to ensure the smoothness and safety of pedestrian passages. At the same time, it is necessary to take into account the needs of people who live and work on the street for a long time, such as delivery workers, transportation workers, service workers, and merchants, to meet their needs for rest, socialization, and temporary work in their leisure time (Figure 4–10).

For the front area of the building, it is recommended to set up foldable tables and chairs to meet the space required by the store owner for daily displays and temporary work. Provide a temporary resting place on the street and a convenient place for shopkeepers to interact with customers or passers-by. For those areas that are less frequently used but have more space, it is recommended to make full use of the space in front of the building, integrate these areas with less daily use, and set up street nodes for rest and interaction to increase the vitality of the space.

In terms of public facilities, it is recommended to combine existing trees to increase greenery and configure leisure facilities to form nodes for people to stay and relax. The parking area between the rest nodes can be designed for functional integration, combining the functions of rest, parking, passage and charging, setting up non-motor vehicle parking stations, and it is recommended to install sunshade canopies to improve the comfort of use. In addition, temporary parking areas for motor vehicles and waiting areas for passengers can also be set up at intervals to meet the needs of different groups of people.

The main contradiction of commercial function nodes lies in the impact of complex activities such as sales, delivery, and passenger visits on the street space. By considering the extension of the function, the use of integrated and flexible design, combined with greenery and modern technology, can empower the boundary space and improve the functionality and comfort of the overall street.

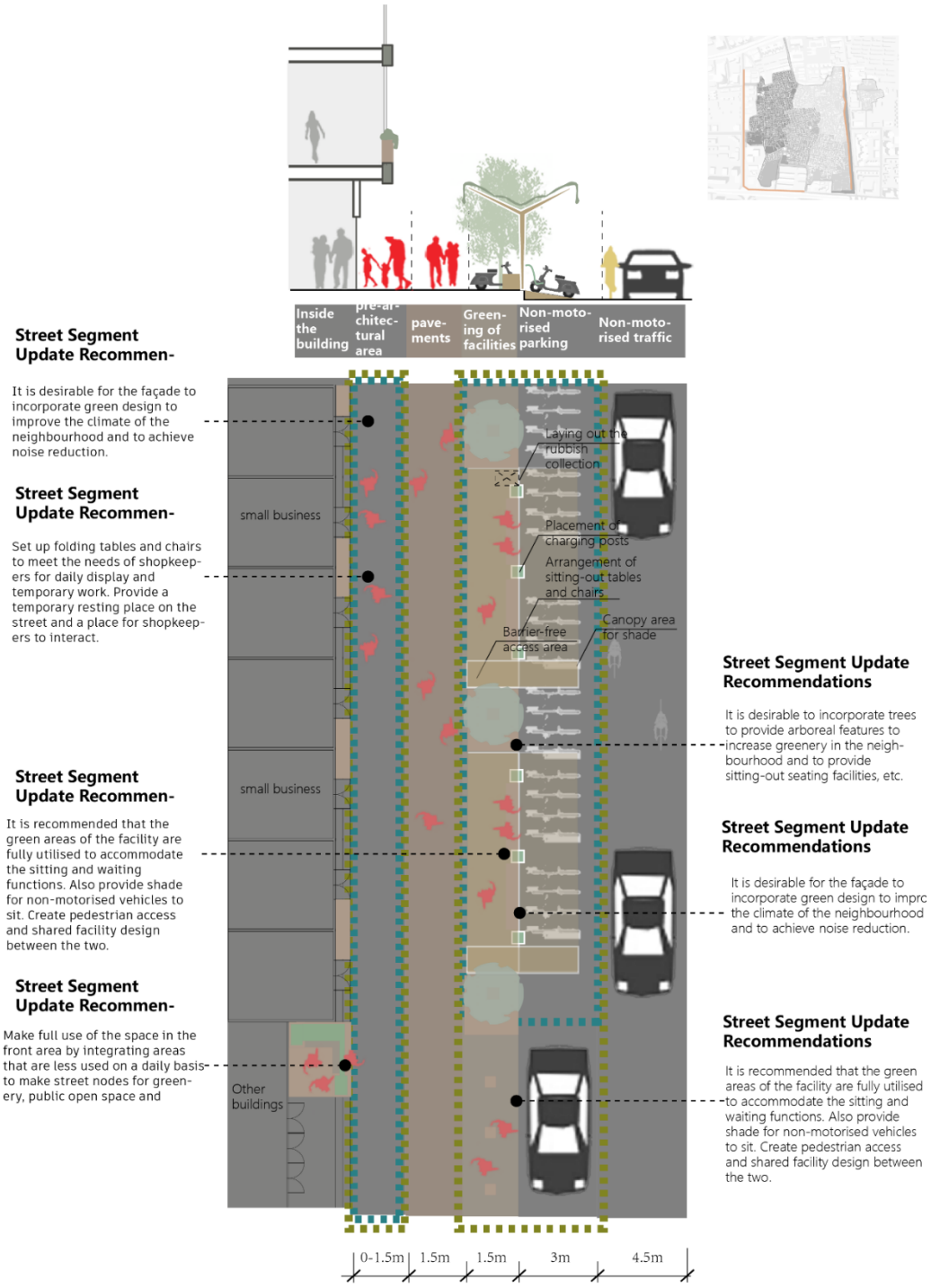


Figure 4–10 Shared city streets-space type 1 design guidelines
(Source: author's own drawing)

（2） Space type 1 - the boundary section adjacent to the kindergarten or bus station

There are two schools on the border of Shipai Village, located in the middle of Shipai West Road, and the students in these schools are young and have the need for parents to pick up and

drop off on a daily basis. Therefore, these scenarios are analyzed in detail and optimization recommendations are made (Figure 4–11).

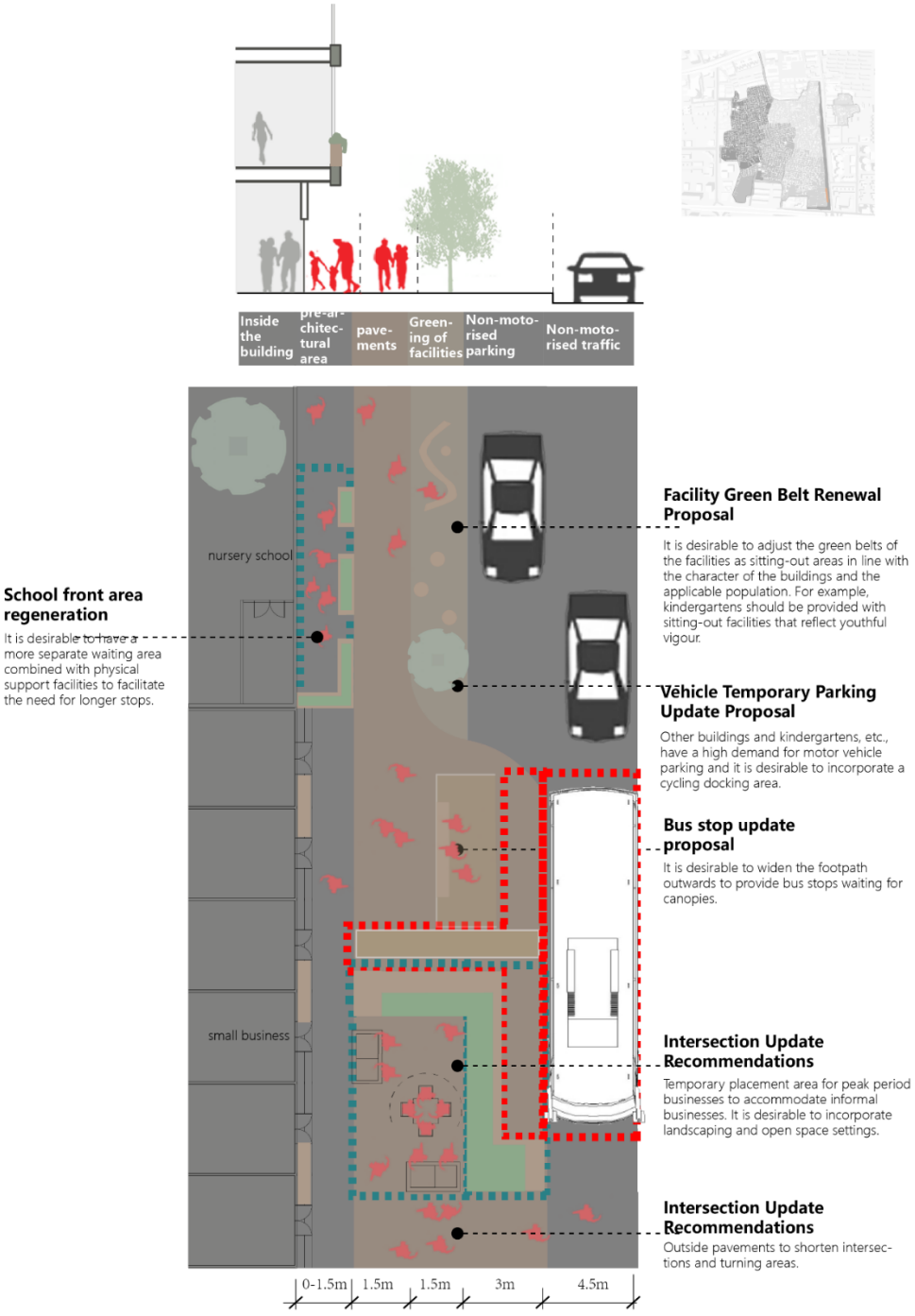


Figure 4–11Shared city streets-space type 1 - adjoining kindergarten design guidelines
(Source: author's own drawing)

First, it is proposed to add a more separate waiting area near the entrance to the school, combined with physical support facilities for standing, to improve comfort and safety for parents while waiting. This waiting area should be well shaded from the sun and rain to ensure that parents can wait comfortably in all weather conditions. In addition, it is proposed to

renovate the public facilities belt and relocate part of the existing green belt into a sitting-out area to better suit the characteristics of the school buildings and meet the needs of users. For example, in the case of kindergartens, recreation facilities should be designed to be youthful and energetic in order to attract and serve children and parents. The proximity to the school can be transformed into a parking area and a waiting area for school rides to cope with the school's temporary gathering needs during the commuting and commuting hours, providing parents and students with multi-functional and optimized spaces for staying, waiting and visiting.

For the bus riding scenario, it is recommended to integrate the setting of pedestrian safety islands and add bus rest platforms. If the bus stop is set at the corner of the street, you can set up a stop node in combination with the green arrangement. These stops can not only provide a place for informal commercial activities and rest and waiting, but also be compatible with the waiting function of pedestrians, further improving the efficiency and comfort of street space. Through these optimization measures, the needs of students, parents and other users can be better met, and the overall quality of the boundary space around the school can be improved.

（3） Space type 1 - the boundary segment adjacent to the transportation space

There is a certain scale of transportation industry in the boundary area of Shipai Village, including e-logistics and delivery services, which are mainly concentrated in the western section of Shipai West Road. The main problem in the transportation industry is the need for space occupied by trucks and cargo transportation. To this end, at the planning level, it is proposed to relocate the transport function to the secondary street to reduce the impact on the main street. Since the transportation industry in Shipai Village has formed a certain scale, it is recommended to further integrate community resources and design a comprehensive park in combination with maker spaces to better manage and optimize transportation functions. For scattered transportation enterprises, it is recommended to adjust and centralize the layout to improve management efficiency and space utilization (Figure 4–12).

For the relevant street segments that retain the transportation function, it is recommended that the non-motorized traffic belt be adjusted to the inside of the sidewalk, and the public utility belt should be arranged close to the motorized lane. This arrangement is able to better meet the storage, operation and transportation needs of trucks, and non-motorized vehicle parking spaces can be set up in appropriate locations to reduce interference with pedestrian traffic. The front area of the building is proposed to be designed in a unified manner, taking into account functions such as temporary storage and daily rest, so as to enhance the versatility of the space.

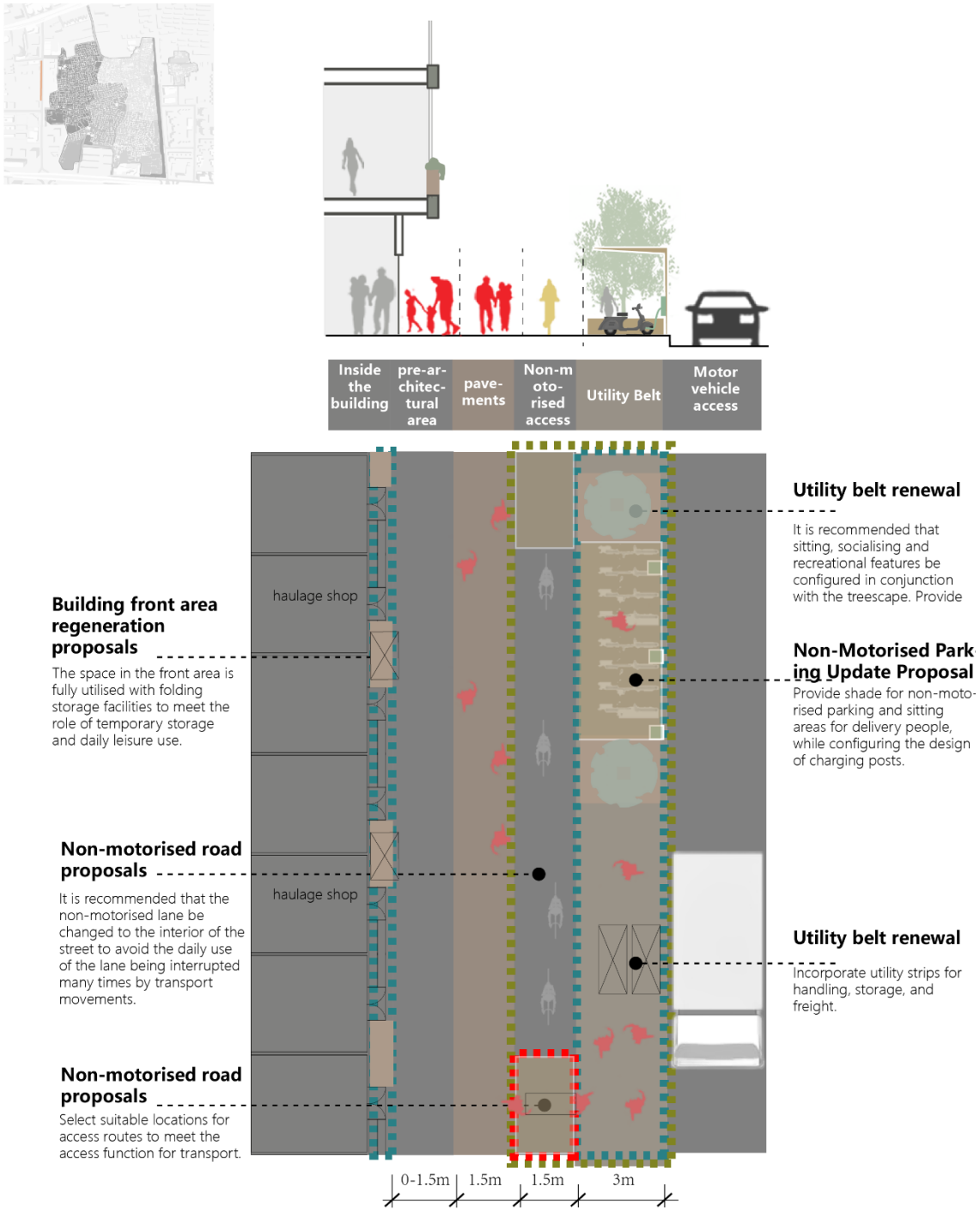


Figure 4–12 Shared city streets-space type 1-adjoining transportation design guidelines
(Source: Author's own drawing)

At the same time, in order to ensure the safety of the pedestrian passage, it is recommended to set up public facilities and sidewalk belts at intervals, especially near the passenger boarding and disembarking points, clear pedestrian passages should be set up to ensure the safety of pedestrians. Through these optimization measures, the impact of the transportation

industry on the street space can be effectively improved, and the overall functionality and safety of the boundary area of Shipai Village can be improved.

（4） Space type 2

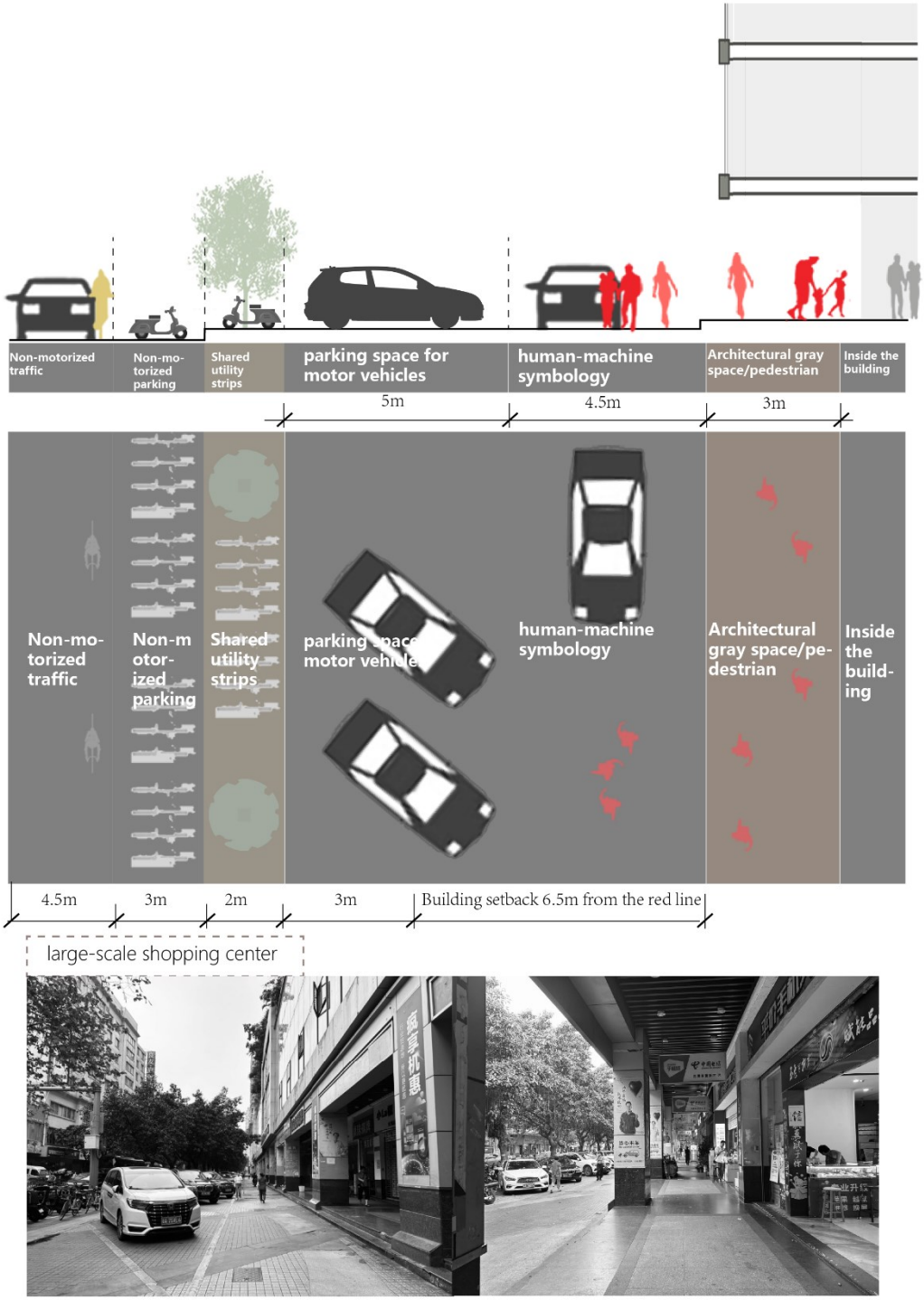


Figure 4–13 Shared city streets-space type 2 - status quo
(Source: author's own drawing)

The total length of the street section of Space Type 2 is 17.5 meters to 20 meters, which is formed by the setback red line of the large shopping mall. Its components include non-motorized vehicle parking areas, public utility belts, motorized vehicle parking spaces, human-machine co-board areas, and building gray spaces. After analysis, there are two main problems: first, the connection between non-motor vehicles and motor vehicle parking and building use is not comprehensively considered; Second, the layout of the existing parking lot affected the quality of the building space (Figure 4–13).

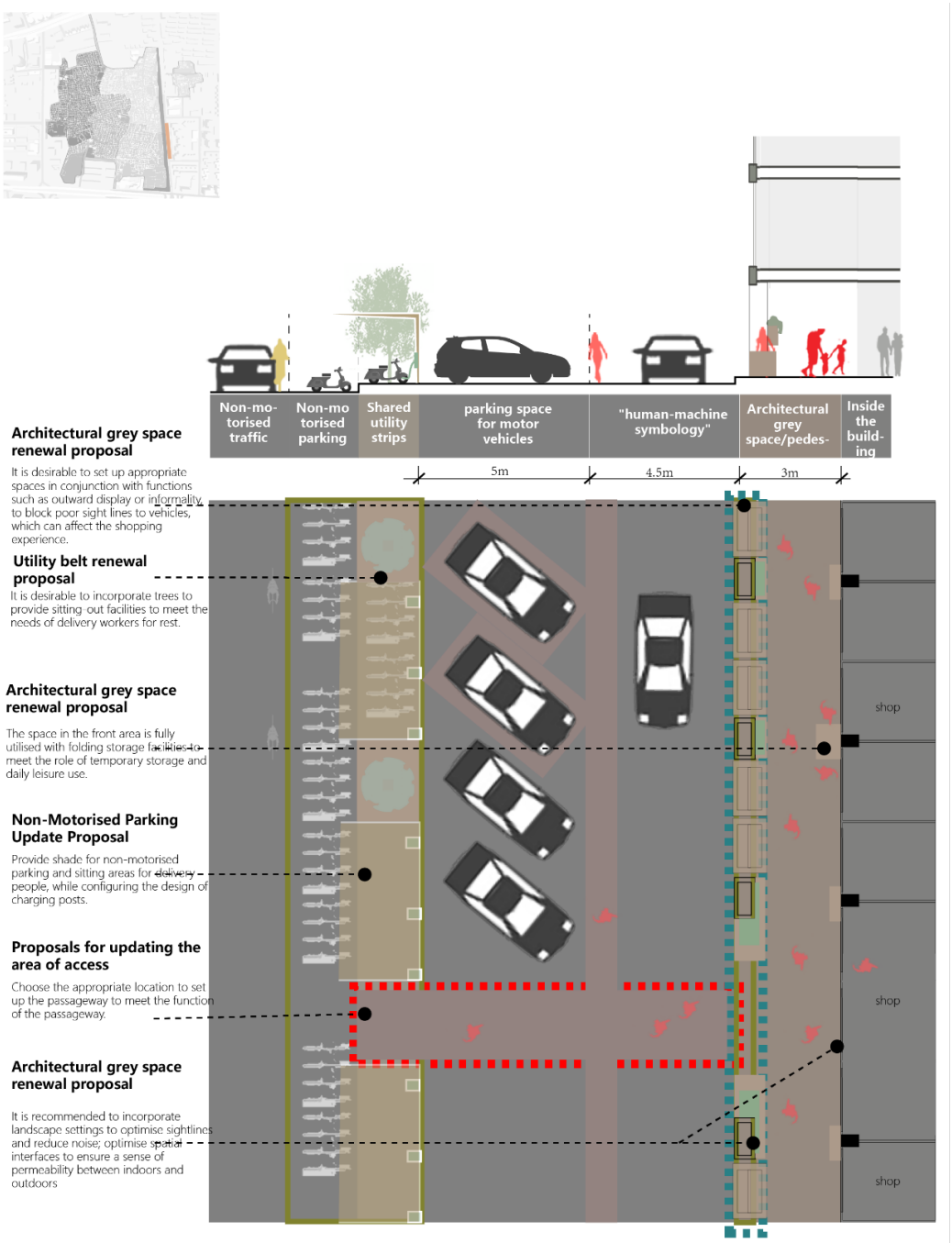


Figure 4–14 Shared city streets-space type 2 - design guidelines
(Source: author's own drawing)

In the updated design of the street section, the first focus should be on optimizing the pedestrian and vehicular flow lanes, providing safe passage for pedestrians, and ensuring the separation of people and vehicles to improve safety. Secondly, to optimize the quality of commercial space, it is recommended to improve the quality of architectural gray space, so that it can be combined with external display or informal functions, and the space should be reasonably allocated to avoid the impact of bad factors on the shopping experience. At the same time, it can be combined with landscape design to optimize sightliness and reduce noise distractions, improve the spatial interface, and ensure the sense of transparency between the interior and exterior of the front area of the building (Figure 4–14).

Finally, considering the needs of the crowd in their leisure time, such as the rest function of the merchant in the front area, folding storage facilities can be used to meet the needs of temporary storage and daily rest. These facilities provide a convenient experience without taking up too much space, allowing for versatility and efficient use of space. Through these renewal measures, the spatial quality of the street section can be comprehensively improved, pedestrian safety can be improved, and the commercial environment can be optimized, so as to promote the harmonious development of the overall space.

4.3.1.2 Detailed Design Reference

According to the street type guidelines and the actual spatial layout, the common urban street sections of Shipai East Road and West Road at the boundary of Shipai Village were tested, and detailed design reference suggestions were put forward. It is preliminarily found that there are 4 conflict nodes, 2 conflict areas and 2 negative interfaces that need to be optimized in the Shipai East Road section, while there is a conflict area, node and a relatively negative interface in the Shipai West Road section.

In the northern section of the west side of Shipai East Road, the space in front of the building is relatively cramped, lacking greenery and pedestrian safety facilities. It is recommended to fully integrate the public utility belt and non-motorized parking areas to meet the needs of multi-functional use and improve the efficiency and safety of street use. The southern section of the east side of Shipai East Road is relatively open, but the interface is relatively monotonous, lacking leisure facilities and the design of the front area of the building. It is advisable to include interactive design or activity spaces to activate the space (Figure 4–15).

In front of the Social Security Bureau in the middle of the east side, the street space is relatively open, and people choose to do this spontaneously. It is suggested to optimize the

design of open space, comprehensively consider the activity needs of the crowd, and enhance interaction. The area in front of the bus stop in the southern section of the west side is relatively narrow, and it is recommended that the bus stop be integrated with other public facilities, such as fitness, rest and social spaces, to enhance the user experience. The spatial interface quality of the garbage station in the south section of the west side is low, which has a great impact on the overall feeling of the street and occupies traffic space, so it is recommended to rearrange or update the design. The interface of the fence at the north and south ends of the west side is relatively simple and lengthy, which lacks interest, so it is recommended to optimize the interface design and set up multi-functional places for rest or activities to enhance the attractiveness of the space.

In the west section of Shipai, the space of the conflict nodes in the north section of the east side is relatively open, but the interface quality is poor, and there is a temporary structure. It is recommended to combine building renewal and place activation design to improve the quality of space. The entrance to the Pan Ancestral Hall in the south section of the east side is spacious, but the interface quality is also poor, so it is recommended to enhance its attractiveness through architectural renewal and site activation design. The quality of the building interface in the north section of the west side is not high, and the front area of the building is temporarily occupied, so it is recommended to integrate the use of the front area of the building and update the overall interface to enhance the overall image of the street (Figure 4–16).

In general, for the shared urban street type, it is recommended to take elastic and integrated design as the leading factor, adopt a modern minimalist style, carefully consider the activity characteristics of the crowd, and provide a comfortable, pleasant and green street environment. Through these optimization measures, the street space of Shipai Village will be more coordinated and livable, and promote the integration and development of urban villages and cities.

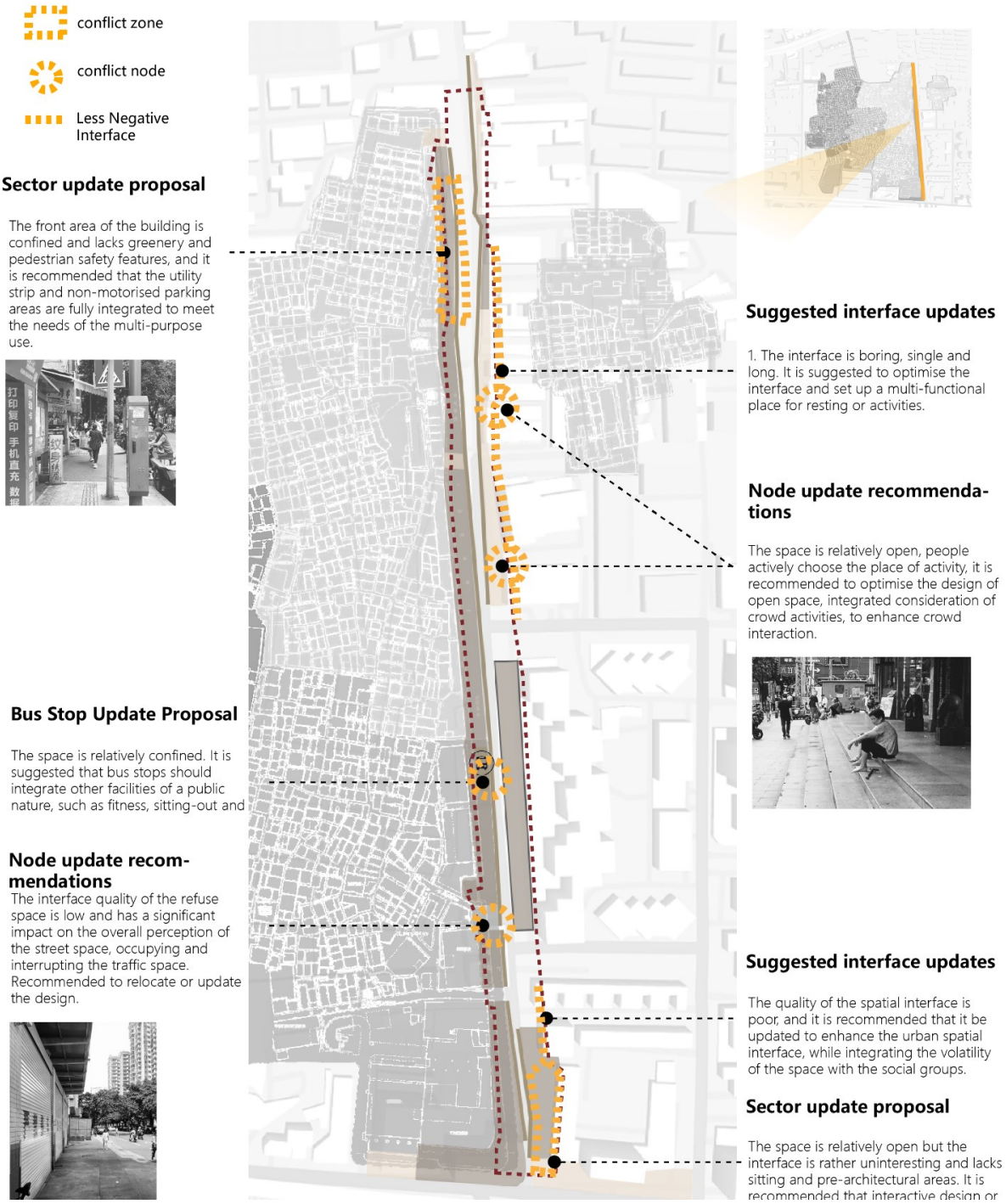


Figure 4–15 Shipai east road - detailed design reference
(Source: author's own drawing)

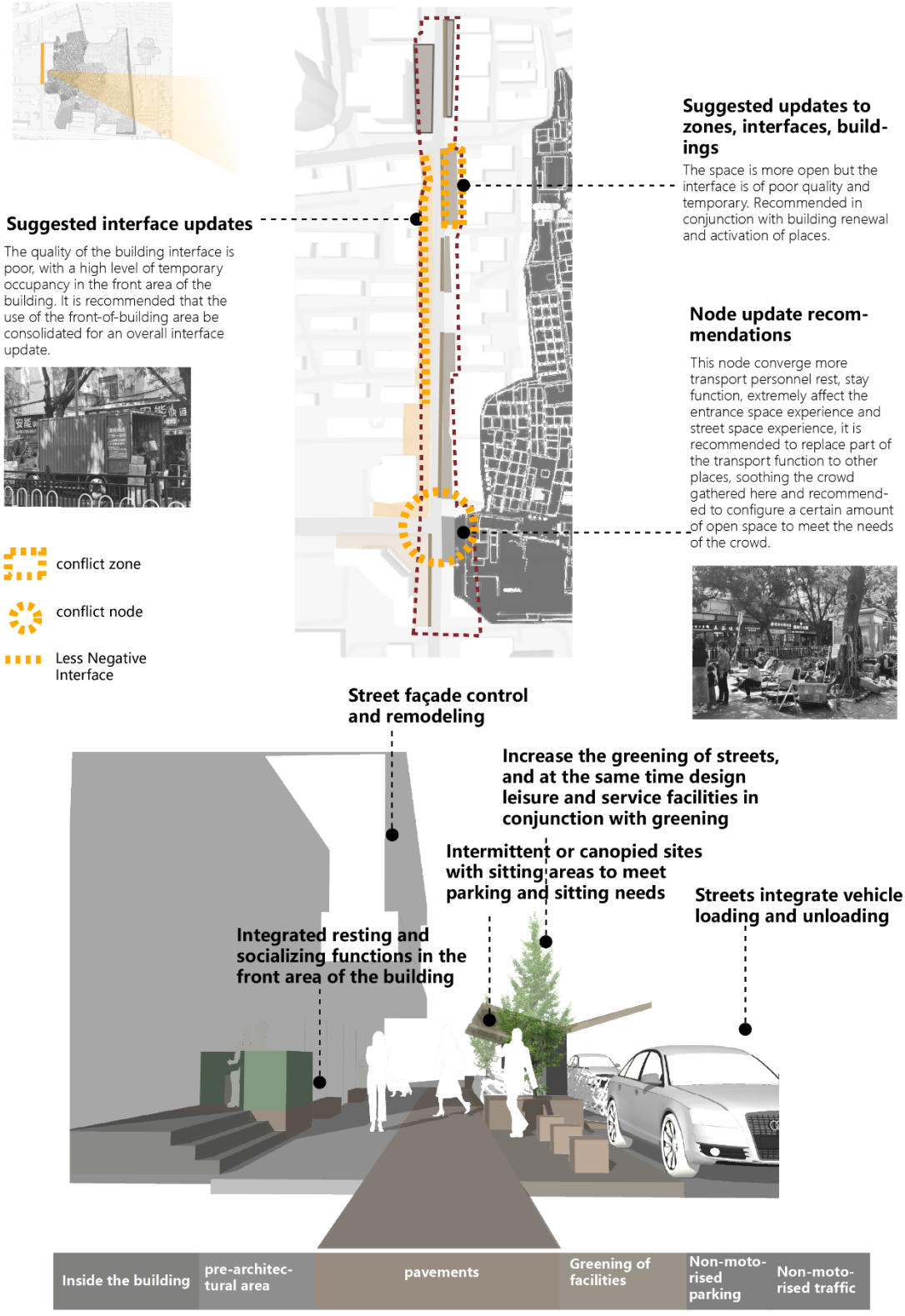


Figure 4–16 Shipai west road - detailed design reference
(Source: author's own drawing)

4.3.2 Roads Within Urban Villages

4.3.2.1 Overall Design Guidelines

（1） Space type 1 - both sides of the fence

For sections of walled roads with a width of about 6 meters, they are usually separated by high, closed walls due to property rights, and the perimeter interface and function are more negative (Figure 4–17).。 According to the analysis of the production dimension, it is recommended to carry out functional and visual transformation of the street section, combined with the informal production function and the renovation suggestions of the Gangding archway node, so as to enhance the overall vitality of the street. First of all, considering that the internal space of the original street is relatively empty, and there is a large demand for parking and a quiet and safe dining environment, it is recommended to adopt a multi-storey design and configure booths with temporary devices to meet the diversified functional needs. The overall layout of the fence and its surroundings should be integrated design, including standardizing the non-motorized vehicle parking area, and the design of multiple first floors can be considered to enhance the agglomeration effect of the space. Service facilities such as tables and chairs, canopies, and comfortable social facilities are set up along the fence to provide shelter and a sense of safety for street users. In order to beautify the fence and improve the environment of the block, it is

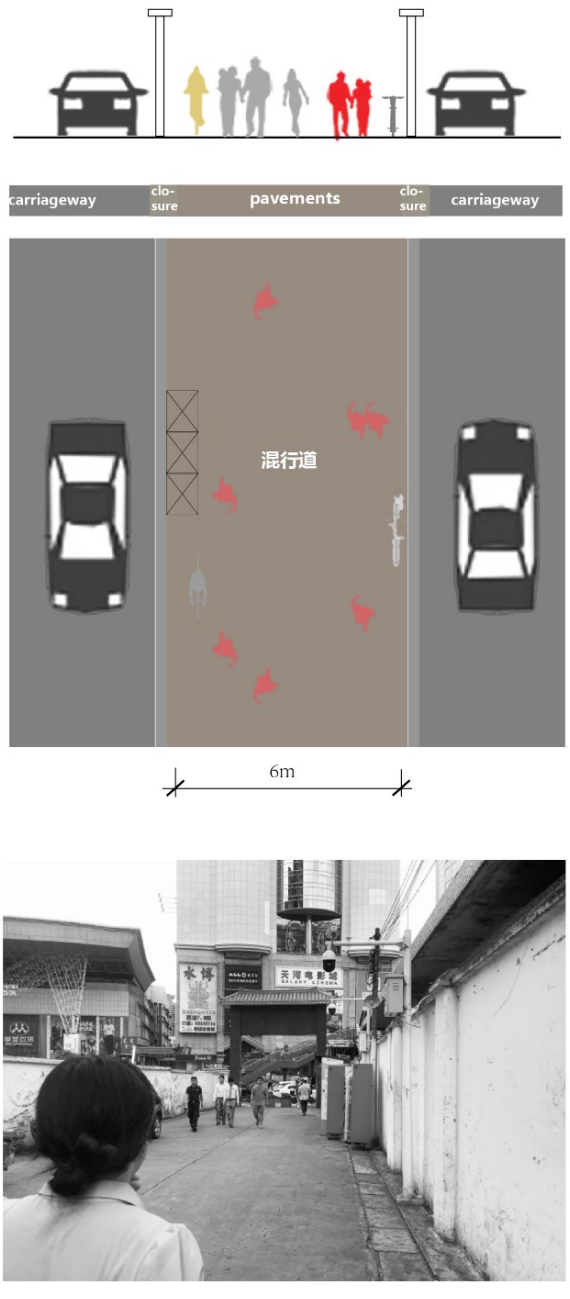


Figure 4–17 Other street-space type 1 - fence on both sides- status quo
(Source: author's own drawing)

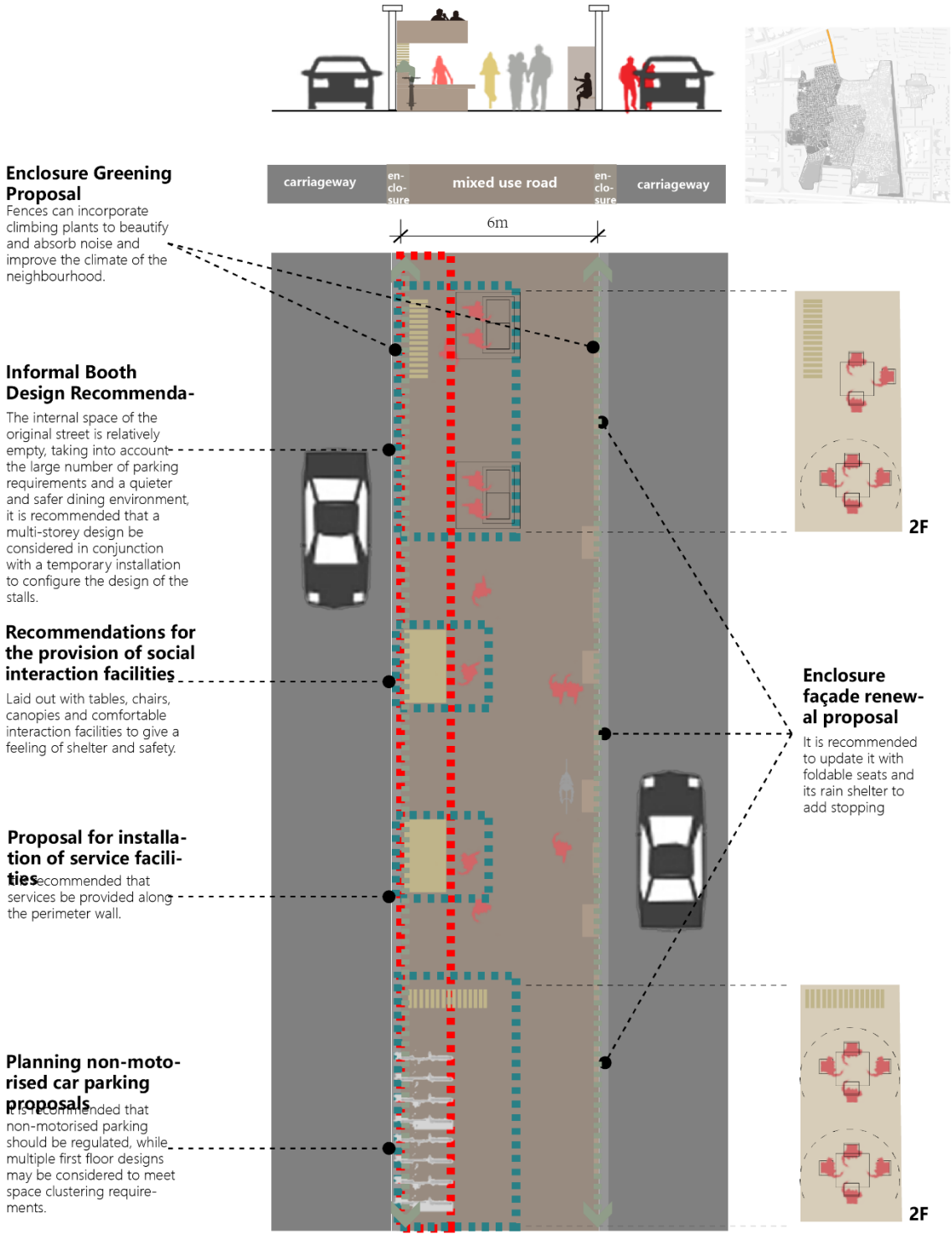


Figure 4–18 Other street-space type 1 - fence on both sides- design guidelines
(Source: Author's own drawing)

recommended to combine climbing plants for vertical greening, which can not only improve the aesthetics, but also absorb noise and improve the microclimate of the block. For the fence adjacent to the pedestrian walkway, it is recommended to configure foldable seats and

rain shelter facilities to increase the number of stops, provide pedestrians with rest space, and enrich the street experience. Through these comprehensive renovation measures, the section of the road on both sides of the fence can be transformed from monotonous and closed to a vibrant, attractive, multi-purpose space that fosters social interaction and environmental improvement in the community (Figure 4–18).

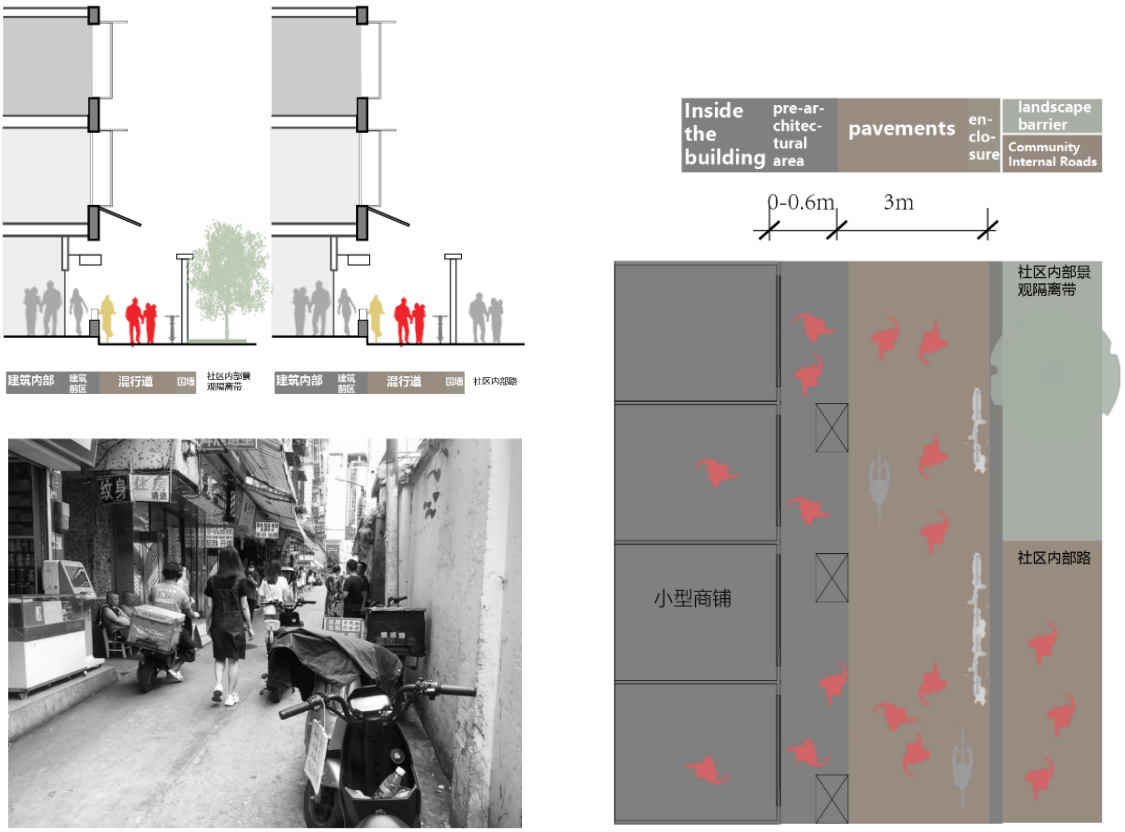


Figure 4–19 Space type 2 - one side of the fence - status quo
(Source: Author's own drawing)

Space type 2 - one side of the fence

The unilateral fence road type is 3 to 3.6 m wide and includes a front building area, a mixed lane and a fence. According to the different functional components on both sides, this type of road can be divided into two types: the landscape isolation zone within the community and the road within the community. In the update of th e fence type, the main problem is the parking of non-motorized vehicles and the optimization of the fence (Figure 4–19).。 Therefore, it is recommended that an integrated design be adopted in the renewal of the fence to combine parking, recreation and social functions. For the landscape isolation zone within the community, it is recommended to adopt a permeable design, so that residents can share and utilize landscape resources, and enhance the openness and interaction of space. Among the road types, it is suggested that the fence can be designed in a more transparent and green form in combination

with the setting of roads and public facilities, so as to further share the green resources of the community and add greenery to the street.

The fence design allows for the setting of rest seats, while slightly widening each side by 0.6 meters, and setting up rain shelter facilities to improve the comfort of use. If conditions permit, the fence can also be transformed into internal and external public living facilities, such as built-in courier boxes, shared bins, etc., to enhance the functionality of the fence. In addition, lamps and lanterns can be added in an integrated manner, monitoring equipment (such as the "Sky Eye" system), and wall greening can be appropriately carried out to create a good and interesting wall image. It is advisable to set up supports and rest seats in the corners near the fence to provide convenient stopping points for pedestrians.

Through these design and renovation measures, the unilateral fence road segment can improve the aesthetics and user experience of the space while maintaining functionality, creating a more comfortable and pleasant environment for community residents and pedestrians (Figure 4–20)

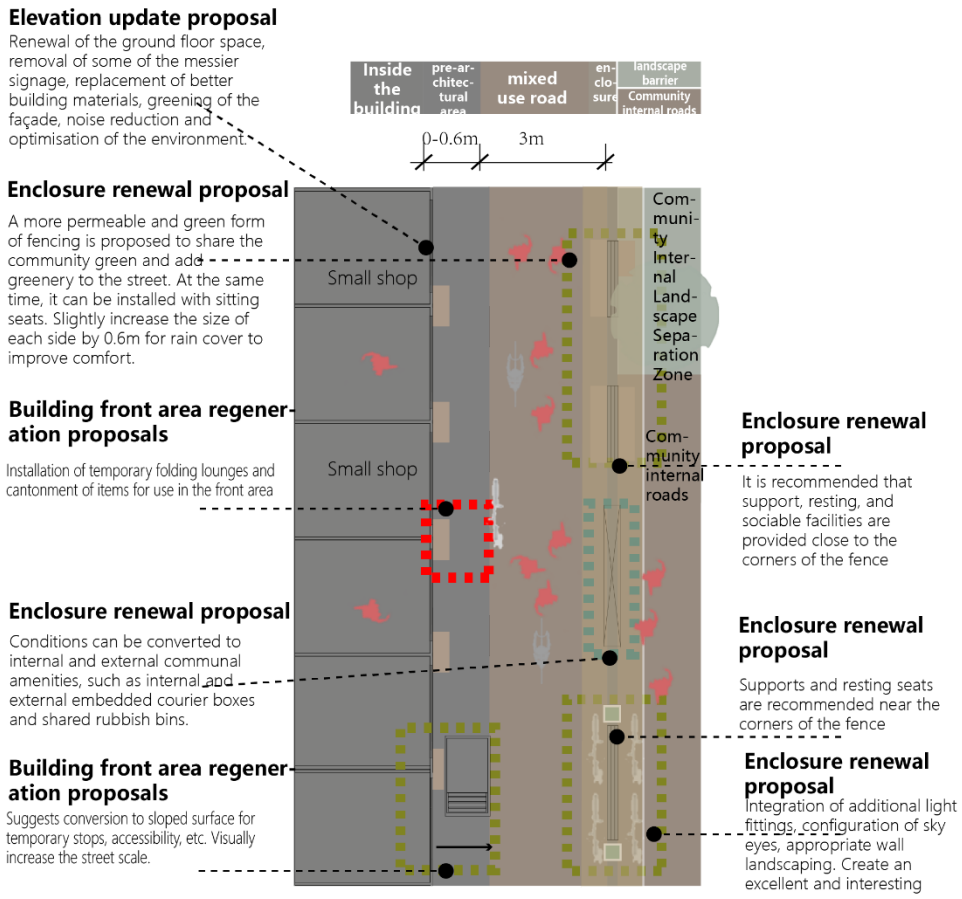


Figure 4–20 Space type 2 - one side of the fence - design guidelines
(Source: author's own drawing)

（2） Space type 3 – no walls on both sides

The main form of the interior of the urban village is the unwalled street on both sides, which is arranged on both sides of the street with commercial and high vitality, consisting of 0.8 to 1 meter of building front area and 3 meters of pedestrian passage, and the street section is close to about 5 meters. Due to the relatively high and narrow space, the long-term lack of sunlight leads to poor living and quality of life. Through the analysis, it was found that the main problem of the type of street space without walls was how to accommodate and organize multifunctional crowd activities in a limited space (Figure 4–21).

The main activities of these streets are mainly commercial, including sales, delivery, waiting, etc., as well as transportation and service functions, and at the same time, it is also necessary to consider the parking, driving and departure of non-motorized vehicles, as well as the rest activities of people. Therefore, the design of the front area of the building needs to comprehensively consider the needs of diverse uses, and be flexible to cope with multi-scenario applications.

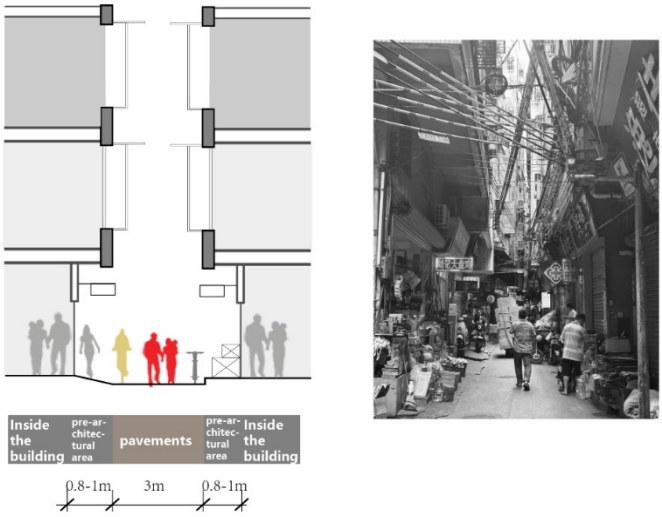


Figure 4–21 Space type 3 – no walls on both sides - status quo
(Source: author's own drawing)

In terms of the renewal of the front area of the building, it is recommended to remove the height difference by paving the ground and unify the design of the slope to meet the temporary parking needs of non-motorized vehicles and trucks, while considering the experience of barrier-free people as much as possible. Temporary outside tables may be allowed, but no encroachment on pedestrian passages is allowed to ensure smooth passage. It is recommended to remove the walls between the existing shops and create a transparent and shared street interface to enhance the openness and interactivity of the street. In order to ensure the hygiene of the block, it is recommended to set up a garbage storage point every 50 meters. The space in the front area of the building should also be fully utilized, with folding storage facilities to meet the needs of temporary storage and daily rest.

In terms of street interface design, the interfaces on the left and right sides should seek common ground while reserving differences in design to enrich the spatial experience of the sidewalk. For the presence of too many "white" areas, special design treatments are required to avoid wasted space and monotony. It is recommended to demolish the illegally erected balconies, improve the ventilation and lighting conditions of the streets, and bring in sunlight and fresh air. At the same time, planting green plants to improve the environment of the block, unified planning, and supplementing walls or street lamps to add brilliance and vitality to the block.

At the road level, the existing road quality is poor, there are many obstacles, which is not conducive to traffic, it is recommended to renovate and lay materials such as red stone and bluestone slabs to improve the aesthetics and practicality of the road. In general, the renovation of the street without walls on both sides is growing, typical and demonstrative, and it is

suggested that the boundary should be used as the initial transformation for observation and improvement, and it is expected to be further promoted and applied to the transformation of

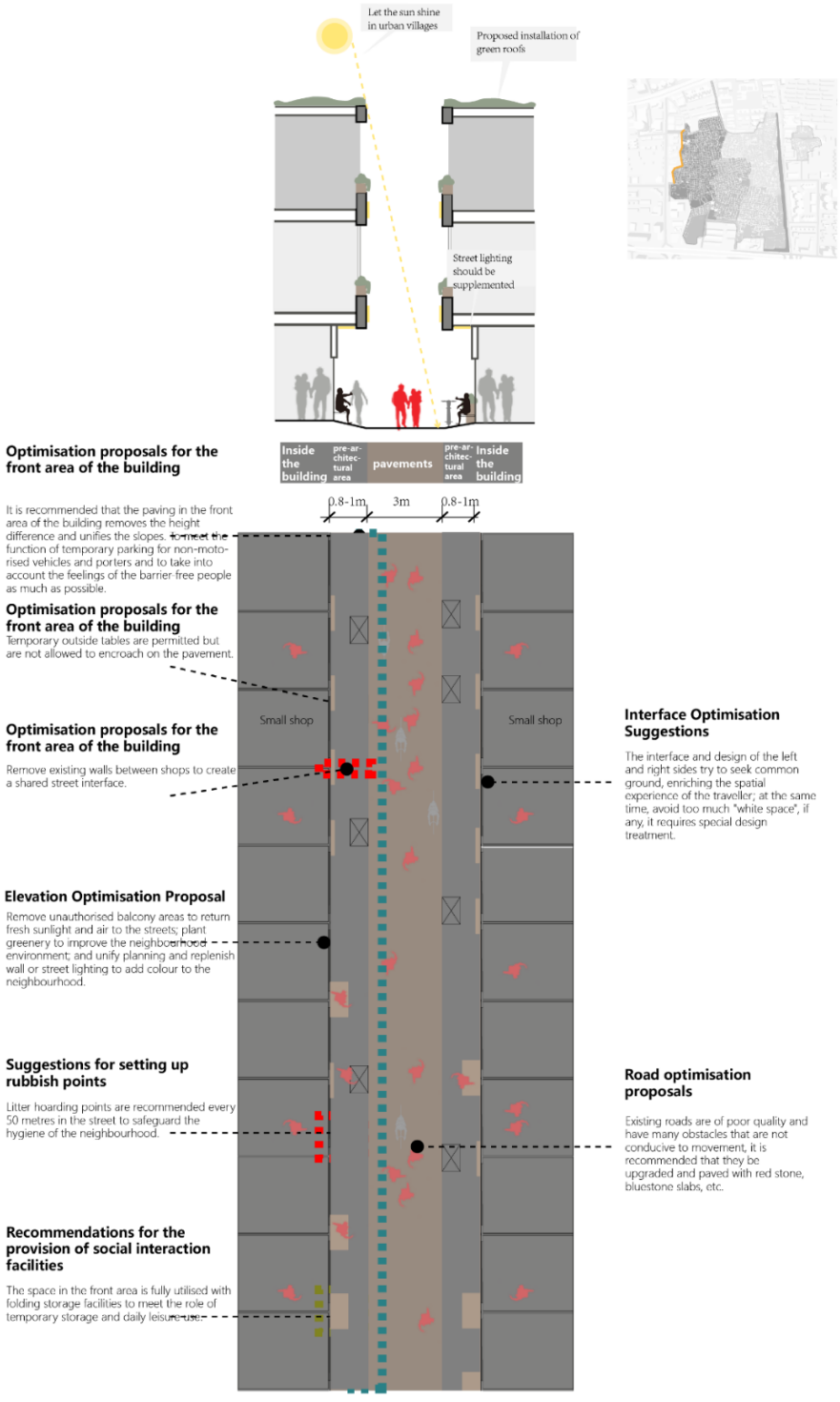


Figure 4–22 Space type 3 – no walls on both sides - design guidelines
(Source: author's own drawing)

roads inside urban village and alleys in urban villages in the later stage. Through these renovation measures, the overall quality of the street space will be significantly improved, and

the living and business environment of residents and businesses will be more pleasant and convenient (Figure 4–22).

（3） Space type 4-Fence in the middle, greenery on the side

This type is composed of a 0.5 to 0.8 meter front area, a 4 meter sidewalk and a 1 meter public facility belt, with a total width of about 10 meters. Depending on whether one side is walled, it can be divided into two categories: "middle greening, one side wall" and "middle greening, no wall" (Figure 4–23).

Through the analysis, it is found that there are some problems in the use of the street section of the "green in the middle, fence on one side", and the update suggestions are as follows: first, public facilities, rest spaces and social places should be arranged between the walls to provide areas for interaction and rest for the disadvantaged groups; It is recommended to adopt a permeable fence design to increase the landscape effect of the street, while improving ventilation conditions and enhancing the comfort of the space. At the junction of the street with the internal entrances of the community or kindergarten, it is recommended to install speed bumps and ensure the quality of the pavement at the entrance and the clear view to improve pedestrian safety (Figure 4–24).

For the public facility belt, it is recommended to configure a canopy in the existing non-motorized parking area to provide shade and shelter from the sun and rain, and create a comfortable rest space in combination with trees and landscaping. The lounge seat can be replaced with a multi-function mode that promotes crowd interaction and meets the activity needs of the elderly and children. In addition, it is recommended to set up garbage collection stations every 100 meters to ensure the cleanliness and hygiene of the streets (Figure 4–25).

For the "middle green, no fence" type, the update guidelines are basically the same as the update suggestions for "one side fence". Since this type of street section is more focused on the

needs of commercial scenarios and the activities derived from them, it is recommended that the front area of the building make full use of the space and set up folding storage facilities to meet the needs of temporary storage and daily rest. At the same time, it is recommended to add greenery to the façade design to improve the overall environmental quality and enhance the visual appeal.

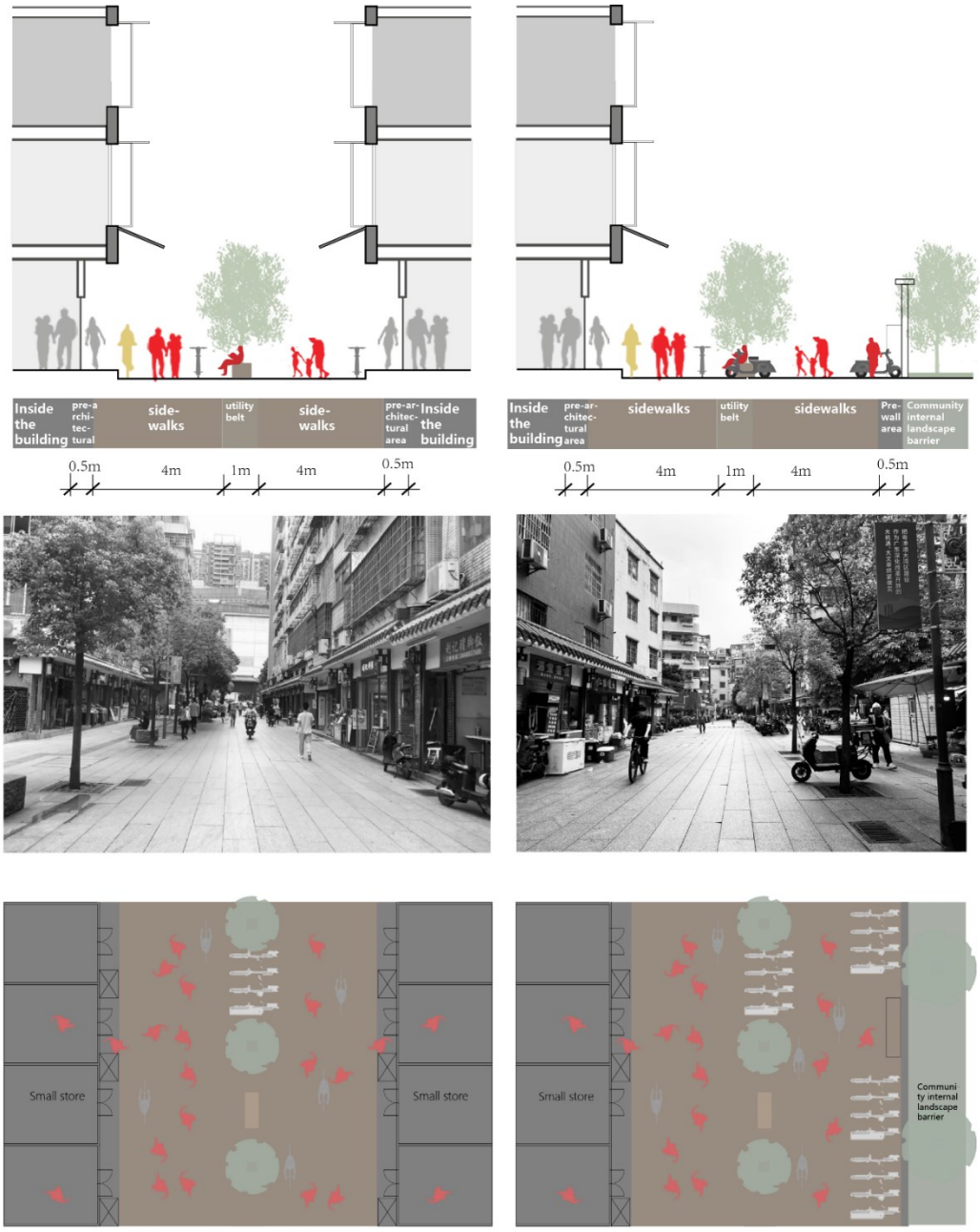


Figure 4–23 Space type 4-fence in the middle, greenery on the side - status quo

(Source: author's own drawing)

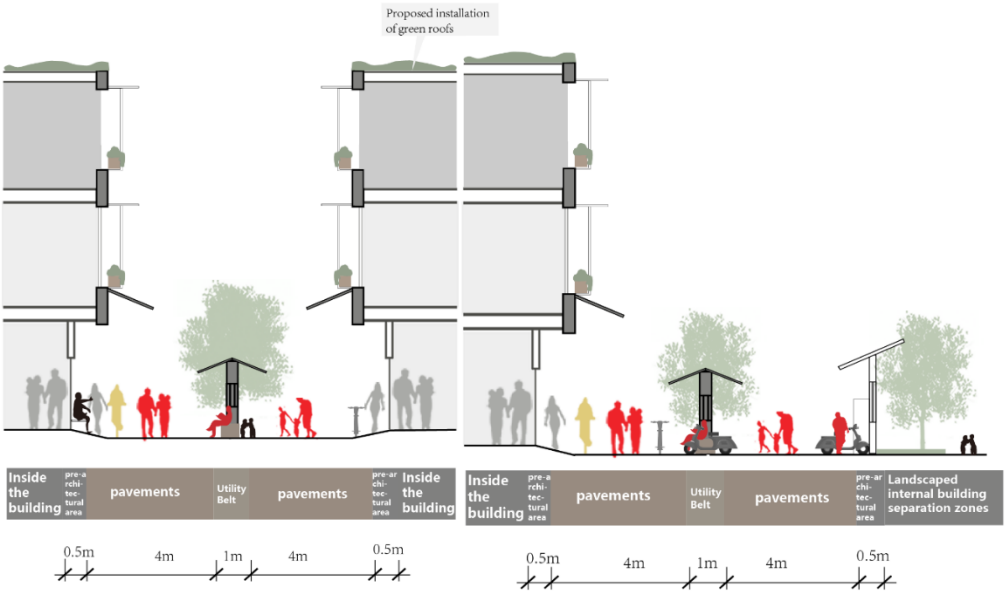


Figure 4–24 Space type 4-fence in the middle, greenery on the side - design guidelines (Source: author's own drawing)

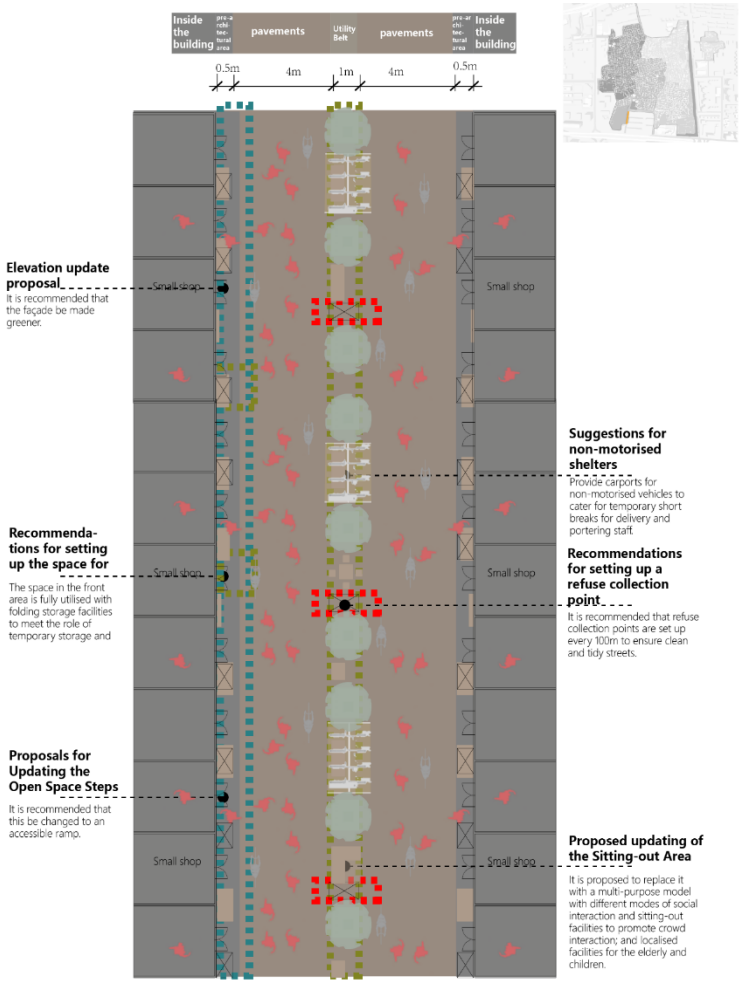


Figure 4–25 Space type 4-fence in the middle, greenery on the side - design guidelines (Source: author's own drawing)

These updates and renovations can enhance the versatility and user experience of these streets, providing a more pleasant living and working environment for residents and businesses, while enhancing the overall image and sustainability of the streets (Figure 4–26).

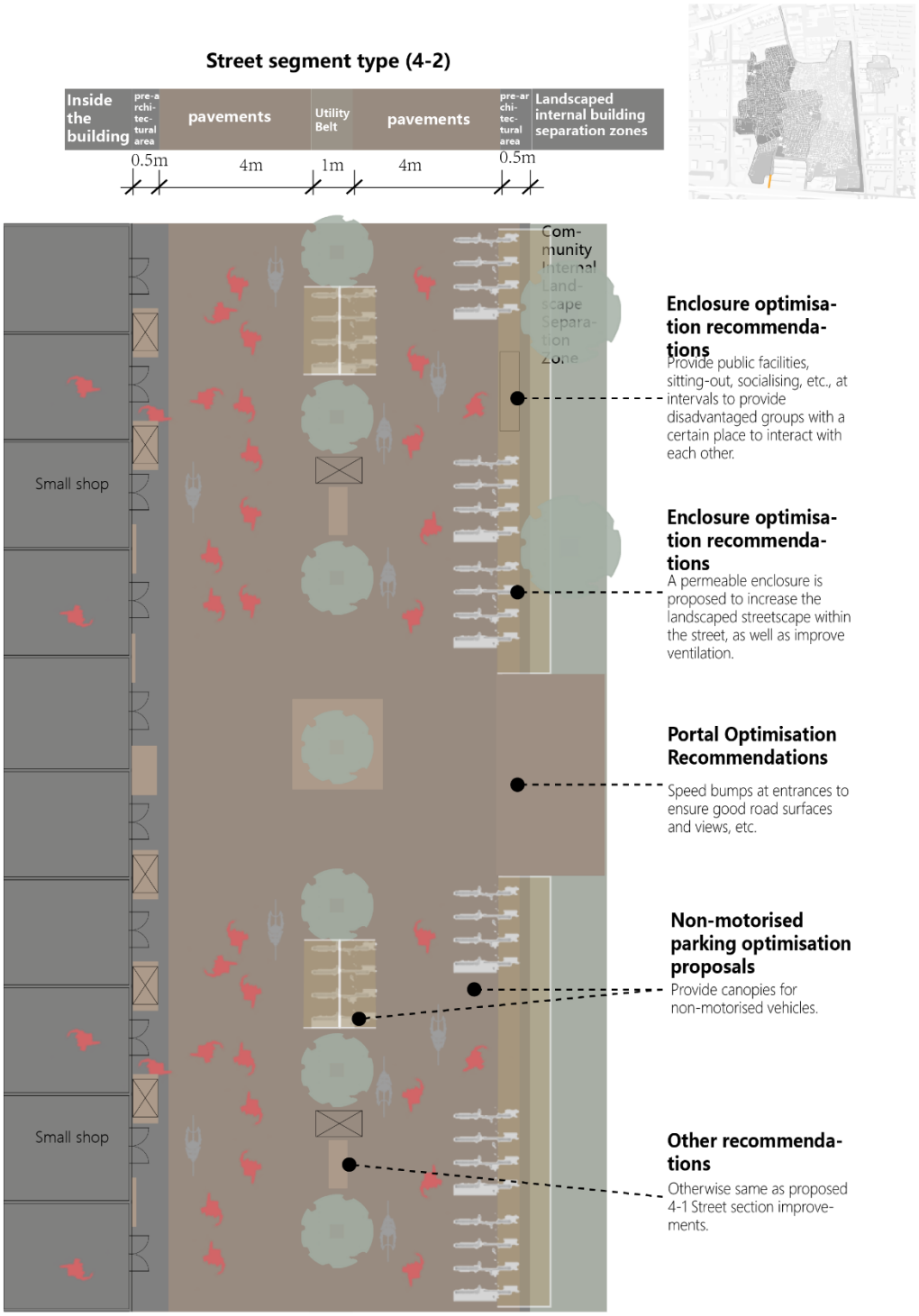


Figure 4–26 Roads inside urban village-space type 4-intermediate greenery (nofence)- design guidelines (Source: author's own drawing)

4.3.2.2 Detailed Design Reference

After selecting Xihe Street, Fengyuan Street, Luhe Street and Haoju Street as the detailed design references for the types of walls on both sides, without walls and on one side, the design guidelines of the types were compared with the real space, and the problems of conflict zones, conflict nodes and negative interfaces were found. Based on these findings, the following updates and retrofit recommendations are proposed:

For West River Street, it is proposed to modify the interface and incorporate integrated parking planning, especially the introduction of flexible design devices in the informal economy, to meet the needs of different commercial and service functions. For the surrounding community merchants adjacent to the fence, it is proposed to increase retail business and open the street interface to enhance the interactivity of the street. At the intersection of Xihe Avenue and Yinglong Street, due to the chaotic traffic at the node, it is recommended to carry out a comprehensive renovation to clear the pedestrian and vehicular flow line, and at the same time improve the chaotic traffic pattern while maintaining the vitality of the node (Figure 4–27).

For Fengyuan Street, the north entrance is relatively hidden, and it is recommended to improve the recognition of the entrance by optimizing visibility, accessibility, and aesthetics. Provision of additional garbage collection points at appropriate locations to keep the streets clean and tidy. Due to the large corners and low visibility in the middle section of the road, it is recommended to optimize this node with additional guidelines and other road designs to ensure the safety and smoothness of traffic (Figure 4–28).

For Luhe Street and Haoju Street, the current boundary is in the form of a physical fence, and it is proposed to add interactive facilities to enhance the possibility of visual communication on both sides of the area. It is recommended to build an interactive fence, for example, the fence extends 0.6 meters to both sides, comprehensively considering the functions of rest, parking, service, greening, communication, recreation, etc., and design flexible architectural sketches to promote social interaction in the areas on both sides of the street. At the southern end of Haoju Street, it is proposed to increase connections to urban roads, open entrances and exits, and configure street greening to improve the environmental quality of the street (Figure 4–29).

In addition, in order to ensure the integrity of the street, it is recommended to design the street furniture in an integrated manner, give priority to flexible furniture, add façade greening and optimize public facilities. For the shop signs, it is recommended to carry out a unified planning and design arrangement, and the style can be optimized with reference to the existing traditional style of Luhe Street, so as to beautify the street and improve the overall quality.

Through these comprehensive design and renovation measures, Xihe Street, Fengyuan Street, Luhe Street and Haoju Street will be able to better play their functions and charms, enhance the livability and interaction of the streets, and promote social interaction and integrated development of the community.

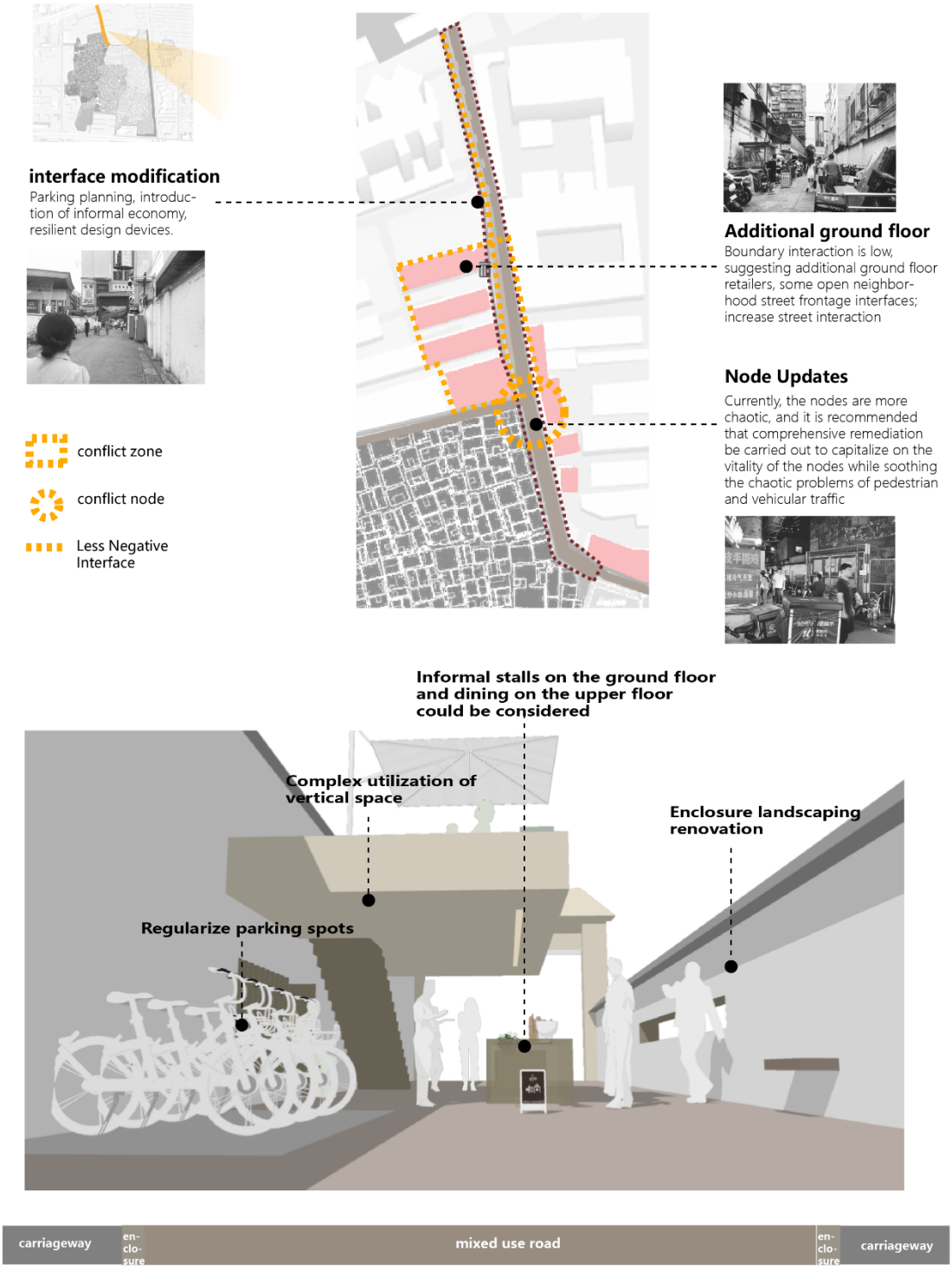


Figure 4–27 West river avenue - detailed design reference
(Source: author's own drawing)

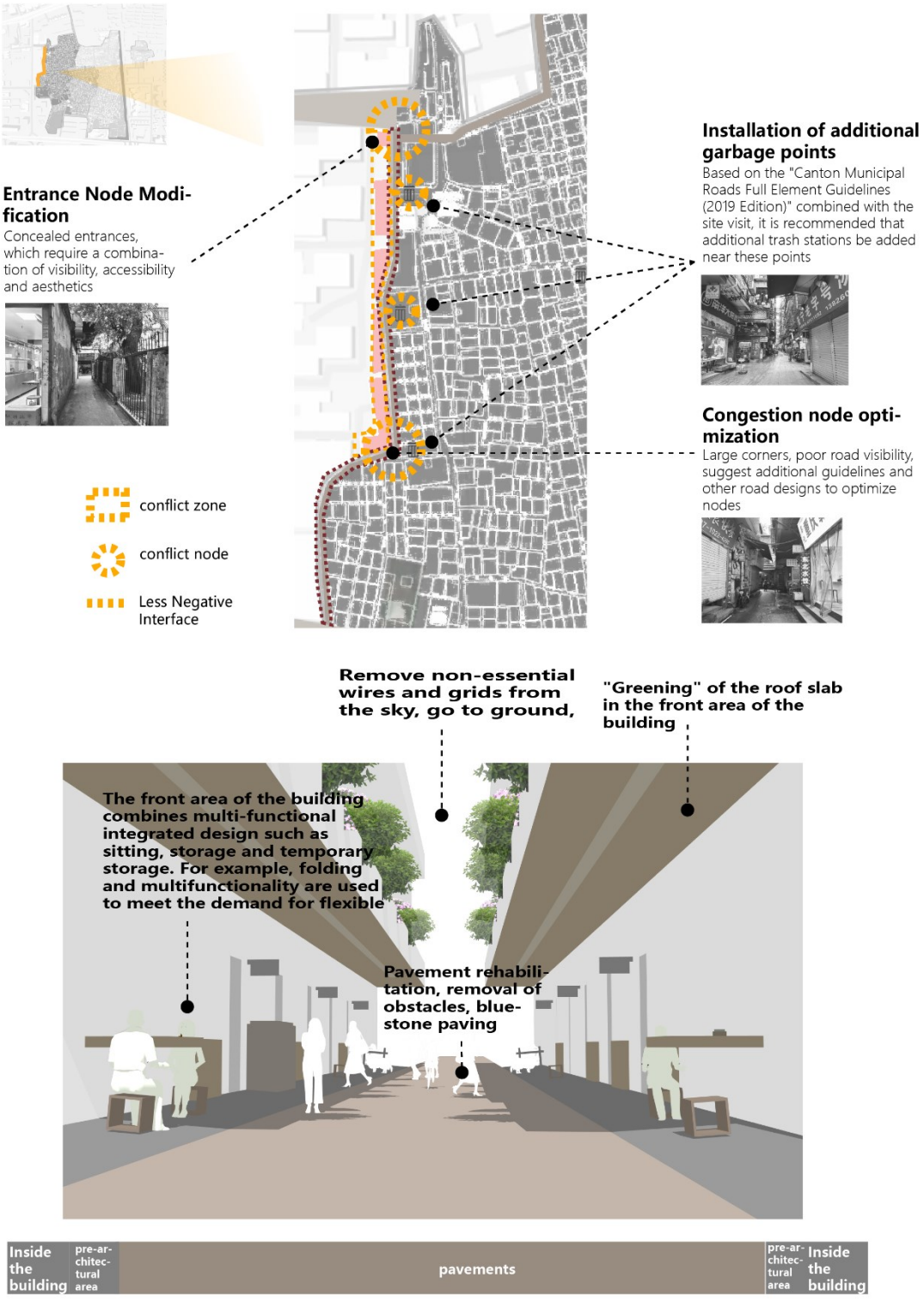


Figure 4–28 Fengyuan street - detailed design reference
(Source: author's own drawing)

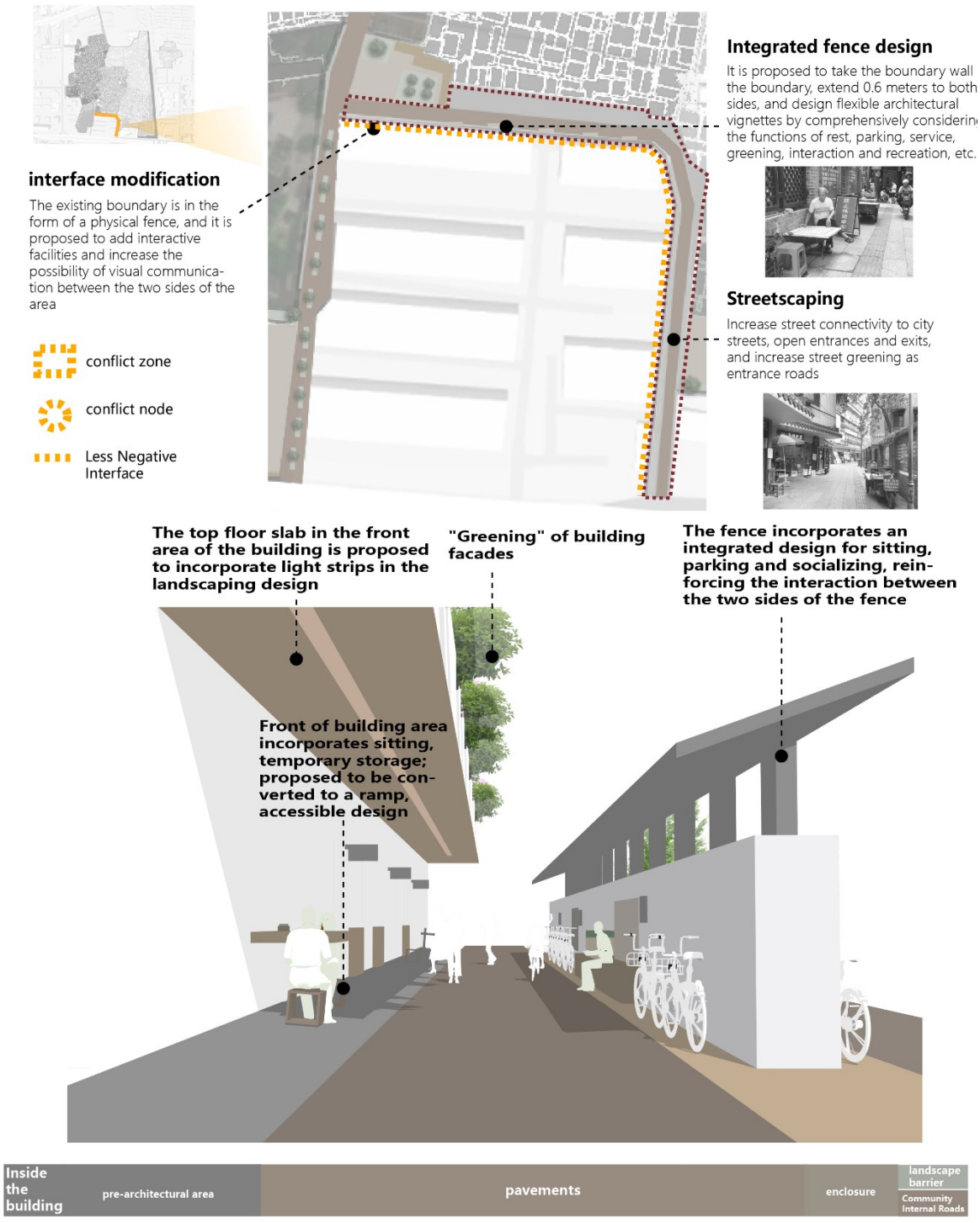


Figure 4–29 Green lotus - haoju street - detailed design reference
(Source: author's own drawing)

4.4 Node Space

4.4.1 General Design Guidelines

The land use of Shipai Village is relatively tight, and the interior is mainly composed of access roads, and there are relatively few public nodes. At present, the main public nodes on the boundary of Shipai Village include the Green Lotus Square on Luhe Street and the square

in front of the Pan Clan Ancestral Hall. These nodal spaces are mainly used for daily activities, and also have the function of displaying and negotiating housing rentals.

For the study of the life of node space, the methods of observation annotation, interview and place self-evaluation are mainly adopted. The design needs to fully consider the individual characteristics and use needs of diverse groups, and pay special attention to the psychological needs of vulnerable groups. According to the user's use time and usage characteristics, the space is optimized to improve the efficiency and comfort of the space. The conclusions of the study will be optimized and improved based on the humane principle of Yangel. In addition, in order to promote communication and interaction between people, in addition to setting up rest functions, we should also consider adding fitness and interaction functions, providing tables and chairs, and creating an environment suitable for conversation. The introduction of these features enhances the diversity of the space and meets the needs of different groups, which in turn enhances the vitality of the place.

In general, as a rare space resource of the village, the node space is the starting point to improve its humanized design. By enhancing the sense of place, enhancing inclusiveness, and creating a vibrant and interactive space for interaction, it is of great significance to promote social integration and community vitality within the village.

4.4.2 Detailed Design Reference

（1） The square in front of the ancestral hall

Panci Square is located in the middle of Shipai West Road, facing the pond, adjacent to the square in front of the ancestral hall, and close to the west entrance of the village, so it has a large flow of people and undertakes multiple functions such as transportation, activities, rest, commerce and sacrifices. At present, the infrastructure of the plaza is scarce, and the relationship between green space and water bodies is relatively isolated from the plaza (Figure 4–30). In view of these problems, the following transformation suggestions are proposed:

First of all, the fence renovation proposal follows the principle of maximizing the openness of the green space or increasing the visual connection between the fence and the green space. The corner plaza area of the fence can be centrally arranged with non-motorized vehicle parking

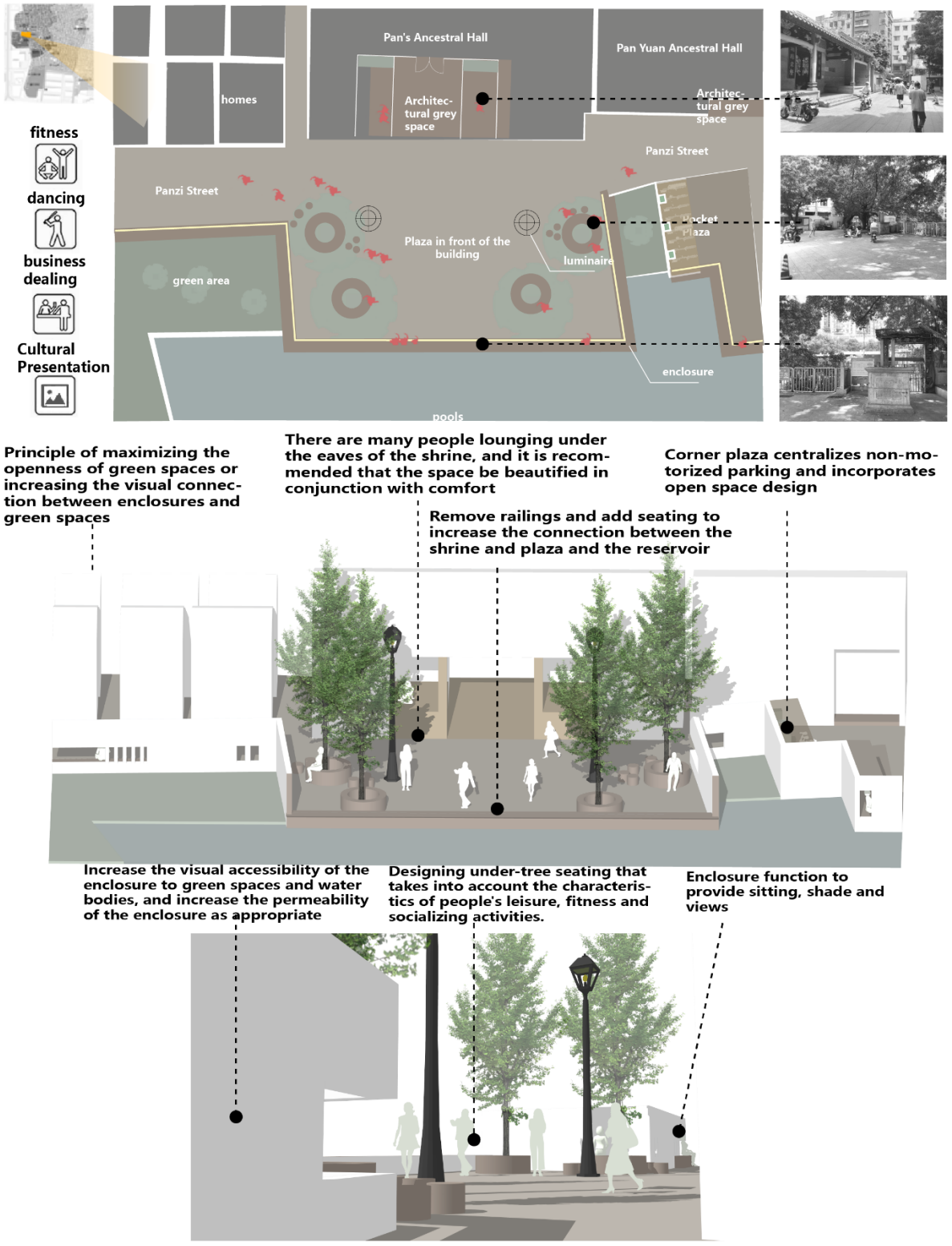


Figure 4–30 The square in front of the Pan Ancestral Hall - detailed design reference
(Source: author's own drawing)

lots, and the open space design is adopted to enhance the use function and accessibility of the square. The fence near the river is proposed to be removed and additional seats to strengthen

the connection between the ancestral hall, the square and the reservoir and create a more harmonious environment.

Secondly, for the gray space in the front area of the ancestral hall building, since this area is an important place for people to rest, it is recommended to increase the communication function and improve the comfort of rest while beautifying. In the design of the rest area under the tree, it is recommended to carry out integrated design and improvement according to the characteristics of people's leisure, fitness and social activities to meet the diversified use needs.

Finally, in terms of sketch design, it is recommended to focus on simple, integrated and elastic seat design to provide flexible and diverse ways of use. The beautification of the enclosure wall is proposed to combine cultural and traditional architectural elements to enhance the cultural atmosphere and aesthetics of the square.

Through these renovation measures, Panci Square will not only be enhanced in terms of functionality, but will also achieve a better balance between aesthetics and humanized design, further enhancing the attractiveness of the square and the cohesion of the village community.

（2） Green Lotus Square

Luhe Square is located in the south of Shipai Village, at the intersection of Luhe Street and Hexi Street, facing the south entrance of Shipai and adjacent to Shipai Primary School in the west. The square accommodates residents' rest, socializing, fitness, children's activities, temporary truck loading and unloading and other multi-functional activities. Although the basic facilities are more functional, there is still room for improvement in the user-friendly design of the details (Figure 4–31).

In order to further optimize the experience of using Green Lotus Plaza, it is recommended to add rest and conversation facilities under the trees to meet the needs of renters for communication and people's daily interactions. For the vacant area, fitness and recreation facilities will be added to enrich the functionality of the plaza without affecting the temporary operation. It is recommended to set up temporary parking sheds in combination with the open space design to facilitate the temporary parking of vehicles and the loading and unloading of goods; The design of the fence can be an integrated solution, combining greenery, open space and interactive design, with the addition of telescopic seating units to provide people with more flexible functions for rest and conversation. The landscape and facility design should fully consider the needs of children, people with disabilities and the elderly, and optimize the design to improve the inclusiveness and accessibility of the square.

Through these improvements, Green Lotus Plaza will be able to better meet the diverse needs of residents, improve the efficiency of public space, enhance the interaction and cohesion of the community, and further create a comfortable, pleasant and vibrant community square.

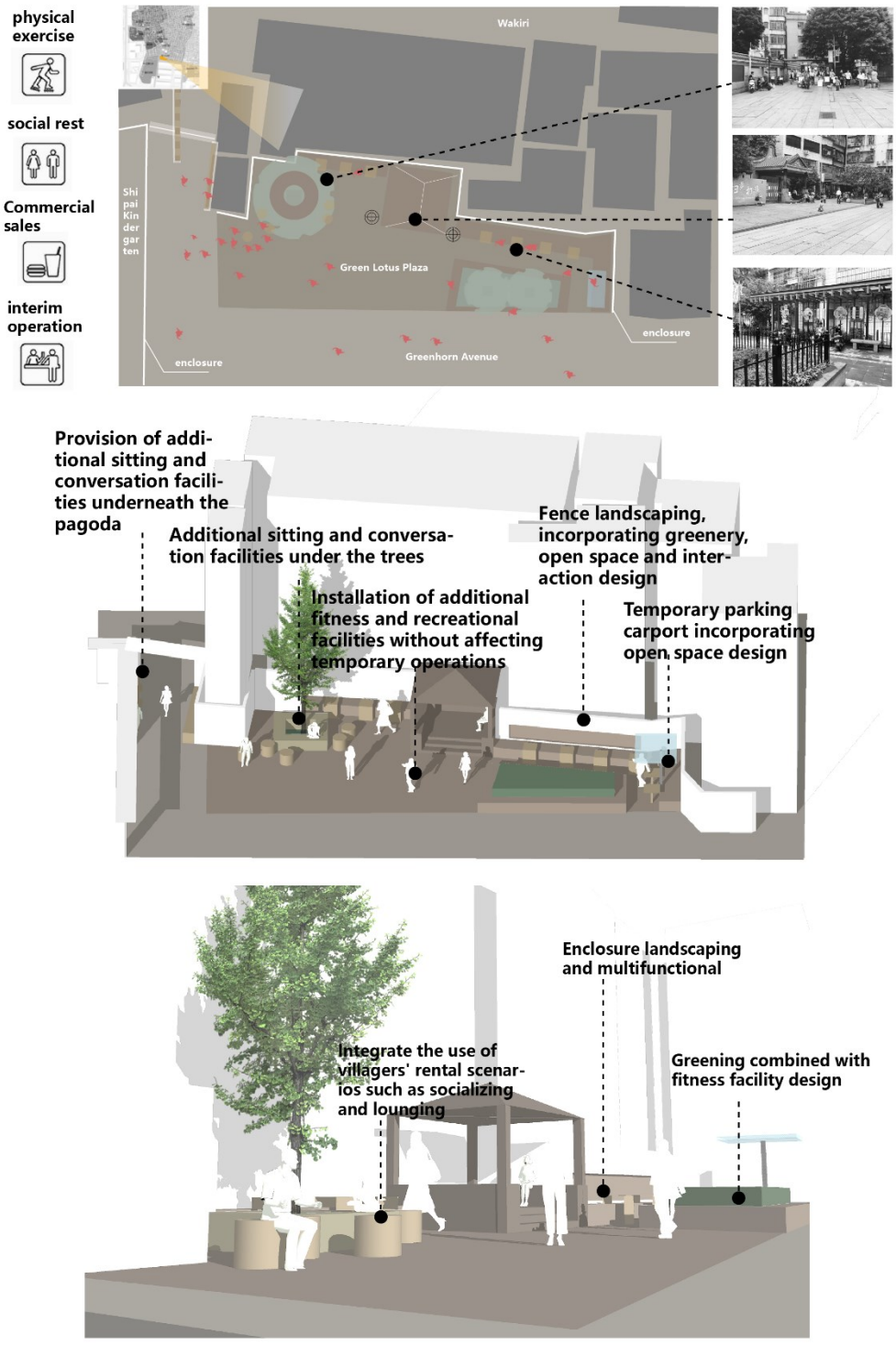


Figure 4–31 Green lotus square - detailed design reference
(Source: author's own drawing)

4.5 Boundary of the Wall

4.5.1 General Design Guidelines

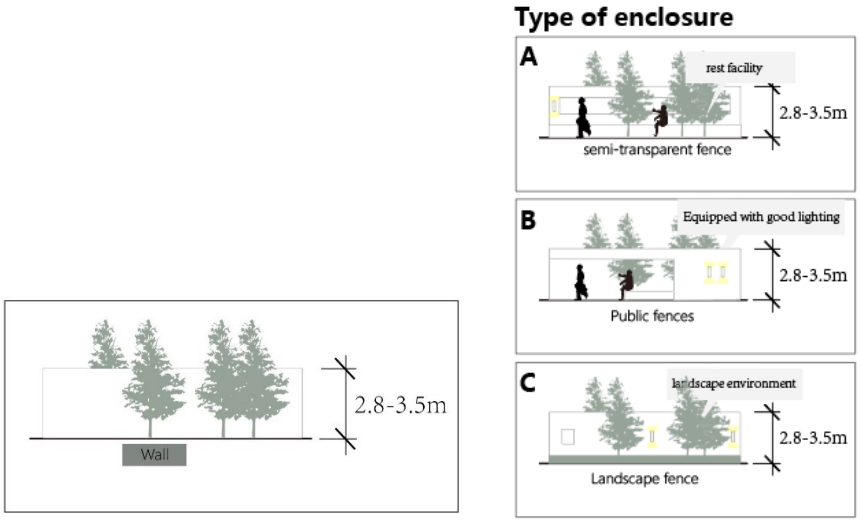


Figure 4–32 Fence type reference
(Source: author's own drawing)

Due to the complex property rights of Shipai Village, the fence has become a direct measure to demarcate different property rights areas and avoid regional interference. However, in the process of promoting the integration of Shipai Village and the city, the role of the wall is relatively negative. At present, there are three main sections of the boundary of Shipai Village, including the section from Pan's Ancestral Hall to Suihua Dental of Jinan University, the section from Chi's Ancestral Hall to Huawei Hotel, and the section from Shipai Street Party Member Service Center in Tianhe District to Jinan Garden. These walls are dominated by physical fences with a height of 2.8 to 3.5 meters, and the perimeter is mainly used for passive functions such as parking non-motorized vehicles and hoarding garbage (Figure 4–32).

The analysis shows that there is potential for further integration of activities around the perimeter of the fence, such as leisure activities in the residential area, fitness facilities, edge greening, and integration with the commercial streets of urban villages. In the process of transformation, the functional properties on both sides of the boundary should be clarified firstly, and the negative or positive relationship of the interface should be judged. If both parties have a more active functional nature, it can be considered to open up the street section appropriately or set up a translucent fence, and share part of the infrastructure to increase the public and interactivity. Conversely, if both sides have negative functions, it is recommended to use a landscape fence design to increase the visibility of the space and improve the visual effect of the poor interface. For example, by introducing elements such as greenery and vertical gardens,

the fence is beautified and a better visual perception of the surrounding environment. In addition, the wall design can also be combined with lighting, art decoration, etc., to further enhance the beauty and security of the space.

Through these renovation measures, the fence can not only be used as a tool to separate the space, but also become an important link to promote the integration of Shipai Village and the city, thereby improving the overall environmental quality and social interaction of the area.

4.5.2 Detailed Design Reference

The optimization of the fence needs to be discussed in detail according to the functional category and the type of crowd activity in light of the actual situation. By combing the distribution of boundaries, the public space can be further integrated and the positive or negative nature of the interface can be defined according to its nature. For areas that can be opened, a public fence design is recommended; For areas with open potential, it is recommended to use translucent interactive walls and set up access entrances and exits at appropriate locations; For the more negative areas, it is recommended to standardize the boundary space and improve the environmental quality through beautification, so as to lay the foundation for the positive transformation of the boundary in the future.

Taking the section from Tiansheng King's Chinese Restaurant to Jinan University Suihua in the southwest of Shipai Village as an example, the updated plan integrates multi-functional spaces such as subway transportation, entertainment, fitness and commerce, and is as open as possible along the boundary to create interaction between the boundaries. Specific measures include the integration of functional areas such as basketball courts, subways, fitness parks, football fields and squares in front of the ancestral hall, the installation of fitness jogging tracks, the introduction of temporary commercial activities, and the renovation of the subway and its underground commercial space to attract pedestrian flow and further activate the boundary space. Through a more open and interactive design, boundaries will no longer be just a tool to separate spaces, but will become an important link that connects and activates different areas, driving the overall development of the community and positive social interaction (Figure 4–33).

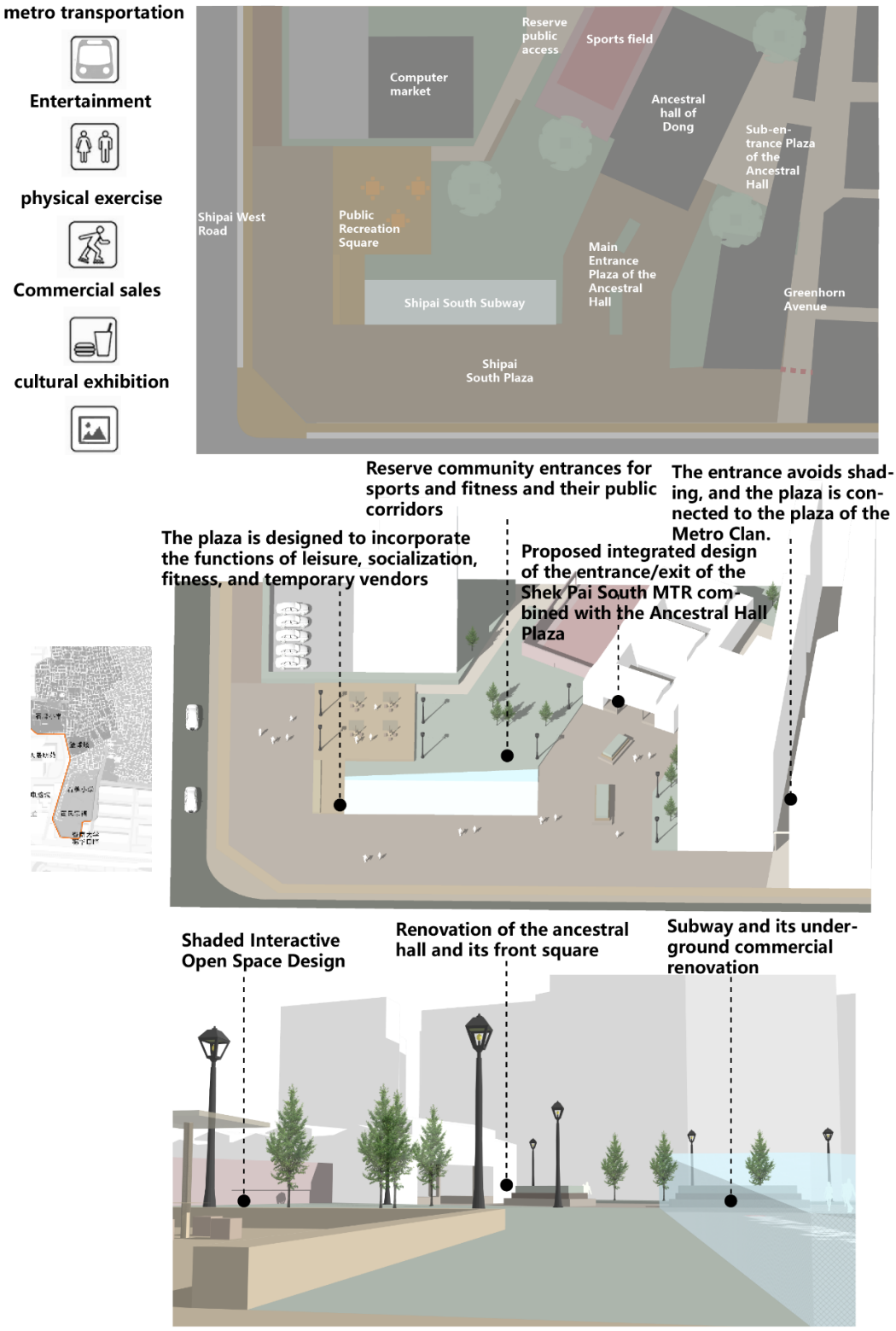


Figure 4–33 Tiansheng King's Chinese Restaurant to Jinan University Wall - detailed design reference
(Source: author's own drawing)

4.6 Elevations

4.6.1 General Design Guidelines

In order to improve the overall environmental quality, it is recommended to carry out unified planning for the shop signboards on the ground floor, control the window opening and façade design of the façade, and formulate unified design guidelines based on cultural characteristics and node characteristics. The overall style is recommended to be elegantly gray, white, dark brown, red and brown as the main colors, and adopt the design form of a sloping roof. The ground floor building proposes to add a canopy to form a continuous rain shelter and provide a sheltered shopping experience for pedestrians. Temporary window railings should be removed and new grilles should be added to block ducts and air-conditioning units to improve the cleanliness of the façade. It is recommended to set up continuous ceiling light strips along the street floor to enhance the lighting effect at night. The roof design can be combined with green elements, and the façade design should also appropriately introduce green elements to increase the ecological sense of the building.

The street façade of Shipai Village is proposed to be divided into two categories for design: the traditional landscape coordinated control area and the modern landscape coordinated control area. For the internal area of Shipai Village, it is recommended to maintain the traditional style, use traditional elements to build a commercial belt along the street, and highlight the cultural characteristics of Shipai Village. For the street side shared with the city along the street, due to the proximity to the city, it is advisable to reflect the cultural characteristics while coordinating the modern landscape. The design can be updated with simple traditional elements to create a modern Shipai Village that is both harmonious and recognizable in a modern urban environment.

Through these design and renovation measures, Shipai Village will be able to enhance its overall architectural style, improve the residential and commercial environment, and better integrate into the surrounding urban environment, while maintaining its unique cultural heritage (Figure 4–34).

Figure 4–34 Renewal of the façade of Shipai Village - General Guidelines
(Source: author's own drawing)

4.6.2 Detailed Design Reference

In the façade renewal plan of Shipai Village, the middle section of the west side of Shipai East Road was selected as the representative section of the modern coordination area, and the green lotus avenue was used as the representative section of the traditional landscape coordination control area. The middle section of the west side of Shipai East Road will adopt a modern and minimalist façade design style, and the façade will maintain clear and concise lines, and the materials can be selected from high-quality glass, metal panels or stone to reflect the sense of modernity and quality. All shop signboards will use a uniform design style, and the use of larger shop signs and glare light boxes will be prohibited to avoid visual pollution and ensure the continuity and harmony of the street façade image. Decorative elements will be kept as simple as possible, highlighting simplicity and fashion, and metal lines or geometric patterns can be used as decorations. In the front area and non-façade of the building, merchants are allowed to display the characteristics of the store, but avoid destroying the overall façade image, and highlight the personality of the store without disrupting the overall harmony by displaying windows or hanging ornaments (Figure 4–35).

Figure 4–35 The middle section of the west side of Shipai east road - detailed design reference
(Source: author's own drawing)

In contrast, Green Lotus Avenue will adopt a traditional architectural language to construct the façade, encouraging the use of traditional materials such as gray brick, wood, stone, etc., to maintain a sense of history and cultural atmosphere. The signage of the shops on the ground floor will be uniformly planned, using traditional style signage, such as wooden plaques and carved text, to ensure that the size and color of the signage are in harmony with the overall style. Green elements will be appropriately introduced into the façade design, and flower beds or plant stands will be set up at the entrance of each shop to encourage the planting of greenery in the shops, and the construction of roof gardens will be encouraged to optimize the living environment and overall quality through the coverage of green plants. The design of the entire façade will pay attention to details, retain the delicacy and charm of traditional buildings, and combine modern construction techniques and materials to ensure the harmony and unity of tradition and modernity. Through these specific design guidelines and intents, the façade renewal of the middle section of the west side of Shipai East Road and Luhe Avenue will effectively enhance the overall image of Shipai Village, showing its unique charm in both modern and traditional styles, enhancing the attractiveness and cultural atmosphere of the community (Figure 4–36).

Figure 4–36 Green Lotus Avenue - detailed design reference
(Source: author's own drawing)

4.7 Street Furniture Design

4.7.1 General Design Guidelines

Street furniture such as benches, lampposts, trash cans, etc., is an important part of public space and directly affects people's daily lives. Not only do these pieces of furniture provide convenience and comfort, but they also promote social interaction, enhancing the functionality

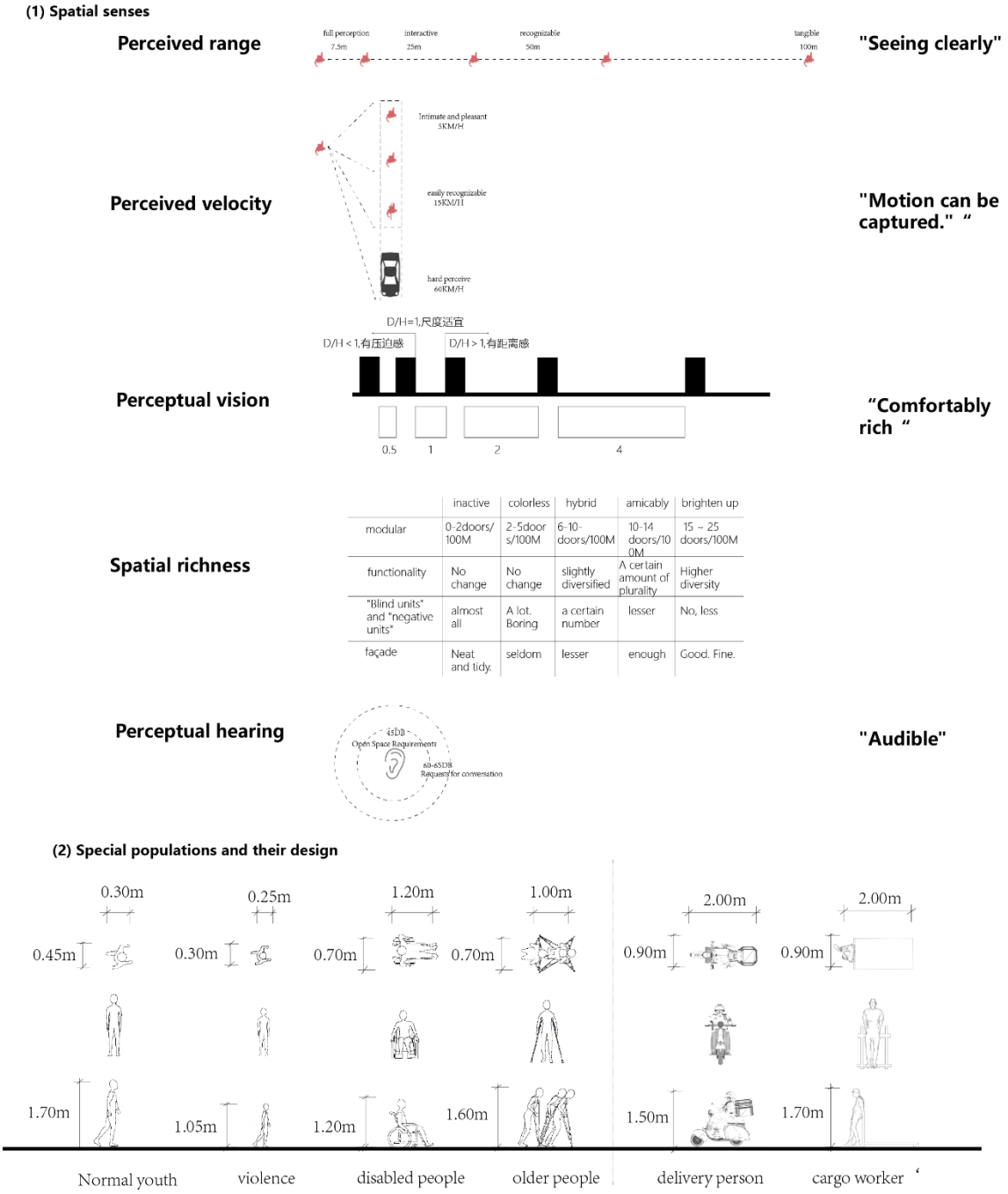


Figure 4–37 Street furniture - design scale reference
(Source: Author's own drawing)

and aesthetics of the space, and making the street a more livable community environment. These furnishings meet the basic needs of living while enhancing the vitality and attractiveness of urban spaces.

In Shipai Village, due to the cramped space and the diversity of users, it is advisable to adopt integrated furniture design, with humanization as the core principle, and the design research should be supported and referenced by relevant research conclusions. In terms of design scale, factors such as visual perception, travel speed, environmental richness, and hearing should be comprehensively considered, and refined design should be carried out in combination with the human scale. Specific aspects of the design should be considered to ensure that the design is realistically relevant, targeted to a specific demographic, can be easily identified and captured, and provides a rich sensory experience while maintaining comfort (Figure 4–37).

Through these design principles, the street furniture in Shipai Village not only meets the diverse needs of residents, but also enhances the overall experience of the public space, making it a vibrant, livable and attractive community environment.

4.7.2 Detailed Design Reference

Taking the integrated design of parking sheds as an example, it is necessary to fully consider the actual needs of the users of the parking sheds, such as their daily activities and stay time, when designing for the two types of shared urban streets and inner streets in urban villages (Figure 4–38).。 In the type of shared urban streets, the design of parking sheds should pay attention to the setting of functions such as rest, shading and charging piles, and at the same time combine urban beautification for greening configuration to improve the overall environmental quality. In addition, it is recommended to introduce a smart system for unified operation and management to realize the efficient use and management of parking sheds. In terms of façade style, it is advisable to adopt a relatively simple modern style for shared city streets to maintain harmony and beauty with the surrounding environment.

For the internal street type of the urban village, the design of the parking shed should be consistent with the façade style. Since the interior of urban villages is mostly combined with the wall, the design should consider the use needs of both sides of the wall, and pay attention to the comprehensive design of interactivity and sharing. For example, the design of the carport can incorporate features such as shared seating areas, interactive facilities or information displays on both sides of the fence to enhance the efficiency of the use of the space and the interaction between residents. At the same time, the appearance of the parking shed should be

in harmony with the overall appearance of the urban village, which not only meets the functional needs, but also integrates into the overall environment of the community.

Through these design measures, the carport can not only provide basic parking functions, but also become an important public amenity in the street and community environment, improving people's quality of life and enhancing the vitality and aesthetics of the community.

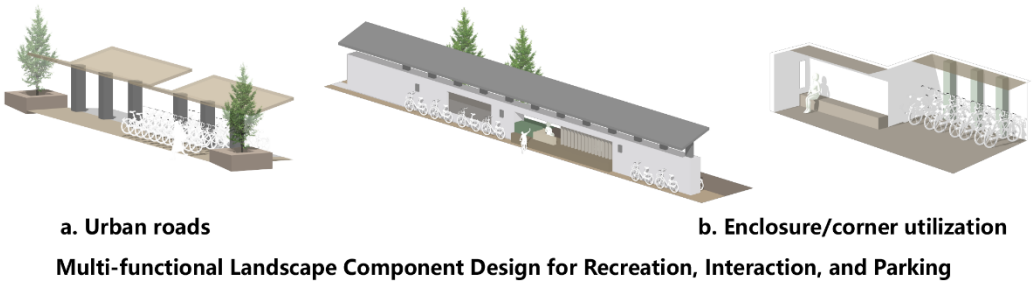


Figure 4–38 Parking shed - updated schematic
(Source: author's own drawing)

4.8 Chapter Summary

Based on the four-dimensional analysis of the boundary from the perspective of "society-space", this chapter analyzes the types of Shipai Village, puts forward general guidelines, supplements them with the specific conditions of real space, and puts forward detailed design references for representative street sections. Based on the design concept of "cohabitation ground", this chapter is committed to building a harmonious coexistence and active integration site at the boundary between the city and the urban village, and promoting social integration and interaction by improving the habitat of people. Specifically, from the aspects of overall layout, street type, node space, fence boundary, façade style, street furniture, etc., the "social-space" optimization suggestions are put forward, aiming to improve the functionality and aesthetics of the border area and promote the coordinated development of the city and urban villages.

Summarize the Implications

Summary and Conclusions

As the intersection of the city and the village, the boundary of the urban village is compl As the intersection of the city and the village, the boundary of the urban village is completely different from the top-down urban street. This unique form is the comprehensive result of multiple factors in the process of social development, such as land acquisition game and market profit-seeking. Optimizing the boundaries of urban villages will not only help improve the quality of life of residents, but also promote social integration and spatial coordination between urban villages and cities, and ultimately achieve sustainable development of urban and rural areas. This paper takes Shipai Village, the largest typical urban village in Guangzhou, as the research object, and subdivides the study of social space into four dimensions: production, psychology, life and culture. A variety of research methods, such as literature summary, cognitive map, social activity analysis and place self-evaluation, were used to comprehensively analyze the social space of Shipai Village. Through these methods, this paper deeply explores the characteristics of the boundaries of Shipai Village in terms of production, psychology, life and culture, and compares and analyzes these characteristics of social space with the actual material space, revealing the fractures and deficiencies in social space. Ultimately, these research results will provide guidance and reference for urban renewal design, help better integrate urban villages and surrounding urban spaces in the process of urbanization, and promote the overall development and progress of the region.

(1) Production dimension: The production mode at the boundary of Shipai Village is diverse, but the social interaction mode under different production states is different, which has different effects on the boundary. Among them, commerce, medical care, education, etc. adopt two-way connections, and the functions are actively open to the street. Logistics, administration, residence, service and other one-way connections, resource flow is relatively one-way, one-way is divided into two ways: delivery and domestic transportation. The former may occupy the lane and cause some pressure on traffic; The latter is produced inward, with less vitality in the adjacent street area. Through functional adjustment, derivative functions or the intervention of public facilities, based on the economy, the border life should be reasonably organized, the synergistic benefits of border production should be improved, and the dynamic exchanges of the border should be promoted.

(2) Psychological dimension: The cognitive map of Shipai Village presents the characteristics of "multi-center, wide-boundary, cognitive center and traditional center

differentiation". A total of 39 locations were involved in the survey of the cognitive map, which made full use of the intention area to plan the locations with high, medium and low different degrees of intimacy, and activated the site boundary at multiple points in a targeted and multi-point manner, strengthened the spatial intention cognition, and enhanced the sense of place in Shipai Village.

(3) Life dimension: Through UML activity diagram analysis, compare with the real space, and analyze the behavior space that does not meet the daily use of crowd activities. In the living space of Shipai Village, there is a lack of consideration for the operation site, parking and temporary use space for rest and activities, so it should be reinforced and strengthened in a targeted design to increase the flexible design. At the same time, the humanized design of the place; It does not meet the needs of the use scenario; Care for vulnerable groups needs to be considered in conjunction with specific spaces and scenarios.

(4) Cultural dimension: Although villages have a deep cultural foundation, in recent years, there is a lack of in-depth consideration of issues such as the design organization of regional culture, the protection of traditional culture, and the low participation of cultural customs. Understand the cultural mechanism behind the development of villages through diachronic evolution; This paper investigates the current traditional culture and regional culture, and suggests activating cultural points, organizing cultural lines, constructing cultural domains, and creating an image and spatial feeling of urban villages with cultural heritage, inclusiveness, openness, and characteristics.

From the dimensions of production, psychology, life and culture of the social space at the boundary of urban villages, it is necessary to promote the coordination between the physical space and society at the border, meet the comprehensive needs of diverse people, multiple activities, humanization and cultural identity, and activate the boundary between urban villages and cities to promote the integration and symbiosis of urban and rural areas.

Limitations and Prospects

This paper adopts the UML activity analysis methodology in System Interaction Studies and combines it with behavioural spatial analysis, focusing on life scenarios dominated by necessity-based activities in boundary life, to provide an in-depth understanding of the daily activity patterns of residents in specific spaces. In addition, in conjunction with the place self-assessment form, the paper further explores the scene availability and humanised design considerations of the place, assessing the effectiveness of the spatial design in meeting the needs of the residents. Overall, this paper adds a means of quantitatively analysing behavioural

associations in social spaces to the traditional observational note-taking and questionnaire methods, helping to identify and trace the root causes of needs for targeted spatial rehabilitation. At the same time, we analyse the humanistic needs of different groups of people in the space by comprehensively evaluating the availability of places, and then pinpoint the location of the ‘socio-spatial’ rupture and propose corresponding spatial restoration strategies. In the future, it can be applied to urban renewal design by combining system dynamics and related software, such as IBM Rational Rhapsody, to achieve the functions of behavioural spatial modelling, continuous updating, scenario comparison, demand tracing and dynamic simulation.

Nevertheless, the analysis in this paper focuses on typical activities, and while this approach effectively reveals universal behavioural patterns, there is room for further expansion in considering individual variability. As residents' behaviours and needs vary according to a variety of factors such as personal background, social status, and lifestyle, future research could consider these individual differences more comprehensively to enhance the applicability and accuracy of the study. In addition, although the methods of observational notations and place self-assessment scales provide in-depth qualitative data, how to enhance their representativeness when dealing with large and diverse populations is still a topic that deserves further exploration.

While the regeneration methods proposed in this paper have practical applications in terms of boundary vitality enhancement and socio-spatial optimisation, future regeneration strategies could focus more on their uniqueness in the specific context of urban villages. The cultural heritage and special social structure of urban villages can be better reflected through more in-depth cultural research and the development of personalised strategies. At the same time, future research can combine big data analysis and more extensive social research to capture a wider range of behavioural patterns and space use preferences, thus providing strong support for more refined spatial design.

Overall, this paper provides new perspectives and methods for socio-spatial optimisation of urban village boundaries, but there is still room for further enhancement and refinement. Future research should build on the existing foundation and develop more innovative and adaptive regeneration strategies to address the specific needs and uniqueness of urban villages, in order to promote the deeper integration of urban villages with the city, and to achieve wider regional sustainable development

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Appendix

Appendix 1 Questionnaire on spatial cognition of society

1. Your age (single choice):

○Under 18 years old ○18~26 years old ○27~45 years old ○46~55 years old ○56 years old or older

Your Occupation (Single Choice):

○ Landlord ○ Commercial staff ○ Administrative office staff ○ Delivery staff ○Logistics staff ○ Service staff ○Students ○Tourists ○Others

2. What do you think the overall feeling here is (multiple choice):

○Lively ○Lively ○Friendly ○Dirty ○Noisy ○Disorderly ○Unsafe ○Others 3Please draw your cognitive map of Shipai Village. Use "〓" for roads, " ★ for centers, "-" boundaries, and "▲" markers.

4. What do you think is a problem with Shipai Village? (Multiple Choice).

○Less landscape ○Less public facilities ○Lack of space for leisure activities ○Lack of commercial space ○Lack of parking space ○Poor living environment ○Unsafe ○Traffic congestion ○Lack of cultural facilities ○Lack of social space ○Unfriendly social groups ○Others

Do you have any special needs or retrofit suggestions? Please write it below.

Appendix 2 A real picture of the current state of the boundary space

Appendix 3 A table of historical events in the development

Time	Social events	Spatial evolution
Ming Dynasty	At the end of the Yuan Dynasty and the beginning of the Ming Dynasty, Miaobiangang Village was built, and later renamed Shipai Village.	The pattern of the village has been basically formed
Qing Dynasty	In the twenty-first year of Daoguang (1841), the representatives of the villagers of Shipai participated in the 103 villagers representative meeting of Sanyuanli, and temporarily joined forces to resist the British invading army.	Anti-imperialism
	In the third year of Xuantong (1911), the Guangzhou-Kowloon Railway was opened to traffic, and a station was set up in Shipai. It is 12 kilometers long from Dashatou Station to Shipai Station.	
Republic of China	In the 4th year of the Republic of China (1915), the embankment in the upper reaches of the Pearl River collapsed, and the flood in Guangzhou caused most of the Shipai area to be flooded, and the water in Xinqing Village was deep to the roof, and all the crops were flooded.	Urbanization begins
	In the 9th year of the Republic of China (1920), Zhicheng School, the predecessor of Shipai Primary School, was opened in the Pan's ancestral hall in Shipai Village.	
	In the 14th year of the Republic of China (1925), the troops of the Guangdong Revolutionary Government were ordered to return from the Dongjiang River to Shipai, and the Yunnan army stationed in Shipai fought fiercely for a day and night, with continuous cannon fire, and finally defeated the Dian army at noon on the 11th. Capture the stone plaque.	Occupation and construction of the government of the Republic of China
	In the 14th year of the Republic of China (1925), the Nationalist Government started construction of the Huangpu Highway in the north of Shipai Village.	
	In the 17th year of the Republic of China (1928), the Aviation Department of the Eighth Road General Headquarters of the National Revolutionary Army selected the open land of Shipai Township on the side of Shouling to prepare for the construction of a new airport, which was later Tianhe Airport.	
	In the 19th year of the Republic of China (1930), a racecourse was built in the big head belt of Shipai many graves.	
	In the 20th year of the Republic of China (1931), the Guangzhou Jockey Club was held.	
	In the 24th year of the Republic of China (1935), the Guangzhou Municipal Meteorological Observatory located in front of Laohugang in Shipai Village was built and began to make meteorological forecasts.	
	In the 27th year of the Republic of China (1938), Japanese planes bombed Tianhe Airport and Shipai Sun Yat-sen University, and Sun Yat-sen University moved to Pengjiang County, Yunnan.	
	In the 28th year of the Republic of China (1939), the Chinese Air Force bombed Tianhe Airport.	
	In the 29th year of the Republic of China (1940), the Shipai area was temporarily under the jurisdiction of Panyu County.	

	In the 35th year of the Republic of China (1946), the Shipai area was returned to the jurisdiction of Guangzhou City.	
	In the 36th year of the Republic of China (1947), the embankments of various villages in the suburbs of Guangzhou collapsed, and the crops of Shipai were seriously flooded.	
	In the 38th year of the Republic of China (1949), the Nanjing Nationalist Government fled south to Guangzhou, and the presidential palace was located in the Shipai Xinjian Municipal No. 3 Middle School. Before the Kuomintang troops withdrew from Guangzhou, they carried out sabotage. The Tianhe airport began to be vandalized; At night, the material warehouses in the Shipai area were bombed one after another, and the sound of explosions continued throughout the night.	
After the statehood	After the liberation of Guangzhou, suburban offices were set up and 12 district people's governments were prepared, among which the Shipai District People's Government was established in Shipai District.	The republican government and the district government were formed
	Chen Geng's unit of the Second Field Army of the Chinese People's Liberation Army opened the Military and Political University in Shipai to recruit the first batch of cadets.	
	With the approval of the Guangzhou Municipal Committee of the Communist Party of China, the Shipai District Committee of the Communist Party of China was established.	
	In 1950, Nanfang University was established and began to enroll students, and the campus was located in the former Military and Political University of Shipai.	construction of universities, middle schools and scientific research institutions; cultural revolution and land reform; industrial placement; The number of public and living facilities in the city has increased
	In May 1950, the suburbs of Guangzhou were reorganized, and 12 districts were merged into 7 districts, and the two districts of Yuanshipai and Xian Liyang were merged into Shipai District.	
	In December 1950, the land reform movement began in Shipai Township, Shipai District.	
	In March 1951, the land reform in Shipai Township ended.	
	In March 1951, the first pumping station of Shipai was completed, and the construction of the Pearl River embankment along Shipaikou was also completed.	
	In 1951, the suburban government of Guangzhou was adjusted from 7 to 4, and Shipai District was merged into Baiyun District.	
	In 1952, six peasant households led by Chi Changchen formed the first peasant mutual aid group in Shipai.	
	In 1952, South China Normal University moved from the city to the former site of Shipai Southern University.	
	In 1953, Guangzhou Post and Telecommunications Hospital was established in Meixingang, Zhongshan Avenue, Shipai.	
	In 1953, the mutual aid group led by Chi Changchen further formed the first primary agricultural production cooperative in Shipai.	
	In 1954, the four suburbs of Guangzhou were merged into three districts, Huangpu, Baiyun and Xin, and Shipai was incorporated into Baiyun District.	
	In 1955, 12 primary agricultural production cooperatives in Shipai Village were merged into 3 senior agricultural production cooperatives.	

	In 1956, the original three suburban districts were merged into one large suburb, and the suburban people's government was established. The stone plaque was assigned to the Wushan Street Office. Shipai Township was established, and 9 agricultural cooperatives including Shipai, Shidong, Xian Village, Liede and Yangji were under its jurisdiction.	
	In 1956, Huangpu Avenue was completed, and the section of Shipai Street was about 2 kilometers.	
	In 1958, the three senior societies of Shipai Village were merged into one brigade, and together with the other 13 brigades, they formed the Shahe People's Commune.	
	In 1958, Guangdong University for Nationalities was established, and the site is located in the Shipai section of Zhongshan Avenue.	
	In 1958, Jinan University was reopened in Shipai.	
	In 1958, a large auditorium with a capacity of 1,000 people was built on Shipai Street.	
	In 1958, the mass movement to make a big fuss about steel, high-yield fields, and "satellites" was launched.	
	In 1959, the masses gathered in the commune canteen to eat.	
	In 1960, the Guangzhou Suburban Committee was abolished, and the Shahe People's Commune was subordinated to the leadership of the Dongshan District Committee.	
	In 1960, a new pumping station was built near Huangpu Avenue in Shipai Village.	
	In 1961, Shahe Commune was divided into three communes: Shipai, Shahe and Longdong. The suburbs were adjusted, and the Shipai Commune was placed under the jurisdiction of Huangpu District.	
	In 1962, a mass fighting broke out between Shipai Village and Xian Village.	
	In 1962, the three communes of Longdong, Shipai and Shahe were reunited: they were restored to Shahe Commune. Shipai was restored to the brigade and belonged to the leadership of Shahe Commune.	
	In 1962, a beautiful Shipai Bridge was built between Shipai Village and Xinqing Village.	
	In 1963, another pumping station was built near Shipai Primary School.	
	In 1964, the "Four Cleansing" campaign was launched in the Shipai area.	
	In 1966, the "Cultural Revolution" began in Shipai, setting off activities among the masses to denounce Deng Tuo, Wu Han, and Liao Mosha's "Three Family Villages".	
	In 1966, the Shipai Brigade began to burn the main cards of the gods and destroy the statues, and renamed the Shipai Brigade as the Dongfeng Brigade.	
	In 1966, the youth and students of Shipai Village organized "Red Guards" one after another to carry out the activity of "breaking the four olds".	
	In 1967, in the struggle of the "rebels" and "seizure of power", the mass organizations in the Shipai area split into two factions, "Dongfeng" and "Red Flag".	
	In 1968, the Shipai area launched "fighting, criticizing, reforming" and "cleaning up the class ranks". Some leaders of Jinan University, South China Normal University and other units. The intellectual boy was tied	

	up, hung black cards, and wore high hats to parade through the streets of Shipai.	
	In 1970, Jinan University was abolished and discontinued.	
	In 1970, Jinan University was abolished and discontinued.	
	In 1971, Guangdong Biopharmaceutical Factory was established in Shipai Meixingang.	
	In 1972, cadres and teachers from Guangdong Normal University, South China Institute of Technology and other former decentralized cadre schools returned to their original units one after another, and the Shipai area gradually regained its vitality.	
	In 1973, the Guangdong Provincial School of Posts and Telecommunications was reopened in Shipai.	
	Guangzhou Sports Center Amateur School was opened in Shipai.	
	Guangzhou was reorganized into two suburbs: the suburbs and the Huangpu district. The Shipai Brigade is located in the suburb of Shahe Commune.	
	Guangdong Provincial Research Institute of Posts and Telecommunications was rebuilt in Shipailonggang.	
	In 1974, Guangdong Normal University and other colleges and universities launched the "Criticism of Forests and Confucius" campaign. He went to Shipai Village and other places to post big-character posters of "Criticizing Forests and Criticizing Holes" and carried out various publicity activities.	
	In 1975, Guangzhou Automatic Control Research Institute was established in Songgang Road, Shipai. Three residents' committees were set up in Wushan Street, of which the third residents' committee was under the jurisdiction of the "Nanda" section of Shipai.	
	In 1976, the "Gang of Four" launched a campaign to "cut the tail of capitalism" and restricted the sideline business of rural operations as capitalism.	
	In 1978, Jinan University was reopened at the original site of Shipai.	
	Guangzhou No. 113 Middle School was opened on Shipai Wushan Road.	
	In 1979, the reform of the rural economic system began to be carried out, and the Shipai area also began to implement the contract responsibility system for joint production, and the enthusiasm of the peasants was greatly enhanced.	
	In 1980, the Guangzhou Communist Youth League School was reopened and prepared, and the new school site was located on Wushan Road, Shipai Gangding.	
	The management system of "integration of government and society" has been abolished, village administrative organizations have been established, and the rural household contract responsibility system for joint production has been formally implemented	
	In 1981, Shipai was placed under the management of the Wushan Street Office and belonged to the Wushan Street Residents' Committee.	
	In 1982, Shipai Village borrowed 700,000 yuan from the state to build a warehouse in Nanfang Building. from The elderly in Shipai Village began to have a living allowance.	

	In 1984, the Standing Committee of the People's Congress of Guangdong Province and Guangzhou Municipality instructed to abolish the Management Committee of Shahe Commune, renamed Shahe District Office, and renamed Shipai Village as Shipai Village.	
	Construction of Tianhe Sports Center began.	Tianhe District was established; sports center construction; construction of surrounding modern facilities; Urbanization is advancing and arable land is gradually being lost
	The new school building of the Guangzhou Communist Youth League School was completed on Shipai Wushan Road and moved in immediately.	
After the reform and opening up	In 1985, the Shipai Farmers' Market was built with an investment of 600,000 yuan from Shipai Village.	
	Tianhe District of Guangzhou City was established, with jurisdiction over two towns of Shahe and Dong, and four administrative streets of Wushan, Shahe, Yuancun and Chebei. Shipai Village is under the jurisdiction of the Wushan Street Office.	
	In 1986, Shipai Village built a birthday rest garden, a nursing home and a village committee office.	
	The number of self-employed commercial households in Shipai Street has grown rapidly, reaching 455.	
	In 1987, the Tianhe District Committee of the Communist Party of China issued a notice to establish the Provisional Committee of Gangding Street in Tianhe District, and the Gangding Street Office of Tianhe District took over the Nanda Residents' Committee and the Shipai Village Residents' Committee carved out from Wushan Street.	
	In 1987, the Tianhe Sports Center was completed. Before the opening of the 6th National Games, the Tianhe District Government allocated 60,000 yuan to the Shipai Street Office for environmental beautification and greening.	
	The party and government organs of Tianhe District moved into the newly completed office building on the east Shiying side of Shipaiqiao on Zhongshan Avenue.	
	Shipai Street Labor Service Company was established. Shipai Street Industrial Company was established.	
	Zhongshan Highway (now Zhongshan Avenue) was expanded to a 48-meter-wide concrete road.	
	In 1988, the Shipai Street Cultural Station was established.	
	The Shipai Street Light Night Market opened, with 80 stalls.	
	Guangzhou Economic and Technological Development Zone Tianhe New Technology Industry Development Corporation was established.	
	The Jinan University Residents' Committee was established.	
	Shipai Street returned overseas Chinese and overseas Chinese relatives were united.	
	In 1989, the joint-stock system of Shipai cooperative economy began to be implemented. Joint-stock assets are composed of shares of collective property depreciation and private fund-raising shares.	
	The inauguration ceremony of the Shipai Village Respect for the Elderly Building was held.	
	A heavy rainstorm rarely seen in more than a decade hit Shipai Street and the surrounding area, with 242.5 mm of rainfall. The low-lying roads are water-deep and vehicular for hours.	

	The Science and Technology Street on the west side of Shipai Wushan Road was opened.	
	In 1990, the building stone plaque was newly Jiao, which was constructed and completed that year.	
	In 1991, Shipai Village, Shipai Street, began the "socialist ideological education work", and Tianhe District organized the social education team of Shipai Village to enter the village.	
	The Shipai Iron and Steel Market, which was built with an initial investment of 20 million yuan by Shipai Village Economic Development Company, was completed and opened.	
	The Shipai East Road Residents' Committee was established.	
	The dormitory building for teachers of Shipai Primary School was completed and put into use.	
	In 1992, the socialist ideological education work in Shipai Village was successfully completed.	
	The party and government organs of Shipai Street moved from the old site of Songgang Road to the newly completed office building at No. 127 East Shipai Road.	
	In 1995, there were no more villagers and no arable land, but they were still registered as farmers. In order to adapt to the development of society,	
	In 1997, the village was withdrawn and restructured, and at the same time, the villagers were converted into citizens. The first is the establishment of neighborhood committees, and the people belong to the five neighborhood committees of Shipai Street and become citizens. The second is to carry out the formal formalities. All the original agricultural household registration books of the public security have been replaced with resident household registration books, and they have officially become urban residents in law.	changes in management systems; The city has perfect public facilities; The city has perfect consumption facilities; Resident resettlement settings;
	Since the 1990s, the people of Shipai Village have expanded their houses, expanding the original three- and four-story buildings into seven or eight floors for rent, and they themselves have moved to live in communities outside the village.	
	In 1996, the Tianhe District Committee of the Communist Party of China and the Tianhe District Government forwarded the Opinions of the District Comprehensive Management Committee on the Management of Public Security in the Population and Rental Houses to strengthen the safety rectification activities in urban villages.	
	In 1997, the Shipai Village Committee was abolished and the Shipai Sanjun Enterprise Group was established, which was under the jurisdiction of Shipai Street.	
	In 1999, the Tianhe District Committee and the Tianhe District Government formulated the "Outline for Quality Education for Villagers in Tianhe District".	
21st century	In 2000, the Shipai Village Restructuring Company used the land requisitioned by the village to build 6 houses with 9 floors and a total of 154 sets on the west side of the archway of Sun Yat-sen University on Guangyuan East Road, named Nanmen Garden.	

	In 2002, due to the construction of Zhujiang New Town, Xinqing Village of Shipai Village was demolished as a whole, and there were 3 buildings in Zhujiang New Town as Xinqing Village relocation houses.	
	Since 2014, the unified deployment of the Tianhe District Government of Shipai Street has carried out environmental remediation in urban villages such as Shipai, including the "three-line" pavement. The renovation project includes the demolition of the messy shops and parking lots on both sides of the village street, the widening of the original 10-meter-wide street to more than 20 meters, the paving of large pieces of terrazzo marble, the renovation of the facades of the shops on both sides, and the construction of a new 600-square-meter street park with pavilions and relief walls.	
	In 2016, there were 56,351 temporary residents living in a 0.31-square-kilometer village, and only about 1,000 of the 10,000 local villagers lived in the village.	
	In 2016, except for the two larger teahouses in Shipai Village, which were run by the villagers, almost all other small shops were operated. Outsiders have little capital, so renting a shop can not only do business, but also stay.	
	In 2021, the construction of Shipaicun South Station began, which is expected to open in 2023, including the construction of the square in front of the subway station.	

Source: The author supplemented and sorted out according to the "Shipai Village Chronicles" and other relevant literature

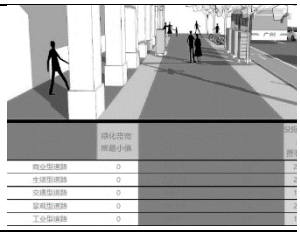
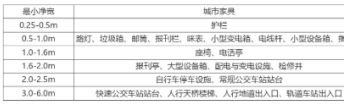
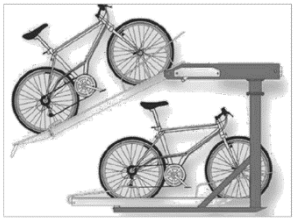
Appendix 4 Update Table of Historic Important Buildings and Spaces

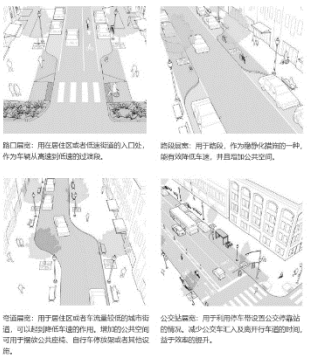
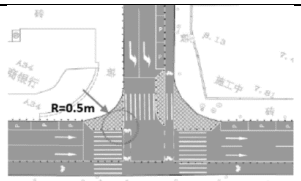
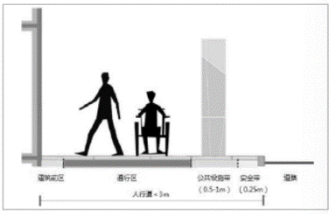
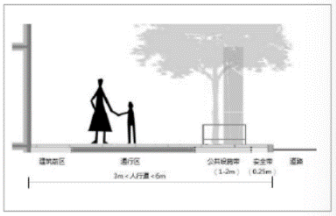
Sōshōna	Before 1949	1949-1978	status quo
Mr. Ban			
Pan's ancestral hall	Early 20's: Zhicheng School (Primary).	1. The office location of the Shipai District Branch of the Guangzhou Municipal Public Security Bureau; 2. It was used as a barracks for soldiers of the People's Liberation Army; 3. After that, he served as a dormitory and classroom for teachers in Shipai Primary School for a long time	1999: The ancestral hall was rebuilt
Pan Dehua Ancestral Hall	During the Republic of China: Shipaibao Township Police Bureau and Salt Police Force Station	1. Where the Shipai District Branch of the Guangzhou Municipal Public Security Bureau is located; 2. Later, it was used as a barracks for the People's Liberation Army	1999: The ancestral hall was rebuilt
Pan's Taifu Hall		It has been used as a nursery school in Shipai Village for a long time	Now it is converted into a building for the village collective office
Pan's Yingchang Office	It has been used as a habitat for cattle for a long time	In the 60s, it was converted into a kindergarten	It is now a cleaning worker's dormitory
Mr. Chi			
Chi clan ancestral hall		1. In the early days of the founding of the People's Republic of China: village farm tool factories and agricultural machinery stations; 2. Shipai Primary School Preschool Classroom; 3.1979~1983 Loading and processing plant	The original land was converted into a building; In 2002, the ancestral hall was removed from the old site Move south and rebuild
Chi's three-bedroom apartment		Shipai Police Station of the Public Security Bureau	Shipai Primary School and Shipai Public Kindergarten Teachers' Dormitory
Ikejia Liangma Hall	In the early years of the Republic of China, it was a private school	1. In the early days of liberation: the class point of the branch of Shipai Primary School; 2. The office of the Shipai Police Station of the Public Security Bureau	1999: After reconstruction, it was used as an activity center for the elderly of the three neighborhood committees of Shipai Village
Chi's newcomers and hall		Shipai Village Farmers' Association	It is now an old hall

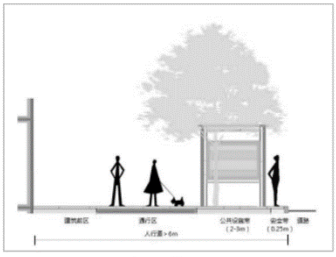
Chi's Chushi Mansion		It is divided into two rooms, one of which has been the location of the Shipai grain store since 1949	It is now converted into a building
Chi's Shixi Mansion		After the founding of the People's Republic of China, it served as the Shahe Health Center and the Shuguang Agricultural Cooperative Office	It is now converted into a building
Mr. Dong			
Dong ancestral hall	Early 30's: Zhicheng The school moved to this location	Early liberation: Shipai District Government	The original site was partially used for the construction of Shipai Primary School, and the original "Feng Shui Pond" of the ancestral hall was converted into a swimming pool of Shipai Primary School in 1997 1999: The ancestral hall was restored
Dong Shi Li Zhuang Jia School	During the Republic of China, it was a stone plaque Corps Headquarters	At the beginning of the founding of the People's Republic of China: Shipai Township Government and Peasant Association; During the period of the People's Commune: the General Accounting Office of the Cooperative Before 1968: Liminsheng Rice Milling Farm 1968~1986: Shipai Embroidery Society 1979~1982: Shipai Clothing Group	It has been used as a village-run kindergarten, health station, and activity center for the elderly, ...In 2002, it was demolished and transformed into a kindergarten playground in Shipai Village
Dong's Shanping Study		The office location of the Guangzhou Shipai District Committee of the Communist Party of China; Later, he ran a health clinic and a kindergarten surnamed Dong	It is now the activity center for the elderly of the Shipai Second Neighborhood Committee
Dong's ancestral mountain			In 1986, it was used to build a village kindergarten

Source: Compiled by the author, based on "Shipai Village Chronicles": 5-11, 32-43

Appendix 5 Control table of indicators related to street design

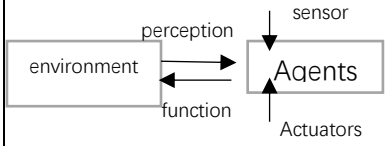
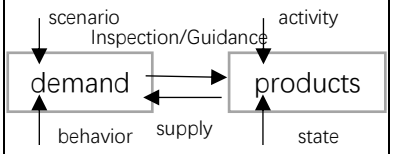
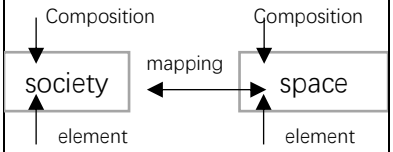
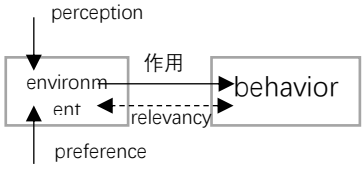
Control of indicators related to street design (normative design)		
category	**gist**	**schema**
sidewalk	1. The width of the traffic belt: the pedestrian flow is less than 4000 people/h, and the minimum width of the traffic belt should not be less than 1.5m;	
	2. Width of public facilities: The public facilities can be set up in combination with the green belt, or it can be set separately. The width of the facility belt or green belt shall not be less than 0.5m, and the width of the street tree shall not be less than 1.5m;	
	3. Parking space: low-rent housing vehicles are estimated according to 0.3 parking spaces/household and 2.0 parking spaces/household; Catering according to 1.0 parking spaces/100㎡; Hotels are based on 0.3 parking spaces/room, 1.0 parking spaces/room; The principle of small-scale and high-density layout of non-motor vehicles, the service radius should not be greater than 50m; If the parking demand is larger, you can consider the three-dimensional type, no more than two floors. 	
	4. Pedestrian crossing: The minimum width of the main road is 5m, and the minimum width of other grade roads is 3m	/
	5. Street crossing safety island: the width should not be less than 2 meters, the width should not be less than 1.5 meters when the conditions are limited, and the length should not be less than b) the width of the pedestrian crossing at the junction, and another 1 m should be added when there are bicycles in use.	 路段交错式过街安全岛
Roadway	1. Motor lanes: The basic traffic requirements of motor vehicles should be met, and when motor vehicle traffic conflicts with other road resources, priority should be given to adjusting the width of motor lanes to realize the transformation from "vehicle-oriented" to "people-oriented".	

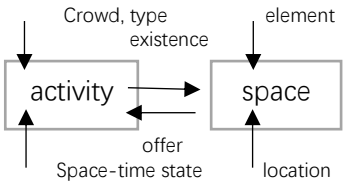
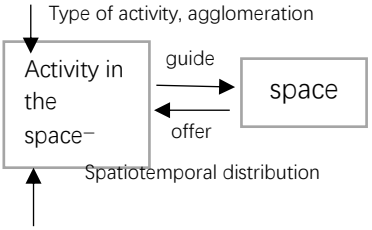
	2. The non-motorized lane combined with the sidewalk widening design can be widened on one side or both sides. It can be widened at intersections or on road sections. Design according to the specific situation.	
	3.Turning radius: For intersections that are mainly for daily travel, it is recommended to use a small turning radius R=0.5m.	 无右转弯的交叉口小转弯半径示意
Ancillary facilities	Meet the requirements of roads, landscapes, road names, sound insulation, etc	/
Plant greening	Road green belt, three-dimensional greening, mobile flower bowl	/
Communal facilities	1.Narrow (0.5-1m) The overall width of the sidewalk < 3m. Basic elements: traffic lights, traffic monitoring and testing facilities, electronic police, public security monitoring, fire protection facilities, traffic signs, road nameplates, isolation railings, vehicle stop stones, street lights, small optical boxes and other boxes; Expansion elements: garbage bins, mailboxes, mobile flower bowls, guardrails hanging flowers;	 窄型设施带示意图
	2.Medium-sized (1~2m). The overall width of the sidewalk is between 3m~6m; Basic elements: street trees, bus stops, bus electronic maps, traffic lights, traffic monitoring and testing facilities, electronic police, public security monitoring, fire fighting facilities, traffic signs, road name plates, isolation railings, vehicle stop stones, street lights, landscape lighting lights, small optical boxes and other boxes, public security boxes; Expansion elements: bicycle parking racks, seats, garbage bins, handwashing basins (direct drinking water), intelligent service facilities, information bulletin boards, mailboxes, mobile flower bowls, guardrail hanging flowers, flower ponds, flower beds, information boards	 中型设施带示意图

	3.Wide type (2~3m) The overall width of the sidewalk >6m; a) basic elements: street trees, bus stops (including harbor-style stops), taxi passenger points, bus electronic maps, traffic lights, traffic monitoring and testing facilities, electronic police, public security monitoring, fire protection facilities, traffic signs, road nameplates, isolation railings, car stop stones, street lights, landscape lighting small light boxes and other boxes, public security boxes; Expansion elements: public bicycle rental points, bicycle parking racks, seats, garbage bins, handwashing basins (direct drinking water), intelligent service facilities, information bulletin boards, mailboxes, newspaper kiosks, sanitation tool rooms, sketches, sculptures, mobile flower bowls, guardrail hanging flowers, flower ponds, flower beds, information boards.	 宽型设施带示意图
Room to retreat	1.Setback distance	/
	2.Surface parking: The non-motor vehicle parking lot of the building should be set up near the entrance and exit of the building in the vicinity of the principle of combining decentralization and centralization, and the scale of the ground parking space should not be less than 50% of the total scale	/
other	1. Entrance and exit of buildings, subways, and overpass tunnels	/
	2. Bus passage area: When the road traffic intensity is not large, the slow traffic space should not be compressed. When the demand for bus travel is strong and the existing slow traffic space cannot be compressed, as a waiting space, the station design form can be taken in the form of convex station.	/
	3. Intersections, smart light poles and other considerations	/

Source: The author is based on the "Urban Parking Planning Code GB/T51149-2016" and "Guangzhou Road All Elements Design Guidelines".

Appendix 6 Comparison of methods for social behavior analysis

Comparison table of methods for social behavior analysis			
category	**way**	**Emphasis**	**Application prospects**
(Automation) Agent simulation	By setting rules for the environment, subject, and movement, and setting constraints on the spatial evaluation index system, a spatial model of virtual humans is established to simulate the behavior and activity characteristics of the crowd.	"Perception-Behavior-Space". 	Excellent: Simulating people, understanding and expanding the understanding of spatial activities, testing and screening schemes Deficiency: The complexity of society and individuals is difficult to fully express in agents
(Industrial Products) System interaction analysis	User-centric, analyze and design interactive products that support people's daily work and life, and enhance the emotion of user experience. By recognizing and understanding user usage scenarios, behaviors and product feedback, the technical solution is optimized through product system design.	"Demand-Behavior-Space" 	Excellent: Match requirements and provide methods for analyzing demand scenarios, behaviors, and product status. Missing: The perceived aspect of the environment is not well considered
(Sociology) Social 网络分析	By analyzing the relationship and interaction between social entities, we can understand the organization and dynamics of the social system, and understand the social connotation of spatial structure and elements with the help of mapping and association	"Relational-Spatial" 	Excellent: Apply social research to understand the meaning of space and guide the optimal design of space Missing: The complexity of social research
(Environmental Behavior) Environmental behavior analysis	Through questionnaire surveys, behavior observations, experimental research, big data analysis, etc., we understand the role and correlation of environmental elements on population behavior	"Perception-behaviour" 	Excellent: Analyze behavior based on crowd perception to understand, recognize and optimize space. Lacking: Lack of social behavior

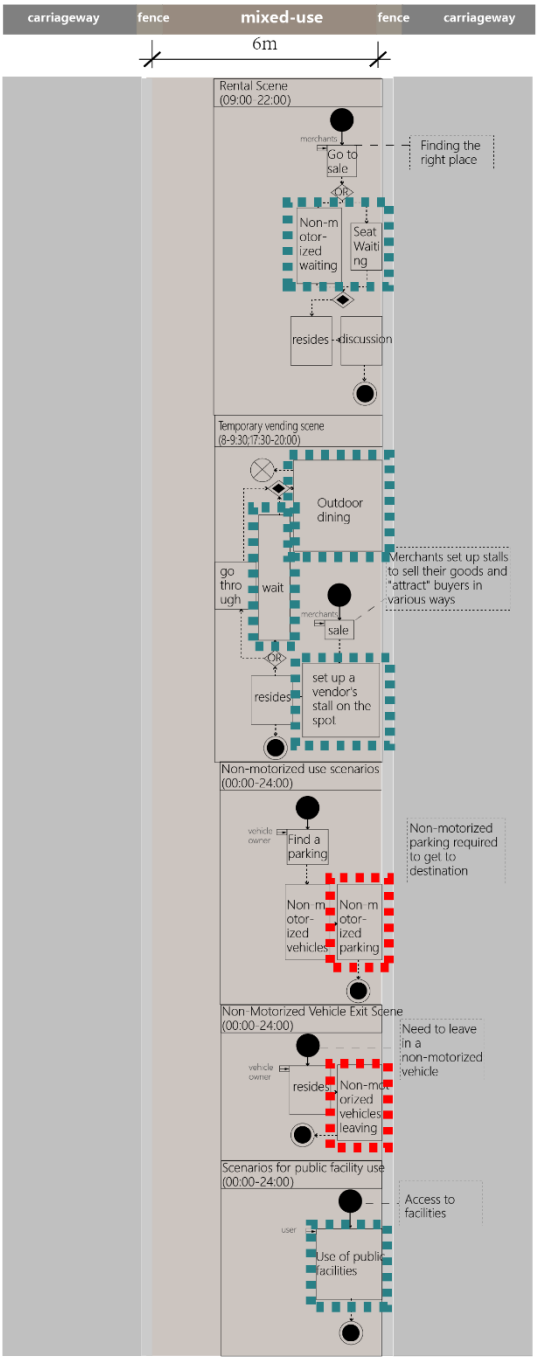
			correlation at the macro social level
(Architecture) Observational annotation, questionnaire interviews, video recordings, experiments, etc	Understand and evaluate how people use and interact with the building space through the behavior of people in the space, so as to design an environment that is more in line with the needs of users	"Activity-Space"  	Excellent: "Direct" analysis of places and elements Lacking: Lack of accurate spatial identification and search for updates
(Geography/ Planning disciplines) behavior observation, questionnaire surveys, interviews, GPS tracking, spatial syntax analysis, GIS analysis and big data analysis, etc	Through the summary of the types of geospatial crowd activities and their activity characteristics, the spatial activity rules of the crowd were summarized, and the spatial allocation design was guided and optimized	 	Excellent: Directly analyze the activity characteristics of the space and summarize the rules Lacking: It is more macroscopic, attaches importance to regularity, and it is difficult to consider the place and individual level of space

Source: Compiled and drawn by the author

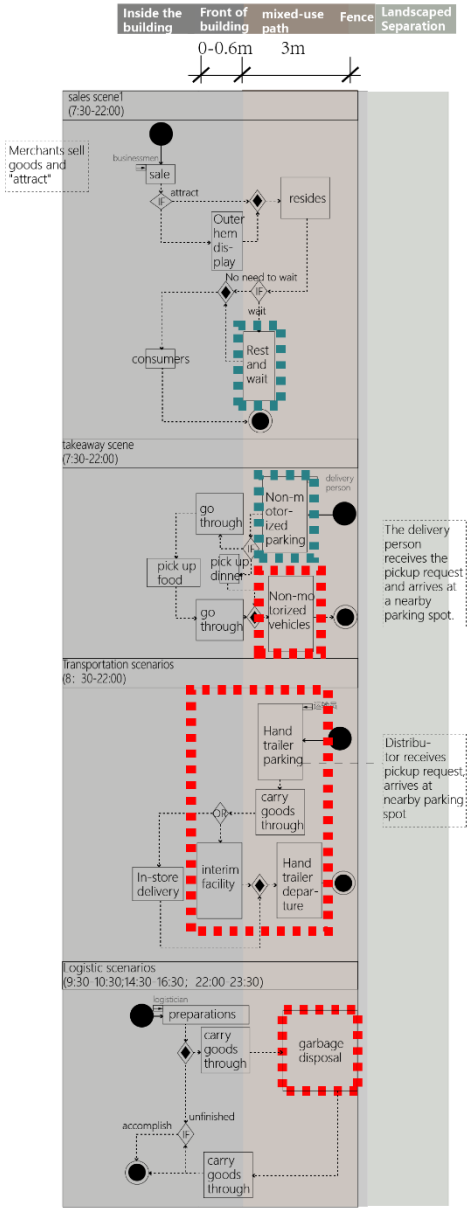
Appendix 7 UML Activity Analysis Process Diagram (Screenshot)

(1) Activity analysis and physical space conflict detection（portion）

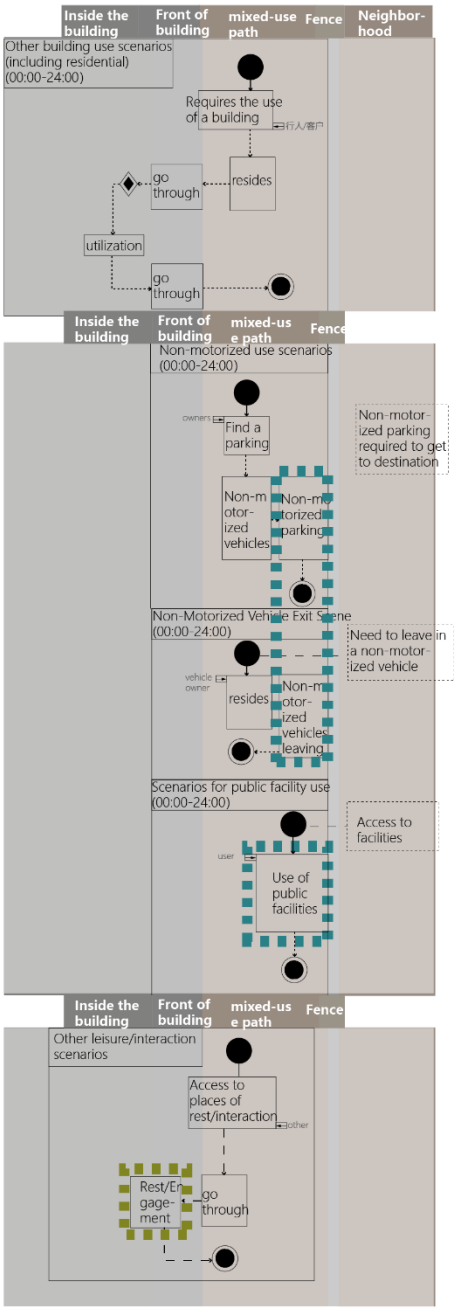
a) Urban Village Internal Streets - Two Side Fence Type

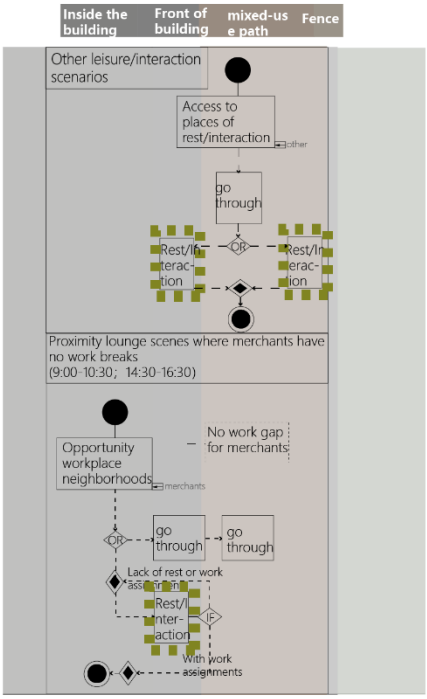


b) Internal streets in urban villages - walled on one side



b) Walled-in on one side (continued)

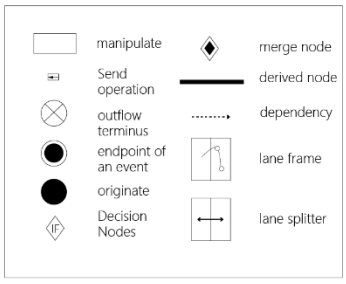




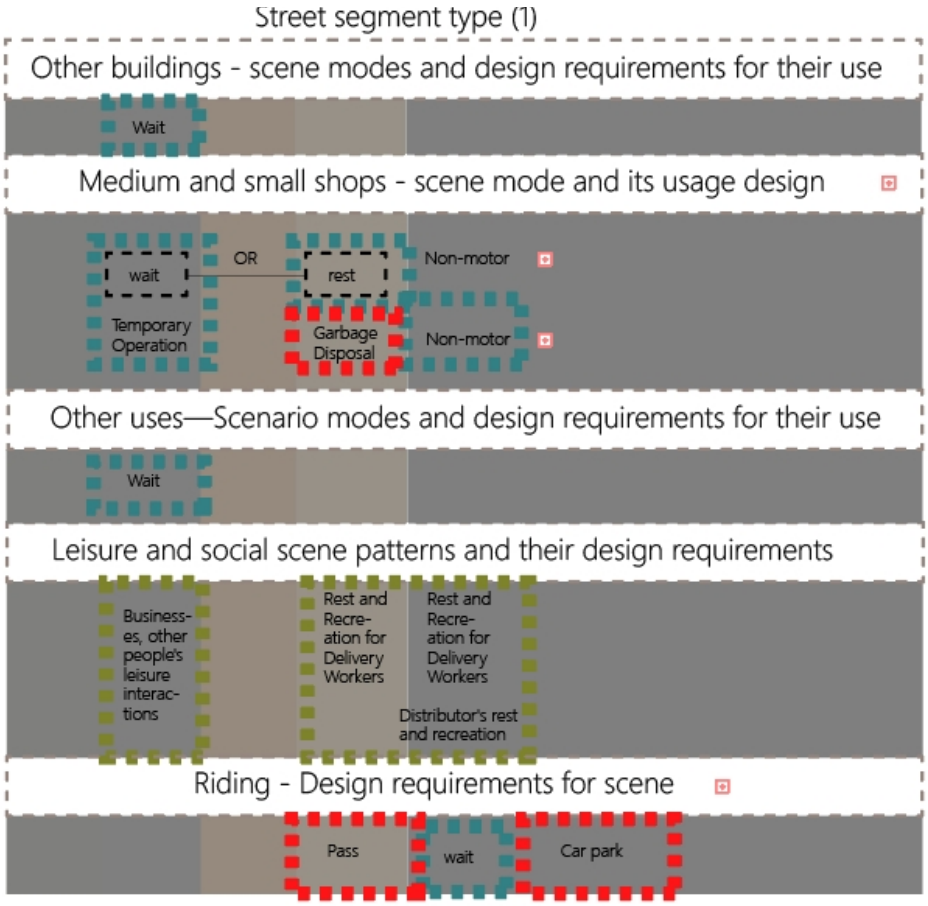
Non-originally defined functions in the flow of action - space should be provided for corresponding activities

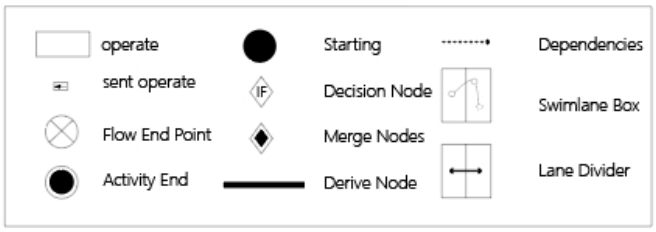
Possible leisure interactions in the action process - try to equip the support design with the appropriate behaviors when available

Other open spaces - better environmental conditions and provision of facilities where possible



(2) Requirements Integration and Design Task List

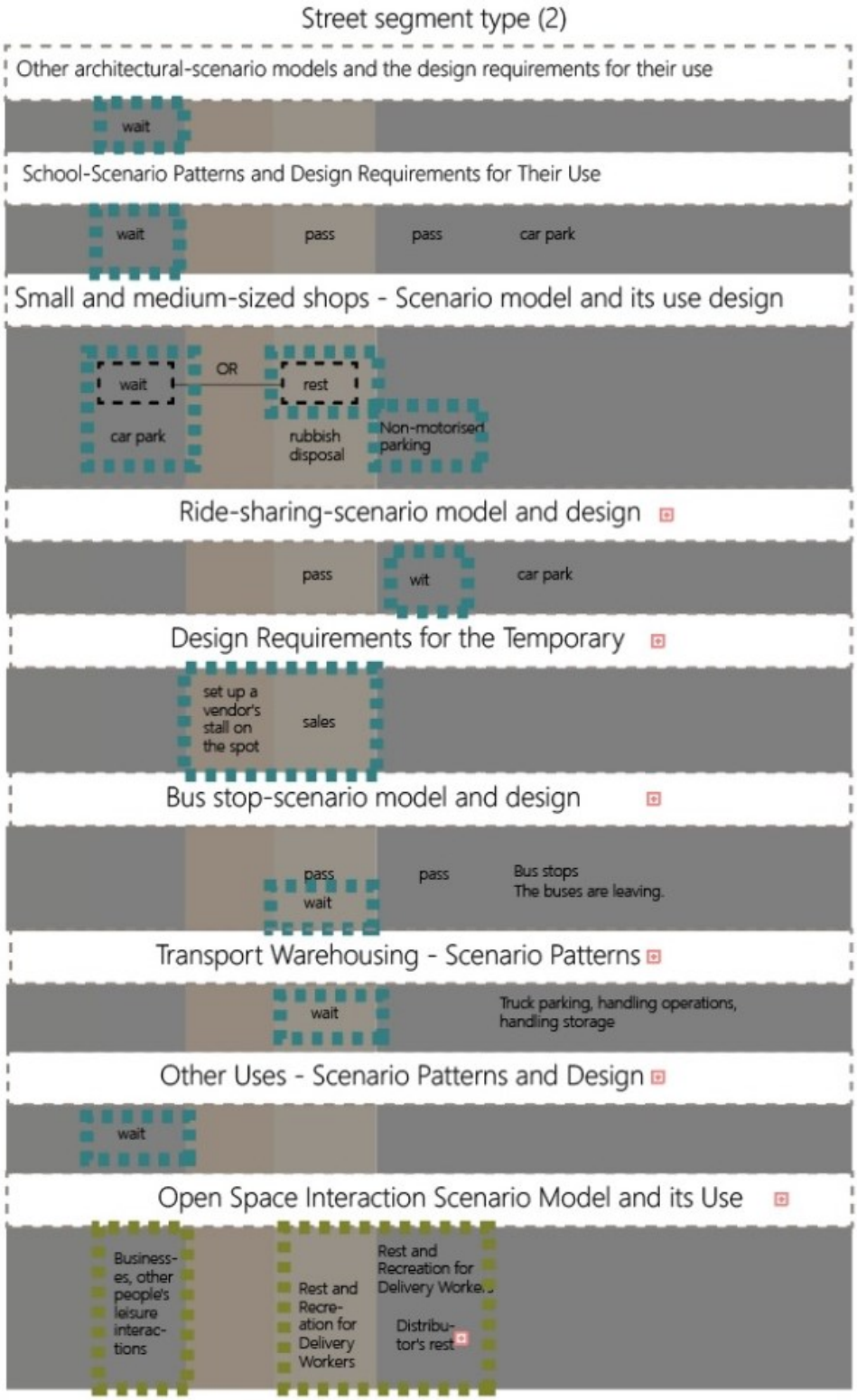


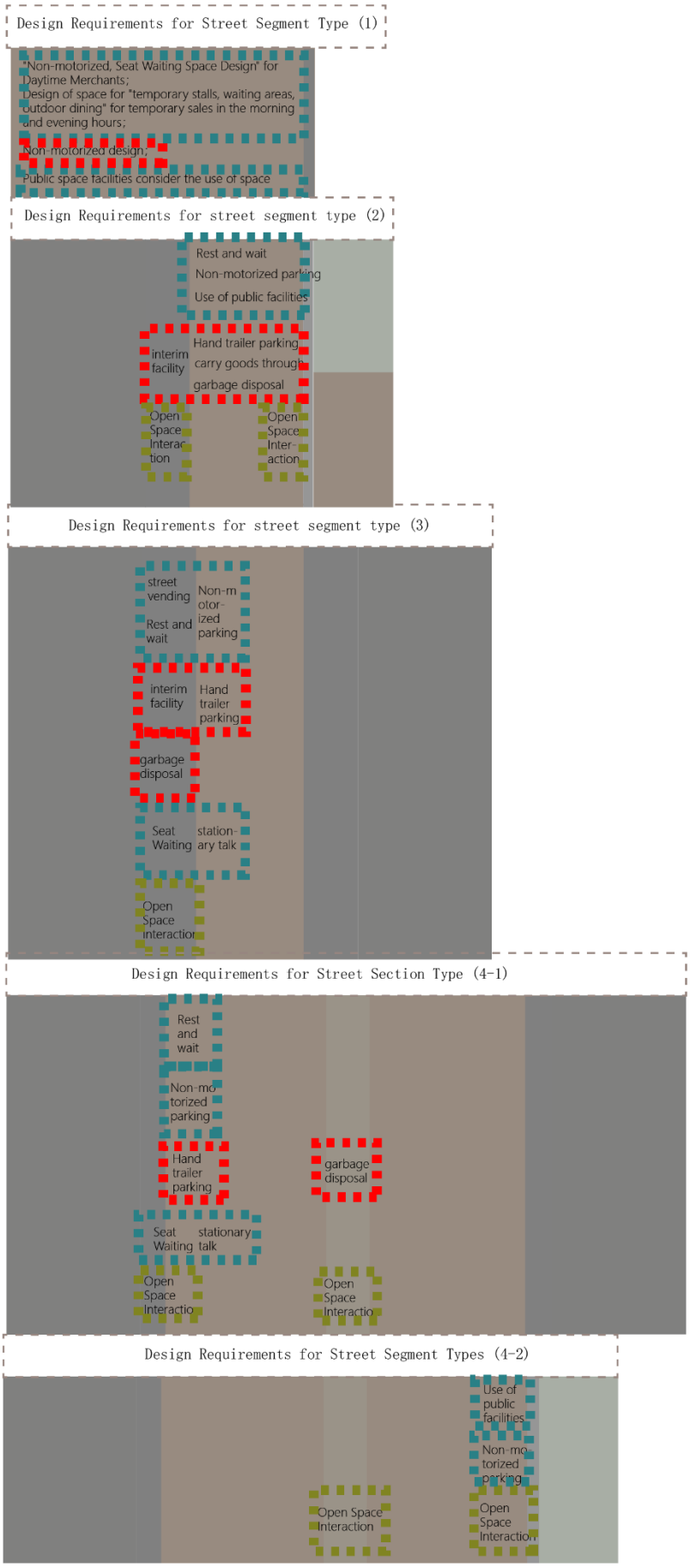


Non-originally defined functions in the flow of action - space should be provided for appropriate activities

Possible leisure interactions in the flow of action - try to equip the support design with the appropriate behaviours

Other open spaces - better environmental conditions and provision of facilities where possible


Street segment type (2)
Other architectural-scenario models and the design requirements for their use
wait
School-Scenario Patterns and Design Requirements for Their Use
wait
pass
pass
car park
Small and medium-sized shops - Scenario model and its use design
wait
OR
rest
car park
rubbish disposal
Non-motorised parking
Ride-sharing-scenario model and design
pass
wit
car park
Design Requirements for the Temporary
set up a vendor's stall on the spot
sales
Bus stop-scenario model and design
pass
wait
pass
Bus stops
The buses are leaving.
Transport Warehousing - Scenario Patterns
wait
Truck parking, handling operations, handling storage
Other Uses - Scenario Patterns and Design
wait
Open Space Interaction Scenario Model and its Use
Business-es, other people's leisure interac-tions
Rest and Recre-ation for Delivery Workers
Rest and Recreation for Delivery Worke
Distribu-tor's rest


Design Requirements for Street Segment Type (1)
"Non-motorized, Seat Waiting Space Design" for Daytime Merchants;
Design of space for "temporary stalls, waiting areas, outdoor dining" for temporary sales in the morning and evening hours;
Non-motorized design;
Public space facilities consider the use of space
Design Requirements for street segment type (2)
Rest and wait
Non-motorized parking
Use of public facilities
interim facility
Hand trailer parking
carry goods through
garbage disposal
Open Space Interac tion
Open Space Inter-action
Design Requirements for street segment type (3)
street vending
Non-m otor-ized parking
Rest and wait
interim facility
Hand trailer parking
garbage disposal
Seat Waiting
station-ary talk
Open Space interactior
Design Requirements for Street Section Type (4-1)
Rest and wait
Non-mo torized parking
Hand trailer parking
garbage disposal
Seat Waiting
stationary talk
Open Space Interactio
Open Space Interactio
Design Requirements for Street Segment Types (4-2)
Use of public facilities
Non-mo torized parking
Open Space Interaction
Open Space Interaction

Self-testing evaluation (I)	
basic quality	1.Lack of pedestrian protection design, pedestrian-vehicle mixing
Charac-teristics of the scene	2. lack of facilities to support the design of rest and stay; 3. poor sensory experience; 4. lack of a richer shopping experience;
Crowd Care	5. Lack of crowd care, e.g. the need for rest and relaxation for delivery workers.

Self-testing evaluation (II)	
basic quality	1. noise control 65DB; 2. poor comfort and scale of space travelling; 3. some poor architectural detailing affecting the feeling of space.
Charac-teristics of the scene	4. Lack of open space facilities and more interesting views of the street; 5. Less consideration of the quality of places of interaction.
Crowd Care	6. Lack of feeling of use by long-term workers such as transport-ers and delivery workers; 7. Insufficient consideration of space for vulnerable groups, such as children, the elderly and the disabled; 8. Lack of provision of sheltered places for people on the move.

Street Section Types (1) - Self-Test Evaluation	
basic quality	Human non-shared panels with potential safety hazards; dim light-ing and inadequate illumination; lack of shading and noise; relatively uninteresting elevations; lack of supportive, sit-down activity facilities; lack of human scale considerations; poor travelling senses.
Scenic qualities	Lack of information on people on the move, transport, delivery
Crowd care	Lack of psycho-sensory considerations for use by mobile people, transport, delivery workers, etc.

Street Section Types (2) - Self-Test Evaluation	
basic quality	Human non-common panels with potential safety hazards; dim and inadequate lighting; lack of shading; relatively uninteresting eleva-tions; lack of supportive, sit-down activity facilities; poor sensory experience on some streets; lack of human scale considerations.
Scenic qualities	There is a lack of psycho-sensory consideration of the use of mobile people, transport, delivery workers, the elderly, children, and so on. The soul of the movement.
Crowd care	There is a lack of psycho-sensory consideration of the use of mobile people, transport, delivery workers, the elderly, children, and so on.

Street Section Type (3) - Self-Test Evaluation	
basic quality	Serious pedestrian-vehicle mixing, pedestrian safety is difficult to protect; poor lighting in some areas; poor lighting, humidi-ty; noise; more obstacles in the path of travel, lack of barri-er-free design; lack of seating opportunities and related design considerations; poor sensory experience; to be further combined with humane design
Scenic qualities	Lack of basic scenario needs for social entertainment, mental relaxation, transport and listening
Crowd care	Lack of crowd care

Street Section Type (4-1) - Self-Test Evaluation	
basic quality	Lack of pedestrian protection design and mixing of pedestrians and vehicles
Scenic qualities	Lack of relatively sheltered open spaces, favourable conversation scenes
Crowd care	Lack of consideration for the use of child populations, the elderly, rest for transport and delivery workers; the creation of a scene of belonging for mobile people

Street Section Type (4-2) - Self-Test Evaluation	
basic quality	Lack of pedestrian protection design and mixing of pedestrians and vehicles
Scenic qualities	Lack of relatively sheltered open spaces, unfavourable conversa-tion scenes
Crowd care	Lack of rest for transport and delivery workers; creation of scenes of belonging for mobile people