华南理工大学

South China University of Technology

专业学位硕士学位论文

广州水荫小区街道空间改造的包容性设计探索

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论文提交日期	2023 年 7 月

Inclusive Design Exploration for Street Renovation in Shuiyin Community, Guangzhou

A Dissertation Submitted for the Degree of Master

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申请学位级别：硕士　　学科专业名称：建筑学

研究方向：城市设计

论文提交日期：　2023 年　9　月　4　日　　论文答辩日期：　2023 年　9　月　4　日

学位授予单位：华南理工大学　　学位授予日期：　2023 年　　月　　日

答辩委员会成员：

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摘要

城市的街道空间不仅是人们通行的路径，还是居民社交和活动的场所。但是，在人口老龄化与住区老龄化的社会背景下，我国目前的城市街道对于老年人、残障人士等弱势群体的关注明显不足，包括环境设计、无障碍设计和公共服务设施均处于比较缺乏的状态。

包容性设计理念对于解决弱势群体的街道空间使用问题提供了一种十分有效的方法。它起源于对残障群体和人口老龄化问题的密切关注，强调将所有人的需求、能力和差异性纳入设计过程中。

本文是基于包容性设计理念对城市街道空间设计方法论的研究。文章整体上分为三个部分。在第一部分的理论研究中，首先探讨了包容性设计在设计学领域中重要的理论模型和设计原则，再从时间、空间与社会维度论述了包容性环境的本质与内涵，并得出包容性街道的定义。案例研究则选取了三个街道改造案例，通过分析案例的设计背景、设计目标与手法，分别从人车矛盾、儿童友好和空间弹性三个视角，进一步印证街道包容性在实际项目中对于不同弱势群体的具体表现。第二部分的方法论则是对理论研究的提炼，提出了包容性街道的设计方法论，包括了设计原则、评价标准、设计策略和设计流程。第三部分的设计实践是对包容性街道设计方法论在广州水荫小区街道空间中的具体运用。

基于上述理论研究、方法论总结与设计实践，本文的主要结论如下：（1）包容性街道的设计原则有 6 点，即安全性（Safety）、可及性（Accessibility）、舒适性（Comfort）、易读性（Legibility）、可适应性（Adaptability）和熟悉性（Familiarity）；（2）包容性街道应采取交通缓行策略以提升步行安全性、设置弱势群体可及的街道空间与设施、为行人提供更多的城市空间、激活街道的口袋空间；（3）包容性街道的设计流程包括了总结空间问题和挖掘用户需求的共情（Empathizing）阶段、提出针对性设计策略的构思（Ideation）阶段和迭代优化设计的评估（Evaluation）阶段。

关键词：包容性设计；街道空间；弱势群体

Abstract

The street space in cities serves not only as pathways for people but also as places for residents to socialize and engage in activities. However, given the current social context of an aging population and aging residential areas, there is a noticeable lack of attention to vulnerable groups such as the elderly and disabled in our country's urban streets. This deficiency is evident in the areas of environmental design, accessibility, and public service facilities, all of which are relatively lacking.

The concept of inclusive design offers a highly effective approach to address the issues of street space usage by vulnerable groups. Originating from a close focus on the needs of disabled and aging populations, inclusive design emphasizes the incorporation of the needs, abilities, and diversities of all individuals into the design process.

This paper is based on research into the methodology of urban street space design using the concept of inclusive design. The article is divided into three main parts. In the first part, the theoretical research explores the essential models and design principles of inclusive design in the field of design. It then discusses the essence and significance of inclusive environments from temporal, spatial, and social dimensions, ultimately leading to a definition of inclusive streets. Case studies have been selected to examine three street renovation projects. By analyzing the design context, objectives, and techniques of each case, this study explores the perspectives of pedestrian-vehicle conflict, child-friendliness, and spatial flexibility. Through these lenses, it further validates how inclusive street design manifests in real projects, catering to specific vulnerable groups. The second part focuses on the methodology distilled from the theoretical research, presenting the inclusive street design methodology, including design principles, evaluation criteria, design strategies, and the design process. The third part, the design practice, demonstrates the specific application of the inclusive street design methodology in the street space of Guangzhou Shuiyin Community.

Based on the aforementioned theoretical research, methodology, and design practice, the main conclusions of this paper are as follows: (1) The design principles of inclusive streets consist of six aspects: safety, accessibility, comfort, legibility, adaptability, and familiarity; (2) Inclusive streets should adopt traffic calming strategies to enhance pedestrian safety, provide accessible street spaces and facilities for vulnerable groups, offer more urban spaces for pedestrians, and activate pocket spaces within the streets; (3) The design process of inclusive streets includes the empathizing stage, which involves understanding spatial issues and exploring user needs, the ideation stage, where targeted design strategies are proposed, and the evaluation stage, where iterative optimization of the design is conducted.

Keywords: Inclusive design; Street space; Disadvantaged groups

Table of Contents

Chapter 1 Introduction

1.1 Background

1.1.1 Dual Aging

(1) Aging of Population

Since the explosive population growth and implementation of the family planning policy in the last century, China is currently facing a severe aging population situation. According to the results of the seventh national census, the population distribution in China is as follows: the population aged 0-14 is 253,383,938, accounting for 17.95%; the population aged 15-59 is 894,376,020, accounting for 63.35%; the population aged 60 and above is 264,018,766, accounting for 18.70%, of which the population aged 65 and above is 190,635,280, accounting for 13.50% [9]. In Guangdong Province, the distribution is as follows: the population aged 0-14 is 23,749,882, accounting for 18.85%; the population aged 15-59 is 86,697,562, accounting for 68.80%; the population aged 60 and above is 15,565,066, accounting for 12.35%, of which the population aged 65 and above is 10,813,000, accounting for 8.58% [10] . The aging population in China can be summarized by the following four characteristics:

i. Quantity

According to data from the National Bureau of Statistics, by the end of 2016, the elderly population in China had reached 231 million, accounting for 16.7% of the total population. It is projected that by 2025 and 2033, the elderly population in China will reach 300 million and 400 million, respectively. In 2053, it will peak at 487 million, accounting for 1/4 of the global elderly population. Among them, the number of disabled and semi-disabled elderly people will continue to increase. The number of elderly people aged 80 and above will increase from 25 million to 108 million.

ii. Speed

Projections show that the global level of aging will increase from 10% to 22%, while the aging level in China will increase from 10% to 34%, representing an increase of 12 and 24 percentage points, respectively. Looking at the time required for the proportion of the population aged 65 and above to increase from 7% to 14%, it took France 115 years, the United States and the United Kingdom more than 40 years, while China only took 23 years.

iii. Burden

With the rapid increase in the number and proportion of elderly people, China's social support burden is continuously increasing. Around 2053, China's elderly population size, proportion, elderly dependency ratio, and social dependency ratio will reach their peak values successively. This means that China will face the heavy pressure of supporting 71 elderly people and 32 children for every 100 working-age population. Moreover, the overall health level of the elderly population in China is relatively low, facing a heavier actual support burden compared to developed countries at the same level of aging. Furthermore, compared to the phased and gradual aging trends observed in developed countries over the past century, China is experiencing a concentrated and synchronized aging phenomenon within a short period of time [11].

(2) Aging of Residential Areas

Most of China's old residential communities were built from the early stages of the reform and opening up period to the late 1990s. They mainly consist of communities constructed by government institutions, state-owned enterprises, mixed-use developments, and early commodity housing. However, as these buildings age, various problems have emerged, including neglect, lack of maintenance and management, inadequate municipal infrastructure, and poor living environments, which have caused inconveniences for residents. Currently, urban old residential areas in China face several practical issues, which can be summarized as follows [12]:

Overall urban environment: Old residential areas are located in the old urban areas of cities.

While they enjoy favorable locations, the significant physical and functional aging of residential buildings, coupled with dirty and disorderly internal environments, create a stark contrast with the surrounding high-rise buildings, significantly impacting the overall urban image.

Residents' living conditions: Due to the old construction periods and limitations of economic and social development at that time, as well as technological constraints, many old residential areas have small building sizes and basic facilities, with some lacking independent kitchen and bathroom facilities. The poor living environment has severely affected the residents' quality of life.

Housing conditions: Insufficient living space in these areas has led to rampant self-construction by residents. The internal structures of some houses are severely damaged, and some are in a state of disrepair, leaving residents constantly worried about their living conditions.

Inadequate public facility support: Many old residential areas lack adequate rainwater and sewage facilities, as well as environmental sanitation facilities. Some residents even make unauthorized modifications to the drainage systems for their own needs, leading to the improper discharge of domestic wastewater and indiscriminate dumping of household garbage, exacerbating the problems with public facility support.

Social issues: Due to high population density and severe aging, old residential areas are mainly occupied by elderly local residents and temporary residents from other regions working in the city. Families with better conditions or capable young people have generally purchased commercial housing in urban areas, leading to obvious spatial and residential segregation. Additionally, the overall quality of the population in old residential areas is relatively low, with unstable incomes, weak neighborhood consciousness, and most of these areas are beyond the effective management of the government or the community, resulting in complex social issues.

Economic issues: The residents in old residential areas mainly rely on informal income sources. Local residents generate income by renting out their houses, while temporary residents from other regions, due to a lack of professional skills, mainly engage in temporary jobs or related service industries for economic support.

In recent years, the central and local governments in China have attached great importance to the renovation of old residential areas to improve people's livelihoods, promote the transformation and upgrading of urban construction models, expand domestic demand, stabilize investment, promote circular development, and stimulate economic growth. In July 2020, the General Office of the State Council issued the "Guiding Opinions on Comprehensive Promotion of Renovation of Urban Old Residential Areas" (State Council Document No. [2020] 23), which stipulated that by 2022, China will have established a systemic framework, policy system, and working mechanisms for the renovation of urban old residential areas. Efforts will be made to complete the renovation tasks for old residential areas built before the end of 2000, according to local conditions, by the end of the 14th Five-Year Plan period [13] . In February 2021, the General Office of the Guangdong Provincial People's Government issued the "Implementation Opinions on Comprehensive Promotion of Renovation of Urban Old Residential Areas in Guangdong Province," which clarifies the scope and content of renovation for old residential areas based on the local situation. The renovation targets include residential communities in cities or county towns (urban areas) with an early construction period, disrepair, inadequate municipal infrastructure, incomplete community service facilities, and strong willingness among residents for renovation. The renovation content can be classified into three categories: basic renovation, improvement renovation, and upgrading renovation. The basic renovation should be primarily funded by government finances, ensuring all necessary improvements are made. Improvement renovation should respect the residents' wishes and make necessary improvements promptly. Upgrading renovation should follow government guidance and a market-oriented approach, implementing improvements wherever possible [14].

1.1.2 Insufficient Inclusiveness in the Streets for Vulnerable Groups

China's vulnerable groups include the elderly, people with disabilities, children, and other individuals with special needs, who face many difficulties in using urban streets.

With the worsening of population aging, the needs of the elderly on urban streets are becoming more prominent. However, current street designs often fail to meet their specific requirements. The lack of suitable seating, shading facilities, and extended signal times limits the mobility and sense of security for older adults. The absence of accessible facilities is one of the main challenges faced by people with disabilities on urban streets. The lack of ramps, handrails, tactile paving, and other facilities restricts the freedom of movement and access for wheelchair users and individuals with mobility impairments. This inadequacy also creates barriers for individuals with visual or hearing impairments on urban streets. Current urban streets often lack safe play areas and pedestrian signage, and do not provide sufficient pedestrian crossing facilities. This limits the involvement and safety of children on the streets, affecting their normal growth and activities.

These deficiencies highlight the necessity of inclusive street design. Inclusive street design aims to create a city environment that is inclusive for everyone, providing accessible, safe, and comfortable street spaces. It should consider the needs of the elderly, people with disabilities, children, and other vulnerable groups, providing them with appropriate seating, shading facilities, accessible pathways, and other supportive amenities. Such design will make streets more friendly and accommodating, enhancing the participation and quality of life for vulnerable groups. By creating an equitable urban environment where everyone can freely use and enjoy street spaces, regardless of age, ability, or cultural background, it helps build a more inclusive and harmonious society, reducing the existence of inequality.

1.2 Definition

1.2.1 Inclusive Design

Inclusive design, derived from the concepts of barrier-free design and universal design, cannot be discussed without considering the development history of these two design approaches.

The concept of barrier-free design was first introduced by the United Nations in 1974. In the rapidly developing modern society, barrier-free design advocates for considering the needs of individuals with mobility impairments (such as persons with disabilities and older adults) and those with functional limitations when designing environments and products. It emphasizes paying full attention to the specific needs of vulnerable groups and ensuring the safety, convenience, and comfort of the general population. However, as time has progressed, the thinking behind barrier-free design has gradually fallen behind the pace of societal development, and some drawbacks have gradually emerged.

In the mid-1980s, the drawbacks of barrier-free design further manifested. Due to excessive focus on vulnerable groups, the design process often overlooks the needs of mainstream populations, resulting in many design solutions only catering to individuals with physical disabilities, leading to wastage of design resources [15] . As a result, the concept of universal design emerged. The concept of universal design was first proposed by Ron Mace, the director of the Center for Accessible Housing at North Carolina State University, in the 1970s [16] . He pointed out that barrier-free design, by solely focusing on the needs of specific user groups, has limitations. The concept of universal design emphasizes serving the public as a basis, starting with the entire population, and striving to consider the needs of all individuals during the design process. It encourages designing products and environmental facilities that can accommodate individuals with diverse physical or psychological abilities, enabling everyone to participate in social life.

With the continuous development of the concept of universal design, a series of products related to universal design have emerged. However, in the modern society of rapid economic

development, the emphasis on universality in universal design often leads design manufacturers to overlook the specific needs of vulnerable groups in pursuit of economic benefits. This exposes some drawbacks of universal design, leading to the emergence of the concept of inclusive design. The concept of inclusive design was first proposed by European architect Richard Hatch in 1984. Initially, the concept of inclusive design referred to design that allows users to participate and use without discrimination to a certain extent. In 1994, the concept of inclusive design was first proposed at an international conference in Canada and subsequently gained widespread usage, particularly in the United Kingdom and Nordic countries.

Compared to the traditional concept of barrier-free design, inclusive design no longer considers individuals with functional impairments such as older adults and persons with disabilities as a group requiring special design. Instead, it views them as part of a diverse population. Inclusive design is a flexible and adaptable process that redefines user needs and behaviors. Through studying the needs and characteristics of different users, it enhances the inclusivity of products for various user groups and improves their applicability. This makes designs more convenient and applicable to the majority of the population, and easier for the general public to approach.

Inclusive design is a method and process. According to the definition in the international standard BS7000-6, inclusive design is "a design approach and process that enables mainstream products and services to be usable by the greatest number of users without the need for adaptation or specialized design." This definition emphasizes the methodological and procedural nature of inclusive design [17].

The core concept of inclusive design is to make designs beneficial to all individuals, rather than limited to specific groups. Many designs inadvertently create difficulties or barriers for potential users such as older adults, children, persons with disabilities, and foreigners. Therefore, inclusive design guides the design process from both a values and methodology perspective. It maximizes the reach of design benefits through various methods, tools, and stakeholder

participation.

Through inclusive design, we can create more inclusive and accessible design environments, providing better user experiences and convenience for various groups. This design approach not only focuses on current needs but also looks toward future development, ensuring that designs can adapt to user needs in different time periods and under various changing conditions.

1.2.2 Street

According to the description in "Cihai" (a Chinese dictionary), a street is defined as a "relatively wide road with houses on both sides." This means that a street is primarily a part of the road, serving as a pathway for people's transportation. As cities form, streets gradually develop. In human history, streets were left as linear spaces to meet people's travel needs after the construction of cities and houses. The physical aspects of a street include the bottom interface, top interface, side interfaces, and visual interfaces. These interfaces delimit the scope of the street space and together constitute the basic material framework of the street space [18] . Streets not only serve transportation functions but also fulfill various social functions.

For people, streets are open spaces that integrate various functions such as living, commerce, leisure, and social interaction, becoming the stage for public life. As scholars have pointed out, "Streets are a collection of connotations that encompass buildings, people, environmental facilities, etc., and are a spatial organizational form of human social life" [19] . Throughout history, various urban activities have taken place on main streets, and there seems to be a natural connection between the busiest, vibrant streets and the most important places in cities. From a physical entity perspective, urban streets fulfill the roles of circulation paths, public spaces, and transitional zones between buildings. From a functional perspective, streets are comprehensive entities that integrate transportation functions with people's daily life, commerce, leisure, recreation, and social functions. The concept of a street has multiple meanings, reflecting the understanding of a multifunctional urban place and its role as a city road.

In summary, a street is a multifunctional space that connects roads with social functions. It not only caters to people's transportation needs but also serves as a venue for various activities such as living, commerce, leisure, and social interaction. The importance of streets lies in their ability to meet people's ever-changing needs and promote urban development and prosperity.

1.3 Research Objectives and Significance

1.3.1 Objectives

As an important space for public life in urban areas, streets serve as the primary environment for people to engage in various activities such as communication, relaxation, and entertainment. The design goal of streets is to facilitate and provide comfort for all citizens to engage in these activities. However, there are still many shortcomings in street design and planning, value perception, and economic foundation, which hinder its inclusivity. At the same time, elderly and disabled individuals do not necessarily require specially designed facilities for them but rather aspire to live independently and be integrated into society. Inclusive design offers a highly effective approach to addressing the issues faced by vulnerable groups in outdoor spaces. For example, the design of ramps not only meets the needs of wheelchair users but also facilitates individuals pushing strollers, shopping carts, and pulling luggage.

This paper aims to conduct a case study on the Shuiyin Community in Guangzhou's Yuexiu District to establish the key points and evaluation criteria for inclusive street design. Subsequently, this new approach and method of inclusive design will be applied to the design process to address existing shortcomings and enhance the inclusivity of streets. This research aims to provide a reference for creating an inclusive urban environment by serving a wider range of people.

1.3.2 Significance

The significance of researching inclusive street design lies in addressing the needs of vulnerable

groups, promoting social inclusion, and enhancing social equity. Firstly, inclusive street design can meet the specific needs of vulnerable groups such as the elderly, disabled individuals, and children. Through thoughtful design and facilities, these groups can participate more freely in urban life, improving their quality of life and social engagement. Secondly, inclusive street design helps foster social inclusion. By providing accessible, friendly, and inclusive public spaces, streets become places for people to meet and interact, promoting communication and connection within and outside communities, and strengthening social cohesion. Most importantly, inclusive street design contributes to achieving social equity. By offering equal opportunities and convenience, everyone can enjoy the resources and services provided by the city, eliminating inequalities in society and creating a fairer and more just urban environment. Therefore, researching inclusive street design holds significant academic and practical value in advancing social inclusivity and fairness.

1.4 Research Status

1.4.1 Inclusive Design

The concept of inclusive design was first introduced by Roger Coleman at the 12th International Ergonomics Association - Canadian Federation in 1994. At that time, inclusive design was seen as a concept that helps manufacturers recognize the potential social benefits of their products. Coleman stated, "With an aging population, this new approach bridges the gap between mainstream design and older users. In the context of an aging population and evolving understanding of disability, the concept of inclusive design expands people's perception of the branch of design targeted at disabled individuals to encompass more human-centered design products for a broader range of users through storytelling and scenario building" [20].

In 2005, the British Standards Institution defined inclusive design as "the design of mainstream products or services that are accessible to, and usable by, as many people as reasonably possible without the need for special adaptation or specialized design" [21] . In the field of design, inclusive design shares similarities and differences with the commonly used "Design for All"

concept in continental Europe and the "Universal Design" concept in the United States and Japan. Design for All and Universal Design both emphasize designing for all people within a population, while inclusive design focuses more on serving as many people as possible. In comparison to traditional accessibility design, inclusive design no longer views disabled individuals, older people, etc., as a separate group requiring special design but considers them as part of the diverse population.

Currently, inclusive design has become a widely recognized research direction in developed countries such as the UK, Denmark, Finland, Norway, Sweden, the US, Canada, and others. Furthermore, well-known companies like Microsoft have adopted inclusive design as part of their design principles, and Ford has introduced inclusive design products that have been well-received in the market, among many other similar cases.

In China, research on inclusive design began with the publication of Dong Hua's article "Inclusive Design: New Practices in Interdisciplinary Engineering Research in the UK" in 2011. This article provided a brief analysis of the development of inclusive design and opened a new chapter in inclusive design research in China [22] . In the following years, Chinese researchers have explored and made significant achievements in various fields such as product design, clothing design, signage system design, open space, and public space design. The publication of "Inclusive Design: Chinese Archives" in 2019 marked the first academic monograph on inclusive design in China[23]. This book provides a comprehensive introduction to the research and development of inclusive design in China from a broader perspective, providing an important theoretical foundation for inclusive design research in the country [24].

1.4.2 Street

In foreign countries, street spaces are the focus of architectural design and urban studies as carriers of daily life. From the ancient Greek agora to medieval marketplaces, street spaces have been an integral part of the urban environment, embodying the essence of the city. As constructed spaces, streets are both physical objects and important material spaces that shape

people's perception of the urban image, reflect urban meanings, and establish contextual continuity. Jane Jacobs (1961) proposed the concept of "street ethics," emphasizing the interaction among people, space, and activities in creating well-designed material spaces. She believed that diversity in material spaces is key to successful urban community streets [25] . In 1979, Japanese architect Yoshinobu Ashihara introduced the term "street aesthetics" in academia, suggesting that studying street spaces from a visual aesthetic perspective can enhance our understanding of their role in cities. Related research primarily focuses on fields such as architectural and landscape design, examining street forms and aesthetic paradigms from the perspective of shaping the quality of material spaces [26] . In "Life Between Buildings," Jan Gehl (1987) further emphasized the need to improve the quality of urban squares, street corners, and other spaces to create vibrant urban streets and public life [27]. Likewise, Carr et al. (1991) argued that urban space design should be based on people's needs, particularly in relation to urban life in spaces [28].

In China, Duan Jin (2009) states, "The city is a complex whole composed of specific simple elements, and urban design should adopt a systemic perspective, observing it as an organic entity to understand its inherent evolution and development, guiding the development of urban spaces" [29] . Therefore, as an organic system, old city street spaces can be divided into two parts: one is the top-down designed and constructed street spaces, and the other is the bottom-up spaces formed through everyday life, including spaces spontaneously created by ordinary residents and vendors. Zhu Qipeng (2010) analyzes the morphology of street spaces from a morphological perspective, with a focus on the interface as the core. He views the interface as the continuity of "socialized skin" architecture, extracting the intrinsic humanistic connotations of street spaces and achieving the continuity of urban contexts through the spatial patterns and atmospheres carried by the "socialized skin" [30].. In addition, in the study of typical informal spaces, Xiao Xiao (2020) uses the example of the seam markets in Shanghai. By selecting representative cases and based on the events that facilitated the evolution of the markets, she systematically studies the spatial aspects of the markets, including their motivations, formation,

types, forms, boundaries, and landscapes, focusing on the atypical two-dimensional urban morphology.

1.5 Methods and Framework

1.5.1 Methods

(1) Literature Research

Gather relevant journal articles, books, and other scholarly works to compile, classify, summarize, and analyze the collected data. Through this process, acquire an understanding of mature methods and relevant theories in inclusive design and urban street design from both domestic and international scholars.

(2) Case Study

Study excellent urban street design cases from various countries, summarize inclusive design methods and strategies, and provide a basis for subsequent design work.

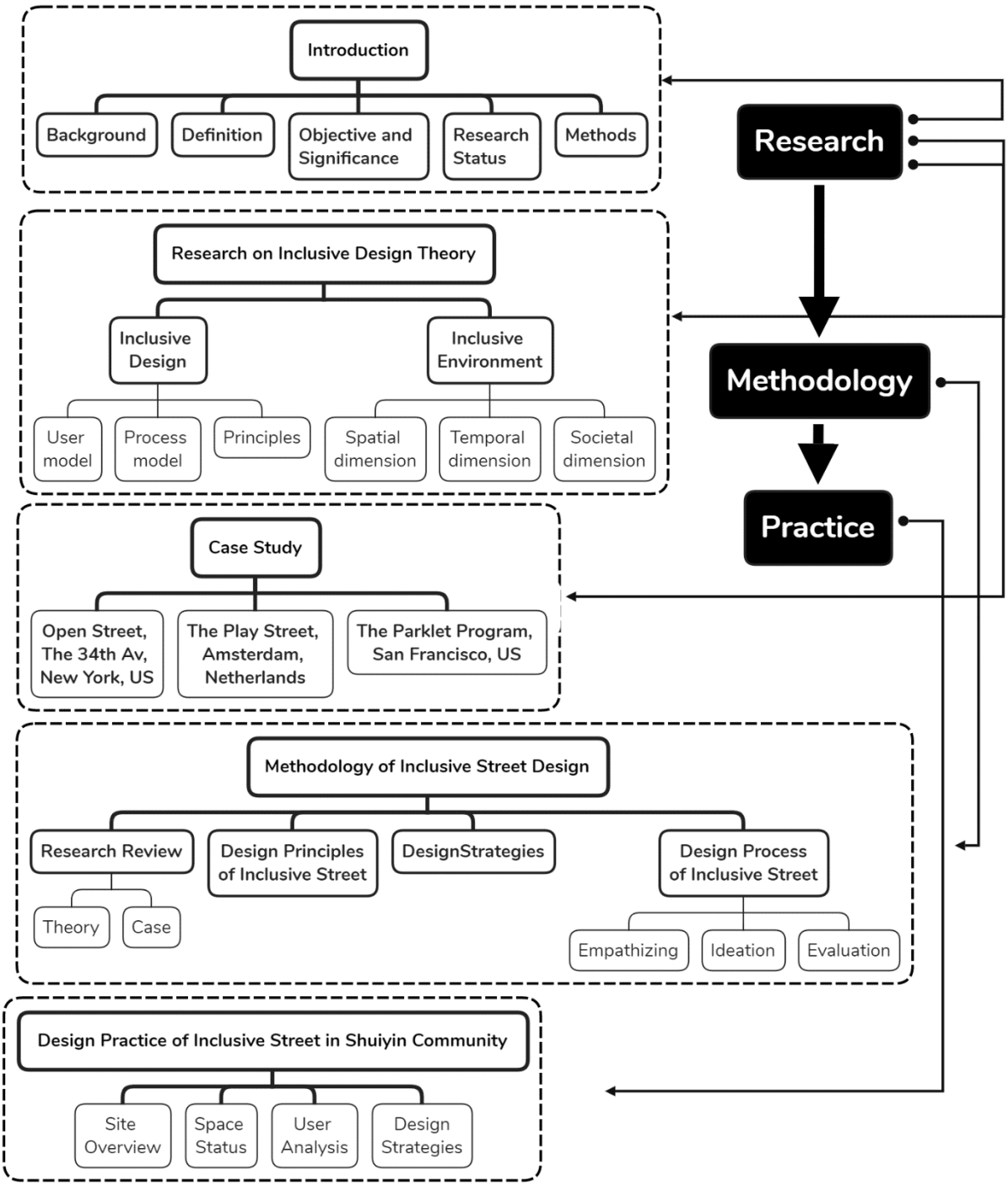
(3) Site Evaluation

Conduct on-site observations and create behavior maps to evaluate the site using inclusive evaluation criteria.

(4) Design Application

Select the Shuiyin District in Guangzhou as the research object. First, assess it based on inclusive design standards, and then apply inclusive design methods to address existing deficiencies. Provide design references for similar urban spaces in the process.

1.5.2 Framework



Chapter 2 Theoretical Research on Inclusive Design

2.1 Inclusive Design Theory

2.1.1 Inclusive Design Cube

The Inclusive Design Cube (IDC) is a theoretical design model for inclusive design that was developed by Keates, Clarkson, Harrison and Robinson [31] based on Benktzon [32] Pyramid model of users. The IDC draws inspiration from Card [33] classification of human abilities and categorizes human capabilities into three dimensions: Perception, Cognition, and Motor. These dimensions form the basis of the IDC. In measuring the abilities of different user groups, the IDC adopts the standards of the Pyramid model and classifies users into three scales: Severely Impaired, Moderately Impaired, and Unimpaired (Fig 2-1).

By continuously matching design with user abilities, user-centered inclusive design is carried out for the inclusive population. The WINIT model is then used to describe the target user groups based on the design requirements and capabilities of users. The WINIT model distinguishes the target users from the whole population and divides them into five groups: Whole population, Ideal population, Negotiable max population, Included population, and Target population (Fig 2-1).

Based on the users' abilities in action, perception, and cognition, design inputs, outputs, and affordances are matched to achieve inclusive design. Inclusive design can further be subdivided

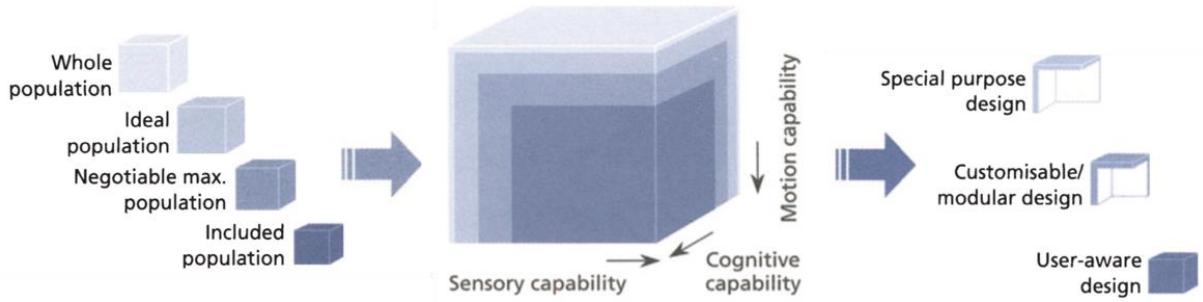


Fig 2-1 Inclusive Design Cube

Source：[5]

into various subtypes as user groups expand, including customizable/modular design, special-purpose design, or user-aware design, to facilitate the interaction between users and the environment.

2.1.2 Design Process by Norwegian Design Council

The Norwegian Design Council has developed a linear inclusive design process based on the user-centered design approach. Building upon the British Design Council's Double Diamond Model, the Norwegian model consists of four stages and eight key activities. The four stages of the process are Explore, Focus, Develop, and Deliver. Each stage involves two key activities (Table 2-1).

In the Explore stage, researchers and design teams aim to gain a deep understanding of the problem context and form preliminary concepts based on market and user research. Through design research, they establish real connections with user groups and define the target user population for the design, particularly the "lead users." In the context of inclusive design, lead users are individuals who "challenge products, systems, services, and environments in ways that go beyond the capabilities of mainstream and average users." The more severe the comprehensive ability deficits of users in using products, the closer they are to being lead users. If the design can meet the ability requirements of these lead users with limited abilities, it can naturally meet the needs of other user groups with stronger abilities. As Bernard Isaacs put it, "Design for the young and you exclude the old; design for the old and you include the young."

The Focus stage requires researchers to immerse themselves in users' lives and understand their problems, needs, desires, and aspirations. In the activity of uncovering user needs, researchers can employ methods such as surveys, observations, and interviews. After collecting a wealth of data, researchers need to structure and organize it, visualize the data according to patterns and themes for comparison and contrast, eliminate irrelevant information, and prioritize high-priority data.

In the Develop stage, researchers use the information and data obtained in the earlier stages as a basis to define design goals and the challenges and problems to address. They then select the most promising design concepts for further development. Researchers can also set criteria and specific principles for evaluating design concepts and solutions as a standard for screening and evaluating them. After confirming specific design concepts and solutions, researchers can use the information and materials collected during the earlier research to reconstruct the key characteristics of different user groups and establish a virtual user and context to assess how well the design solutions perform in the established context.

In the Deliver stage, researchers gather real user feedback through methods such as on-site or remote testing to validate whether the design solutions address the design problem and meet user needs, as well as to identify any usability issues and details of the product. This feedback data can be structured, organized, and stored to form a user database, serving as a reference for design iterations and future projects.

Stage	Activity	Method and process
Explore	Context understanding	Literature review, market research, competitive analysis, user insights
	Design research	Formulating research questions, identifying focus areas, establishing frameworks, and selecting participants
Focus	Uncovering user needs	Conducting user research, refining research focus, and adapting research methods.
	Insight mapping	Analyzing and organizing data, visualizing data through various techniques, and prioritizing findings
Develop	Design specifications	Setting design standards, articulating design requirements, and selecting appropriate design solutions
	Creating user	Developing user personas, defining user roles, and

	scenarios	designing user-specific contexts
Deliver	User feedback	Conducting on-site testing, remote testing, and large-scale market testing to gather user feedback
	Resource establishment	Building image libraries, maintaining insight databases, developing user role repositories, and exploring uncharted domains

Table 2-1 Design Process by Norwegian Design Council
Source: Organized from [34]

2.1.3 Inclusive Design Wheel

The Inclusive Design Wheel, derived from the three-stage, seven-step process proposed by the Engineering Design Centre at the University of Cambridge, is commonly referred to as the "Three-Seven Rule" in China. The three stages and seven steps of the process include gathering user requirements, defining design functions, outputting user perceptions, establishing functional solutions, optimizing user experiences, eliminating design exclusions, and evaluating demand matching [39]. Through continuous application, the Three-Seven Rule of inclusive design has evolved into an iterative form and has been further developed and supplemented by the Engineering Design Centre at the University of Cambridge as a theoretical model called the Inclusive Design Wheel (Fig 2-2).

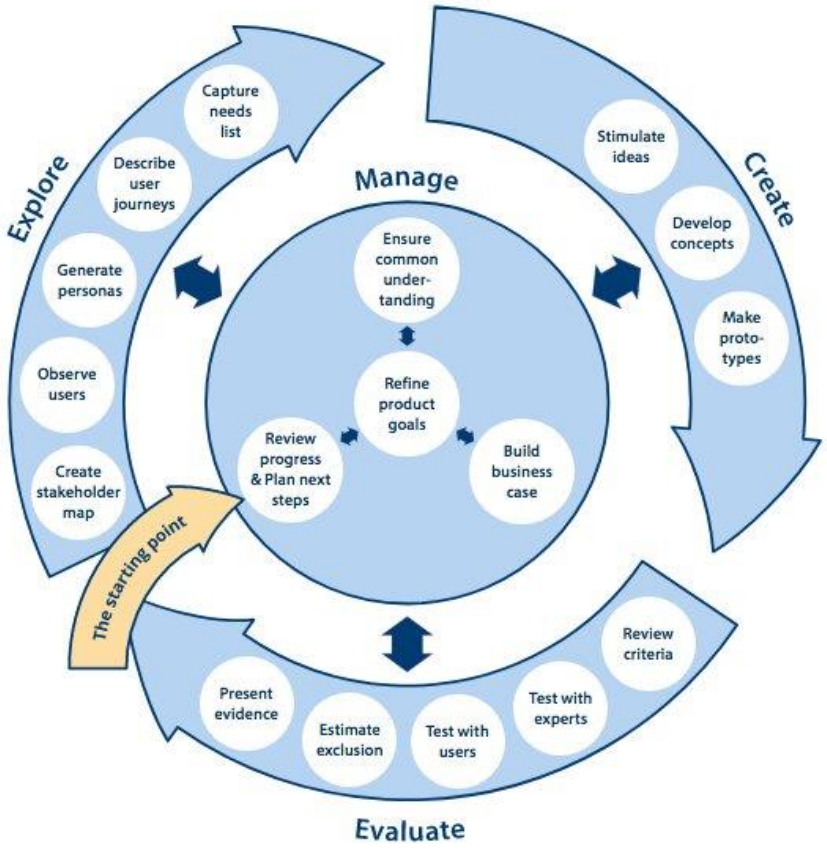


Fig 2-2 Inclusive Design Wheel

The Inclusive Design Wheel consists of a central "Management" component and three outer "Explore," "Create," and "Evaluate" segments, incorporating both management and innovation

cycles. The management phase ensures that the project progresses in the right direction and answers the question of "what to do next." The exploration phase aims to gain a clearer understanding of the requirements and addresses the question of "what are the needs." The creation phase focuses on generating further solutions and answers the question of "how to meet the needs." Lastly, the evaluation phase assesses the extent to which the needs have been met.

2.1.4 Inclusive Design Principles

Different organizations and companies have varying understandings of inclusive design, leading to the publication of multiple versions of inclusive design principles in recent years (Table 2-2).

CABE	• Place people at the heart of the design process • Acknowledge diversity and difference • Offer choice where a single design solution cannot accommodate all users • Provide for flexibility in use • Provided buildings and environments that are convenient and enjoyable to use for everyone
TPG	• Provide comparable experience • Consider situation • Be consistent • Give control • Offer choice • Prioritize content • Add value
Microsoft	• Recognize exclusion • Learn from diversity • Solve for one, extend to many

Table 2-2 Inclusive Design Principles from Different Organizations
Source: Organized from [35-37]

(1) CABE

The Commission for Architecture and the Built Environment (CABE) in the UK published "The

Principles of Inclusive Design" in 2016, authored by Howard Fletcher [35]. It summarizes five inclusive design principles: (i) placing people at the core of the design process, (ii) acknowledging diversity and differences, (iii) providing more choices when a single design solution cannot meet all users' needs, (iv) offering flexibility in use, and (v) creating buildings and environments that are convenient and enjoyable for everyone. CABE believes that the simplest and most powerful criterion for evaluating the inclusiveness of the built environment is its ease of use for everyone. This usability extends beyond the physical dimension to encompass cognitive and emotional dimensions as well.

(2) TPG

The Paciello Group (TPG), an accessibility consultancy firm in the United States, primarily focuses on software and interaction interfaces. Their inclusive design principles, which resemble design prompts during the interface design stage, can be summarized into seven points [36] : (i) comparable experience, (ii) consider context, (iii) maintain consistency, (iv) provide control, (v) offer choices, (vi) prioritize content, and (vii) add value. TPG's inclusive design principles align with the core concept of person-centeredness and respect for diversity of populations and needs, which inclusive design has long upheld.

(3) Microsoft

Similar to TPG, Microsoft's main business area is digital products. The Microsoft Design department has accumulated extensive research and practical cases in inclusive design over the years, summarizing them into three concise inclusive design principles: (i) recognize exclusion, (ii) learn from diversity, and (iii) solve for one, extend to many. Microsoft's inclusive design principles do not dictate what designers should pay attention to or achieve in their design solutions; instead, they provide guidance on how to approach inclusive design. They believe that inclusive design not only provides products and experiences for a broader range of individuals with diverse abilities but also reflects the reality that people are constantly growing, changing, and adapting to the world around them. They aim for design to reflect this diversity

[37].

In summary, inclusive design principles can generally be categorized into two groups: those that reflect the values and goals represented by the principles, and those that can be seen as methods and approaches to achieving these goals and values. At the value level, inclusive design principles advocate for consideration of the diversity of people and contexts, learning from and embracing diversity and differences. Moreover, inclusive design emphasizes a person-centered approach, considering users' abilities and needs as fundamental determinants of design. At the methodological level, simplicity, usability, and flexibility are important principles emphasized in inclusive design. Additionally, inclusive design places a strong emphasis on providing users with a positive experience, going beyond mere accessibility concerns.

2.2 Inclusive Environment

An inclusive environment refers to an environment where individuals are accepted and embraced by both the environment itself and the individuals within it. In other words, inclusivity is the manifestation of the environment's ability to accept individuals. The term "environment" here encompasses not only the physical environment external to individuals but also the social or psychological environment established collectively by others [23].

There are multiple perspectives and dimensions to understanding inclusive environments, and this article focuses on explaining the connotation of inclusive environments from spatial, temporal, and social dimensions.

2.2.1 Spatial Dimension – Street for Life

The built environment serves as the inclusive physical medium. Interpreting the inclusivity of the built environment from a spatial dimension means that its functions and forms can meet the diverse needs of different users, especially lead users. Equity is the core of material spatial

inclusivity, as it recognizes the diversity and differences among different user groups, ensuring that everyone has the right and opportunity to use the space.

Traditional urban street spaces have long lacked inclusivity for vulnerable groups, especially the elderly. Research has shown that the level of inclusivity of urban street environments significantly influences the willingness and frequency of the elderly to use the streets [4, 38]. . In the book "Inclusive Urban Design: Streets for Life," Burton and Mitchell [4] proposed the concept of "Streets for Life" as a means to achieve inclusive street spaces at the neighborhood scale. They identified six fundamental design principles for outdoor environment design: familiarity, legibility, distinctiveness, accessibility, comfort, and safety [4]. The legibility of streets is first reflected in their signage and wayfinding design. It helps older adults with declining cognitive abilities to orient themselves and understand their routes. Accessibility fulfills the needs of older adults to reach, enter, use, and move within the environment. Wide and smooth sidewalks, service facilities within short walking distances, and accessibility designs for level changes all ensure that older adults can reach their destinations smoothly and without hindrance. Providing a pleasant sensory experience and leisure seating along walking paths enhance the comfort of streets. Safety refers to the absence of concerns about tripping hazards, speeding, or potential attacks when people enjoy and use the outdoor environment. These principles all reflect the inclusivity for the elderly at the material spatial level of streets.

2.2.2 Spatial Dimension – Universal Design and Tactical Urbanism

From the perspective of time, the understanding of inclusivity in the environment focuses on the mutual influence between users and the built environment over time, creating a sense of inclusion or exclusion. Synchrony and diachrony are key terms when considering the inclusivity of architecture in the temporal dimension. Synchrony refers to a horizontal perspective that emphasizes the inclusivity of the environment at a particular moment, examining whether the current spatial state can meet diverse functional requirements, i.e., spatial universality. Diachrony, on the other hand, involves a longitudinal perspective that

dynamically investigates the inclusivity of the environment in relation to changes in people or the environment over time. Diachrony requires spatial design to possess flexibility and adaptability, allowing for cost-effective functional transformations to meet future usage needs.

(1) Spatial Universality – Universal Design

The concept of universal design evolved from the concept of barrier-free design. There are many similar design concepts, such as inclusive design in the UK and design for all in Europe. Steinfeld (2013) defines universal design as "a process that enables and empowers a diverse population by improving human performance, health, and wellness, and social participation, with the goal of developing products and environments that are usable by all people, to the greatest extent possible" [39].

From the perspective of human efficiency in using designed products, considerations for universal design can be divided into four aspects: ergonomics, biomechanics, sensory abilities, and cognitive abilities. Under the concept of universal design, products should aim to meet the needs of a wide range of users, providing them with diverse choices and considering extreme usage scenarios [39].

(2) Spatial Flexibility – Tactical Urbanism

Tactical urbanism refers to the use of a series of short-term, low-cost, and scalable construction methods or policies by implementers during community-building processes to intervene in urban spaces. The outcomes of tactical urbanism are iterative, continuously evaluating and optimizing design results throughout the design process [3] . One of the core ideas of tactical urbanism is the use of low-cost means to create temporary urban facilities. This idea has historical precedents, from temporary Roman army camps to 16th-century Parisian riverside bookstores (les bouquinistes) and the "White City" at the 1893 Chicago World's Fair [40, 41]. . However, the definitive appearance of tactical urbanism was marked by a conference held by New Urbanists in New Orleans in 2010, followed by the establishment of an open-source urban

project called "Tactical Urbanism: Short-term Action for Long-term Change" [42].

In the book "*Tactical Urbanism: Short-term Action for Long-term Change*", Campo [3] divides the implementation steps of tactical urbanism into five stages, with the final stage of "testing" reflecting the consideration of spatial flexibility in tactical urbanism. The core of the testing stage is the "build-measure-learn" process. By rapidly building design prototypes and employing surveys, interviews, and other research methods to evaluate the results, design flaws are identified using evaluation criteria, and iterative improvements are made until relatively successful design outcomes are achieved. This dynamic process over time aims to meet the evolving needs of users.

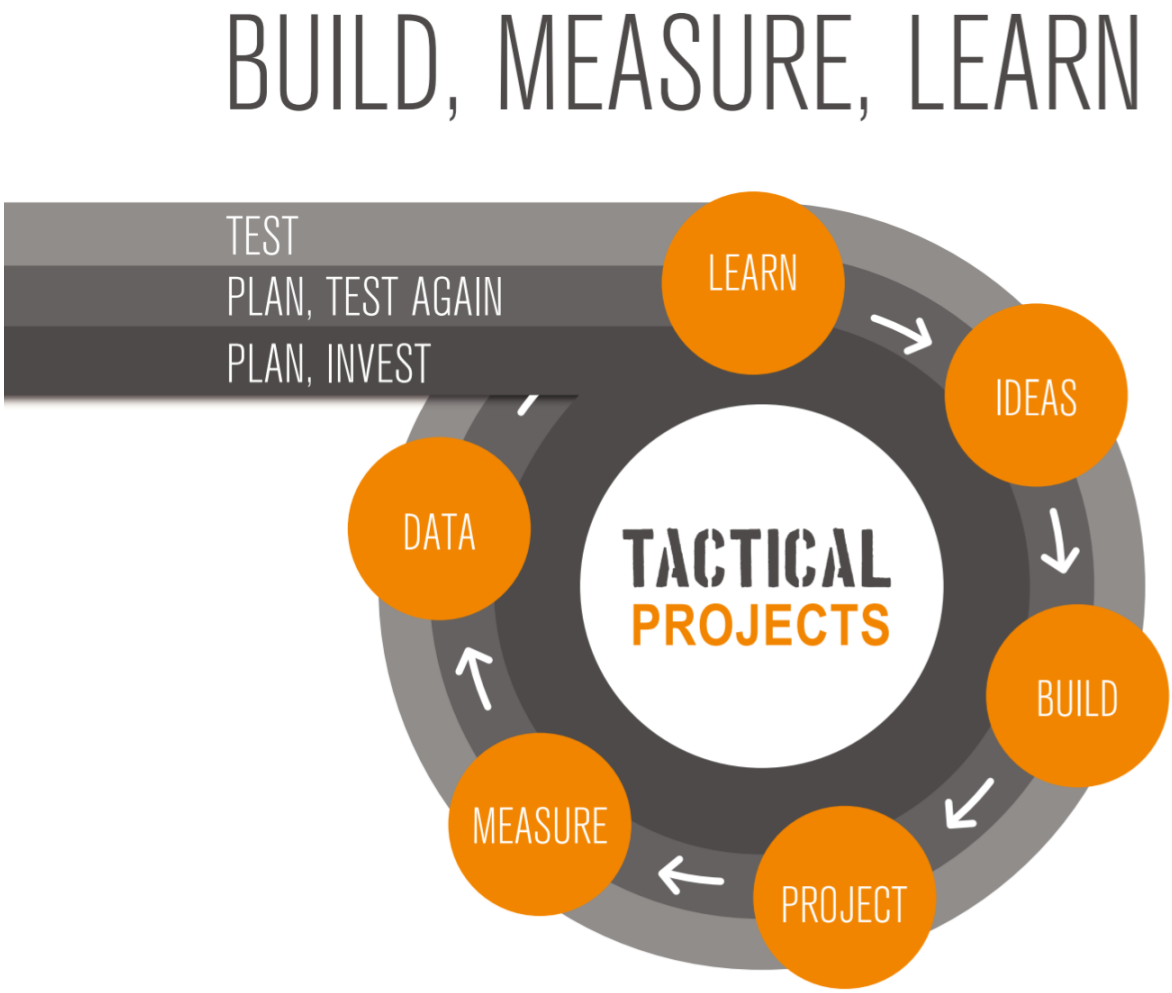


Fig 2-3 "Build – Measure – Learn" Process
Source: [3]

2.2.3 Societal Dimension – Social Inclusion and Social Imagery of Architecture

The built environment serves as the material spatial carrier for social activities, as well as

representing history, culture, humanities, and regional aesthetics. The interpretation of inclusiveness in the social dimension of the built environment can be divided into two aspects: first, the inclusiveness and exclusion in social relationships among individuals within the built environment, and second, the inclusiveness and exclusion of individuals based on the social imagery represented by the built environment.

(1) Inclusiveness in the Social Relationship

The interpretation of inclusiveness in social relationships can be traced back to the theory of social inclusion. Social inclusion is a concept in the field of social policy that refers to the state of society treating social members with different social characteristics and their social behaviors equally and tolerantly [43] . Its emergence originated from the research on social exclusion by European scholars, with the goal of eliminating any form of social exclusion. Vulnerable groups are the main targets of social exclusion. Vulnerable groups are individuals who find themselves in disadvantaged situations due to physical, psychological, or fundamental quality deficiencies, as well as uncontrollable factors such as access to natural resources, social rights, and cultural perspectives [44]. They are usually populations who do not have the same opportunities as others, such as children, the elderly, pregnant women, and people with disabilities.

There are two main theoretical frameworks for social exclusion [45, 46](Table 2-3).Burchardt, Le Grand and Piachaud [46] conducted extensive practices and investigations in the UK during the 1990s and identified four dimensions for assessing the degree of social exclusion: consumption capacity, which refers to the ability to purchase goods and services; production capacity, which involves engaging in valuable economic or social activities; political engagement capacity, which involves participating in local community or national political decision-making; and social interaction, which refers to the harmony of relationships with family, friends, and the community. On the other hand, Saunders, Naidoo and Griffiths [45] categorized evaluations of social exclusion into the following types: inadequate access to resources, including weak financial income and limited access to resources; exclusion from the labor market, including

living in an unemployed household; exclusion from social life services, such as public transportation, recreational facilities, youth clubs, and other essential home infrastructure like water, electricity, and communication; and exclusion from social relationships. Evaluating social exclusion in terms of social relationships can be further divided into five criteria, namely the degree of participation in normal social activities, the quality and breadth of interpersonal networks, the timeliness of receiving social assistance, the level of participation in political and civic activities, and the ability to move freely.

Burchardt, Le Grand and Piachaud [46]	• consumption: the capacity to purchase goods and services; • production: participation in economically or socially valuable activities; • political engagement: involvement in local or national decision-making; • social interaction: integration with family, friends and community.
Saunders, Naidoo and Griffiths [45]	• Impoverishment, or exclusion from adequate resources; • Labor market exclusion; • Service exclusion; • Exclusion from social relations: - Non-participation in common activities; - The extent and quality of social networks; - Support available in normal times and in times of crisis; - Disengagement from political and civic activity; - Confinement, resulting from fear of crime, disability or other factors.

Table 2-3 Evaluation on Social Exclusion from different dimensions
Source: Organized from [45, 46]

(2) Inclusiveness in the Social Imagery represented by Architecture

Fig 2-4 Seniors Prefer Traditional Pattern
Source: [4]

Due to its cultural, artistic, aesthetic, and historical characteristics, architecture within the built environment becomes an environmental imagery that can evoke responses from the public's ideological consciousness. It serves as a means for people to transform their environment and express their understanding of the world, while also triggering a reevaluation of their perception of the environment. Burton and Mitchell [4] mentioned in their principle of familiarity in inclusive streets that people have certain psychological expectations regarding the appearance of their surroundings. When the style and appearance of the environment do not align with their familiar visual types, they often feel confused and unable to comprehend its functional purpose. This phenomenon is particularly evident in elderly dementia patients. Survey results on the design of dementia care facilities show that elderly dementia patients often struggle to understand modern designs or may misinterpret their purposes. For example, dementia patients may perceive all glass doors as windows. Therefore, the majority of the elderly population prefer traditional design elements (Fig 2-4), not only because traditional designs appear more familiar but also because they can understand the purpose of the design based on their past experiences. For instance, they are more inclined to use street furniture with traditional styles. When shown a photograph of a barber pole with spiral stripes, dementia patients can recognize it as a sign for a barber shop [4]. Thus, employing traditional historical styles can enhance familiarity for individuals with cognitive difficulties, avoiding confusion and anxiety, and helping them better comprehend and utilize design functions.

Space also possesses social attributes. For instance, the territoriality of space reflects the

ownership of space by its occupants and can represent certain social status. The right to use space demonstrates the intimacy or distance in social relationships among different groups of people. Exclusion represents detachment, while sharing represents intimacy [39]. The public and private aspects of space, which refer to the small-scale social environment existing within a space, determine whether it is accepting or excluding, intimate or distant towards outsiders. Therefore, the shared attribute of space, to some extent, can reflect the inclusiveness of the social environment towards different groups of people.

2.3 Summary

Inclusive design was initially a concept in design studies, and its theoretical models can be classified into three categories: inclusive design user models that depict user profiles and determine the design context in the early stages, inclusive design process models with specific solutions and linear processes, and inclusive design knowledge transfer models for iterative design innovation. The previous discussion explored inclusive design user models and inclusive design process models, which can provide references and guidance for the inclusiveness of urban environmental design. Later, the concept of inclusive design was expanded to the level of architecture and outdoor spaces, specifically addressing the inclusiveness of the built environment. This article explores the inclusiveness of the built environment from the spatial dimension, temporal dimension, and social dimension, and lists several important characteristics and design principles of inclusive built environments, laying a theoretical foundation for subsequent methodological research.

So, what is an inclusive street? From the perspective of the street's spatial and physical attributes, the street's environment should eliminate any physical factors that pose risks to personal safety, and the spatial environment should be as comfortable and pleasant as possible, with clean and tidy surfaces, resting facilities along the street, and pleasing greenery, among others. From the temporal dimension of the street, the current space should strive to meet the diverse usage needs

of different groups, incorporating universal design principles, while also considering potential future changes and adaptations, leaving sufficient design space and minimizing iterative costs. From the social environment perspective of the street, creating a harmonious, friendly, and vibrant street atmosphere enhances citizens' sense of affinity, belonging, and well-being. Space sharing is a necessary prerequisite for creating such an atmosphere. In conclusion, an inclusive street is a street space that "can accommodate the current and future physical usage needs and social interaction needs of different groups."

Chapter 3 Case Studies

3.1 Open Street – 34th Avenue, New York, US

3.1.1 Background

Jackson Heights is one of the most densely populated communities in New York City, with approximately 40,000 people per square mile. It is also one of the most racially diverse communities, with about 167 languages spoken. One of the main thoroughfares in the community is 34th Avenue, which spans approximately 1.3 miles and covers 30 city blocks.

In the past, 34th Avenue served not only as a transportation route but also as an outdoor gathering space for community residents. However, the demand for outdoor open space often conflicted with the function of vehicular traffic, posing safety hazards for people engaging in various outdoor activities on the roadway. As a result, 34th Avenue has also been one of the roads with a high frequency of traffic accidents. One tragic accident that resulted in the death of a 9-year-old child sparked extreme dissatisfaction among community residents with New York City's road planning and prompted demands for more and safer outdoor activity spaces in the community [6].

3.1.2 Design Strategies

(1) A Safer Street

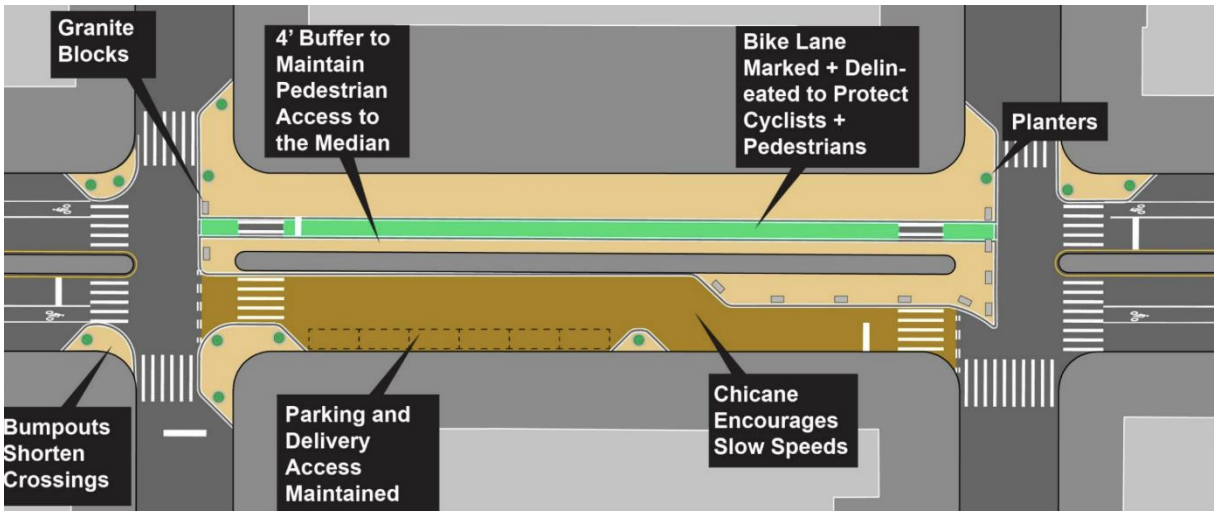


Fig 3-1 Road Security Measures
Source: [1]

In order to create a safer neighborhood, the New York City Department of Transportation (DOT) has implemented a series of protective measures to restrict and prevent outside vehicles from entering the area. For example, barriers have been installed at road intersections to enforce vehicular turning movements and determine the direction of traffic flow. East-west vehicle traffic is forced to shift away from the sidewalks, ensuring higher priority and safety for pedestrians. Certain roads within the neighborhood have also been equipped with barriers to restrict vehicle access. High-contrast green and gray pavement markings have been used on the road surface to assist individuals with visual and cognitive difficulties in distinguishing and identifying the road. Turning and lane-changing measures have been implemented in excessively long road segments to remind drivers to reduce speed [1](Fig 3-1). These measures have resulted in a reduction of over 41% in pedestrian-involved traffic accidents. "Knowing that it's safer for my son to walk to and from school is a great relief for us as parents," said Steven McIntosh, a resident of Jackson Heights and father of two children [47].

(2) All-age-friendly Public Space

Travers Park is a small public park within the community (Fig 3-3). The park space is clean, vibrant, well-maintained, but relatively utilitarian, with no security or surveillance and no posted rules. In other words, the designers have provided basic amenities such as various seating

and abundant plant landscapes, while leaving the remaining space uses to be defined by the residents themselves. It is this flexibility that has made this community a hub of activities for people of all ages. Here, you can see adults resting and socializing, as well as children creatively transforming various public facilities, turning them into playgrounds. The experience of Travers Park demonstrates that "non-designed" public spaces can foster diverse and creative uses rather than predetermined activities. Flexible, adaptable, and variable space designs can promote interactions among different groups of people [8].

(3) Improvement of Street Comfort

Taking into account the physical abilities of different population groups and aiming to create a more diverse social space, various seating facilities have been installed along 34th Avenue, such as seating platforms around landscape flower beds and tables and chairs along the street (Fig 3-3). Community residents have also spontaneously defined the functions of the entire street, where raised platforms covered with canvas become small spaces for family birthday celebrations. These diverse seating facilities not only reduce the distance of walking, providing resting places for elderly or disabled individuals, but they also serve as vibrant micro spaces for social interactions, adding vitality to the community and enhancing the comfort of the street.

Fig 3-3 Roadside Rest Facilities
Source: [6]

Fig 3-3 Travers Parks in the Community
Source: [8]

3.2 The Play Street – Amsterdam, the Netherland

3.2.1 Background

Potgieterstraat is a major street in a community in Amsterdam, the Netherlands. Due to

historical urban planning reasons, the earlier design of the neighborhood could no longer meet the current community's need for public space. Potgieterstraat was dominated by heavy traffic and lacked public squares and greenery. In order to increase public activity spaces and enhance the vibrancy of the neighborhood, the landscape architecture firm Carve adopted the concept of "The Play Street" to transform the street into a linear park for children to play [2, 48].

3.2.2 Design Strategies

(1) Reclaim Space

After obtaining the agreement of over 70% of the community residents and the local government, Carve removed four parking lots within the community and the vehicular lanes in the neighborhood. They integrated them with the road medians and sidewalks to create a larger community activity space. Carve also ensured the safety of the activities within the space by limiting vehicle access.

(2) Activate Space

Carve activated the street space by adding play elements and landscape features to encourage children's play behavior in the street (Fig 3-4). There are numerous play objects, including graffiti-friendly pavement materials, sprinklers, trampolines, slides, spinning devices, crawling tunnels, and sound-transmitting pipes. Additionally, many seating facilities are placed adjacent to the children's play area, allowing parents to sit on benches, chat, and supervise their children. This setup promotes neighborhood interactions and intergenerational integration to a certain extent.

Fig 3-4 Play Elements in the Street
Source: [2]

3.3 The Parklet Program – San Francisco, US

3.3.1 Background

The Parklet Program is a city-led micro-transformations project initiated by the City of San Francisco in 2010 (Fig 3-5). The road designs of the mid-20th century prioritized fast automobile traffic to meet the demands of the industrial era, leading to a significant occupation of urban sidewalks by vehicles. However, from a humanistic perspective, the city streets of San Francisco lacked care for residents and pedestrians. The establishment of the Parklet Program aimed to reduce the dominance of cars in urban spaces and reclaim the streets for the public.

Any resident within a community can submit an application to the city government to transform roadside parking spaces into parklets. Once the application is approved, the applicant is responsible for designing and purchasing construction materials at their own expense. The

materials used for constructing the parklet must be lightweight, allowing for easy adaptation to future needs and changes with minimal cost. The completed parklets unlock the potential of urban spaces, enhance neighborhood comfort, and promote community interactions [7].

Fig 3-5 The Parklet Program
Source: [7]

3.3.2 Design Strategies

(1) Flexible Space

The Parklet Program encourages designers to use lightweight and removable eco-friendly wooden materials. This approach aims to minimize environmental impact and facilitate easy removal of the facilities during future road maintenance by the city. Furniture elements, such as tables and chairs, should be selected to be movable, allowing for the flexibility to free up space for alternative uses when needed. The space can accommodate various functions, including bicycle parking, planting, resting, and dining, all defined by the community members themselves (Fig 3-7).

(2) Accessible Space

The design guidelines for parklets prioritize care for vulnerable groups and emphasize

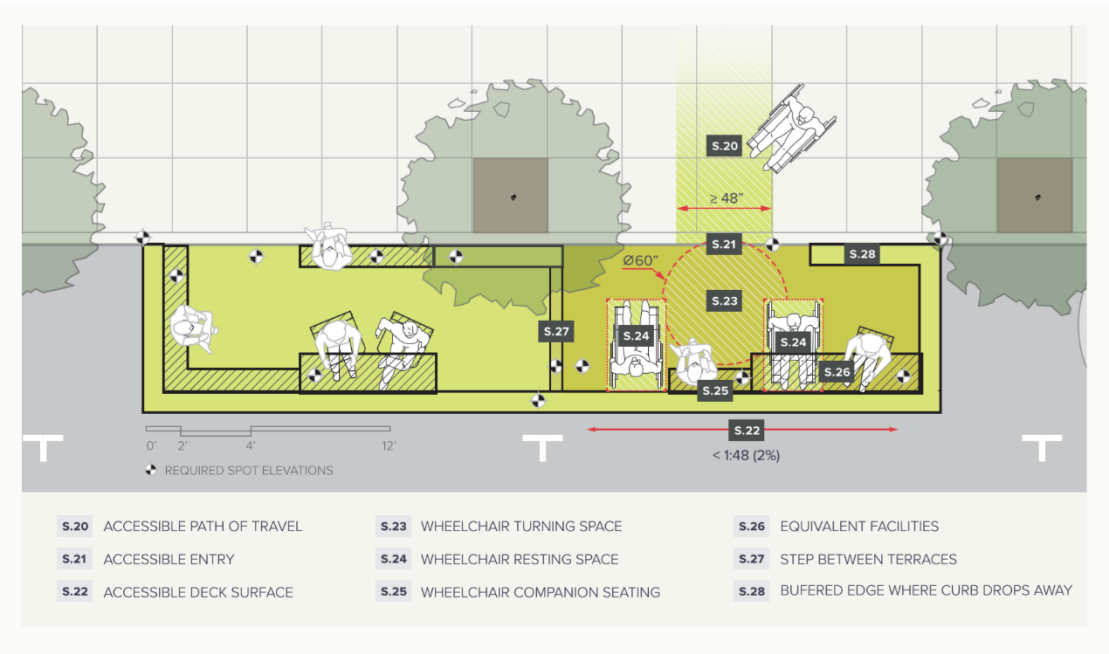


Fig 3-6 Inclusive Design in a Parklet
Source: [7]

Fig 3-7 Diverse Functions in Parklets
Source: [7]

accessibility (Fig 3-6). It stipulates that access to the parklet space must consider accessibility, with the entrance aligned as much as possible with the sidewalk and wide enough to accommodate wheelchair access. The pavement of the space must be even and slip-resistant. Sufficient turning space for wheelchairs and resting areas for wheelchair users should be

provided within the space. The height of facilities within the space should consider the needs of wheelchair users and children.

(3) Sustainability

To reduce environmental pollution and carbon footprint, most of the construction materials for parklets come from local wood sources (Fig 3-8). Using locally sourced materials creates parklets that blend in with the local environment in terms of style and facade, appearing natural and harmonious within the neighborhood. This enhances the sense of affinity for community residents, especially for elderly individuals with cognitive impairments.

Fig 3-8 Furniture Built from Local Materials
Source: [7]

3.4 Summary

In summary, the analysis of the three cases of inclusive street design demonstrates different focal points in each project.

The Open Streets project on 34th Avenue in New York City originated from the community's demand for more open street spaces and improved safety. The government implemented measures to reduce motor vehicle traffic in the community, ensuring safety and inclusiveness for children, the elderly, and people with disabilities. The street spaces and public areas within the community gradually became places for communication and interaction among people of different ages, races, and cultures, showcasing the inclusiveness of the social environment. The

provision of benches, flower beds, and other amenities along the street catered to the resting needs of individuals with mobility limitations, emphasizing the comfort requirements of inclusive environments. The designers also considered the dynamic and evolving needs of users over time, leaving ample space for users to define the functionality of the public spaces, reflecting the temporal dimension of inclusivity in the environment, including adaptability, flexibility, and resilience.

The Play Street project in Potgieterstraat, Amsterdam, prioritized the play needs of children in the street space design and incorporated various play elements. The street was transformed into a car-free zone to ensure the safety of the play areas, demonstrating inclusiveness for children. The adjacent seating facilities became areas for parents to socialize and communicate, promoting intergenerational integration and neighborhood harmony, further emphasizing the inclusiveness of the social environment.

The Parklet Program in San Francisco considered the dynamic use of space over time and showed care for people with mobility limitations. From a synchronous perspective, the parklet design accommodated diverse needs and allowed for low-cost transitions between different functionalities. From a diachronic perspective, the lightweight, eco-friendly, and easily removable construction materials considered future factors such as road maintenance, parking shortages, and municipal infrastructure repairs. The design also showed care for vulnerable groups, and the familiarity of the materials catered to users with lower cognitive abilities. Citizens could engage in conversations in these spaces, increasing the sense of affinity within the neighborhood. Overall, the Parklet Program exemplifies the principles of flexibility, usability, familiarity in inclusive design, and highlights the inclusiveness of the social environment.

Chapter 4 Methodology of Inclusive Street Design

4.1 Research Review

This chapter will summarize a methodology for inclusive street space design in Guangzhou, based on the previous literature, design practices, model theories, and case studies. However, before summarizing the methodology, it is necessary to provide an overall review of the research mentioned in the previous sections, explaining their relevance to this study and providing a theoretical basis and practical foundation for the formation of the subsequent methodology.

Inclusive design process models, such as the four-stage eight-activity model by the Norwegian Design Council and the inclusive design wheel by the Engineering Design Centre at the University of Cambridge, depict a general design process methodology. These models can be roughly divided into three steps: the initial research stage, the design stage, and the evaluation stage. The initial stage aims to understand the context of the design problem and define the user groups that the design will cater to, as well as their needs. Methods and theories that can be referenced in this stage include the inclusive design cube model by Keates, Clarkson, Harrison and Robinson [31] , the user pyramid model and stakeholder analysis by Benktzon [32] , the WINIT model, and others. The middle stage involves summarizing, selecting, organizing, and prioritizing the research data collected in the initial stage, based on which evaluation criteria for the design are established and feasible design solutions are explored. The final stage entails presenting the preliminary design outcomes to users, experts, and other stakeholders for evaluation, obtaining specific user feedback, and organizing this feedback into a database for future design iterations and reference in other projects. This design practice process and methodology are equally applicable to urban street design (Table 2-1， Table 4-1).

Design Stage	Specification
Initial Stage	• Understand the contextual aspects of the design problem and

	define the user groups that the design will address, gaining insight into their needs • Approaches - Inclusive Design Cube - User Pyramid - Stakeholder analysis - WINIT model
Middle Stage	• Consolidating, filtering, organizing, and prioritizing the research data collected during the early stage • Based on this data, evaluation criteria for design and feasible design solutions are developed and discussed
Late Stage	• The preliminary implementation of the design outcomes, subjecting them to evaluation by users, experts, and other stakeholders to gather specific feedback on usability. • The feedback is then compiled into a database, serving as a reference for subsequent design iterations and other projects

Table 4-1 Three Main Stages of Inclusive Design Process
Source: organized from the previous

The chapter on inclusive environments discusses the specific connotations and essence of inclusive environments from three dimensions: spatial, temporal, and social. It elucidates the important features of inclusive environments and answers the question of what inclusive streets entail. Various organizations and institutions, such as CABE, TPG, and Microsoft, have also put forward inclusive design principles from both a methodological and values perspective. These provide important references for the establishment of design principles and evaluation criteria for inclusive streets.

Dimension	Specification
Spatial Dimension	• Principles of Street for Life theory - Legibility - Accessibility - Comfort

	- Safety
Temporal Dimension	• Synchrony - Universality of Universal Design • Diachrony - Flexibility and adaptability of Tactical Urbanism
Societal Dimension	• Social relationship in built-environment - Social Inclusion theory - Social Exclusion theory • Social imaginary from built-environment - Familiarity principle of Street for Life theory - Shared space

Table 4-2 Three Dimensions of Inclusive Environment
Source: organized from the previous

The section on case analysis selects the examples of the Open Streets on 34th Avenue in New York City, the Play Street in Amsterdam, the Netherlands, and the Mini-Parks in San Francisco, USA, to further illustrate the specific practices of inclusive design in urban street spaces. Although each case has a different project background, all designs demonstrate a focus on marginalized groups. These exemplary projects provide inspiring design techniques and transformation methods for the subsequent inclusive renovations of community streets (Table 4-3).

	Location	Background	Design Strategies
Open Street	The 34th Av., New York, US	• Community with diversity • Dweller's need for public space and safety • Car accident on a child	• Safe street - barriers to divert cars - roadblock - high-contrast pavement - turning for the slow-down • Space for all-age - Non-design space • Comfortable Street

			- rest facilities - amicable atmosphere
The Play Street	Potgieterstraat St., Amsterdam, Netherlands	• Reclaim space from vehicles • Consideration for children	• Reclaim of space - removal of parking lot - combination of lanes and sidewalks - Ban on car-pass • Activation of space - play elements in the street - playground with rest facilities
The Parklet Program	San Francisco, US	• Reclaim space from vehicles • Led by citizens, designed by citizens, built by citizens and maintained by citizens	• Flexibility - lightweight, movable, detachable components - space function defined by citizens - inclusion for diverse needs • Accessibility - barrier-free design • Sustainability - constructed with local materials - affinity

Table 4-3 Summary of Case Studies
Source: organized from the previous

Based on previous literatures, materials and cases, hereby I propose the methodology of inclusive street design (Fig 4-1):

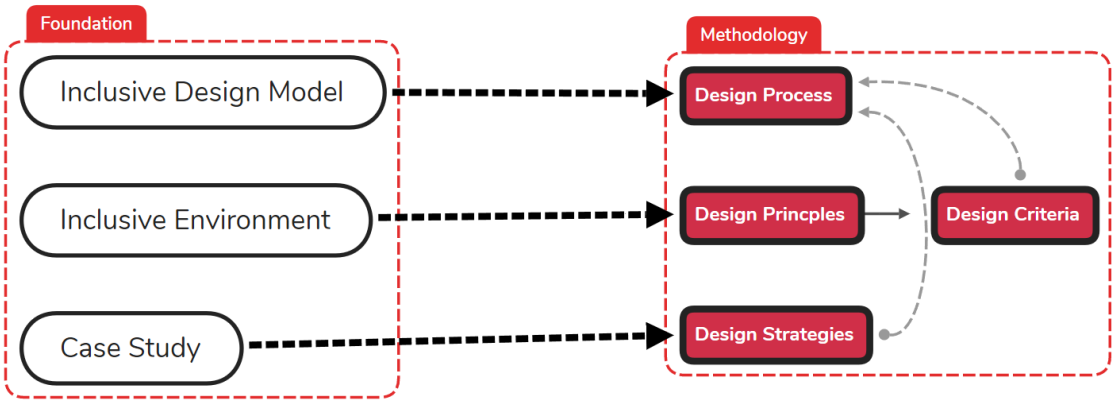


Fig 4-1 Foundation of methodology Source: by author

4.2 Design Principles

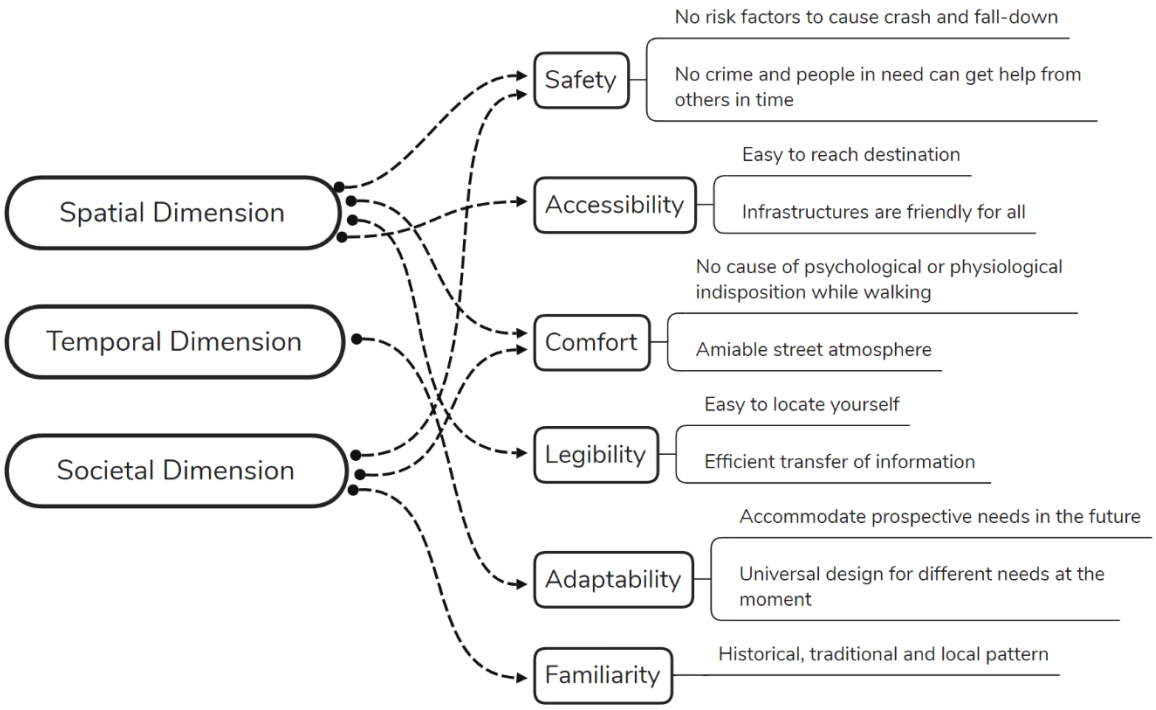


Fig 4-2 Design Principles of Inclusive Street
Source: by author

The streets not only have physical spatial attributes but also possess temporal and social attributes. Therefore, the formulation of inclusive street design principles will consider the dimensions of space, time, and society. Six major design principles are proposed: (i) Safety, (ii) Accessibility, (iii) Comfort, (iv) Legibility, (v) Adaptability, and (vi) Familiarity. These design principles and the three dimensions are not a one-to-many or many-to-one relationship but rather a tightly interconnected and mutually inclusive multi-to-multi relationship. Additionally, based on previous research, each design principle has varying priorities. Their priority is ranked from high to low, with the Safety principle having the highest priority and the Familiarity principle having the lowest priority (Fig 4-2).

4.2.1 Safety

Safety refers to the assurance that people can use and enjoy street environments without worrying about tripping, collision, or assault while walking. It encompasses both spatial safety,

which involves identifying potential hazards that may cause pedestrians to trip or collide, such as level changes, uneven paving, and fast-moving traffic, and social safety, which pertains to the overall security within the community, the presence of crime prevention measures, and the availability of timely assistance for individuals in dangerous situations.

Safety is the highest priority indicator for inclusive streets as it plays a crucial role in creating a sense of security within the community and serves as the foundation for other indicators.

4.2.2 Accessibility

Accessibility has two aspects: the efficient ability of people to reach their destinations while walking on the streets and the fair usability of street facilities for all individuals, particularly vulnerable groups. For example, considering the elderly population in a neighborhood, with limitations in physical abilities, the comfortable walking distance is around 500 meters, with a maximum distance of approximately 800 meters. Therefore, within a 5-minute walkable radius, basic public services facilities used by residents in their daily lives (e.g., grocery stores, post offices, banks, bus stops, pharmacies, community clinics) should be available, while a 10-minute walkable radius should include major secondary public service facilities (e.g., recreational facilities, city-level hospitals). The usability of street facilities is exemplified by the inclusion of accessible design features within the street environment.

Accessibility represents the threshold for the use of public facilities, enabling individuals with limited physical abilities to be independent and not rely on assistance from others.

4.2.3 Comfort

Comfort refers to the absence of physical or psychological discomfort while people are present or walking on the streets, allowing them to enjoy outdoor activities. The comfort of streets stems from two aspects: the spatial perception of the street, including pleasant spatial dimensions, comfortable green landscapes, and clean and tidy street environments, and the availability of

well-equipped street facilities, such as resting amenities that alleviate fatigue from walking and emergency public toilets. Additionally, the comfort of the street is influenced by the neighborhood atmosphere, characterized by a friendly and harmonious ambiance, which significantly enhances the sense of belonging and happiness within the community.

Comfort is related to the user experience, measuring to what extent the spatial design of the street satisfies the users' needs.

4.2.4 Legibility

Legibility refers to whether the street environment can help pedestrians determine their location, establish their routes, and efficiently convey information through signage design. Distinct landmarks, spatial functionality, and clear road network structures contribute to creating a comprehensible mental map, assisting individuals with cognitive impairments in obtaining clear route planning. Street signage should utilize large fonts and high-contrast color relationships to facilitate recognition by others.

The legibility of streets provides clear guidance for navigation, creating an easily understandable urban environment and preventing individuals from getting lost.

4.2.5 Adaptability

Adaptability refers to the design of street spaces that can meet the universal usage requirements of various user groups in the current context while considering the evolving needs of users over time. It involves achieving functional substitution and iteration at a low cost. Important concepts and strategies for functional substitution and iteration include modular design and leaving sufficient room for future needs.

4.2.6 Familiarity

Familiarity refers to the extent to which individuals can recognize and understand the community environment, streets, buildings, and facilities. The design of these spatial elements should align with the traditional cognition of the elderly population, avoiding confusion or misinterpretation of functional usage due to design forms. Therefore, before undertaking street space design, it is essential to have a sufficient understanding of the local historical traditions and cultural context and incorporate these traditional elements into the spatial design of the streets.

4.3 Design Criteria

The significance of establishing evaluation criteria for inclusive streets lies in providing a systematic exposition and depiction of the spatial conditions, aiding researchers in identifying existing issues and deficiencies within the space and facilitating their improvement. The evaluation criteria for inclusive streets are derived from the specific problems corresponding to each principle of inclusive street design. In this paper, the street space is categorized into five major classes and thirteen sub-classes, and the evaluation criteria for different spatial types are summarized (see Appendix I):

i. Traffic Space: sidewalk; crossing.
ii. Landscape: lawn; vegetation; water.
iii. Pocket Space: entrance; shopfront; corner.
iv. Amenity: signage; rest points; illumination; parking lot; public toilets

4.4 Design Strategies

Design strategy refers to a structured series of organized actions and decisions formulated during the process of creation, planning, or problem-solving, with the aim of achieving specific goals or visions. It typically involves selecting the optimal approach to accomplish design objectives based on predetermined goals and values, often within the constraints of limited resources. Therefore, building upon the previously mentioned six principles of inclusive design, a proposal is put forth here for inclusive design strategies within the context of urban streetscapes.

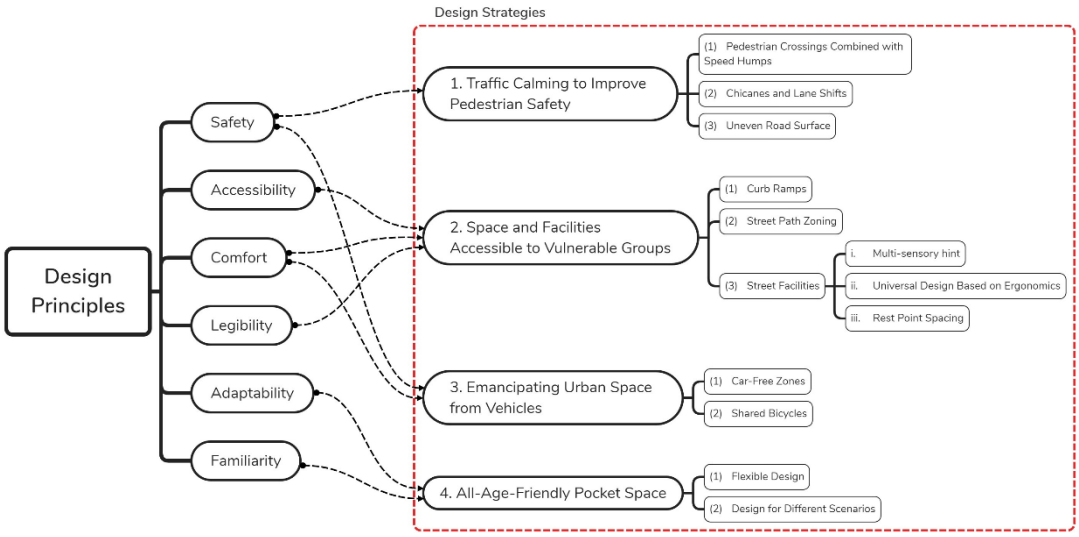


Fig 4-3 Relationship between design principles and strategies in inclusve streets
Source: by author

4.4.1 Traffic Calming to Improve Pedestrian Safety

(1) Pedestrian Crossings Combined with Speed Humps

Speed humps and speed cushions are common traffic calming measures. By raising the road surface, they not only alert drivers' attention but also encourage them to reduce vehicle speed to minimize discomfort from the bumps. Combining speed humps with pedestrian crossings in the neighborhood allows pedestrians to traverse on elevated road surfaces. The height difference and different texture of the road surface on the humps make pedestrians more noticeable to drivers.

(2) Chicanes and Lane Shifts

Chicanes and lane shift often result in reduced lane width, which forces drivers to slow down. When lanes become narrower, drivers perceive limited space, leading them to naturally decelerate to adapt to the new road conditions. This design is often accompanied by curves or bends, requiring drivers to reduce speed while negotiating the turns to ensure safe passage through the curves. Drivers must slow down to accommodate the radius and curvature of the curve, thereby reducing the risk of skidding and loss of control.

(3) Uneven Road Surface

Uneven paving bricks create bumps and vibrations for vehicles during travel, making the driving experience uncomfortable. This discomfort prompts drivers to decelerate to reduce the jolting sensation of their vehicles on the uneven road surface, enhancing the driving experience. Moreover, it negatively affects the vehicle's handling, making it more unstable during travel. Drivers may feel the steering wheel shaking and a sense of instability, leading them to naturally slow down to reduce handling risks and cope with uneven road surfaces and sudden conditions.

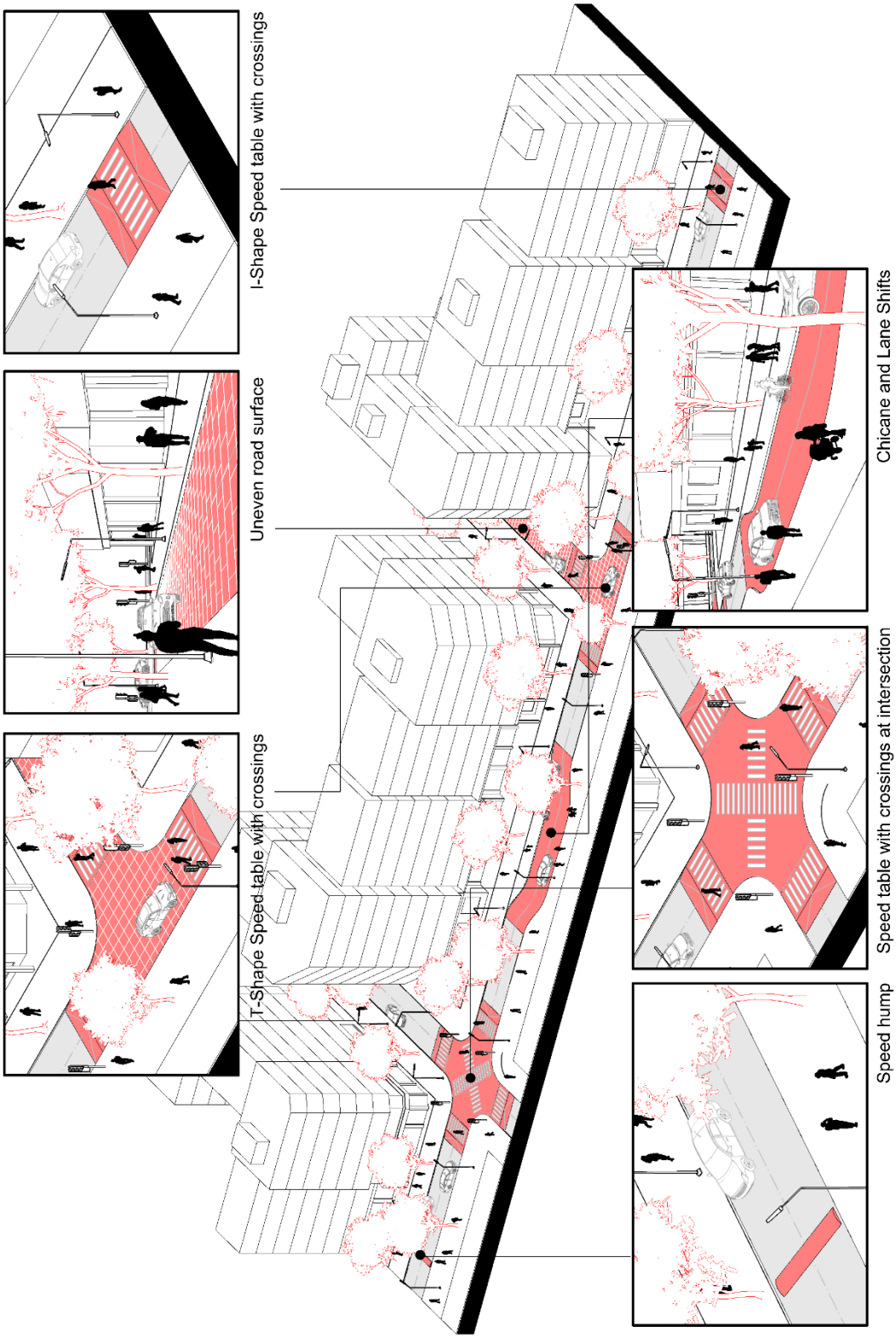


Fig 4-4 Traffic Calming Strategies
Source: by author

4.4.2 Space and Facilities Accessible to Vulnerable Groups

(1) Curb Ramps

Curb ramps are installed at the junctions of sidewalks and pedestrian crossings to facilitate the passage of pedestrians, wheelchair users, and caregivers with strollers. Depending on their location within the sidewalk, curb ramps come in different types, with the most common being single-slope and three-slope designs. The slope gradient of the ramp surface typically does not exceed 1:12, and the width for passage should be greater than 1200mm (Fig 4-5).

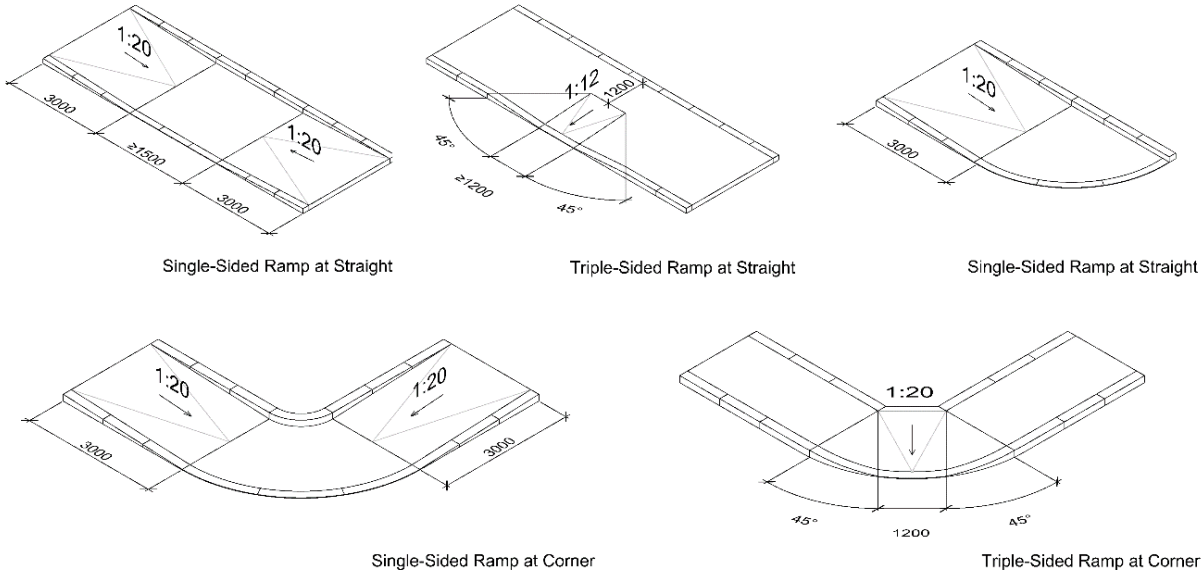


Fig 4-5 Types of Curb Ramps
Source: by author

(2) Street Path Zoning

Well-organized path zoning in streets not only enhances the visual aesthetics but also optimizes the spatial efficiency of the street. Based on their different functions and purposes, paths in the street can be categorized into four types: storefront zones, clear paths, non-design zones, and buffer zones (Fig 4-6).

The storefront zone is an integral part of the building interface and a crucial element contributing to the street's appearance and spatial quality. The clear paths are designed to ensure barrier-free access for pedestrians and vulnerable groups, with widths typically ranging from 1.8 to 2.4 meters. Non-design zones are dynamic spaces that change based on spatial demands and can serve as temporary parking spaces, shared bicycle facilities, places for street furniture placement, or small meeting spaces (Fig 4-7). The buffer zone is a green area that separates the pedestrian walkways from the motor vehicle lanes, ensuring pedestrian safety and providing a sense of security.

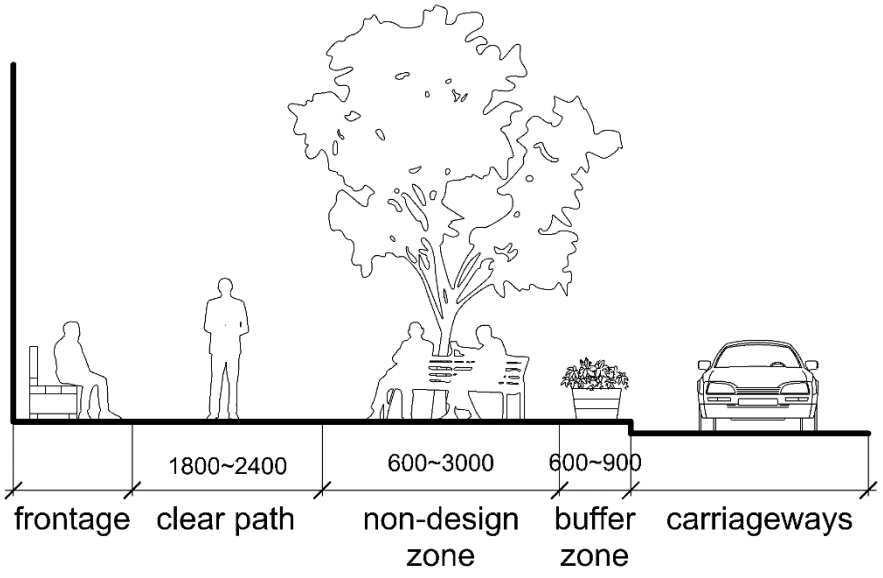
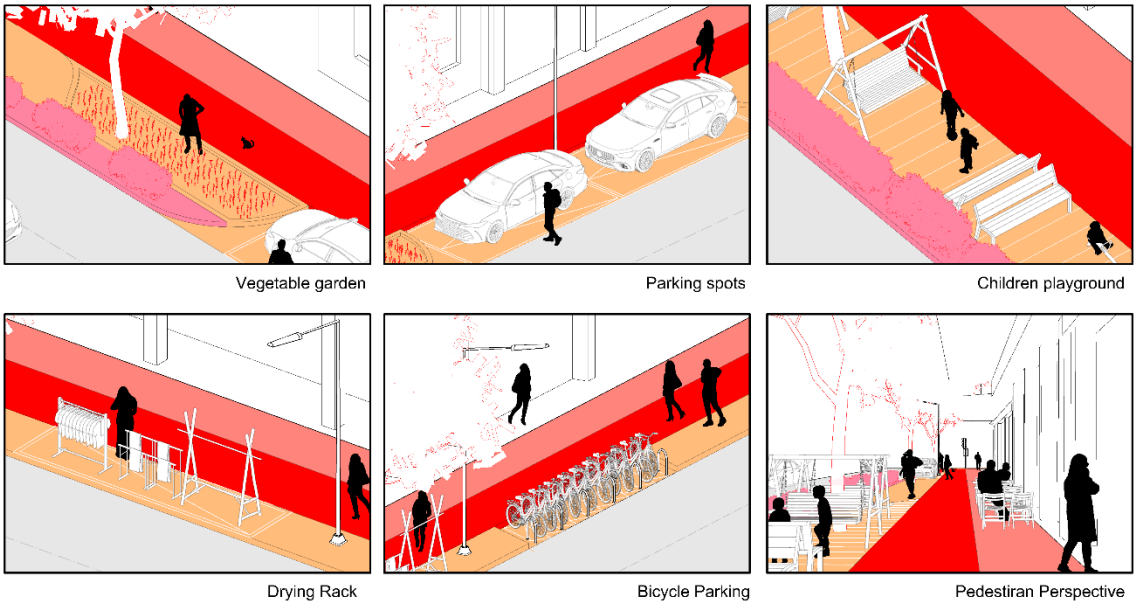


Fig 4-6 Sidewalk Zoning
Source: by author



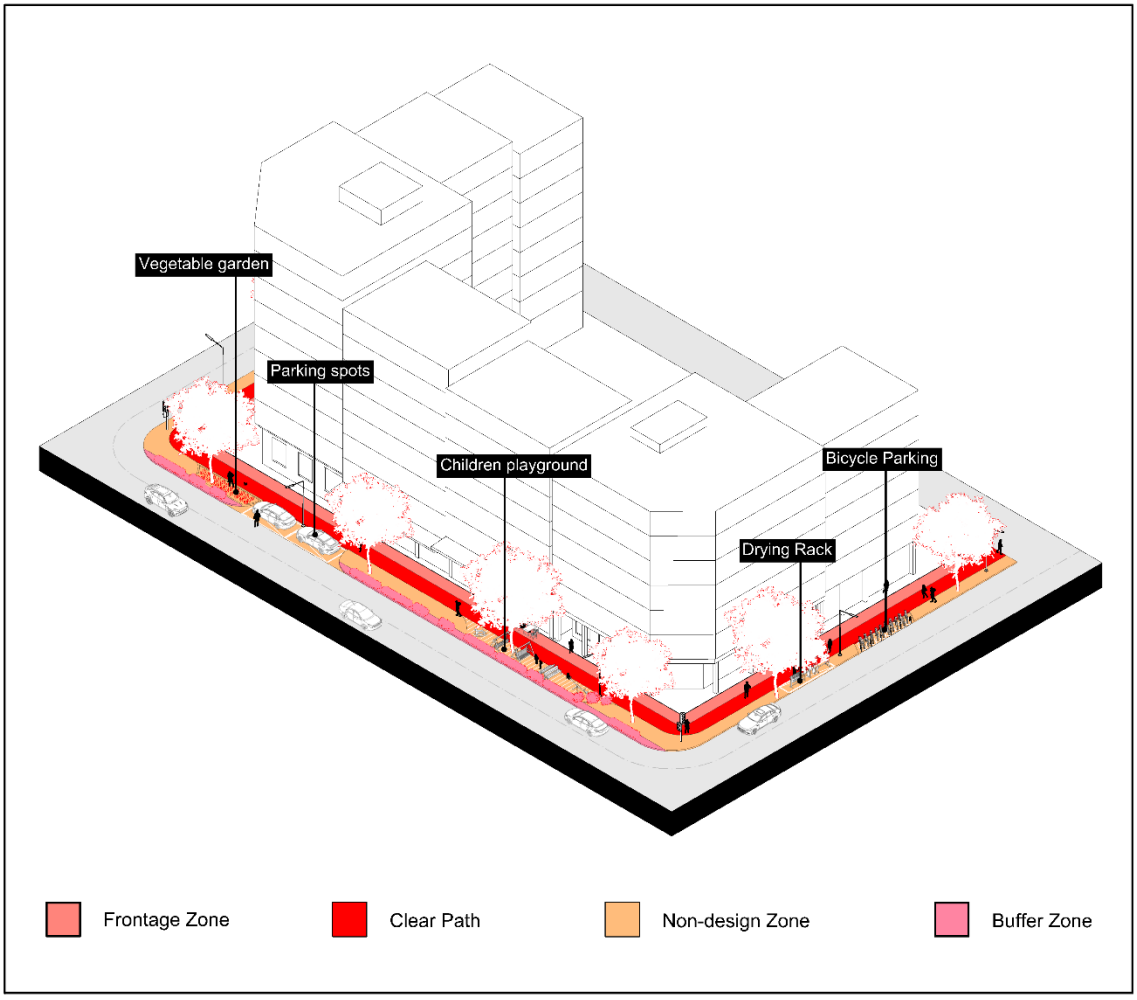


Fig 4-7 Non-design Zones on the street Source: by author

(3) Street Facilities

i. Multi-sensory hint

To ensure the normal mobility of vulnerable groups such as the blind, hearing-impaired, and visually impaired individuals, streets can incorporate various multi-sensory signaling facilities. Visual signaling facilities include visual indicators such as signs and markings used to indicate pedestrian directions, pedestrian traffic lights, and crosswalks. These signs and markings should have clear contrast, colors, and shapes to aid recognition for visually impaired individuals. Auditory signaling facilities include pedestrian traffic lights with countdown sound cues, providing auditory signals for traffic signals. This way, blind individuals can judge the status of the traffic lights based on sound cues and safely cross the road. Additionally, some traffic facilities such as intersections and crosswalks can have sound guidance systems that emit sounds to indicate pedestrian directions and safety prompts. Tactile paths, designed to guide blind pedestrians, should use raised or textured materials, allowing blind individuals to perceive paths and obstacles through touch. Apart from tactile paths, tactile markings can be added to street facilities, such as raised indicator buttons and touch plates engraved with text or patterns. These facilities can aid blind and visually impaired individuals in identifying and operating them through tactile perception (Fig 4-8).

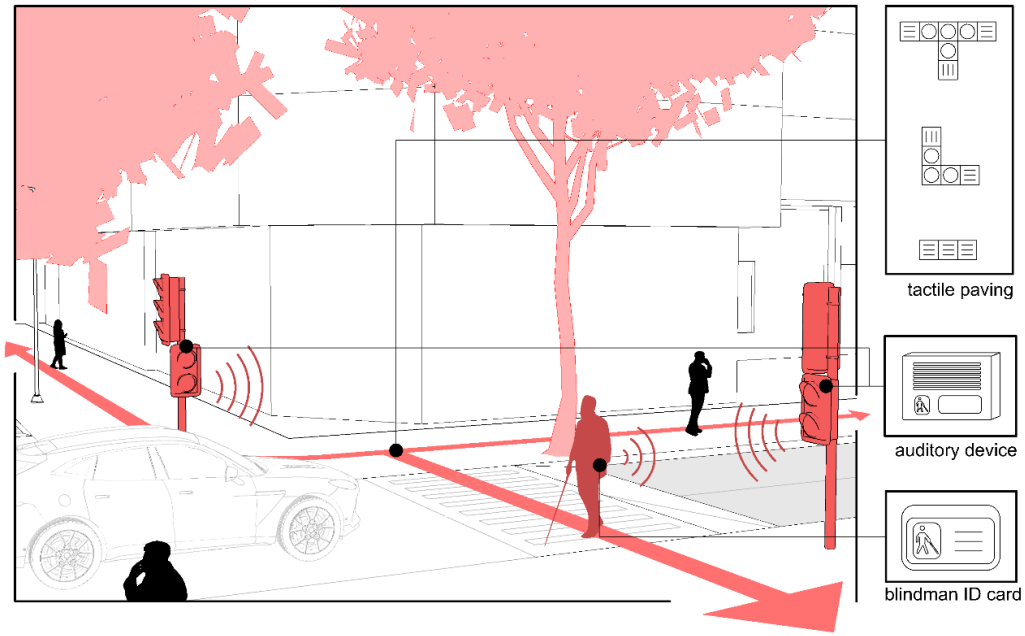


Fig 4-8 multi-sensory hint in pedestrian crossings Source: by author

ii. Universal Design Based on Ergonomics

The everyday use of street facilities needs to consider various characteristics of different groups and employ a universal design concept. The author compiled the body measurements of common user groups and vulnerable groups in the street, including the space required for staying and walking, the height and range of facilities that can be reached by hand, eye height, and the visual range. By selecting the maximum and minimum values from this data, they serve as a reference basis for street facility design (Fig 4-9). The minimum width required for staying and walking is 900mm, so all pathway designs in the street should not be smaller than this value. The eye height of different groups ranges from 850 to 1550mm; therefore, the height positioning of facility information should fall within this range. Street facilities should also consider the different heights of individuals and the range accessible by hand, ensuring that the facility's height is reachable for both adults and children.

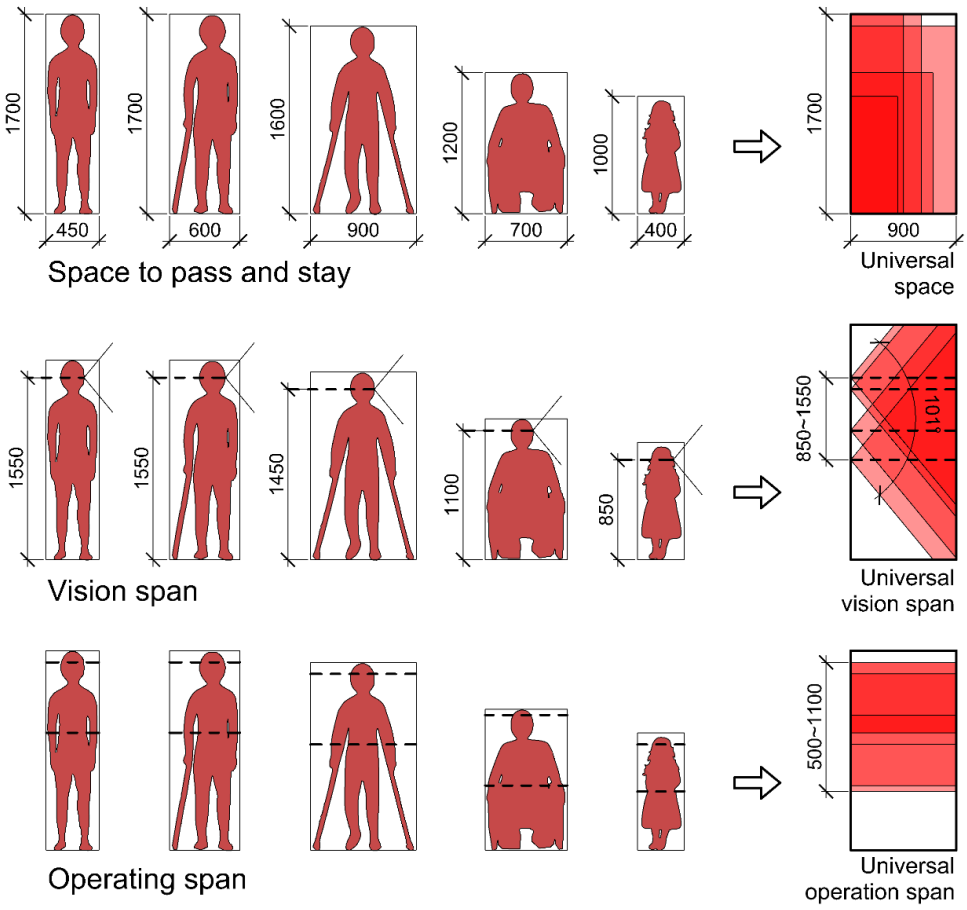


Fig 4-9 Universal Design based on Ergonomics Source: by author

iii. Rest Point Spacing

Different mobility capabilities among different groups imply varying comfortable walking distances. For regular individuals, a comfortable walking distance on streets is generally between 200-300 meters, while for the elderly, the recommended walking distance is within 100-150 meters. However, for pregnant individuals, who face the most significant mobility challenges, their comfortable walking distance is around 50-100 meters. To cater to the resting needs of the group with the lowest mobility, rest area spacing should be approximately 75 meters (Fig 4-10).

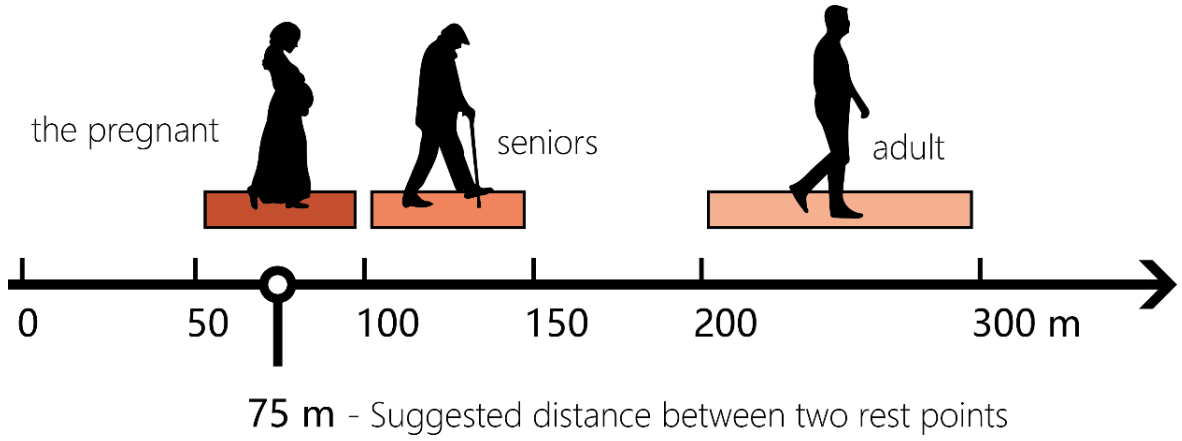


Fig 4-10 Comfortable Walking Distance of Different Groups
Source: by author

4.4.3 Emancipating Urban Space from Vehicles

(1) Car-Free Zones

Due to the excessive emphasis on motor vehicle traffic and insufficient consideration of human-centered needs in past urban designs, the existing urban spaces have been occupied by a large number of motor vehicles (Fig 4-11). To provide pedestrians with more space for movement, car-free zones can be established within the city blocks. By implementing policy regulations, time restrictions, or spatial design to limit motor vehicle access, car-free street environments can be created.

There are various ways to transform car-free zones. For streets with significant pedestrian flow, numerous shops, but relatively low motor vehicle traffic, the best transformation approach is to create a pedestrian street (Fig 4-13). For streets within residential neighborhoods, they can be transformed into linear playgrounds (Fig 4-12).

Fig 4-11 Streets before Renovation Source: by author

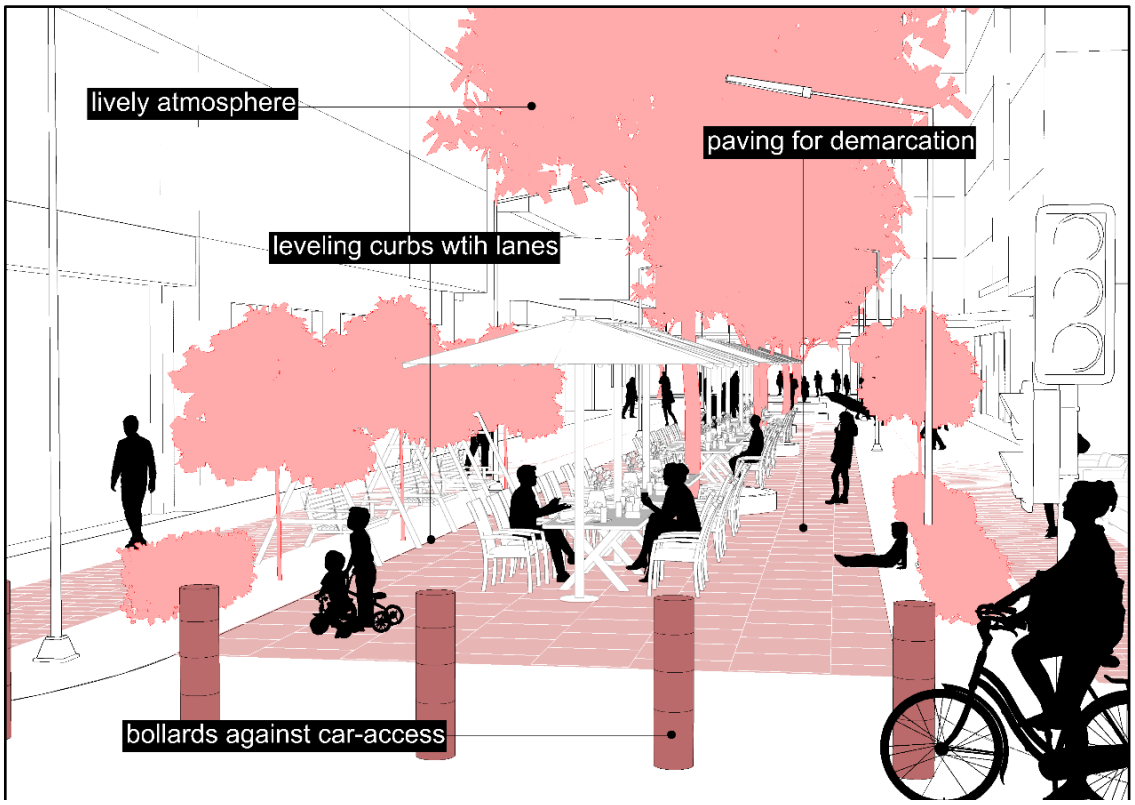


Fig 4-13 Pedestrian Streets after Renovation Source: by author

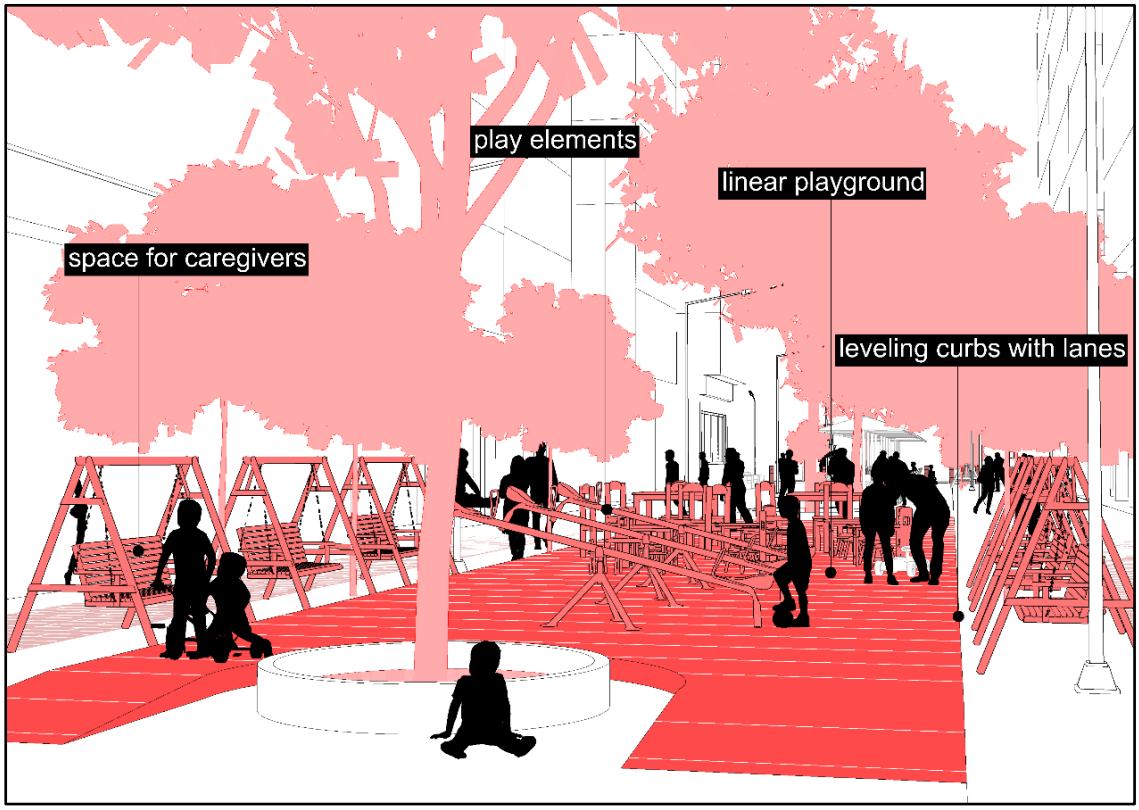


Fig 4-12 Play Streets after Renovation Source: by author

(2) Shared Bicycles

Shared bicycles can also serve as an alternative means of transportation, reducing people's reliance on motor vehicles and, consequently, reducing the number of motor vehicles on the streets. They provide people with a convenient and efficient short-distance transportation option. For short-distance trips, people can choose to ride shared bicycles instead of driving, thereby reducing their reliance on motor vehicles. Excessive reliance on motor vehicles often leads to traffic congestion issues. Encouraging people to use shared bicycles, especially in busy urban areas, can reduce the number of private cars and alleviate traffic congestion.

To encourage people to use shared bicycles for transportation, shared bicycle stations should be conveniently located and have sufficient coverage. Generally, people are willing to walk up to 300 meters to reach a shared bicycle station, so the spacing of shared bicycle stations in communities and cities should not exceed 300 meters (Fig 4-14).

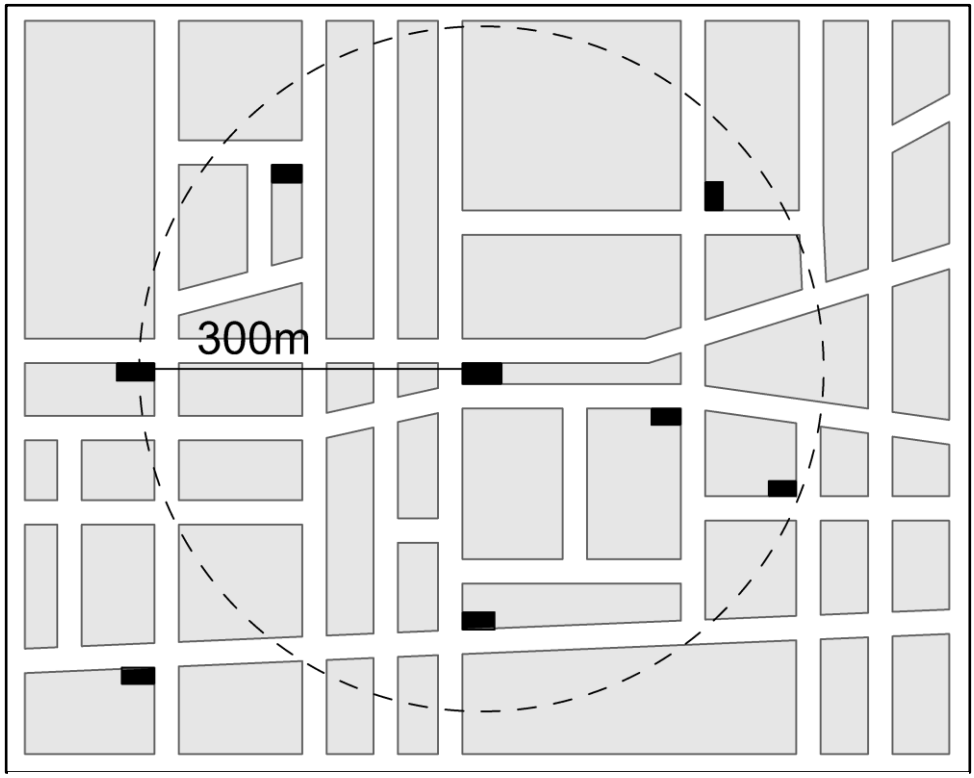


Fig 4-14 The max spacing of shared bicycle stations
Source: by author

Shared bicycle stations should be placed close to sidewalks and bicycle lanes to facilitate pedestrian access. Common locations for station setups include sidewalks, curbside parking areas, and public spaces (Fig 4-15).

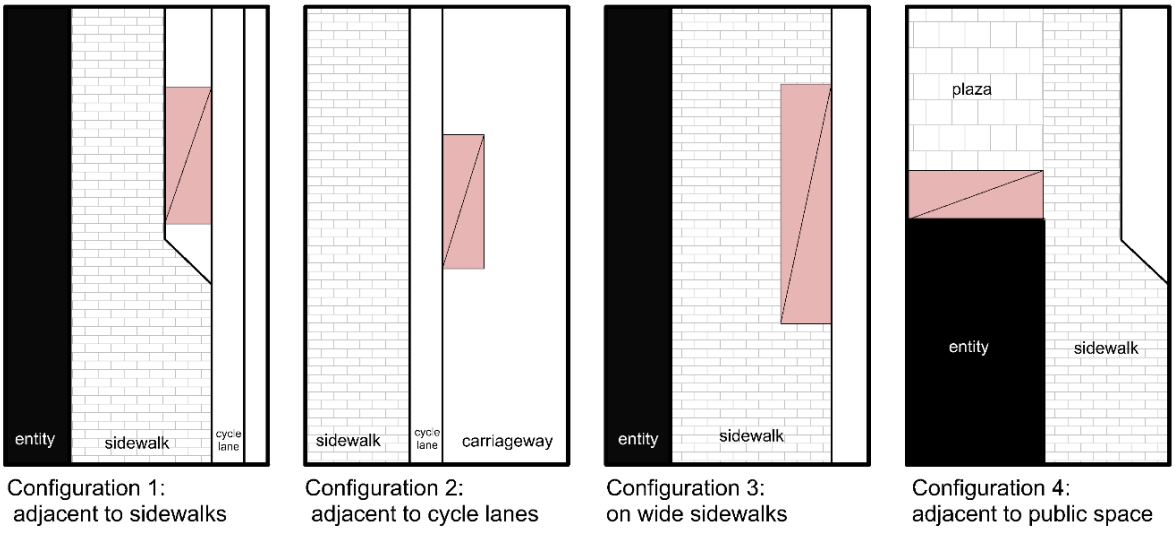


Fig 4-15 Configuration of Shared Bicycle Stations Source: by author

When road width allows, shared bicycle lanes should be separated from motor vehicle lanes and include buffer zones to ensure the safety of cyclists. Common methods for setting up bike lanes include using green spaces as barriers, elevating the road surface, adjacent to motor vehicle lanes, or sharing the lane with motor vehicles (Fig 4-16).

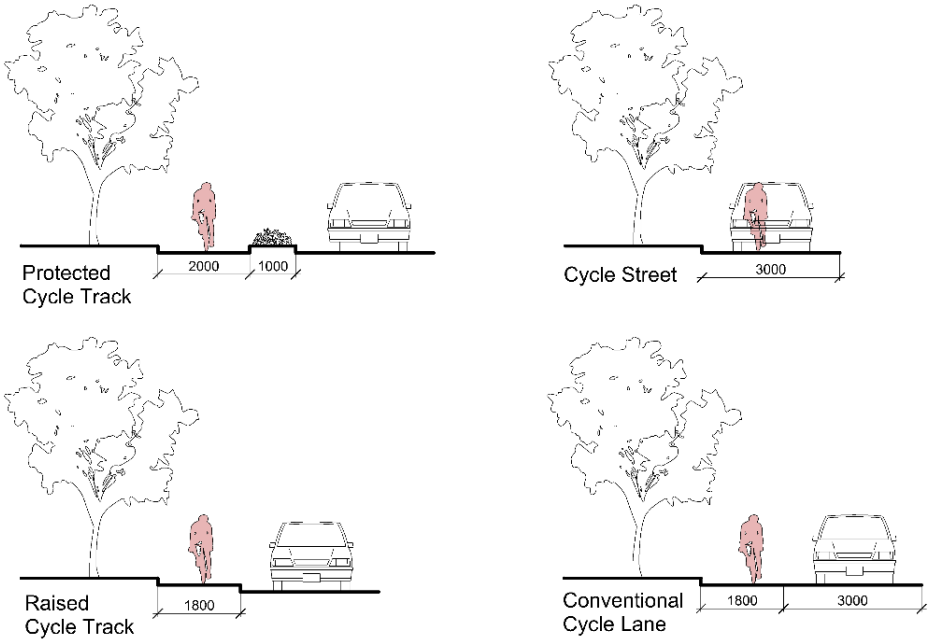


Fig 4-16 Configuration of Cycle Lanes Source: by author

4.4.4 All-Age-Friendly Pocket Space

(1) Flexible Design

Pocket spaces within the neighborhood should not only cater to the needs of all groups as much as possible but also consider the changing spatial requirements of different groups over time. Therefore, the facilities and furniture in pocket spaces should adopt a modular design concept, allowing for easy disassembly and recombination between units. The selection of materials for furniture should be lightweight, easily movable, and easy to dismantle, enabling the space to be adapted with minimal time and economic costs to meet the needs of different age groups (Fig 4-17).

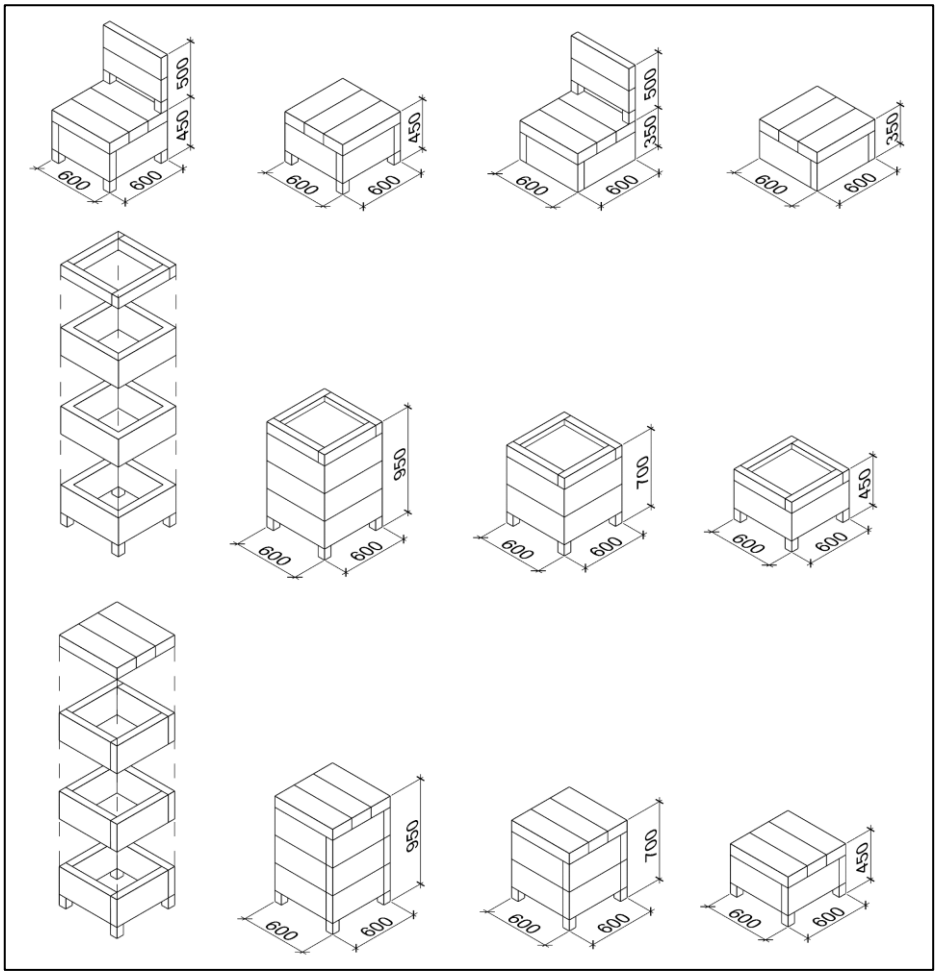


Fig 4-17 Modular Furniture
Source: by author

(2) Design for Different Scenarios

The design of pocket spaces needs to consider the daily usage scenarios of residents living in the community. Different usage scenarios represent different combinations of space, and modular street furniture design allows for quick changes in space functionality to correspond to different scenarios. The author envisions possible daily usage scenarios for pocket spaces in the community and has designed different space combinations accordingly (Fig 4-18).

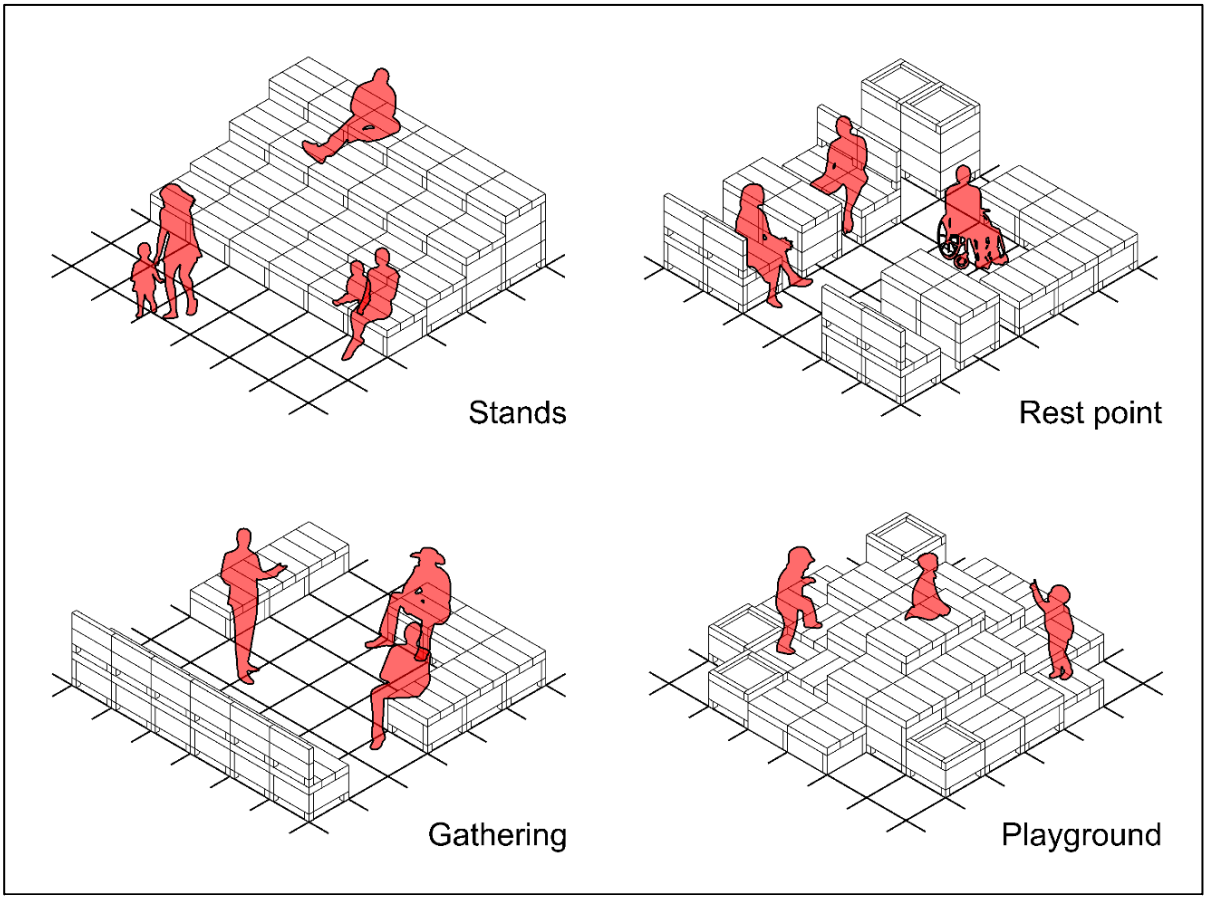


Fig 4-18 Different Scenarios in Pocket Space
Source: by author

4.5 Design Process

The design process of inclusive streets is divided into three steps: Emphasizing, Ideation, and Evaluation (Fig 4-19).

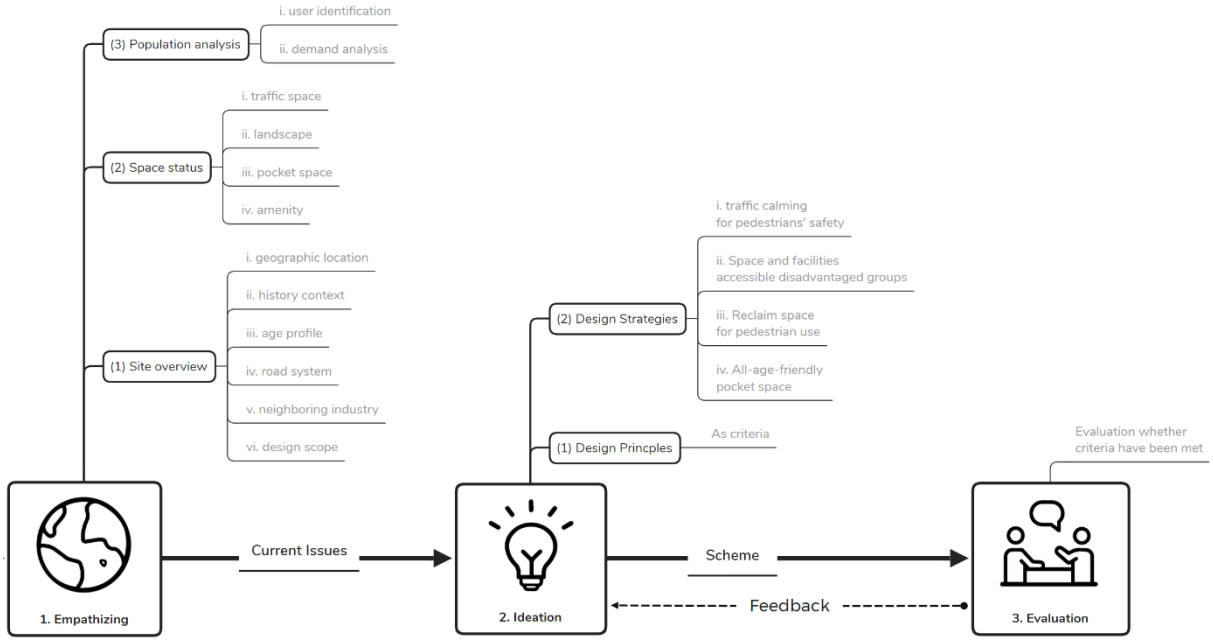


Fig 4-19 Design Process of Inclusive Street
Source: by author

4.5.1 Empathizing

(1) Site Overview

Understanding the overview of the site is the first stage of the design process, aimed at providing researchers with a better understanding of the contextual issues of concern. It serves as the beginning of the design research activities. Researchers can gather information about the urban context where the design objects are located through literature review, case comparisons, site visits, and research interviews. This includes but is not limited to the historical context, climate characteristics, population structure, development history, and business analysis of the site. By having a general understanding of the site, researchers can form preliminary impressions, providing a foundation for subsequent design steps.

(2) Space Status

After gaining a general understanding of the site and collecting basic information, researchers need to conduct on-site inspections of the spatial elements involved in the design, personally experiencing, perceiving, and evaluating the existing conditions. Through methods such as photography, sketching, and note-taking, the types and characteristics of the space, as well as existing issues, are documented. This forms the basis for determining design goals and strategies.

Urban streets encompass various types of spaces. This paper categorizes them into five major categories and thirteen subcategories, along with summarizing design considerations for different space types (Appendix I):

i. Traffic Space: sidewalk; crossing.
ii. Landscape: lawn; vegetation; water.
iii. Pocket Space: entrance; shopfront; corner.
iv. Amenity: signage; rest points; illumination; parking lot; public toilets

(3) User Analysis

i. Identifying Potential Users

After obtaining a preliminary understanding of the site context, researchers should clearly identify the target users, i.e., the user groups for the design. User groups can be classified using models like the IDC model, WINIT model, etc., and different design strategies should be adopted for different target user groups. In this step, it is crucial to identify lead users, who represent the vulnerable groups using the space.

ii. Excavating User Demands

In this step, researchers need to engage with real users. User characteristics can be summarized through literature research, and user needs, such as physiological, psychological, and spatial

requirements, can be obtained through methods like surveys or interviews. After collecting sufficient data, researchers should filter, organize, visualize, and prioritize the gathered data to determine the priority levels of various needs.

4.5.2 Ideation

(1) Design Principles

Design principles are general guiding principles that direct subsequent design activities. They are usually derived from literature analysis, case studies, and detailed project analysis. It is important to note that in practical project situations, design principles may have a sequential order of influence. For example, in the inclusive street design principles mentioned earlier, safety serves as the foundation for other principles.

Design principles can also serve as evaluation criteria in the final evaluation stage to assess the quality of design solutions.

(2) Design Strategies

Based on the specific project context, researchers need to propose targeted design strategies. Design strategies are a systematic approach that includes a series of decisions and actions. From different research scales, design strategies can be categorized into macro-scale, meso-scale, and micro-scale. The macro-scale involves urban planning, traffic flow, urban morphology, including traffic networks, land use layouts, urban landscapes, etc. The meso-scale focuses on street functions, activity spaces, and placemaking, such as road widths, lanes, sidewalks, parking spaces, etc. The micro-scale focuses on details, material selection, color coordination, including road surface materials, streetlight styles, billboard design, etc.

4.5.3 Evaluation

The evaluation stage is the final stage of inclusive street design. It involves assessing and

reviewing the design solutions after their completion. This stage aims to confirm whether the design solutions align with the principles of inclusive design and identify any potential issues and opportunities for improvement. The evaluation stage and the ideation stage are iterative, continuing until researchers arrive at relatively optimal design solutions.

Chapter 5 Inclusive Design Practice in Shuiyin Community

5.1 Site Overview

5.1.1 Geographical Location

Shuiyin Community is located next to the Guangzhou Zoo in Yuexiu District, Guangzhou. It is bordered by Shuiyin Straight Street to the east. The west and south sides of the community face major urban arteries with heavy traffic, including an elevated bridge on the west side. The residential buildings within Shuiyin Community are not very tall, with a maximum of 7 floors. They were constructed in the 1980s and have an average age of over 30 years.

Within a 5-minute walking radius of Shuiyin area, basic public amenities are relatively well-established, including banks, bus stops, grocery stores, kindergartens, pharmacies, and post offices. Within a 10-minute walking radius, there is an elementary school, two urban parks, and a municipal-level hospital (Fig 5-1).

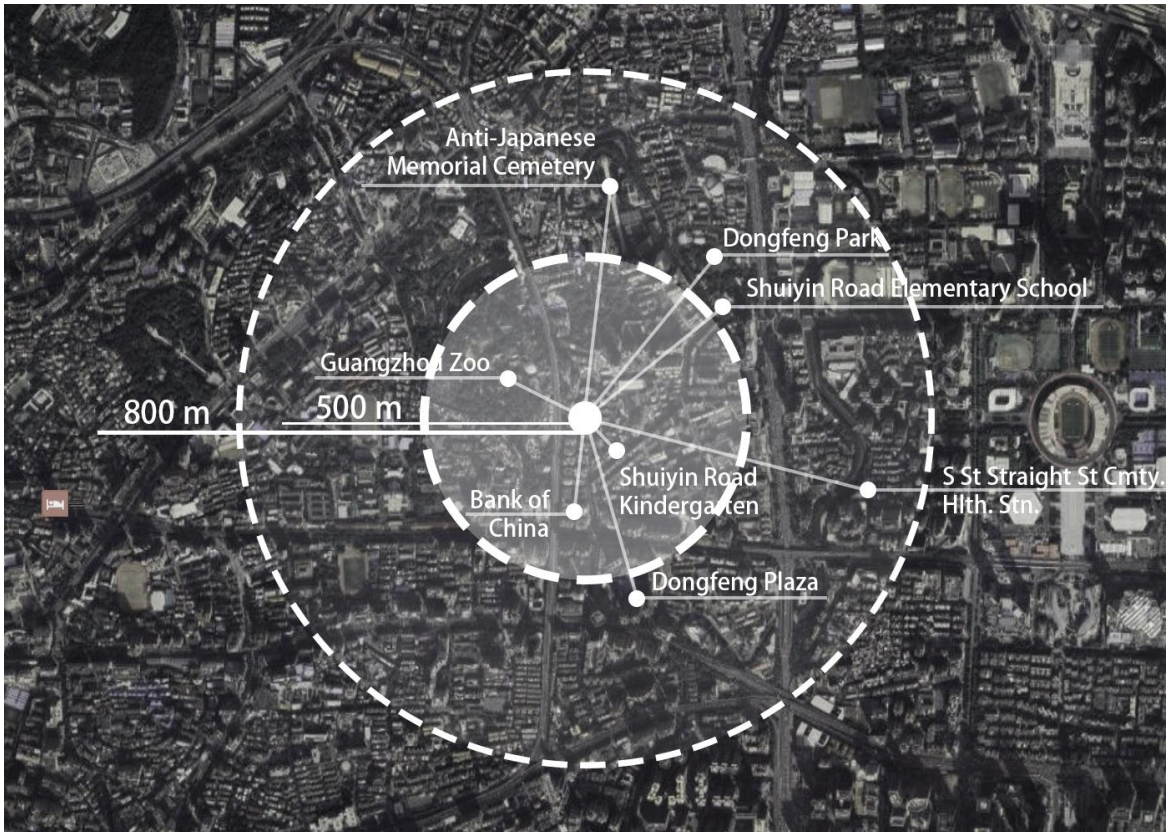


Fig 5-1 Geographical Location
Source: by author

5.1.2 History Context

According to the Guangzhou Chronicles, Shuiyin Road was originally named Shijiu Lu Army Cemetery Road. In 1932, during the "Battle of Shanghai" in the Anti-Japanese War, the soldiers of the Shijiu Lu Army bravely fought against the enemy invasion. To commemorate their sacrifice, overseas Chinese from Guangdong Province built the Shijiu Lu Army Songhu Anti-Japanese Martyrs Cemetery on Shuiyin Road in 1933 [49] . In 1982, Shijiu Lu Army Cemetery Road was renamed Shuiyin Road. In the 1920s, the area around Shuiyin Road was mostly farmland with few residential settlements, and it was surrounded by hills [50].

Shuiyin Road is also the birthplace of Guangzhou's cultural and artistic scene. In 1957, the predecessor of the Xinghai Conservatory of Music, Guangzhou Music School, officially enrolled students on Shuiyin Road. It became the home to various musical landmarks, including the Guangzhou Symphony Orchestra, Guangdong Folk Orchestra, Guangdong Film Publishing House, China Record Guangzhou Branch, Tian Tian Music Store, and Harmonious Music House. In the early 1990s, China's first modern dance troupe was established on Shuiyin Road (Fig 5-2).

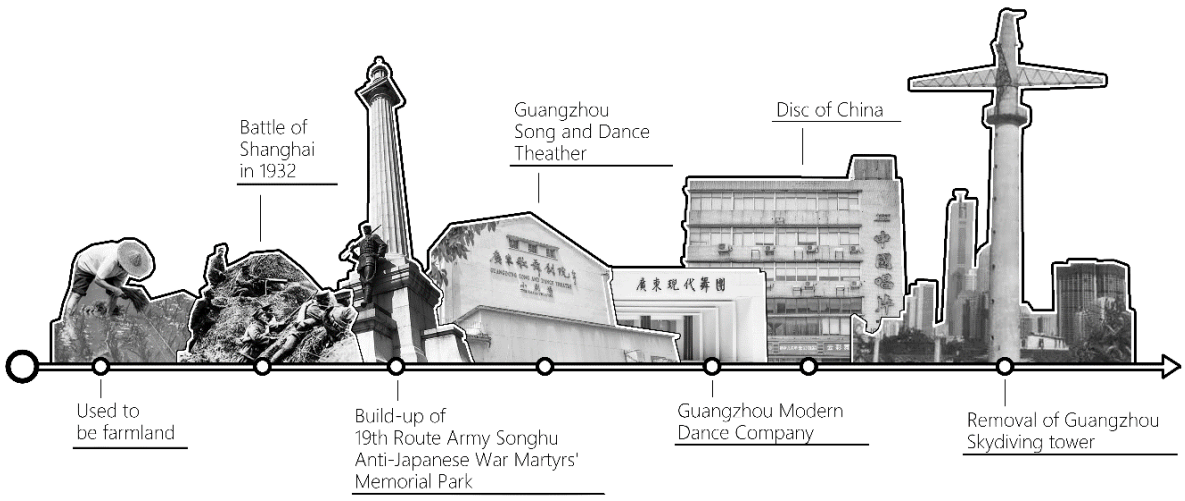


Fig 5-2 History Context
Source: by author

5.1.3 Age Profile

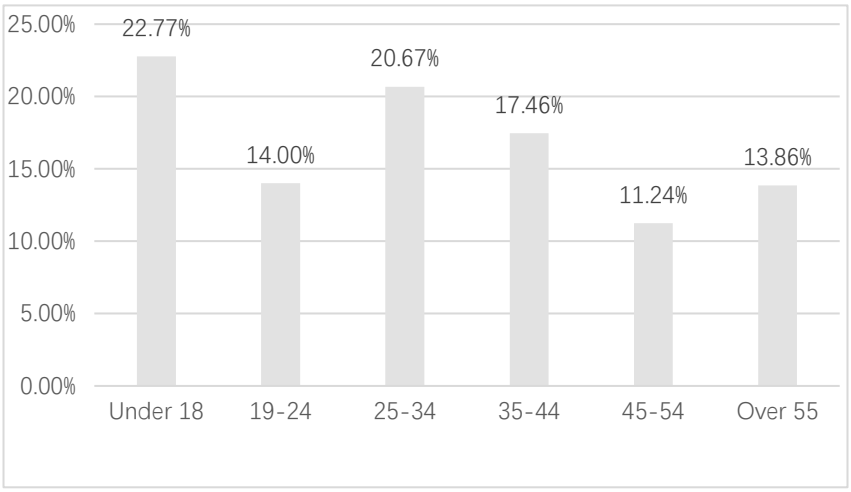


Fig 5-3 Age Profile
Source: https://www.szshuwei.com/

According to statistics, Guangzhou has entered a moderately aging society. Yuexiu District, Haizhu District, and Liwan District are the three oldest urban districts in Guangzhou in terms of aging population [51] . However, according to big data analysis, the age structure of the population within Shuiyin Community remains relatively balanced. The highest proportion is occupied by the youth population and children, accounting for approximately 22.77%. The next largest group is the young adult population aged 19-34. Due to the developed education industry and the presence of office buildings in the vicinity, many young people choose to rent accommodations within Shuiyin Community. The population of individuals aged 55 and above accounts for 13.86%, indicating that the community is in a state of mild aging (Fig 5-3).

5.1.4 Road System

The community is roughly rectangular, extending from south to north. The main intersecting road within the community is Shuiyin Straight Street on the east side, making the overall road network of Shuiyin Community exhibit a comb-shaped structure from south to north. Huanshi East Road to the south is a major urban artery, with the highest road hierarchy and the most lanes. It consists of a fast lane in the middle section and slow lanes along the sides, separated by a green belt. Shuiyin Road, which intersects with Huanshi East Road at a diagonal street, serves as the main commercial street where residents engage in daily activities. The surrounding shops are well-equipped, creating a vibrant commercial atmosphere. Shuiyin Road is

approximately 10 meters wide, with two 3-meter-wide bidirectional lanes in the middle, and roadside parking spaces on both sides. Shuiyin Straight Street, starting from the turning intersection with Shuiyin Road, is a local street for residents within the Shuiyin Community. It is narrower than Shuiyin Road and lacks roadside parking spaces. The width of the pedestrian sidewalks is also relatively narrow, often obstructed by trees planted along the road. The internal roads within the community only support single-lane traffic, and the road conditions are poor. The continuity of pedestrian walkways is often interrupted by obstacles, making it inconvenient for wheelchair access（Fig 5-4，Fig 5-5).

Fig 5-4 Road System
Source: by author

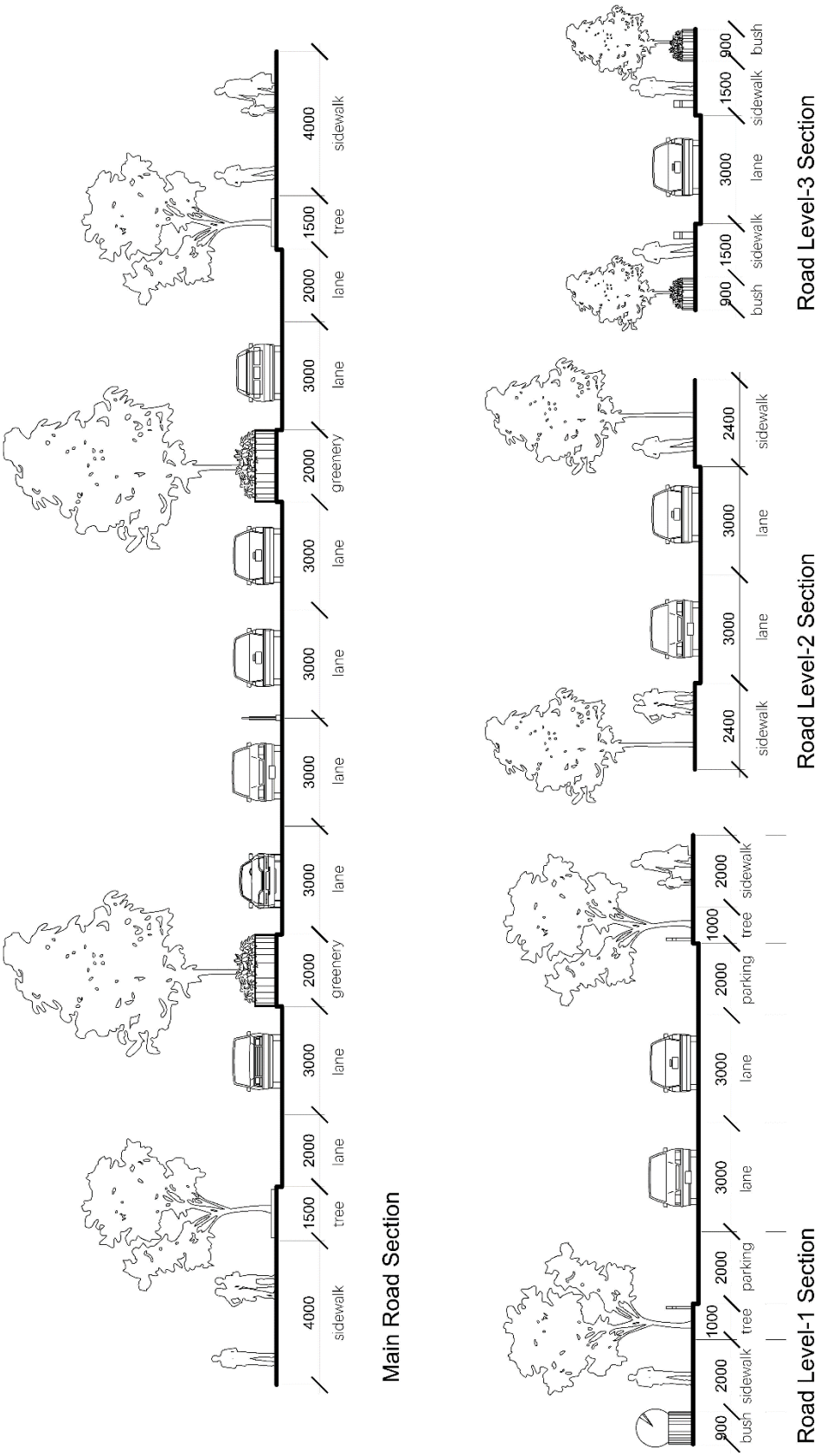


Fig 5-5 Road Sections
Source: by author

5.1.5 Neighboring Businesses

The surrounding area of the community has a diverse range of business types, but the most prominent categories in terms of quantity are retail, dining, and lifestyle services, accounting for 31%, 15%, and 23% respectively. Various types of shops are primarily concentrated on both sides of the urban roads, especially along Shuiyin Road. As the road hierarchy decreases, the density of business establishments also decreases. Overall, the service facilities around Shuiyin Community are well-equipped to meet the daily needs of its residents.

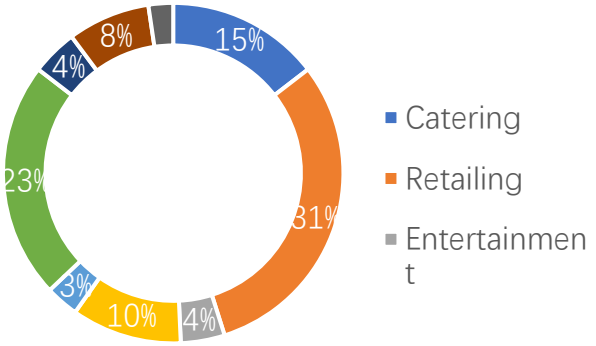


Fig 5-7 Constitution of Neighboring Businesses
Source: https://www.szshuwei.com/

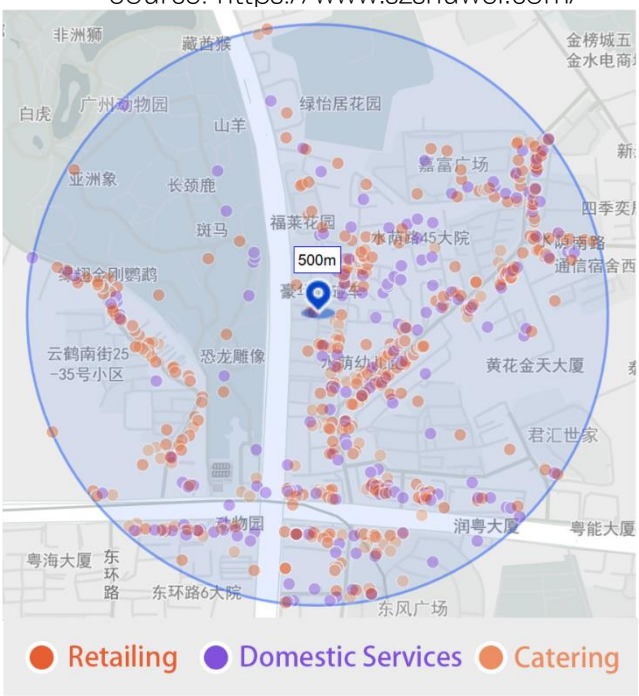


Fig 5-6 Distribution Map of Neighboring Businesses
Source: https://www.szshuwei.com/

5.1.6 Design Scope

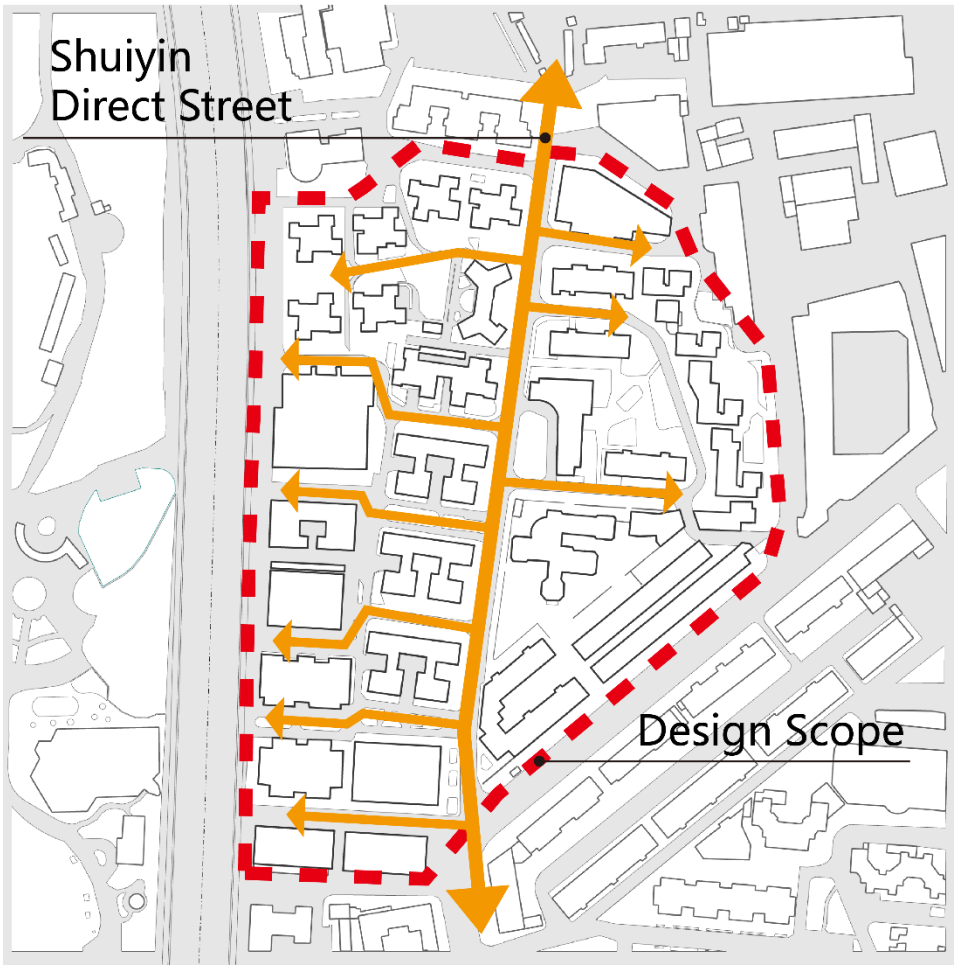


Fig 5-8 Design Scope
Source: by author

5.2 Space Status Evaluation

5.2.1 Traffic Space – Prominent Conflicts between Pedestrians and Vehicles

Overall, the traffic conditions in the community are poor. From a safety perspective, the brick paving on the roads is uneven, posing a tripping hazard and hindering wheelchair accessibility. Most of the brick surfaces lack anti-slip design, making them slippery during rainy days. The brick patterns are mixed and poorly maintained, with gaps filled with cement and mortar, resulting in poor road visibility. Except for the main and secondary roads, nighttime illumination is severely lacking, especially on internal roads within the community, resulting in very poor visibility. Additionally, the pedestrian crosswalk near the intersection of Shady Road and Ring Road East lacks waiting and buffer spaces, with limited crossing time, causing hurried

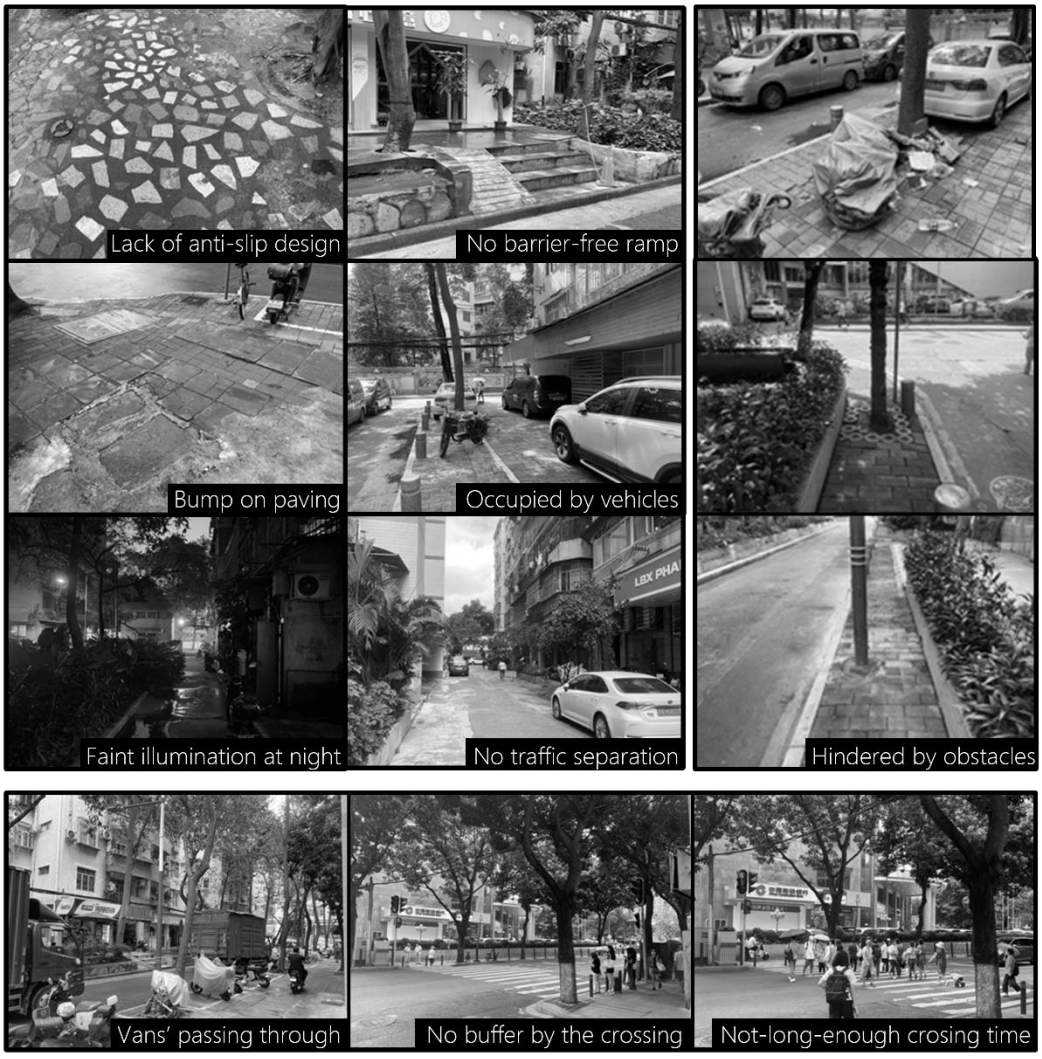


Fig 5-9 Status Quo of Traffic Space
Source: by author

crossings for the elderly. The gathering spaces in front of the kindergarten have insufficient buffer zones, lacking space for vehicles and pedestrians.

5.2.2 Landscape – Inadequate Maintenance

The maintenance of green landscapes improves as road hierarchy and pedestrian flow increase. However, the green landscapes within Shady Community have long been lacking maintenance. For example, the pedestals at the base of vegetation are damaged, and the roadside shrubs are not pruned properly, extending over the sidewalks and obstructing pedestrian passage. Additionally, the vegetation colors and layering in the site's landscaping are relatively monotonous, lacking richness and aesthetic appeal (Fig 5-10).

Water bodies play an important role in temperature regulation within localized areas, and they also enhance the diversity of the site, providing recreational and visual functions for residents. However, the landscape design of Shady Community lacks water features almost entirely.

Fig 5-10 Status Quo of Landscape
Source: by author

5.2.3 Pocket Space – Insufficient Vibrancy

In this article, pocket spaces specifically refer to small public spaces formed by building facades or enclosed facilities along urban streets, providing resting areas for pedestrians. On Shady Road, there are generally three types of pocket spaces: the recessed spaces formed by residential buildings, spaces in front of shops, and vacant spaces at road corners.

These pocket spaces have the potential to become community interaction spaces, but currently, most of them lack planning and design. From a spatial perception perspective, most pocket spaces are occupied by motor vehicles, and the lack of parking design and planning leads to significant issues with haphazard parking. The materials and paving of these spaces are mixed, resulting in low cleanliness. From a social interaction perspective, these pocket spaces lack essential facilities for communication, particularly the absence of resting facilities.

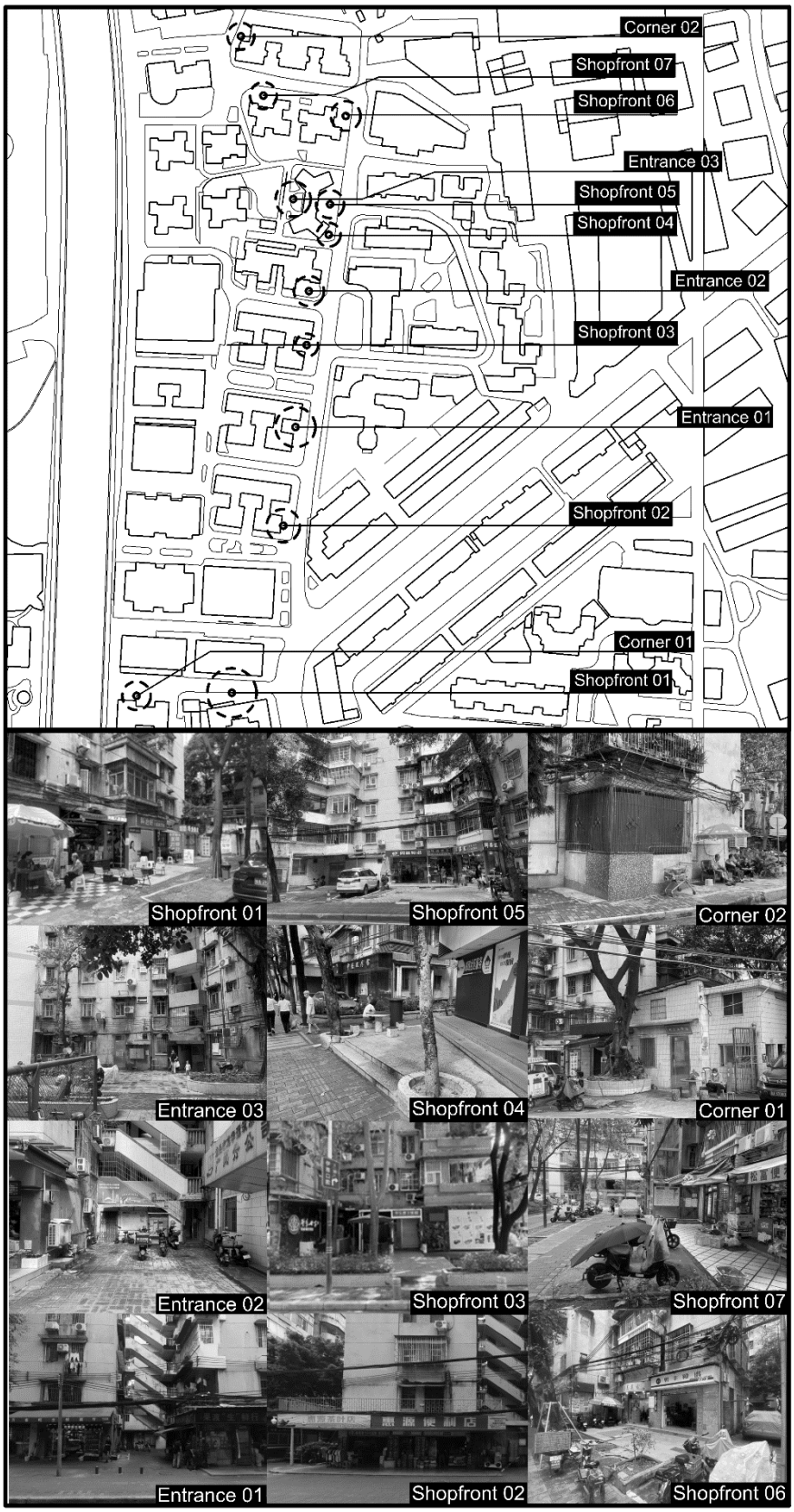


Fig 5-11 Distribution Map and Status Quo of Pocket Space
Source: by author

5.2.4 Amenity – Insufficiency in Quantity

The surrounding basic service facilities of Shady Community are relatively well-established, and most of them have accessible ramps at their entrances, facilitating the use and passage of the elderly. There is a community health center located to the south of the community, providing basic diagnostic and treatment services for the elderly. Additionally, there are several pharmacies along Shady Road. Fruit and vegetable shops and butcher shops are distributed on both sides of Shady Street, and to the east, there is a relatively large underground market, serving as the primary shopping destination for residents (Fig 5-13).

Fig 5-13 Community Hospital (left) Produce Market (mid) Underground Market(right)
Source: by author

Fig 5-12 Added Elevators in Residential Buildings
Source: by author

Moreover, most of the old residential buildings in Shady Community are equipped with elevator facilities (Fig 5-12). However, these elevators were added after the completion of the buildings, and their entrances generally face outward, lacking transitional spaces.

Fig 5-14 Evacuation Square Occupied by Vehicles
Source: by author

However, parking spaces in the community are quite scarce. During the on-site survey in the community, the most significant factor affecting the walking experience was the chaotic parking situation in the area. Various private cars and electric bicycles frequently occupy the sidewalks, causing significant obstacles for pedestrians. Especially in the gathering square in front of the Guangying Times Building on the east side of Shady Street, it is filled with private cars (Fig 5 14). This reflects the severe shortage of parking spaces within the community. Although there are 3-4 parking lots to the north of the community, they are not open to residents of Shady Community.

To the east of Shady Community, there is a kindergarten. From an external perspective, the two entrances of the kindergarten directly connect with the surrounding roads, lacking sufficient gathering spaces and buffer zones, which may pose significant safety hazards during peak hours of high pedestrian traffic. Moreover, there is a lack of facilities at the entrance for parents to rest and wait. From the exterior facade of the kindergarten building, it appears quite outdated, with many stains caused by rainwater erosion, lacking the vibrancy and distinctiveness expected of a kindergarten building (Fig 5-15).

Fig 5-15 Entrance of Shuiyin Kindergarten
Source: by author

There are several resting points within the community, equipped with public benches. However, most of these facilities lack maintenance and are not designed with accessibility in mind. For example, the benches in front of the post office are located on steps without ramps, making it extremely difficult for people with physical disabilities to use them. Additionally, the service radius of the resting points within Shady Community is not fully covered. Generally, the spacing of resting facilities for adults is around 200-300m, for the elderly it is 150-200m, and for special groups like pregnant women, it is recommended to be 50-100m. The service radius of the existing resting points in the community is set to 75m, and it is checked whether the resting facilities can achieve complete coverage of the entire community (Fig 5-17). According to the analysis, there is a large blank space in the middle section of Shady Road. The nearest two resting points are approximately 150m apart. Additionally, the existing resting points are relatively hidden, lacking signage and prominent design, making it difficult for people to find these resting points (Fig 5-18).

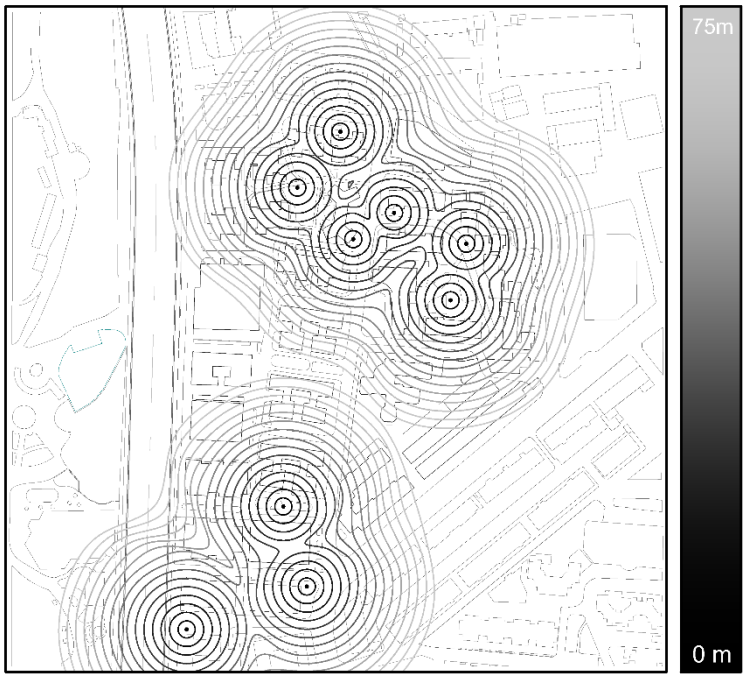


Fig 5-17 Accessibility Analysis of Rest Points
Source: by author

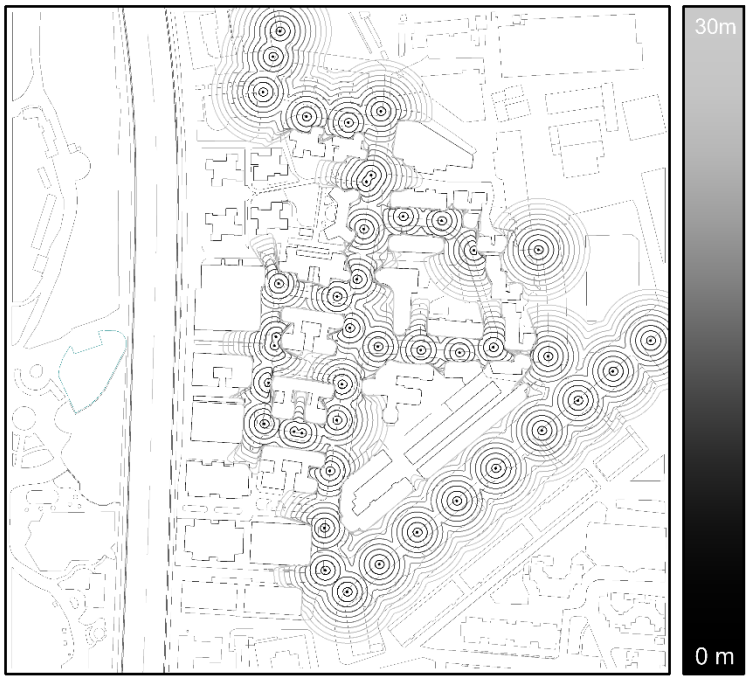


Fig 5-17 Illumination Range of Streetlights
Source: by author

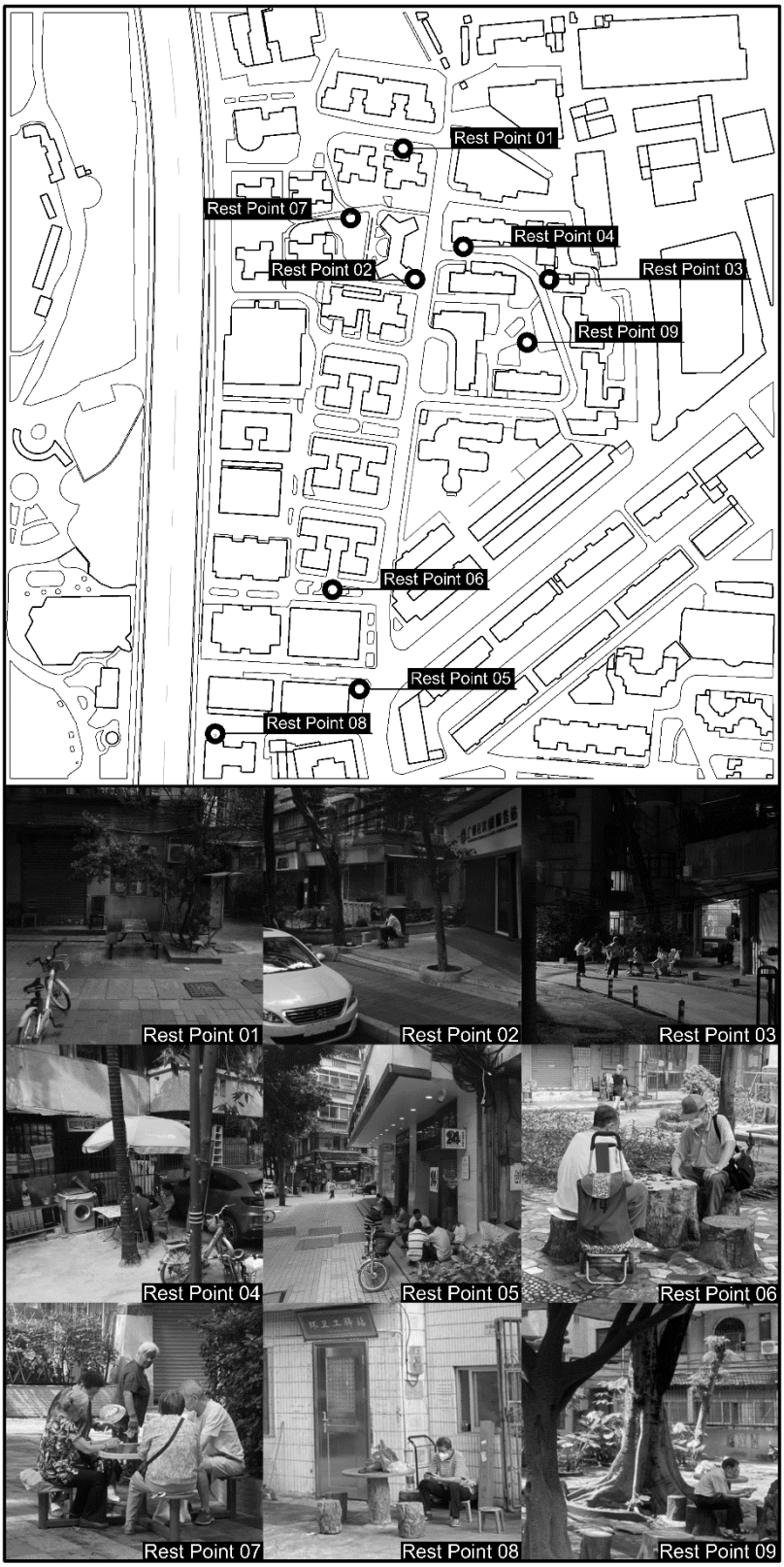


Fig 5-18 Distribution and Status Quo of Rest Points
Source: by author

Furthermore, there is almost no signage design at critical road intersections. The ground floors of the buildings in the community do not have public restrooms. Regarding the analysis of the existing lighting facilities within Shady Community, there is ample lighting along Shady Road, resulting in a busy flow of people at night. However, there is a lack of nighttime illumination for internal community roads, and except for sporadic community residents, there are hardly any pedestrians (Fig 5-17).

5.2.5 Summary of Space Issues

Type	Main Issues of Space Status in Shuiyin Community
Traffic Space	Pedestrian street spaces are occupied by a large number of motor vehicles, which not only affect the mobility and visibility of people with disabilities but also obstruct children's view of traffic flow.
	There are many obstacles on the sidewalks, such as lampposts and trees standing upright on the sidewalks, and miscellaneous objects placed randomly, which are not conducive to the travel of people with visual and mobility impairments and disrupt the continuity of pedestrian spaces.
Pocket Space	In the traditional sense, pocket spaces on the street should be vibrant spots for the elderly to rest and have casual conversations. However, the pocket spaces on Shady Street lack essential facilities for communication, resulting in a low atmosphere and low utilization of space.
Amenity	The inadequate placement of lighting and resting facilities contributes to the discomfort of people with mobility and visual impairments while using the street. The lack of parking spaces within the community leads to haphazard parking on the streets, creating a poor spatial perception.

Table 5-1 Main Issues of Street Space in Shuiyin Community
Source: by author

5.3 User Analysis

User analysis is the most crucial step in the empathetic phase, aiming to identify the pioneering user groups within the spatial area and analyze their needs. The author initially conducted a literature review and on-site observations to compile a list of potential user groups within the shaded water district. Subsequently, a design priority matrix was established based on the dimensions of user quantity and utilization capacity to determine the pioneering user groups that require focused attention within the site. Following that, through research methods such as literature review, surveys, interviews, and on-site observations, the characteristics, needs, and behaviors of these pioneering user groups were analyzed, serving as the basis for further design advancement (Fig 5-19).

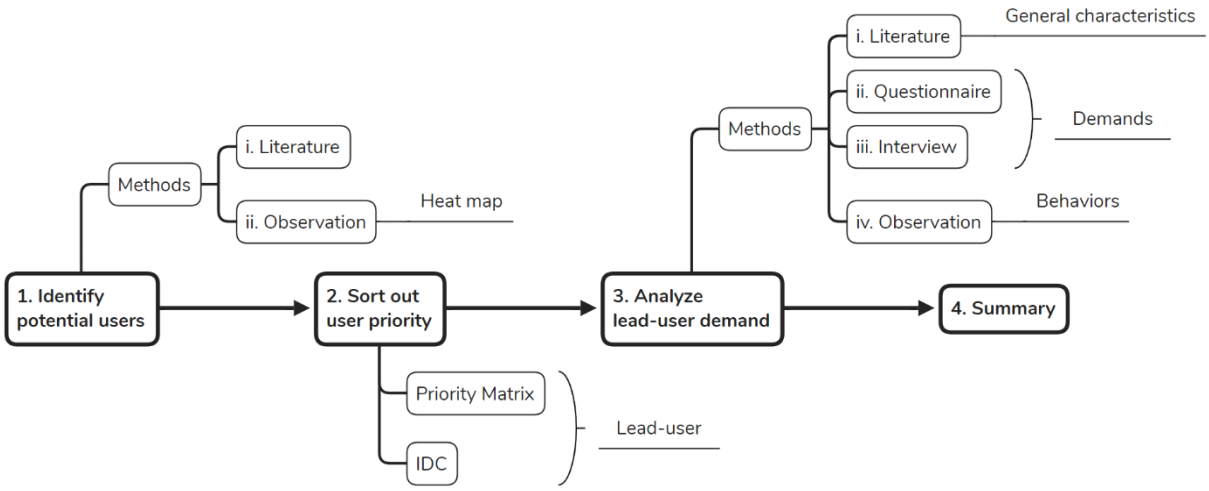


Fig 5-19 Working Path of User Analysis
Source: by author

5.3.1 Identifying Potential Users

In order to identify the main population groups within the shaded water district, the author employed on-site observation as a research method to document the primary categories of people at significant spatial nodes within the community. During three different time periods: 9 am to 12 pm in the morning, 3 pm to 6 pm in the afternoon, and 7 pm to 9 pm in the evening, a 3-minute observation was conducted at each node to record the quantity, categories, and behaviors of the passing crowds (Fig 5-20).

Through on-site observations conducted on different dates, time periods, and locations within the shaded water district, it was discovered that the main population groups on the streets of the community consist of middle-aged and elderly individuals, children, and young tenants (Fig 5-21). There is also significant variation in the physical conditions of the middle-aged and elderly population, with some being physically robust while others rely on wheelchairs or canes. Additionally, there are diverse modes of transportation for adults accompanied by young children, including carrying them with one hand, pushing strollers, and holding hands.

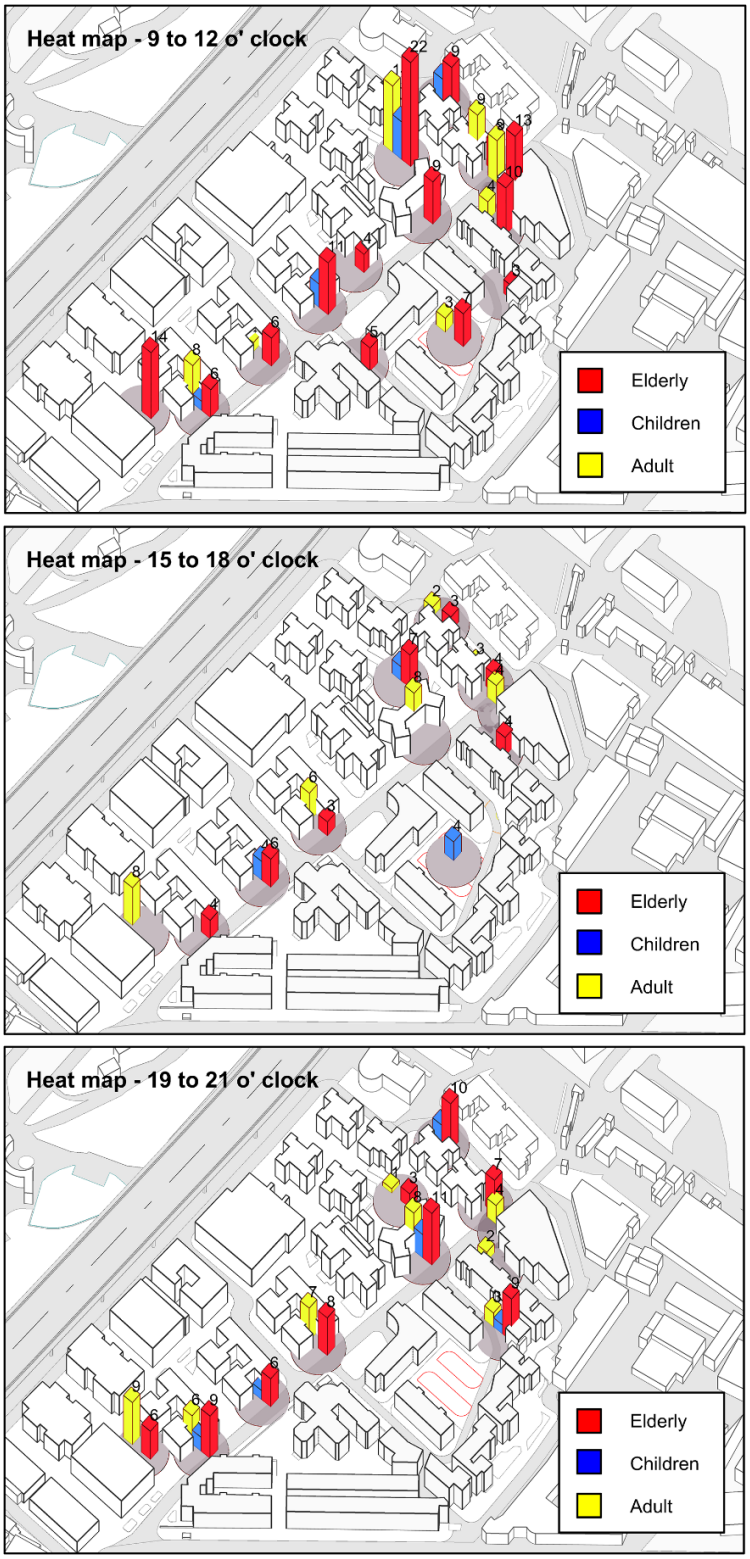


Fig 5-20 Crowd Flow Statistics at different nodes in different periods
Source: by author

By combining on-site investigations and literature research [52] , the author has made an effort to list the potential user groups utilizing the streets within the shaded water district. Through evaluating these user groups based on three dimensions: sensory abilities, cognitive abilities, and physical mobility, they were placed within the inclusive design cube. Each dimension's quantification level was divided into three categories: fully abled, moderate disability, and severe disability. Based on the varying levels of disability across the three dimensions, the user groups were classified into 27 subcategories, thus determining specific targeted design strategies (Fig 5-22).

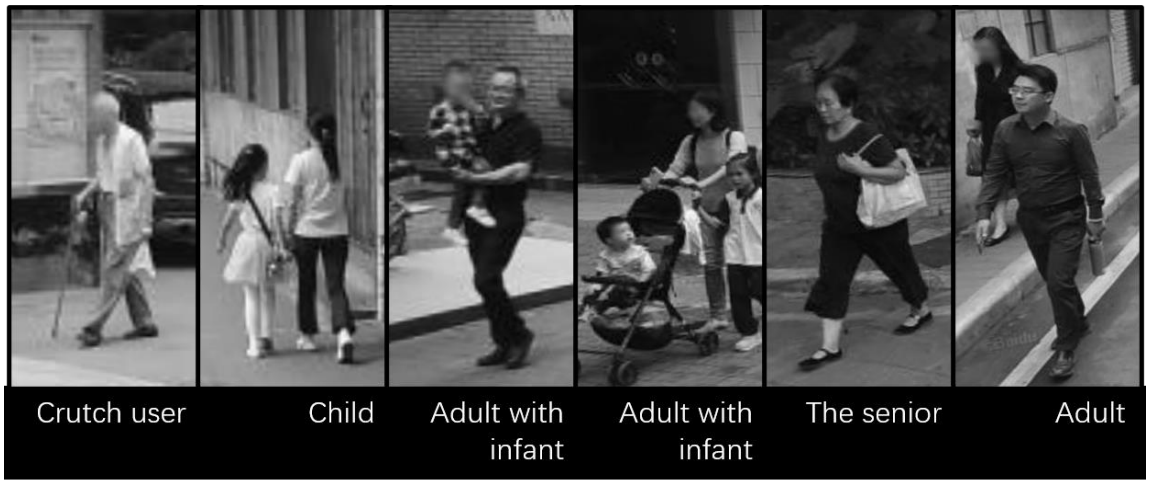


Fig 5-21 Major Population in Shuiyin Community
Source: by author

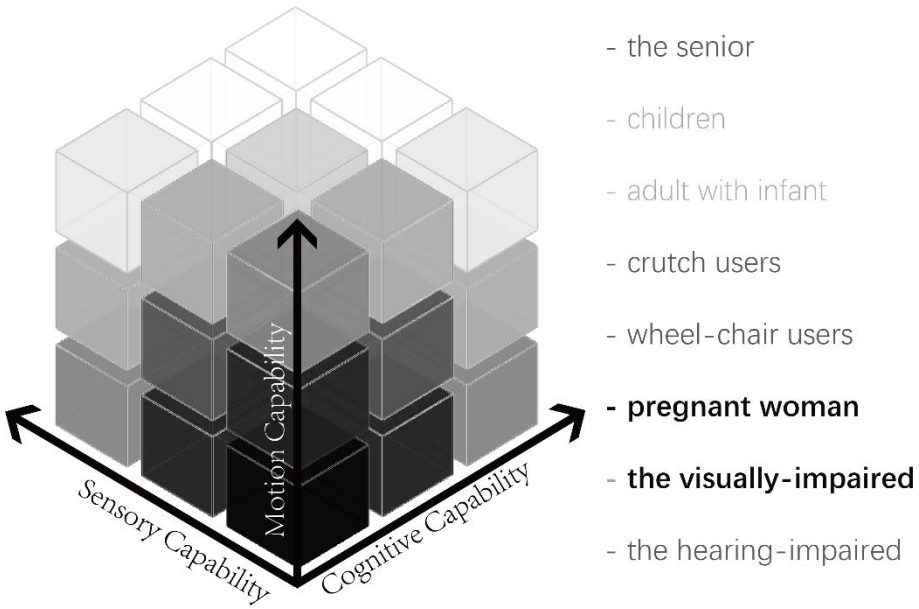


Fig 5-22 Inclusive Street Cube
Source: by author

Ultimately, considering the physical capabilities of street users and the number of individuals within each group, the design priorities for inclusive streets within the shaded water district can be established (Fig 5-23). The group with the highest number of individuals and lower physical abilities should be given the highest priority in design considerations, followed by groups with lower physical abilities but fewer individuals. By addressing the needs of these pioneering users as the minimum threshold for inclusive street design, the design can also accommodate physically abled individuals.

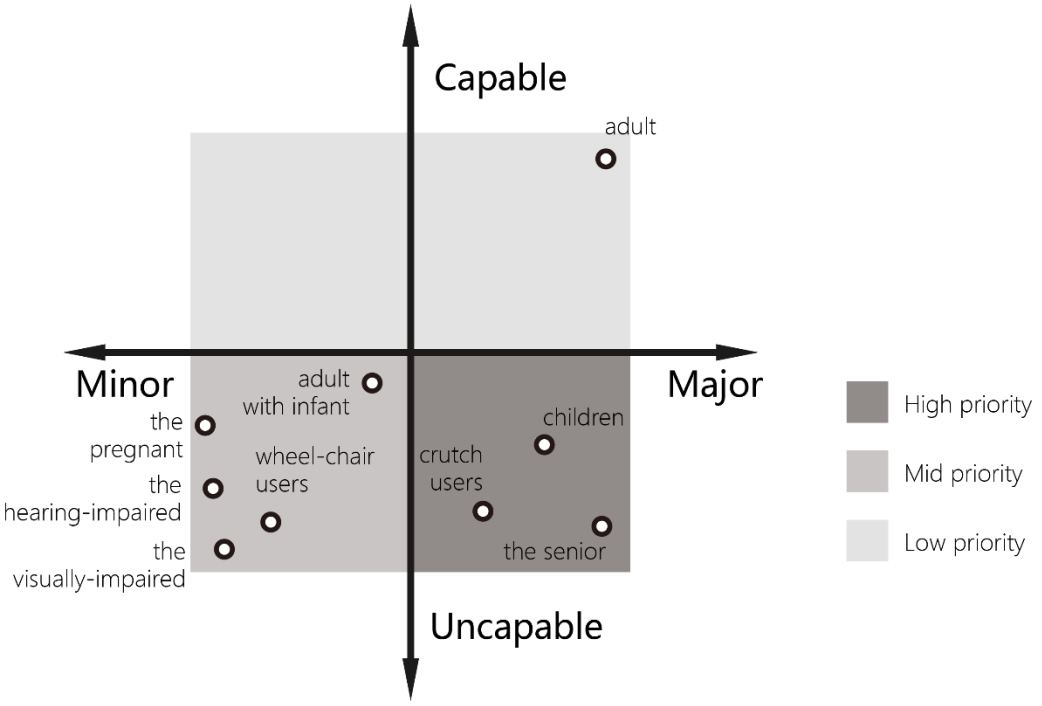


Fig 5-23 User Priority Matrix
Source: by author

5.3.2 Excavating User Demands

(1) User Characteristics

i. The Senior

As individuals age, their bodies start to exhibit physiological signs of aging. In the elderly stage, visual decline leads to reduced ability to discern shapes and colors. Hearing impairment makes it difficult to receive crucial alarm information. Declining olfactory senses reduce sensitivity to odors or harmful gases in the air. Weakened neurological function results in memory loss,

decreased cognitive abilities, and even symptoms of intellectual disabilities. Reduced mobility is characterized by decreased limb flexibility, muscle strength, and brittle bones, increasing the likelihood of injuries such as sprains, fractures, and falls.

The elderly population also has the highest demand for social interaction. After retiring from work, seniors' activities shift from the social sphere to their homes, leading to a gradual decrease in social connections with the outside world. However, due to changes in contemporary Chinese family structures, the opportunities for communication between the elderly and their children are limited. The lack of social interaction often results in feelings of loneliness and isolation among the elderly [53].

ii. Children

Children of different age groups have different developmental characteristics, and therefore, their demands for the external environment vary. The period before the age of 3 is crucial for brain development, including basic sensory functions, language abilities, and higher cognitive functions. During this stage, a stimulating external environment effectively promotes brain development in children. From ages 3 to 8, they are capable of traveling with caregivers and performing some activities independently. The emotional bond between children and caregivers plays a vital role in their subsequent social and emotional development. From ages 8 to 13, most children can travel alone, but their usage of many public facilities is limited due to factors such as height and physical ability.

In most cases, children travel under the guidance of caregivers. Therefore, street space and facility design should consider various modes of transportation, such as bicycles, strollers, hand-holding, and carrying. For children, playing and learning are their main tasks during early childhood. Thus, streets should have playgrounds or incorporate other play elements. Traditional streets are not particularly child-friendly in terms of health and safety, as incidents like collisions, accidents, and air pollution from vehicle emissions are common. Therefore,

safety is of utmost importance for street design. Clear sightlines enable caregivers and nearby residents to promptly detect and assist in dangerous situations. Lastly, considering children's height, many street facilities are out of their reach. Moreover, obstructed sightlines due to their height make it more challenging for them to spot nearby traffic and respond promptly [48].

iii. Disabled Group

Disabled individuals encompass seven categories: visual impairment, hearing impairment, speech impairment, physical impairment, intellectual impairment, mental impairment, and multiple disabilities. This study mainly focuses on the spatial requirements of individuals with mobility impairments and visual impairments.

Regarding visual impairments, individuals can be categorized as either fully blind or partially sighted. The design considerations for individuals with partial sight can reference those for the elderly. Fully blind individuals, who cannot utilize visual cues, rely on various external aids for their daily activities, such as guide dogs, tactile paving, handrails, braille, and auditory traffic signals. Individuals with mobility impairments, also known as lower limb impairments, include users of canes and wheelchairs. Wheelchairs occupy a larger space and are unable to navigate stairs or changes in ground level. Individuals using canes have slower movement, difficulties with climbing, poorer horizontal pushing force, and are more prone to falls. Therefore, inclusive street design should focus on the safety, comfort, and accessibility of space, leaving sufficient clearance for individuals with limited mobility and providing suitable handrails for assistance. Slopes should be provided at changes in ground level, and if necessary, elevators, escalators, and lighting facilities can address vertical transportation issues. The ground should be even, slip-resistant, sturdy, and free from water accumulation to prevent falls or slips [52].

(2) Questionnaire and Interview

After gaining a rough understanding of the pioneering user groups through literature research, researchers need to delve deeper into the site to understand individual situations. On different dates, at different locations and time periods, the author distributed 31 questionnaires, with 30 valid responses received. The questionnaire survey mainly targeted residents of the shaded water district and daily users of the streets. It consisted of three parts: personal profile, evaluation of street space conditions, and an open-ended interview section (Appendix II).

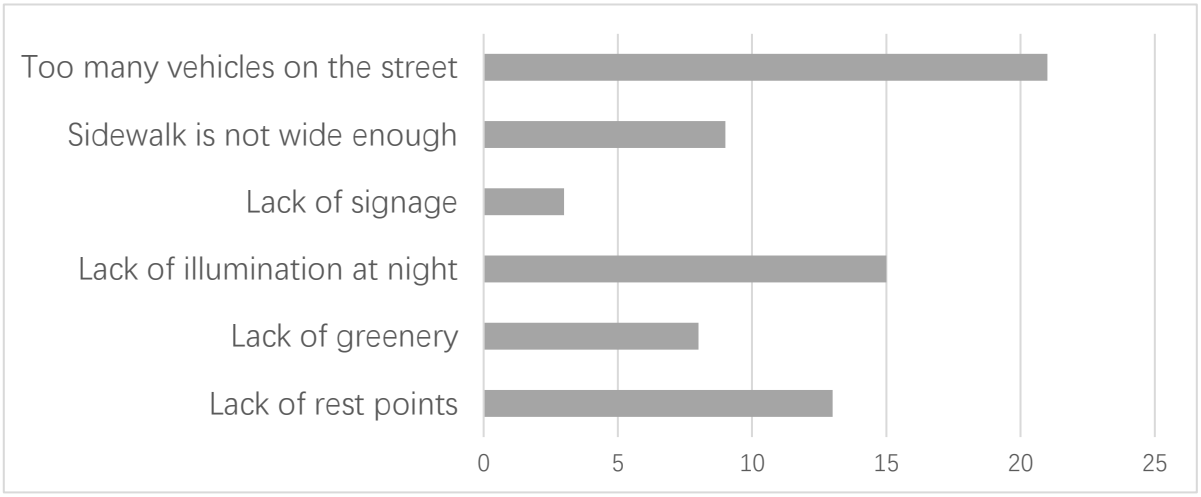


Fig 5-24Insufficiency of Street Space in Shuiyin Community
Source: by author

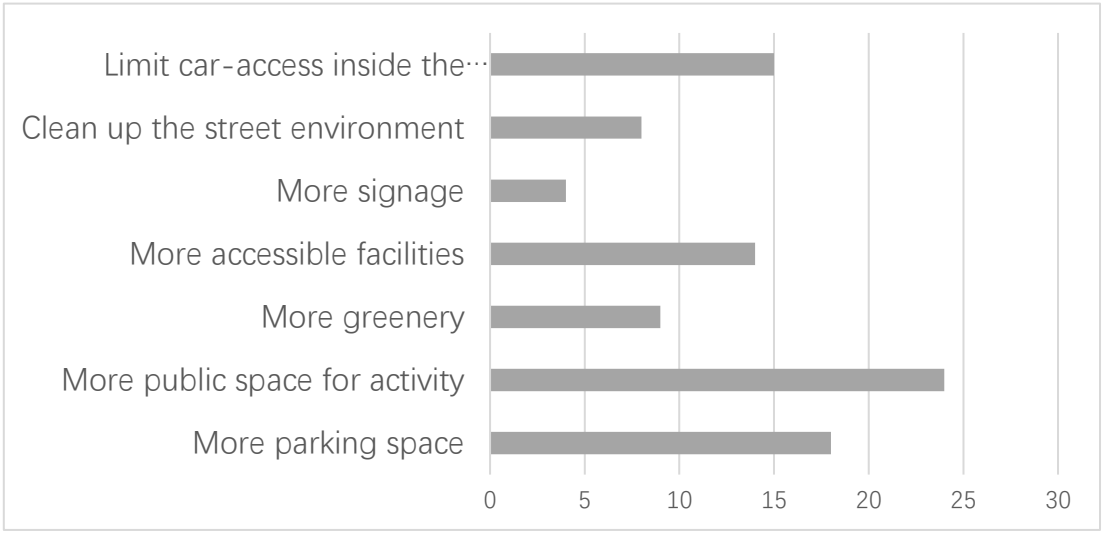


Fig 5-25 Possible Implementation to Improve Street Space
Source: by author

Most of the respondents in the survey were community residents, predominantly middle-aged and elderly individuals, with some young tenants. Regarding the evaluation of street space in the shaded water district, the majority of people identified the excessive presence of motor vehicles on the streets as the most prominent issue, occupying the space and even hindering

continuous walking. The lack of nighttime lighting on internal roads within the community and the absence of resting facilities on the streets were also concerns raised by the interviewees (Fig 5 24). When discussing how to improve street space, most respondents expressed a desire for more public spaces and additional parking spaces within the community. Half of them also supported restrictions on motor vehicles within the community to reduce space occupation.

In the open-ended interview section, respondents' answers continued to focus on the demand for public spaces, but there were subtle differences in spatial requirements among different user groups. For example, children hoped for more play areas, while mothers expressed concerns about street safety. Elderly individuals preferred sitting by the roadside, chatting with neighbors while enjoying the cool breeze. Young tenants wanted more places to socialize and make friends.

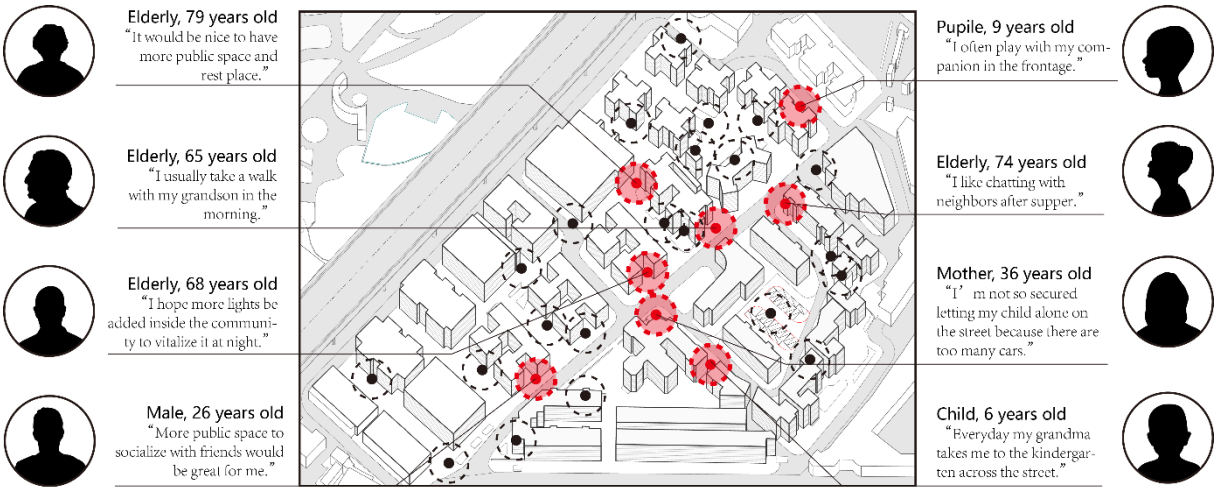


Fig 5-26 Interview Detail
Source: by author

(3) Behavior Observation

Fig 5-28 Daily Behaviors of Children
Source: by author

Fig 5-27 Daily Behaviors of Seniors
Source: by author

While tallying the footfall and identifying the main population groups within the site, the author also observed the daily activities of different user groups on the streets. There were numerous children practicing riding bicycles under the supervision of their parents. They could also be seen doing homework and playing in front of shops. Additionally, there were many students heading to tutoring classes. As for the elderly population, their main daily activities included grocery shopping, casual conversations, and taking care of children.

(4) Summary of Demands

Based on the previous literature review, questionnaire interviews, and actual observations, we can summarize the main demands of the pioneering user groups (Table 5-2).

Group		Special Demands
The senior		- Social interaction - Vision guidance - multi-sensory hint - Barrier-free
Children		- Space to play and learn - Access to facilities - healthiness and safety - Visual access
The handicapped	the visually-impaired	- Space for guide dogs -Tactile paving - Braille - Auditory hint
	the mobility-impaired	- Enough space to pass through - Smooth, anti-slip ground - Elevator - Handrail

Table 5-2 User Demands
Source: by author

5.4 Design Strategies

Based on the analysis of different spatial types and existing issues on the streets within the shaded water district (Table 5-1) , as well as the utilization of the inclusive street design cube model (Fig 5-22) and the design priority matrix (Fig 5-23) to identify the pioneering user groups, and summarizing their needs based on their characteristics (Table 5-2). , the following major design strategies are proposed, taking into account the aforementioned issues and user demands(Fig 5-29).

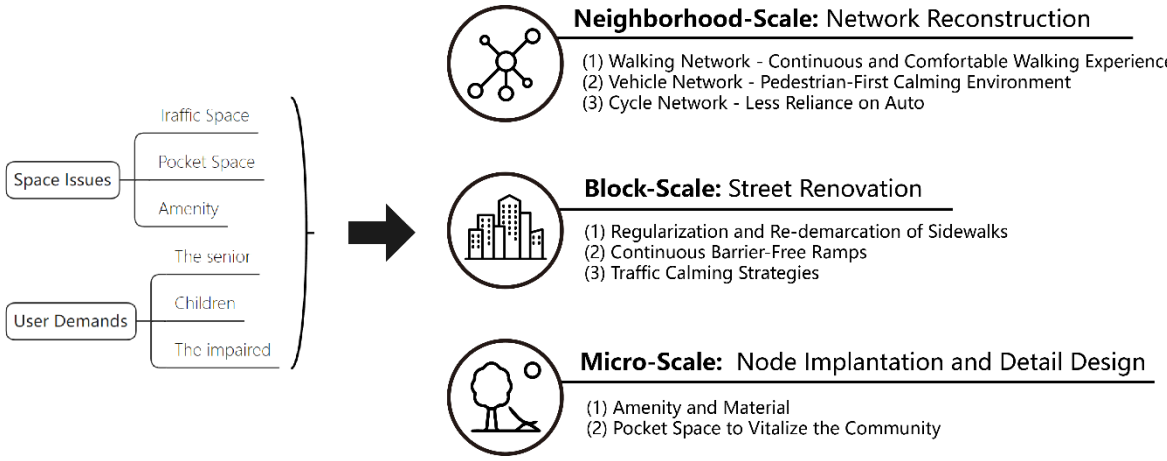


Fig 5-29 Design Strategies
Source: by author

5.4.1 Neighboring Scale – Traffic Network Reconstruction

The author has conducted a re-planning and design of the road system hierarchy within the existing community road network. The previous road network in the community lacked clear and explicit hierarchy, resulting in a significant portion of the community's pedestrian spaces being occupied by motor vehicles. To address this issue, the community has been divided into two clusters, north and south, separated by a second-level road. Within each cluster, there are residential and pedestrian-only roads that are exclusively for the use of residents, with vehicular traffic prohibited (Fig 5-30)

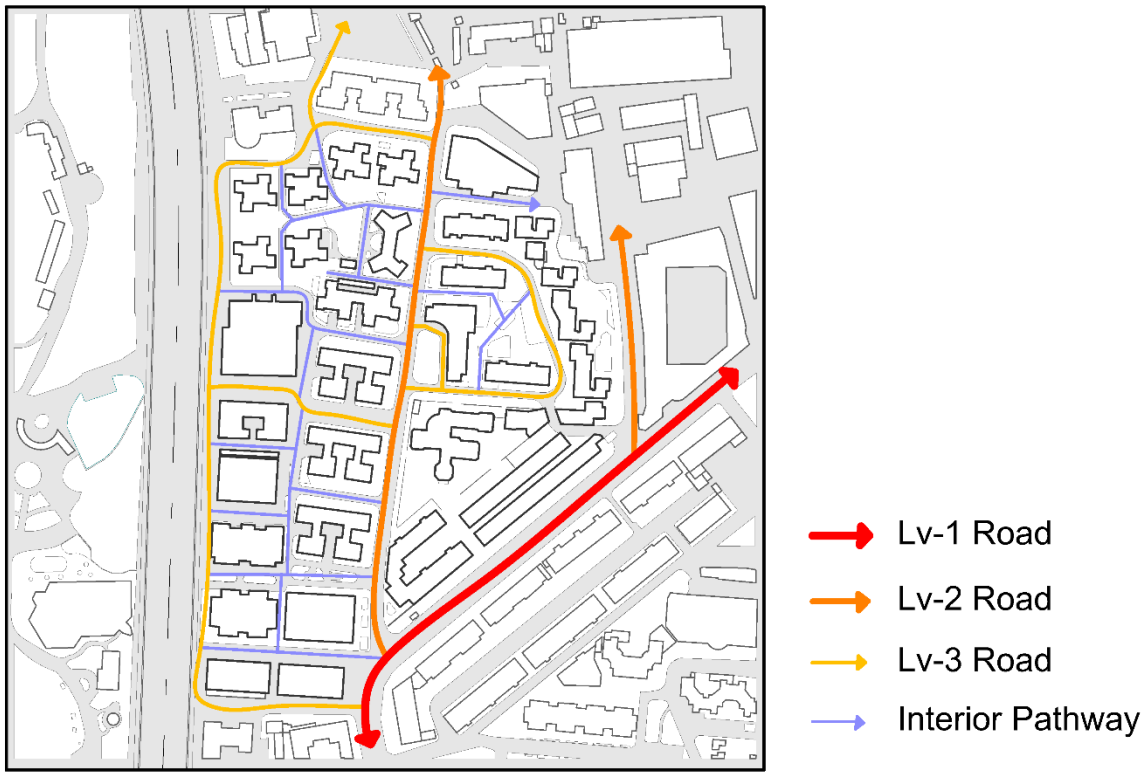


Fig 5-30 Road System After Renovation
Source: by author

(1) Walking Network - Continuous and Comfortable Walking Experience

There is significant room for improvement in enhancing the pedestrian experience within the street spaces of the shaded water district. Based on the analysis of the current spatial conditions, the main issues in the pedestrian spaces include conflicts between pedestrians and vehicles, lack of accessible ramps, and obstacles that disrupt the continuity of walking paths. Additionally, the quantity of infrastructure on the streets is insufficient to meet the requirements of inclusive street design.

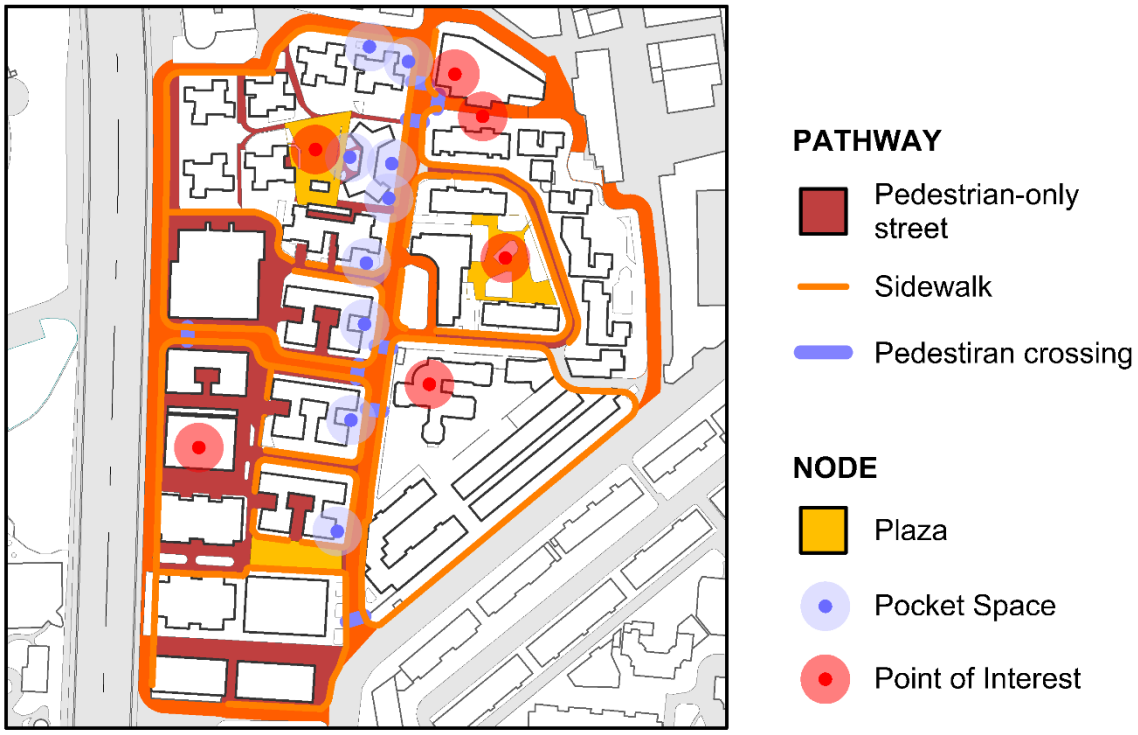


Fig 5-31 Walking Network of Shuiyin Community
Source: by author

To enhance the continuity of the pedestrian network, the author first studied the points of interest within the community. These points of interest are the primary destinations for residents' daily activities and include the community hospital, market, kindergarten, public activity spaces, and pocket spaces. These points of interest are separated by a main road running from south to north within the community, but pedestrian crossings are not provided on the road, which to some extent hinders the continuity of walking. To address this issue, three pedestrian crossings were installed on the main north-south road to improve the continuity of pedestrian movement

across east-west blocks. Furthermore, to further prioritize pedestrian movement, the internal roads within the community were designated as pedestrian-only streets, creating a safe and vehicle-free environment within the community (Fig 5-31).

Based on the analysis of the radiation range of rest areas within the community, there was a significant gap in rest facilities in the middle section of the streets. To increase the quantity of street resting facilities, the author set up two rest areas combined with pocket spaces in the middle section of the streets to cater to individuals with mobility difficulties, such as pregnant women, individuals with mobility impairments, and the elderly (Fig 5-32，Fig 5-33).

While there is an adequate and evenly distributed distribution of lighting facilities on the main roads, there is a lack of lighting within the community. The absence of nighttime lighting within the community is one of the factors contributing to the lack of vitality in the neighborhood, as residents tend to rest and socialize in well-lit areas. Taking into consideration factors such as the height of streetlights and the spacing of existing streetlights, the author arranged streetlights every 30 meters along the roads within the community to meet the nighttime lighting requirements and improve the visibility of the roads (Fig 5-35，Fig 5-34).

Furthermore, the guidance design within the shaded water district is generally lacking, especially at intersections and important nodes. After analyzing the important points of interest within the community, the author set up road signage at the community entrances, road intersections, and pocket spaces, and analyzed the connections between each signage to enhance the legibility of the neighborhood.

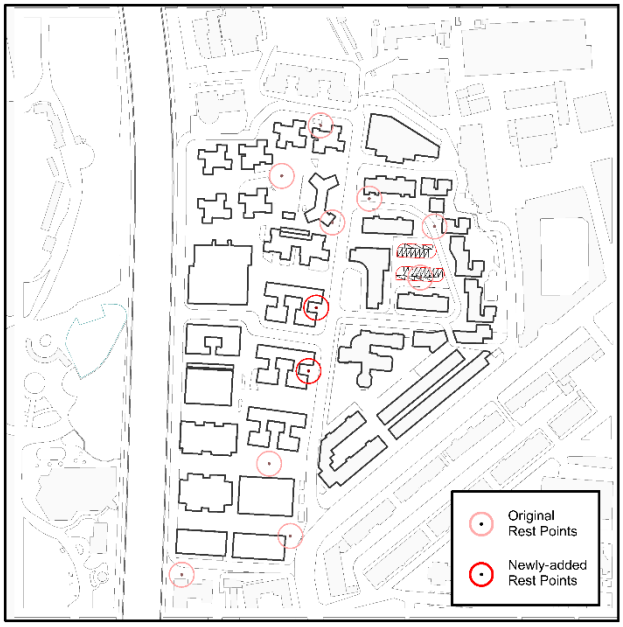


Fig 5-32 Newly-added Rest Points
Source: by author

Fig 5-33 Serving Range of Rest Points
Source: by author

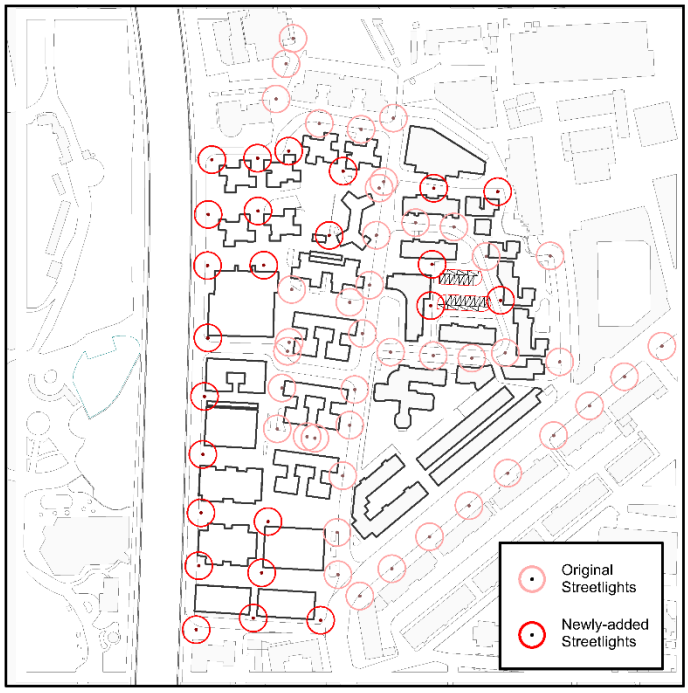


Fig 5-35 Newly-added Streetlights
Source: by author

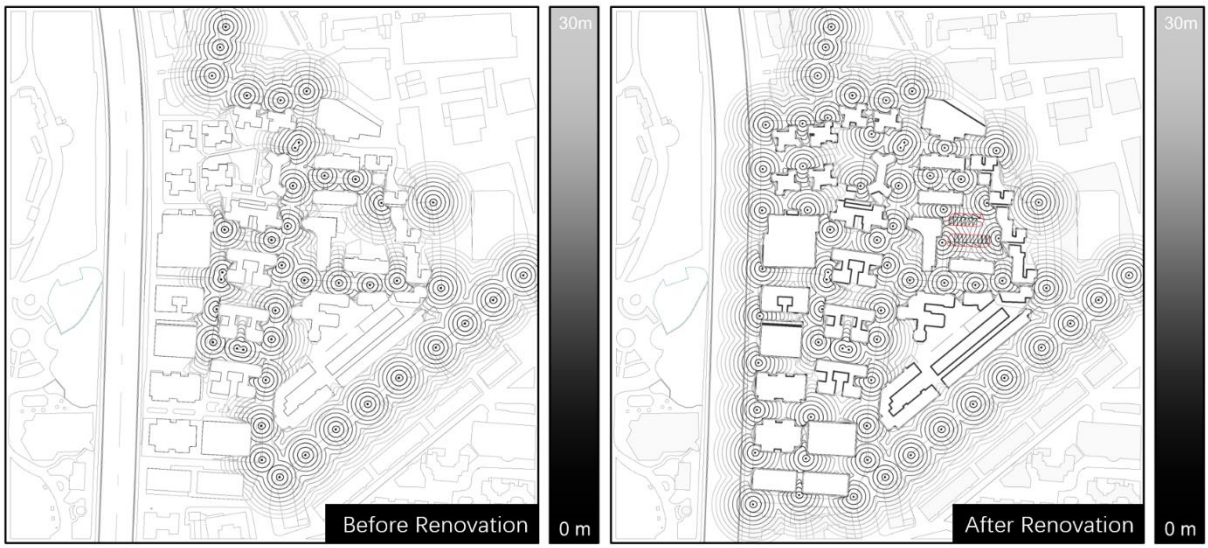


Fig 5-34 Illumination Range of Streetlights
Source: by author

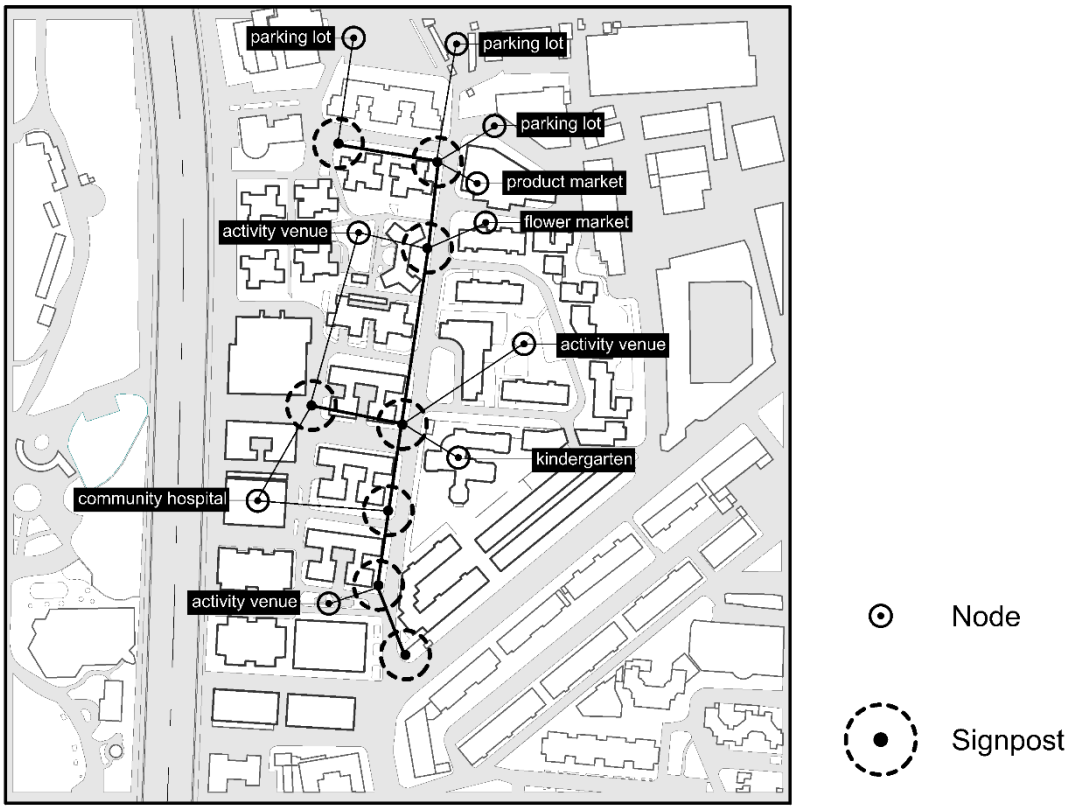


Fig 5-36 Wayfinding System
Source: by author

(2) Vehicle Network - Pedestrian-First Calming Environment

The conflict between motor vehicles and pedestrians is particularly prominent in communities, mainly manifested in the fact that street space is largely occupied by motor vehicles, leaving insufficient space for pedestrians and low traffic priority for pedestrians walking on the street.

There are no more than three types of motor vehicles in the community: first, private cars of community residents, parked in public places and roadsides in the community; second, logistics vehicles temporarily parked; and third, other vehicles passing through. After considering the different uses and paths of these three types of motor vehicles on the community roads, the author reorganized the vehicle flow line. By setting road piles at some entrances of the community to restrict some vehicles from entering the community, the road still retains a certain degree of traffic capacity to meet the accessibility of the main travel points and parking sites. (Fig 5-38，Fig 5-37，Fig 5-39). By redesigning and sorting out the motor vehicle flow line, the space for pedestrians inside the community is guaranteed, and it will not cause too much impact on the parking and travel problems in the community.

To reduce the priority of motor vehicles in the community's transportation network, the roads available for motor vehicles in the community are designed as slow roads to improve the safety of the block (Fig 5-39). The design methods to reduce vehicle speed include setting speed bumps, buffering road arches, and uneven ground paving bricks to remind drivers to slow down and drive slowly.

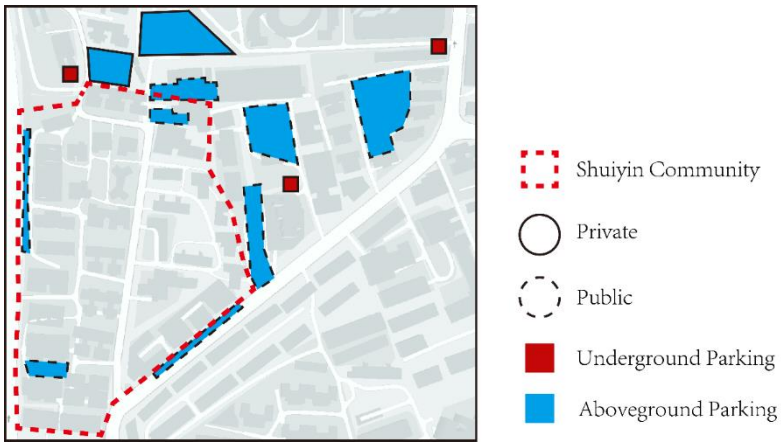


Fig 5-38 Parking Lots around the Community
Source: by author

Fig 5-39 Measures to Limit Car-Access
Source: by author

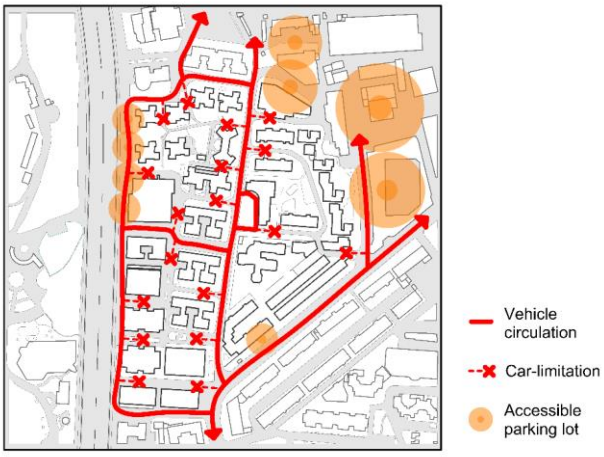


Fig 5-37 Vehicle Circulation Analysis After Renovation
Source: by author

(3) Cycle Network - Less Reliance on Auto

In order to further reduce reliance on motor vehicles, promoting diverse modes of transportation is crucial. Within a 5–10-minute distance range, shared bicycles can be encouraged as a mode of travel. The author has installed shared bicycle facilities at three key nodes along the main roads of the community, ensuring that no location within the community is more than a 3-minute walk away from the nearest shared bicycle (Fig 5-40).

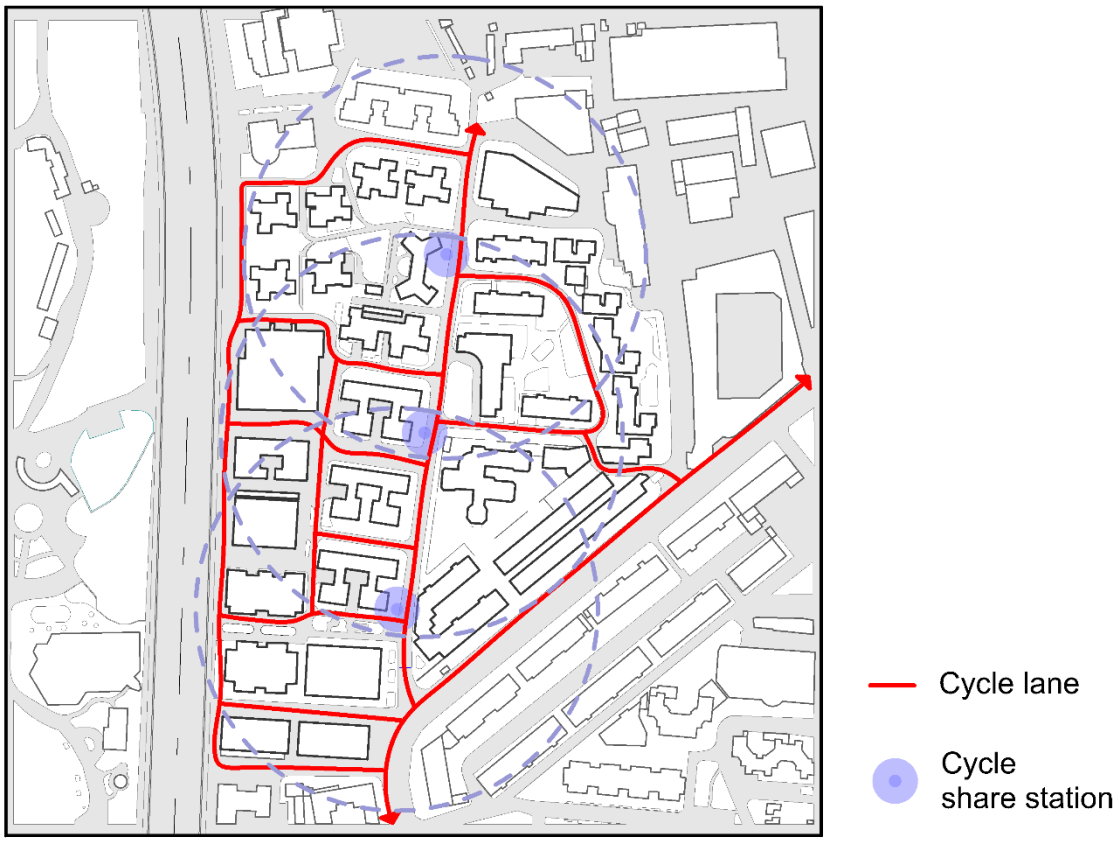


Fig 5-40 Bicycle Network and Share Stations
Source: by author

5.4.2 Block Scale – Street Renovation

(1) Regularization and Re-demarcation of Sidewalks

One of the main reasons for insufficient pedestrian continuity and discomfort within the neighborhood is the lack of clear delineation of road areas. The survey results of the spatial conditions mentioned numerous obstacles on pedestrian sidewalks, such as lamp posts, trees, and random debris placed in the middle of the walkways. This further congests the already narrow sidewalks, resulting in a poor walking experience. Some roads even fail to meet the requirements for wheelchair accessibility.

The author first categorized the road areas based on their functions and redefined the areas of different road levels. The road areas on the sidewalks were divided into four categories: the space in front of shops, the clear passage area, the area for street furniture, and the buffer area separating pedestrian flow from vehicular flow. The clear passage area ensures the continuity and comfort of the sidewalks, making it the highest priority in sidewalk design. The buffer area plays a vital role in pedestrian safety. If there is additional space after meeting the basic passage requirements, street furniture areas can be added to enhance the comfort of walking.

As the pedestrian sidewalks in the shaded water district are not spacious, the priority is given to meeting the passage and safety requirements. The width of the clear passage area is guaranteed to be at least 1.5 meters, accommodating wheelchair access. Additionally, a 0.6-meter-wide buffer zone is set up, using greenery and bollards to separate vehicle and pedestrian flow, ensuring pedestrian safety (Fig 5-43, Fig 5-42, Fig 5-41).

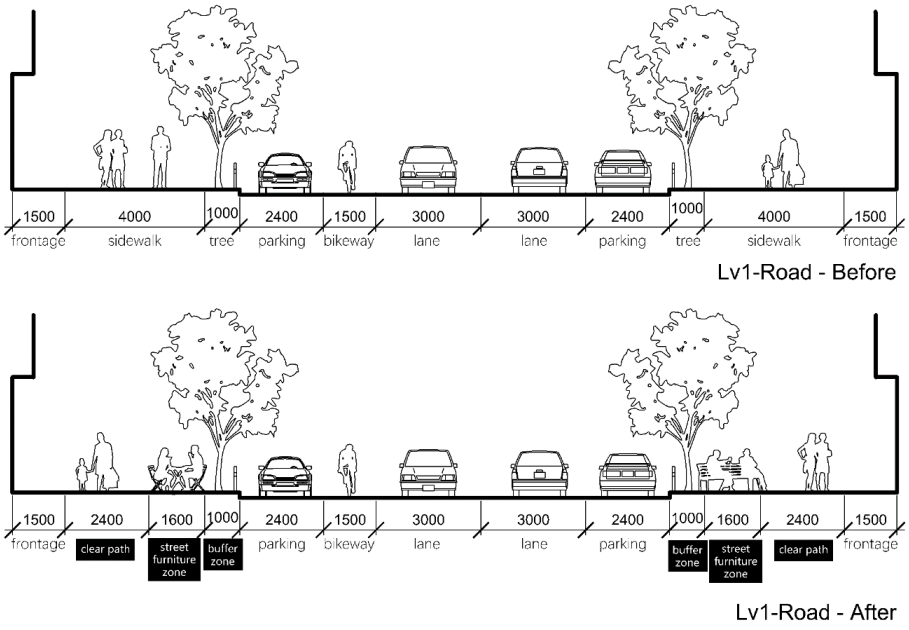


Fig 5-43 Lv-1 Road Section
Source: by author

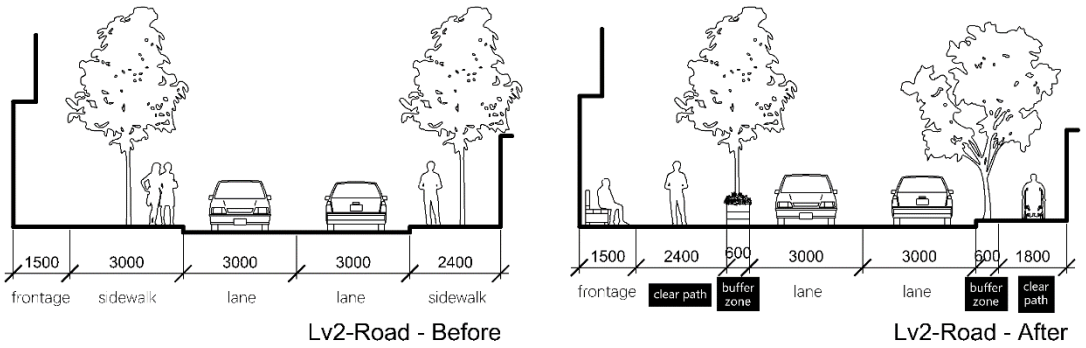


Fig 5-42 Lv-2 Road Section
Source: by author

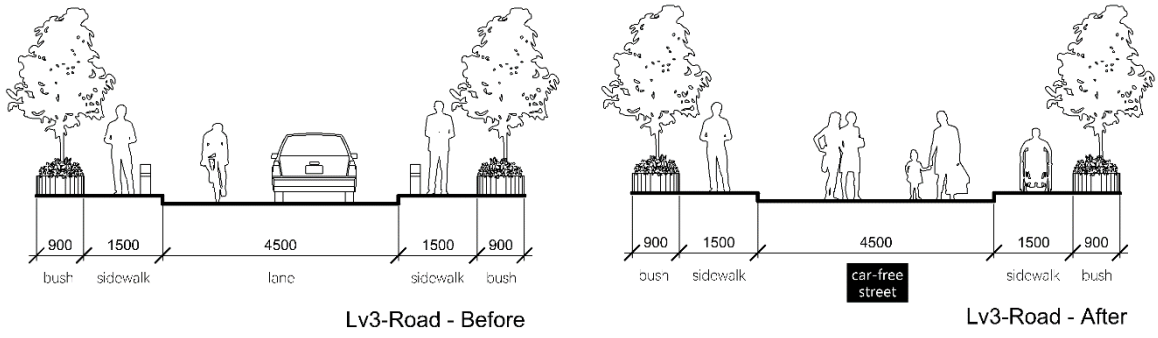


Fig 5-41 Lv-3 Road Section
Source: by author

(2) Continuous Barrier-Free Ramps

There are height differences at the junctions of pedestrian sidewalks and vehicular lanes. To meet the travel needs of goods transportation and individuals with mobility difficulties, as well as to improve pedestrian continuity, the author has identified five types of barrier-free ramps based on different sidewalk edge forms. These include single-sided ramps, double-sided ramps, and three-sided ramps for straight sections, as well as double-sided ramps and three-sided ramps for corner sections. These ramps are installed in the pedestrian sidewalks along the main water-shaded street.

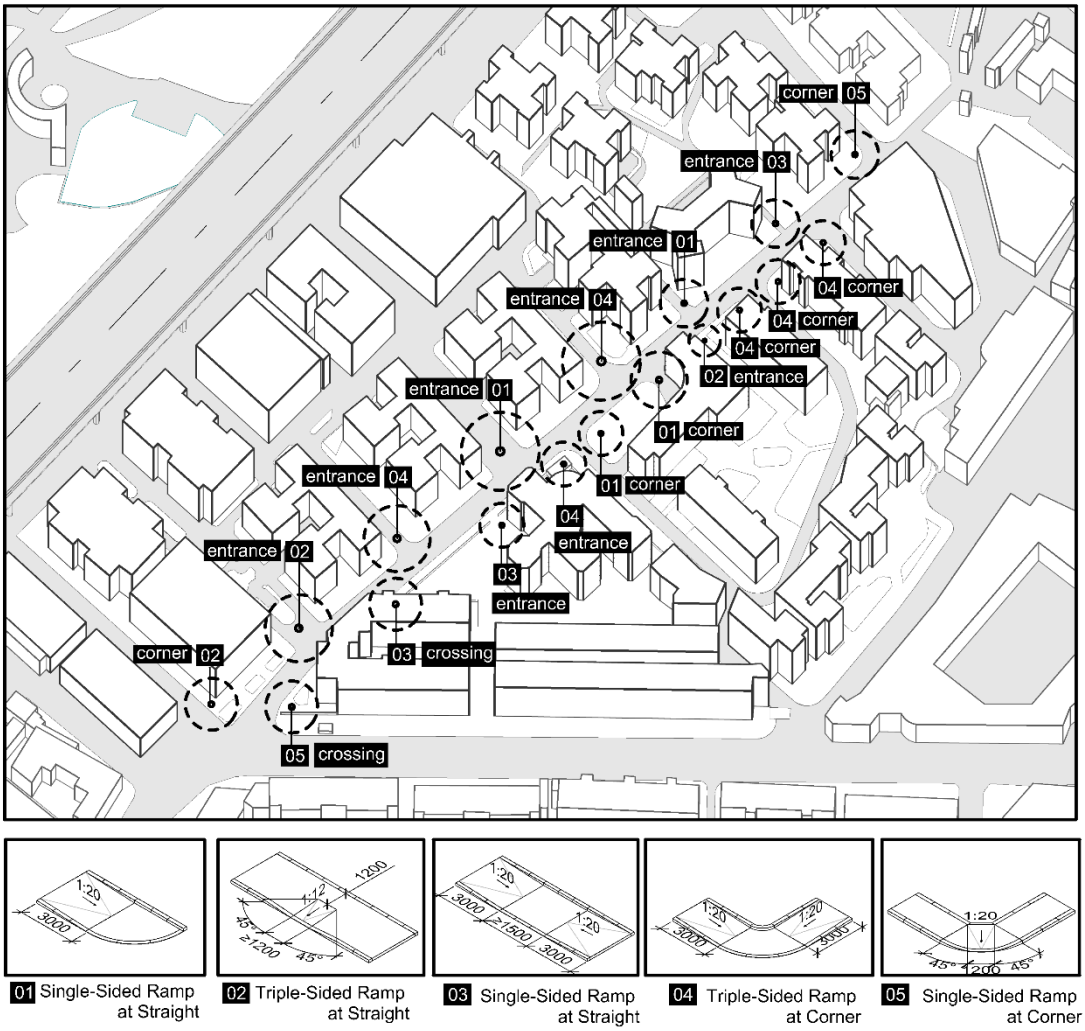


Fig 5-44 Curb Ramp on the Sidewalks

Source: by author

(3) Traffic Calming Strategies

To restrict vehicle speeds within the neighborhood and enhance pedestrian safety, traffic calming strategies have been implemented in the slow traffic areas. Measures for achieving traffic calming include speed humps, cushioned road arches, and undulating lane paving. Speed humps are combined with the three pedestrian crossings within the community. On one hand, they elevate the road surface, making pedestrians more visible to drivers. On the other hand, they serve as reminders and compel motor vehicles to slow down, ensuring pedestrian safety (Fig 5-45).

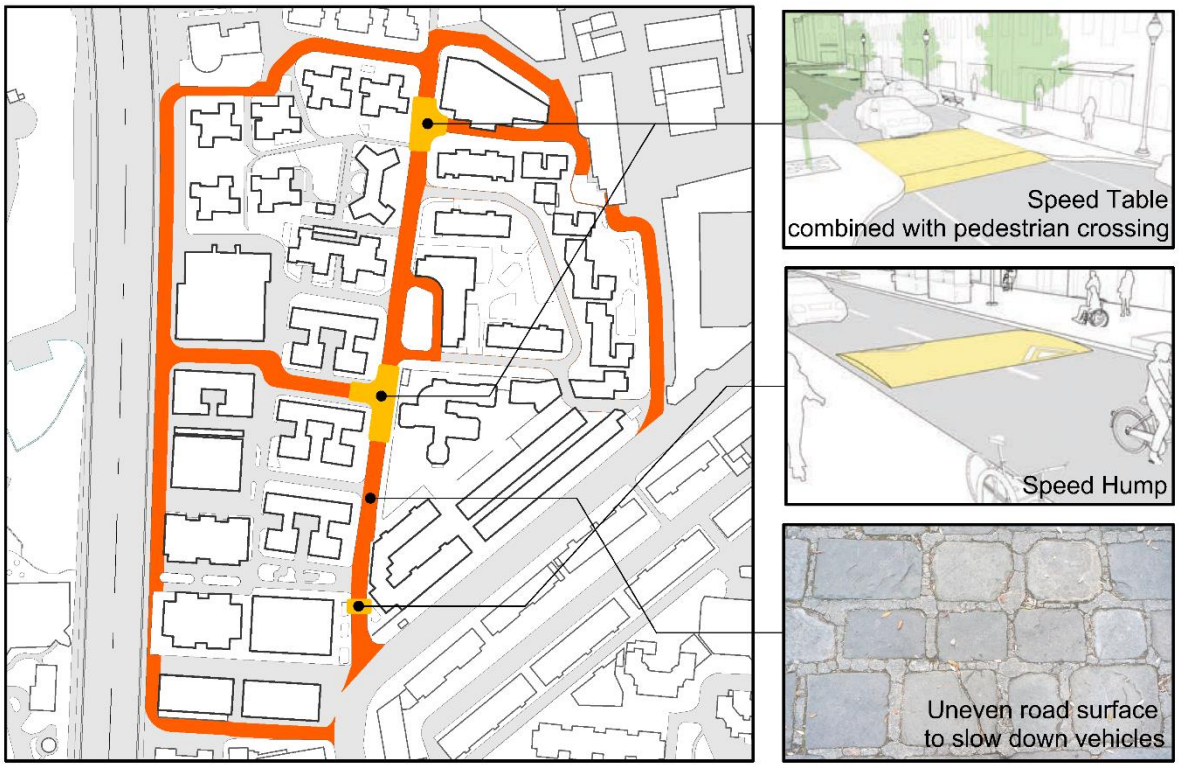


Fig 5-45 Traffic Calming Strategies
Source: by author

5.4.3 Micro Scale - Node Implantation and Detail Design

(1) Amenity and Material

i. Material

The materials used in the street space should have high visibility, allowing individuals with visual impairments to easily distinguish different spatial areas through material differentiation. This design principle ensures readability and safety. Additionally, compatibility with existing materials in the neighborhood should be considered to achieve harmony and unity. Using familiar materials known to residents of the neighborhood facilitates recognition for individuals with cognitive impairments and enhances the sense of affinity with the space. Spaces for social interaction and relaxation should use warm colors to provide a cozy spatial experience for the elderly.

The most common pavement materials in the neighborhood are granite and red brick. Following the familiarity principle of inclusive street design, the renovated pedestrian sidewalks continue to use red brick, while some small plazas are paved with smooth granite. The tactile paving on the red brick surface is designed in yellow color to increase contrast and distinguishability. The transitional spaces and furniture materials connecting indoor and outdoor areas adopt warm wooden tones (Fig 5-46).

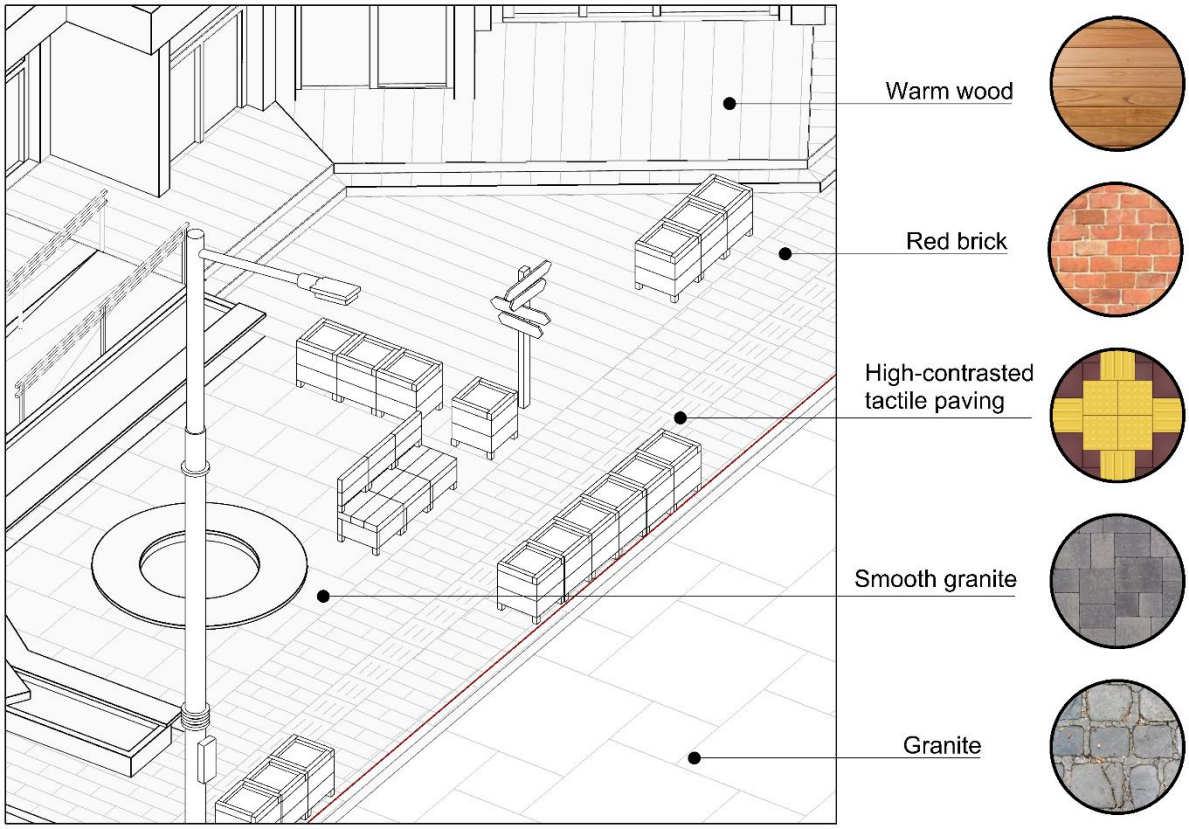


Fig 5-46 Space Materials
Source: by author

ii. Signage

The signage design in the streets aims to provide guidance to pedestrians, enhance the readability and accessibility of the street space, and prevent pedestrians from getting lost. Signage design should also adhere to inclusive design principles, considering factors such as the height characteristics of different groups and the inclusion of braille at key locations (Fig 5-47).

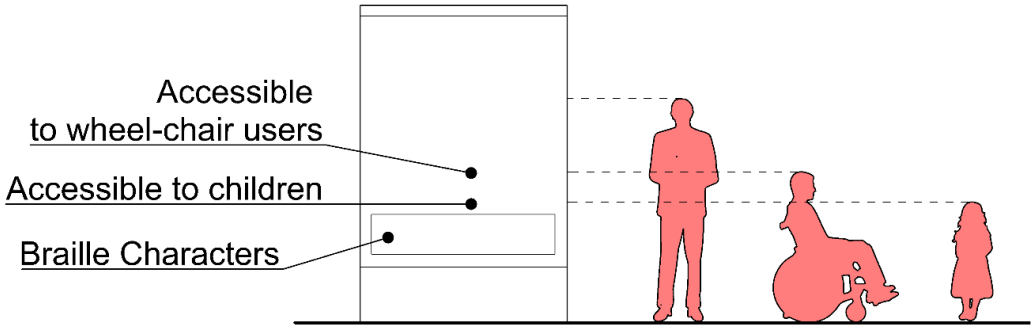


Fig 5-47 Inclusive Design of Signposts
Source: by author

iii. Street Furniture

To meet the diverse spatial needs of different user groups and accommodate dynamic changes over time, street furniture should adopt a modular and flexible design concept. Modular choices include 600mm, 300mm, and 150mm. The height of furniture should also consider the use by children, with seat heights around 300mm-350mm. Street furniture should be lightweight, portable, easy to dismantle, and offer high compositional flexibility (Fig 4-17).

Street furniture in the Shady Water neighborhood mainly caters to the elderly and children. Based on the analysis of user characteristics and needs mentioned earlier, several usage scenarios can be envisioned to meet the spatial needs of different user groups. For example, the furniture can serve as playground equipment for children, gathering spaces for young people, and socializing spots for the elderly. Additionally, the layout of furniture should consider the passage of wheelchair users and provide sufficient space and turning areas for their use (Fig 4-18).

(2) Pocket Space to Vitalize the Community

Pocket spaces are potential catalysts for community vitality within streets. However, the pocket spaces in the Water Shade neighborhood have consistently had low utilization rates due to a lack of essential facilities and corresponding spatial qualities. The pocket spaces in the Water Shade neighborhood can be classified into three types: storefront spaces, entrances to residential units, and small enclosed spaces formed at street corners by surrounding buildings. In this study, the author has selected three representative pocket spaces within the Water Shade neighborhood for detailed node design (Fig 5-48).

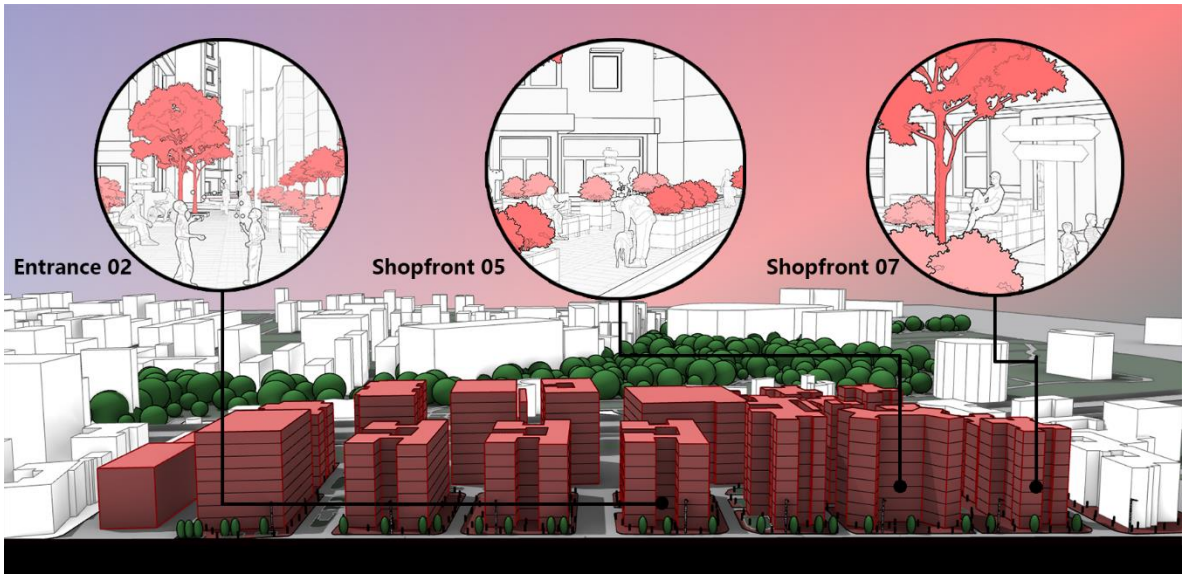


Fig 5-48 Sectional Perspective of Shuiyin Direct Street
Source: by author

i. Entrance 02

Entrance 02 is located at the entrance space in the middle section of Water Shade Street, surrounded by concave physical interfaces that create a good sense of enclosure. There are several shops in the vicinity, with only one street separating it from the Water Shade Kindergarten. The main spatial issues of Entrance 02 include parking problems, insufficient spatial quality, and lack of inclusive design considerations (Fig 5-49).

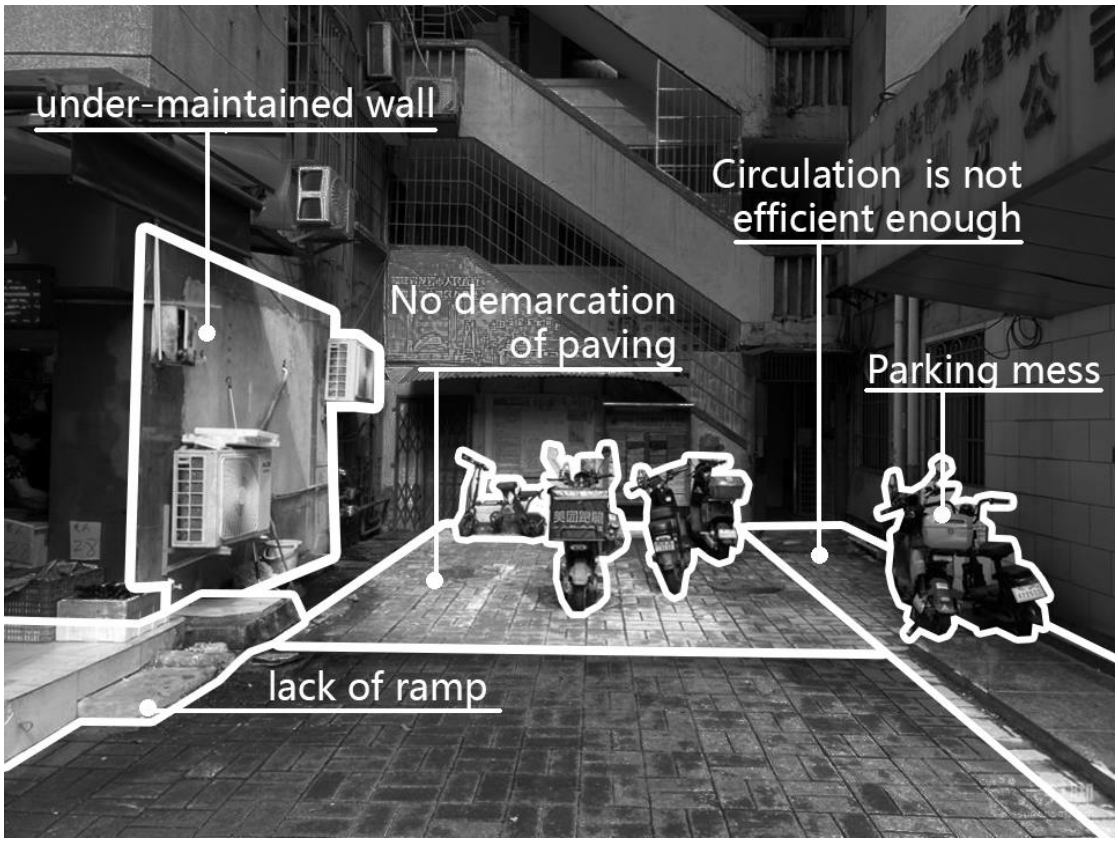


Fig 5-49 Entrance 02 Status Quo
Source: by author

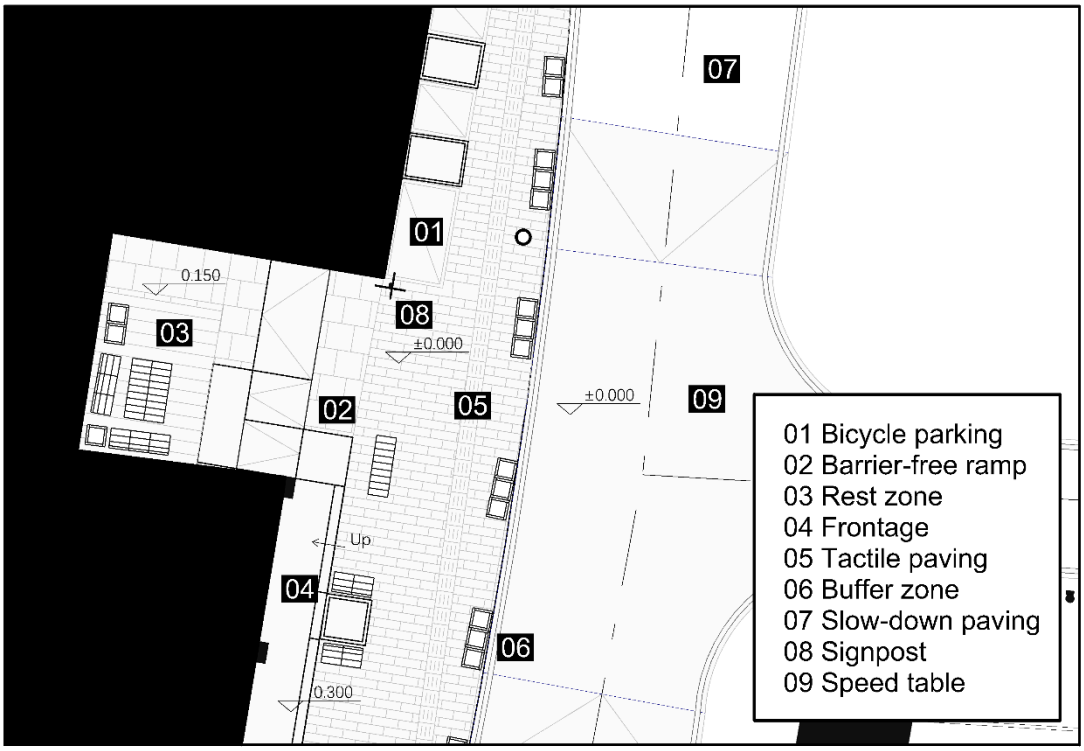


Fig 5-50 Entrance 02 Plan
Source: by author

To enhance the spatial perception of the entrance area, a wooden lattice frame is installed above the entrance, and a designated resting area is created below it. Accessible ramps are provided at both the shop entrances and residential unit entrances to ensure accessibility. Additionally, road signs are installed to enhance legibility and spatial identification within the block. Resting facilities combined with landscape greenery are placed in front of the shops, including child-scaled seating. At the intersection where the lanes converge, speed bumps are implemented. On one hand, they serve as pedestrian crosswalks between the pocket space and the Water Shade Kindergarten. On the other hand, they force vehicles to reduce speed, prioritizing pedestrians' safety and ensuring pedestrian priority (Fig 5-50，Fig 5-52，Fig 5-51，Fig 5-53).

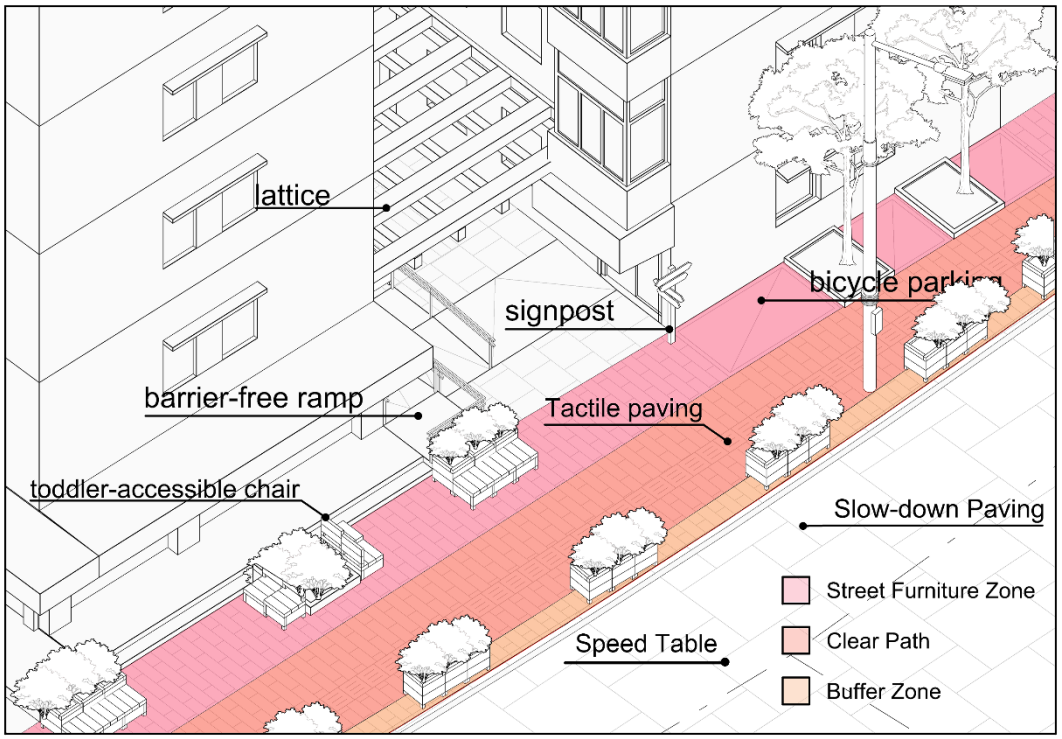


Fig 5-52 Entrance 02 Bird View
Source: by author

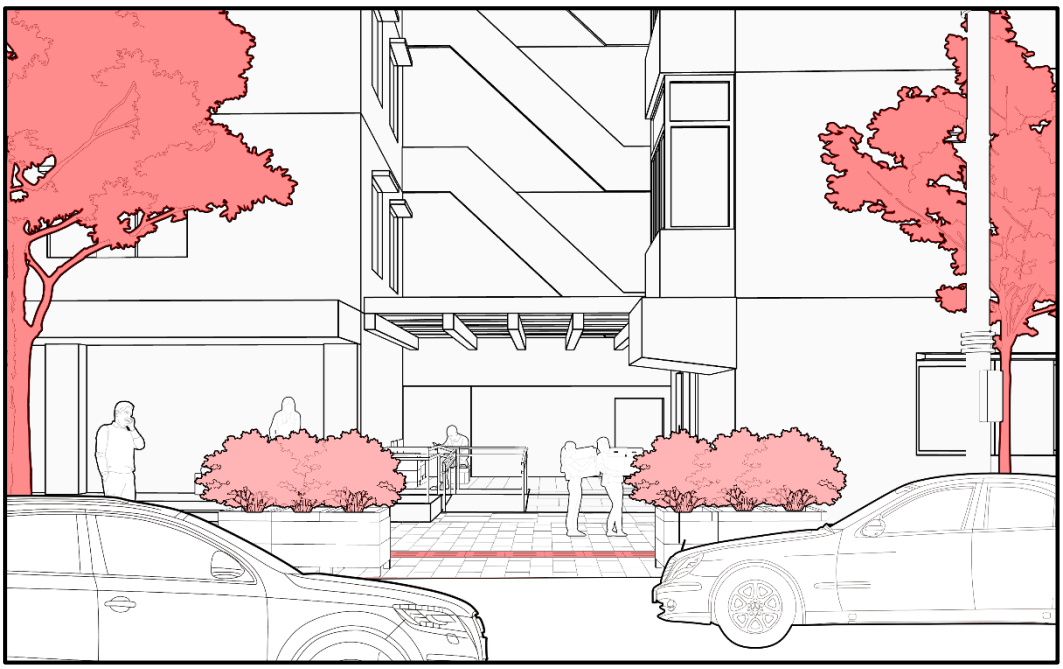


Fig 5-51 Entrance 02 Perspective
Source: by author

Fig 5-53 Entrance 02 Street Perspective
Source: by author

ii. Shopfront 05

Pocket space Shopfront 05 is located in the northern part of the community, with the flower and bird market and underground vegetable market to the east. The spatial interface of this pocket space is trapezoidal, open outward. Similarly, this pocket space faces issues of parking conflicts, disorganized pavement, and lack of accessibility design (Fig 5-54).

After incorporating accessible ramp design, the author reconfigured the spatial flow and redefined the spatial zones. By introducing a small square within the pocket space, it becomes a gathering place for residents. The semi-outdoor space utilizes warm wooden materials.

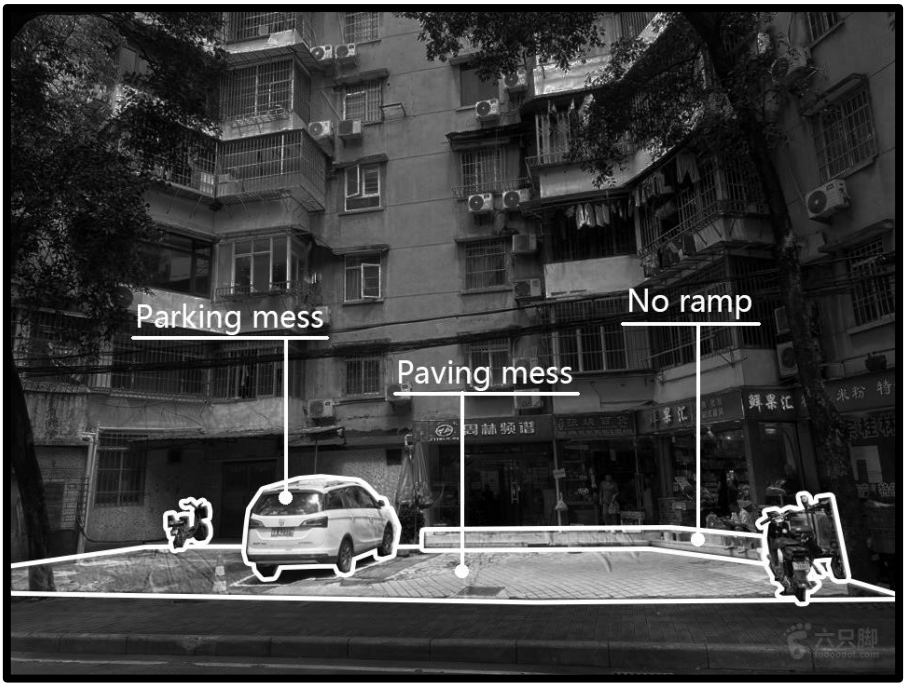


Fig 5-54 Shopfront 05 Status Quo
Source: by author

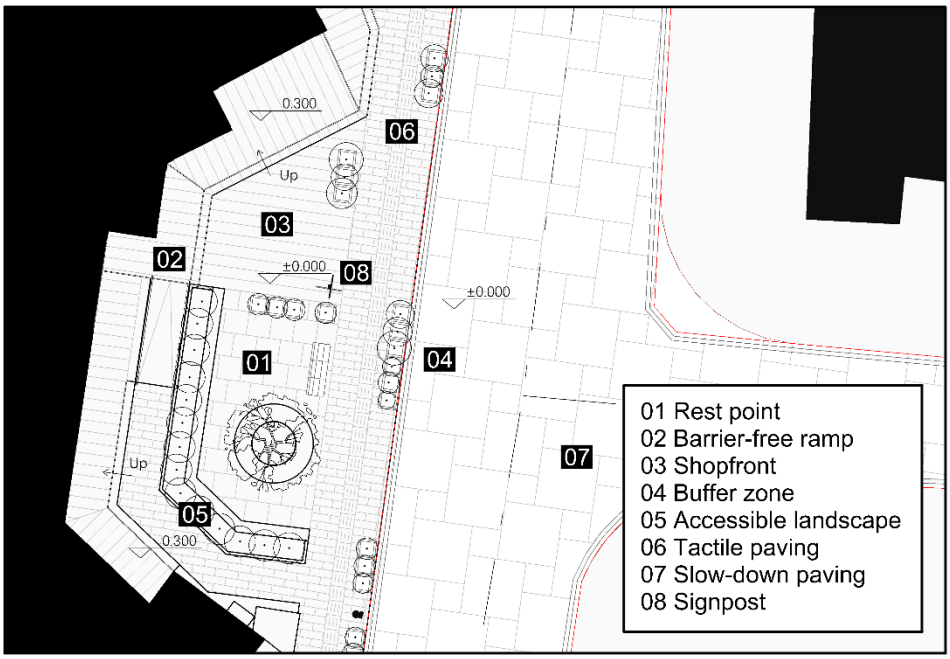


Fig 5-56 Shopfront 05 Plan
Source: by author

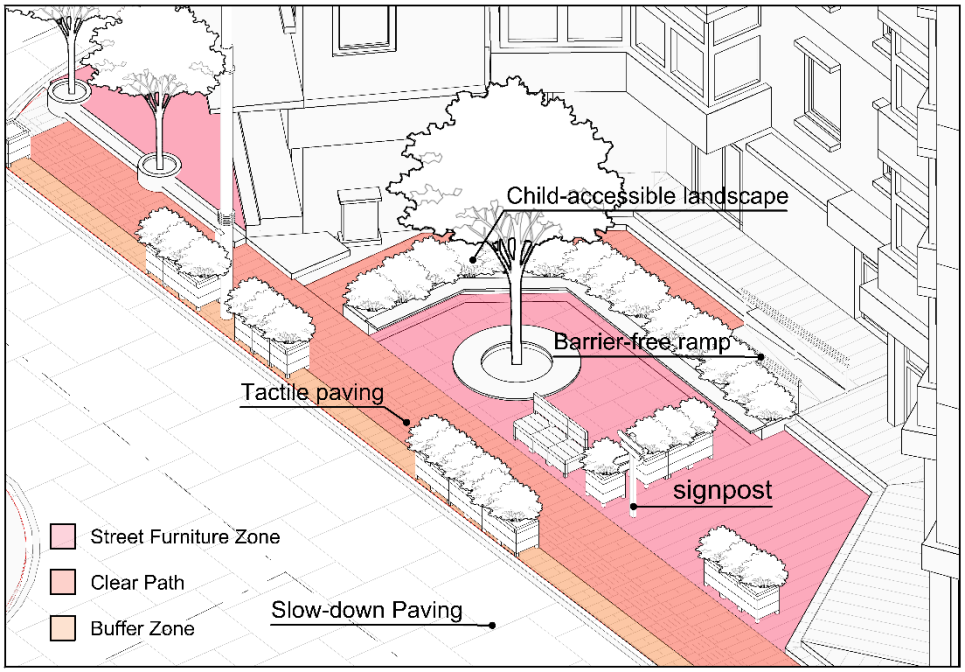


Fig 5-55 Shopfront 05 Bird View Source: by author

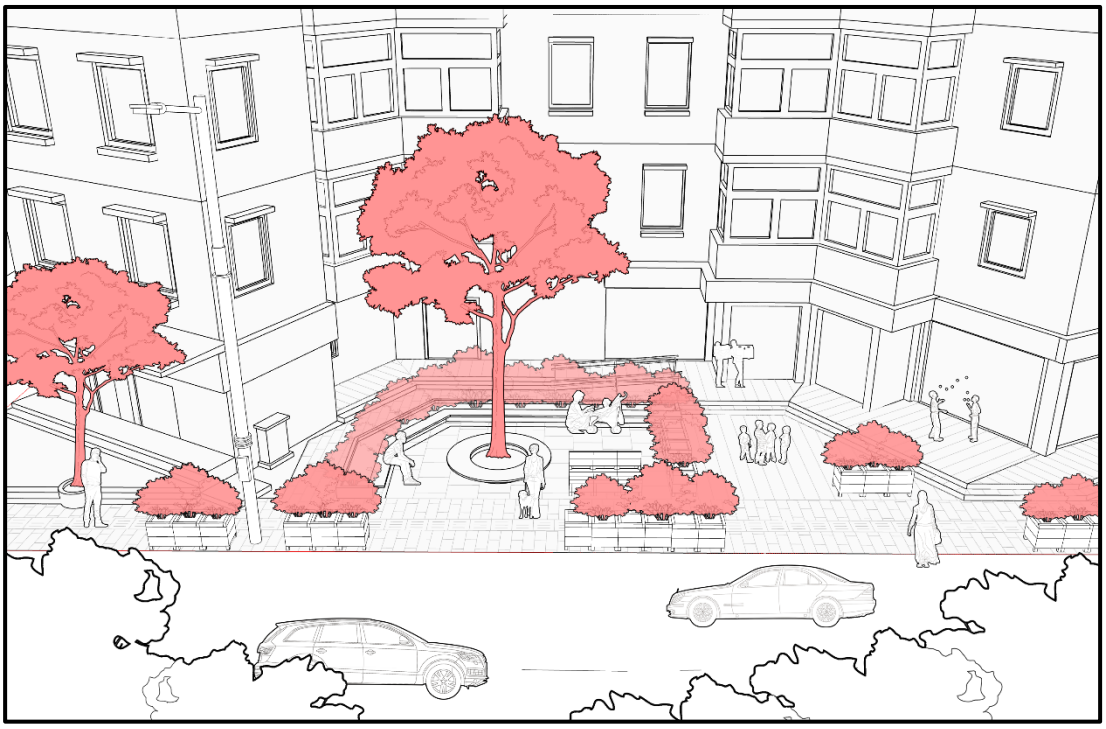


Fig 5-58 shopfront 05 Perspective
Source: by author

Fig 5-57 shopfront 05 Street Perspective
Source: by author

iii. Shopfront 07

Shopfront 07 is located at the entrance to the activity area at the northern end of the community, serving as a pocket space in front of a shop (Fig 5-59).

After delineating the street space zones, a small open area is created in front of the shop to accommodate street furniture. The furniture can be flexibly arranged to meet the needs of different groups of people.

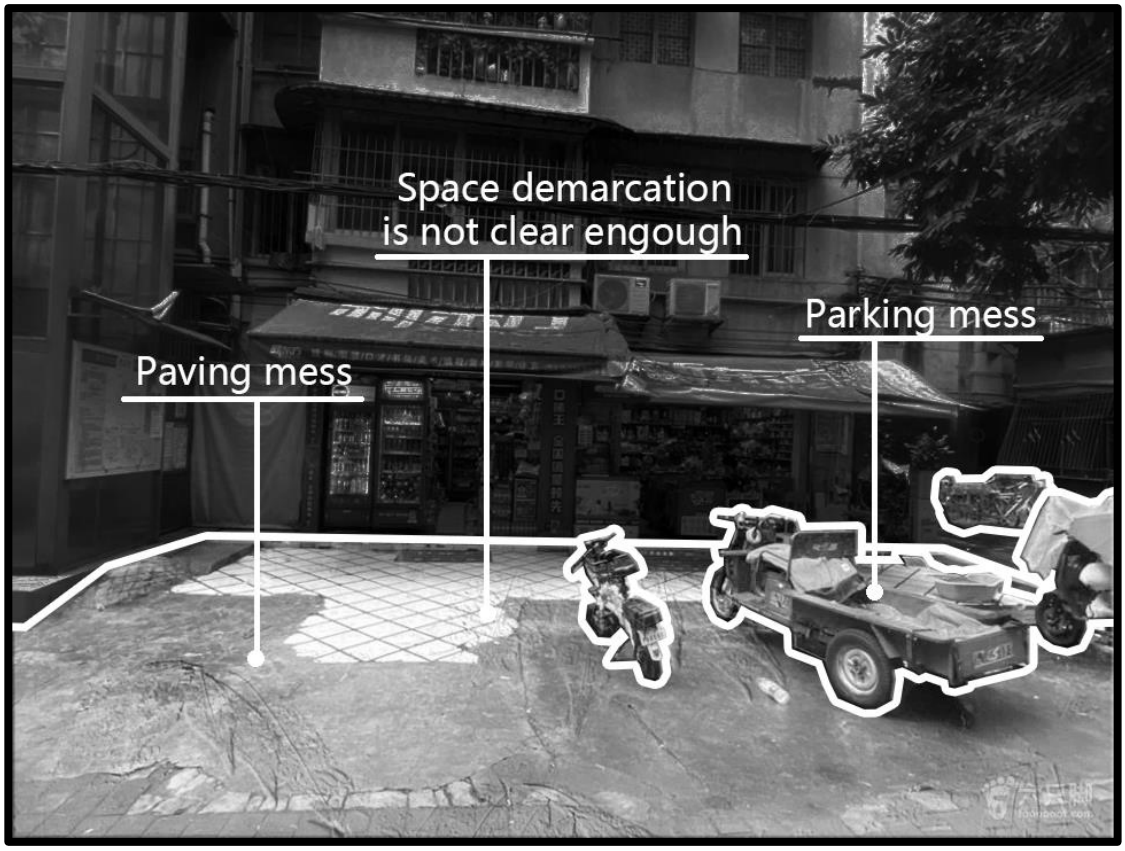


Fig 5-59 shopfront 07 Status Quo
Source: by author

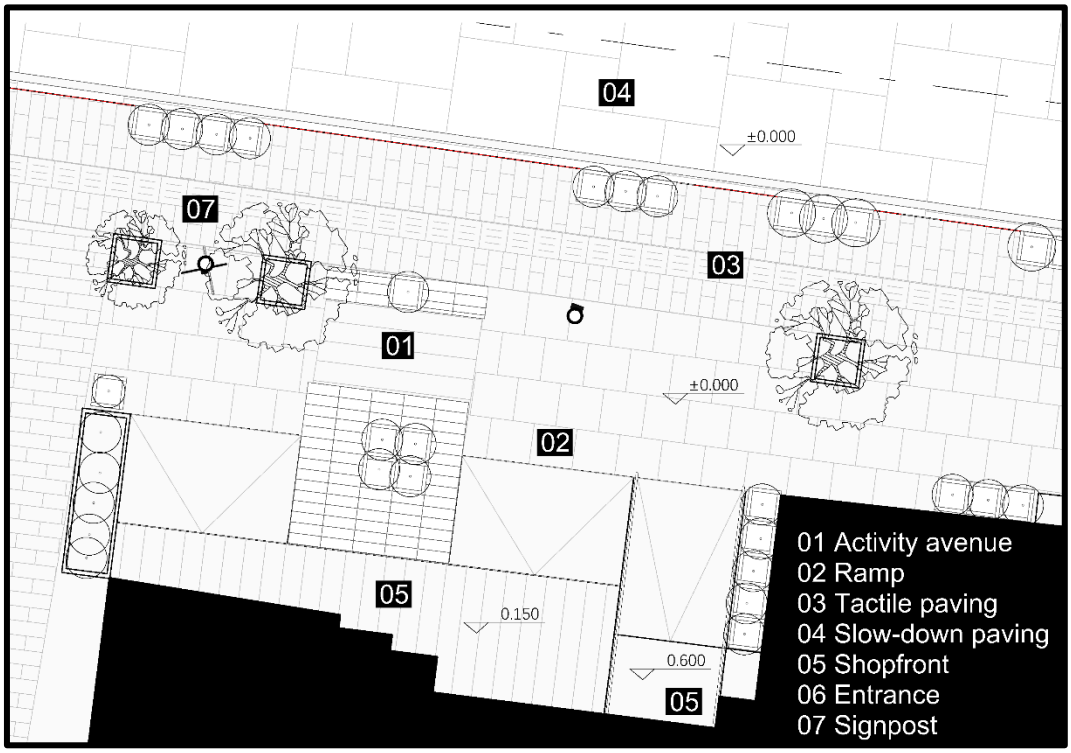


Fig 5-61 shopfront 07 Plan
Source: by author

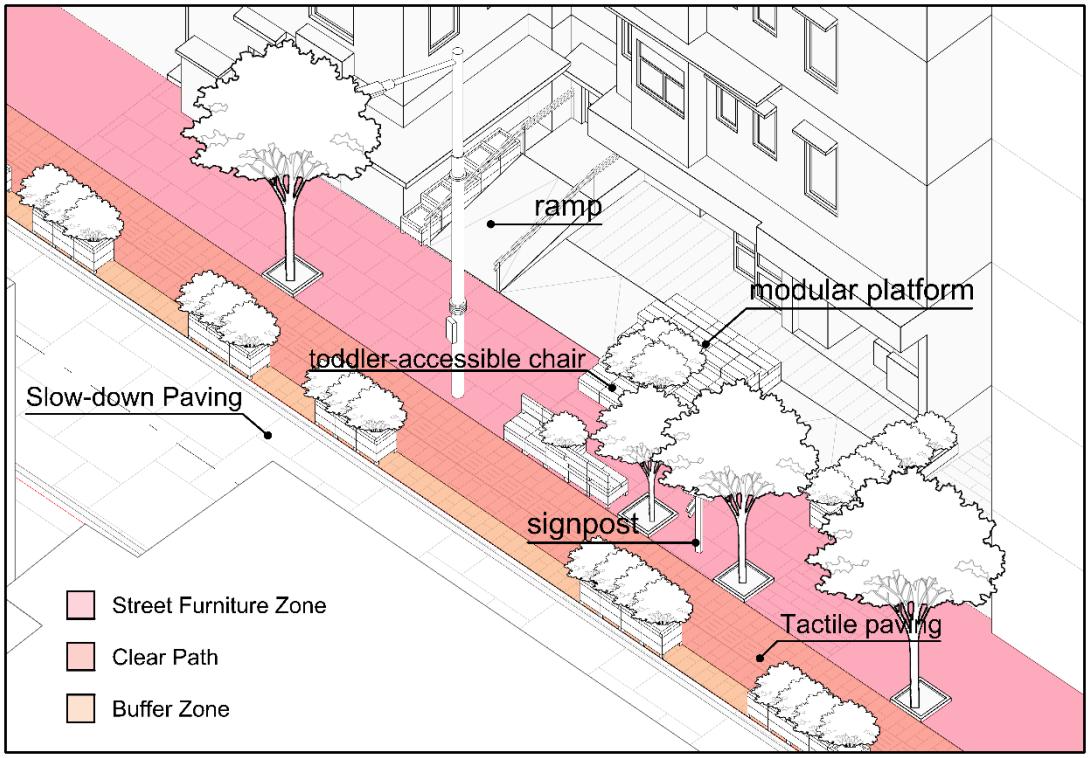


Fig 5-60 shopfront 07 Bird View
Source: by author

Fig 5-62 shopfront 07 Street Perspective
Source: by author

Fig 5-63 shopfront 07 Perspective
Source: by author

Chapter 6 Conclusion

6.1 Conclusion

Through literature research and case analysis, this paper has integrated inclusive design with urban street space and explored the methodology of inclusive street design. The main conclusions are as follows:

(1) Design principles and evaluation criteria of inclusive streets

The discussion on the inclusivity of the built environment from temporal, spatial, and social dimensions provide a theoretical foundation for formulating the design principles of inclusive streets. Guided by these design principles, the evaluation criteria for street space are established. The design principles of inclusive streets encompass six aspects: safety, comfort, accessibility, legibility, adaptability, and familiarity. These six principles comprehensively and systematically cover the essential aspects of inclusive street design. The evaluation criteria provide specific, measurable, and objective design standards for different types of street spaces, making them essential tools for identifying existing issues in street spaces.

(2) Design strategies for inclusive streets

Based on the study of three existing street renovation cases, it is evident that the lack of inclusivity in street spaces mainly arises from insufficient pedestrian spaces, inadequate safety measures, and insufficient accessibility and universal design of facilities. Summarizing the problems addressed, objectives, and proposed strategies in the cases, the design strategies for inclusive streets include four aspects: traffic calming strategies to enhance pedestrian safety, creating accessible street spaces and facilities for vulnerable groups, reclaiming urban spaces occupied by motor vehicles, and creating age-friendly pocket spaces.

(3) Design process of inclusive streets

The design process of inclusive streets consists of three stages: Empathizing, Ideation, and Evaluation. It is derived from the refinement of user models and procedural models of inclusive design, providing a practical and feasible technical route for the design of inclusive street spaces. The Empathizing stage encourages researchers to understand the site's current issues and explore user needs through literature research, field surveys, questionnaires, and interviews. In the Ideation stage, comprehensive and systematic responses to spatial issues and user needs are developed, resulting in different levels of design strategies. The Evaluation stage demonstrates the dynamic and evolving nature of the design outcomes over time, incorporating user feedback for continuous iteration and optimization of the design proposals.

6.2 Innovation

(1) Theoretical Innovation - Supplementary Exploration of the Temporal Dimension in Inclusive Environments

Traditional discussions on inclusive environments have primarily focused on the material and social aspects of the built environment, but there has been limited exploration of the temporal dimension in its inclusive connotation. However, this paper refines the theories of tactical urbanism and universal design to propose the design principle of adaptability in the temporal aspect of inclusive streets. This principle emphasizes that the built environment should meet users' dynamically changing spatial needs at different times, highlighting the inclusivity in the temporal dimension.

(2) Methodological Innovation - Integration of Inclusive Design with Urban Street Space

While there have been various discussions on inclusive design for the built environment, there has been limited research specifically on inclusive design for street spaces. This paper bridges the essence of inclusive environments with practical street renovation cases, further concretizing the research focus on street spaces and proposing a corresponding design methodology. This integration offers a feasible technical route and theoretical foundation for future research on the inclusivity of street spaces.

6.3 Deficiency

(1) Main focus on community streets

The form, function, and demographics of streets vary based on different urban spaces and geographic locations, leading to diverse requirements for inclusive design. However, the author's main focus is on community streets, and the inclusivity design principles derived from this context may not be directly applicable to other urban contexts (e.g., urban commercial areas). For future research, it is essential to explore and study street spaces in various urban regions to reduce the research's contingency.

(2) Lack of evaluation stage in design practice

As this study adopts a research-oriented approach to design, the actual implementation of the inclusive street renovation in Shuiyin Community was not carried out, making it difficult to obtain user feedback on the design outcomes. Moreover, the iterative design approach requires long-term project tracking, which involves significant time and resource costs. Due to limited capabilities, the evaluation stage of the inclusive street design process was not practically implemented.

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Appendix I Criteria of Inclusive Street

		Safety	Accessibilitty	Comfort	Legibility	Adaptability	Familiarity
Traffic Space	Sidewalk	- Contrasting pavement - No bump - Anti-slip paving - Adequate illumination - Transparent street façade - Separate sidewalks from lanes - Monitors	- Barrier-free - Mix-used functions of block - Basic infrastructures within 5 mins and secondary infrastructures within 10 mins - Efficient and clear road system	- Proper ratio of street width to building height - Clean and odorless	- Lucid route planning	-	- Historical, traditional and local pattern
	Crossing	- Limited car-pass - Enough time to cross	-	-	-	-	
Landscape	Lawn	- No harm and odor	- Interactable	- Pleasant	-	-	
	Vegetation						
	Water						
Pocket Space	Entrance	- Away from vehicles	- Barrier-free	- Children playground with benches	-	- Space allowance - Diverse functions	
	Shopfront						
	Corner						
Amenity	Signage	- Harmless materials	- Accessible height - a rest point every 50m to 100m - public toilets within 250m	-	- Landmark - Pattern speaks for function - High-contrast color - Succinct diagram	- Modular furniture and facility - Universal design	
	Rest points						
	Illumination						
	Parking lot						
	Public toilets						

Appendix II　Questionnaire

您好，我是华南理工大学建筑学院的研究生，正在以水荫小区作为实践案例进行课题研究.希望您能抽出几分钟时间填写一下调查问卷，十分感谢！问卷结果仅用作于学术研究.

一、基本情况

1. 【单选题】您的年龄是？

☐ 18 岁以下　☐ 18 - 35　☐ 36 - 60　☐ 60 以上

2. 【单选题】您的性别？

☐ 男　☐ 女

3. 【单选题】您是否住在水荫小区？

☐ 是　☐ 否

二、街道使用调查

1. 【多选题】在日常生活中，您认为水荫小区内街道的使用有哪些不足之处？

☐ 缺少休息地点　☐ 缺少标识和路牌

☐ 缺少绿化　☐ 人行道不够宽

☐ 缺少夜间照明　☐ 小区内的机动车数量太多

☐ 道路凹凸不平，容易摔倒

2. 【多选题】您认为水荫小区内的街道有哪些可以改进的地方？

☐ 更多的停车位　☐ 增加标识设计

☐ 更多的公共活动场地　☐ 提高街道整洁度

☐ 更多的绿化　☐ 限制机动车

☐ 无障碍设施

3. 【访谈】除了上述改进措施以外，您对小区街道还有什么期望和诉求？

Acknowledgement

Thanks for the tuition from A. Prof. Mo and Prof. Qi.

目录

第一章　绪论

1.1 研究背景

1.1.1　双重老龄化

(1)　人口老龄化

自上世纪人口的爆发性增长与计划生育政策的推行以来，当下的中国正面临着十分严峻的老龄化形势。根据第七次全国人口普查结果，全国人口中，0—14 岁人口为 253383938 人，占 17.95%；15—59 岁人口为 894376020 人，占 63.35%；60 岁及以上人口为 264018766 人，占 18.70%，其中 65 岁及以上人口为 190635280 人，占 13.50%[9]。广东省常住人口中，0-14 岁人口为 23749882 人，占 18.85%；15-59 岁人口为 86697562 人，占 68.80%；60 岁及以上人口为 15565066 人，占 12.35%，其中 65 岁及以上人口为 10813000 人，占 8.58%[10]。中国的老龄化形势，可以用以下四大特点来概括：

一是数量之多。据国家统计局数据表明，截至 2016 年底已达 2.31 亿，占总人口比例的 16.7%。预计到 2025 年和 2033 年，中国老年人口将分别达到 3 亿和 4 亿，2053 年将达到峰值 4.87 亿，占全球老年人口的 1/4。其中，失能和半失能老年人将持续增长。80 岁以上高龄老人数量将从 2500 万持续增长到 1.08 亿。

二是速度之快。预测显示，全球老龄化水平将从 10%提升到 22%，中国老龄化水平将从 10%提升到 34%，增幅分别为 12 个和 24 个百分点。以 65 岁及以上老年人口比重从 7%增加到 14%所需的时间看，法国用了 115 年，美国和英国用了 40 多年，而中国只用了 23 年。

三是差异之大。由于大量农村青壮年劳动力向城镇转移，农村老龄化程度超前于城镇。2028 年，农村老年人口比重将高于城市 11 个百分点，达到 30%以上，提前进入重度老龄化阶段。从省际看，各地人口老龄化进程也有很大差别。最早和最迟进入人口老龄化社会行列的上海和西藏之间相差 36 年。从区域发展看，随着中西部青壮年人口向东部流动，常住人口老龄化呈现东部放缓、中西部不断加快的态势。

四是负担之重。随着老年人口数量和比例的快速提升，中国社会抚养压力持续增加。到 2053 年前后，中国老年人口规模和比重、老年抚养比和社会抚养比相继达到峰值。

这意味着中国将面临 100 个劳动年龄人口要抚养 71 个老人和 32 个少年儿童的沉重压力。同时，中国老年人口普遍健康水平较低，在同等老龄化水平下面临比发达国家更为沉重的实际抚养压力。不仅如此，相较于过去发达国家近百年来分阶段呈现的老龄化态势，中国则是在短时间内集中爆发，同步呈现[11]。

(2) 住区老龄化

中国的老旧小区大部分是建成于改革开放初期至九十年代末，主要构成是机关事业单位、国有企业自建或混建和军队建设的小区，以及早期商品房小区。但随着建筑年限渐长，小区年久失养失修失管、市政配套设施不完善、居住环境较差、社区服务设施不健全等诸多问题相继暴露了出来，给人民群众生活造成诸多不便。目前，我国城市旧居住区面临许多现实问题，大致可总结如下[12]：

一、城市整体环境方面。旧居住区位于城市老城区，虽然区位条件优越，但由于住宅建筑物质性老化和功能性老化严重，以及内部环境的脏乱差，与周边高楼形成强烈对比，严重影响城市整体形象的提升。

二、居民生活方面。由于建设年代久远和限于当时的经济、社会发展以及建造技术的限制，大部分旧居住区建筑面积偏小，内部设施简陋，甚至很多旧居住区缺乏独立的厨卫设施，居住环境较差，已经严重影响居民的居住生活质量。

三、住宅方面。由于居住面积不足而导致居民私自搭建现象较多，住宅内部结构损坏严重，部分住宅基本处于危房的境地，旧居住区居民时刻在为自己的生存问题担忧。

四、公共设施配套方面。大部分旧居住区缺乏完善的雨水设施、污水设施以及环卫设施，甚至部分居民为了一己需求私自改造下水道，生活污水就近排放，居民的日常生活垃圾也随意堆放，加剧了公共设施配套的问题。

五、社会问题。由于人口密度高，老年化严重，旧居住区内主要分布有本地居民的老龄人口和以来城务工的外地临时租住人口，而条件较好的家庭或有能力的年轻人基本都在城区购买商品房，居住空间分异、极化以及居住隔离现象明显。此外，旧居住区人口素质普遍偏低，居民收入不稳定，邻里意识淡薄，大部分旧居住区处于城市管理的盲区或社区无力进行管理，内部社会问题复杂。

六、经济问题。旧居住区内居民的经济收入主要以非正规经济收入为主，本地居民通过出租房屋获得一定的经济来源，外地居民则由于缺乏专业技术主要从事临时工或

从事相关服务业获得一定的经济。

为改善民生，推进城市建设模式的转型和升级，促进内需扩大、投资稳定、循环发展和经济增长，近年来中国中央和地方政府高度重视城镇老旧小区的改造工作。2020年 7 月，国务院办公厅发布了《全面推进城镇老旧小区改造工作的指导意见》（国办发〔2020〕23 号），其中规定到 2022 年，我国将基本建立城镇老旧小区改造的制度框架、政策体系和工作机制，并力争在“十四五”规划期末前，根据各地实际情况，基本完成对于 2000 年底前建成的需要改造的城镇老旧小区的改造任务[13]。2021 年 2 月，广东省人民政府办公厅发布了《广东省人民政府办公厅关于全面推进城镇老旧小区改造工作的实施意见》，结合省内实际情况，明确了老旧小区改造的对象范围与内容。改造对象包括城市或县城（城关镇）建成年代较早、失修失养、市政配套设施不完善、社区服务设施不健全、居民改造意愿强烈的住宅小区。改造内容则可分为三类，即基础类、完善类、提升类。基础类改造应发挥财政资金的主导作用，做到应改尽改；完善类改造应在尊重居民意愿的前提下，宜改即改；提升类改造应遵循政府引导和市场化运作的模式，能改则改[14]。

1.1.2 城市街道对弱势群体的包容性不足

中国的弱势群体包括老年人、残疾人、儿童和其他功能特殊群体，他们在城市街道的使用过程中面临着诸多困难。

随着人口老龄化的加剧，老年人在城市街道上的需求日益凸显。然而，目前的街道设计往往未能满足他们的特殊需求。缺乏适宜的座椅、遮阳设施和交通信号灯的延长时间，限制了老年人在街道上的活动能力和安全感。缺乏无障碍设施是残疾人在城市街道上遇到的主要困难之一。缺少坡道、扶手、盲道等设施限制了轮椅使用者和行动不便的人的自由移动和访问能力。这种不适应也使得视觉障碍者和听力障碍者在城市街道上感受到障碍。当前的城市街道往往缺乏安全的游戏区域和行人道标识，也没有提供足够的过马路辅助设施。这限制了儿童在街道中的参与度和安全性，影响了他们的正常成长和活动。

以上种种不足凸显了街道包容性设计的必要性。街道包容性设计旨在创造一个对所有人包容的城市环境，提供无障碍、安全和舒适的街道空间。它应该关注老年人、残

疾人、儿童和其他弱势群体的需求，为他们提供合适的座椅、遮阳设施、无障碍通道和其他支持设施。这样的设计将使得街道更加友好和适应，提高弱势群体的参与度和生活质量。通过创造一个平等的城市环境，每个人都能够自由地使用和享受街道空间，不论其年龄、能力或文化背景如何。这有助于构建一个更加包容和谐的社会，减少不平等现象的存在。

1.2 相关概念界定

1.2.1 包容性设计

包容性设计是由无障碍设计与通用设计衍生而来的，所以讨论包容性设计概念的由来必然绕不开无障碍设计和通用设计的发展历程。

无障碍设计（Barrier Free Design）这个概念最早由联合国组织于 1974 年提出。在快速发展的现代社会环境中，无障碍设计倡导在人类设计环境和产品时，考虑行动障碍者（如残疾人、老年人）和功能缺陷者的需求。它强调充分关注弱势群体的具体需求，确保社会活动人群的安全、便利和舒适。但随着时代的不断发展与进步，无障碍设计的思维方式逐渐不能跟上时代发展的步伐，其一些弊端也慢慢的体现出来。

在 20 世纪 80 年代中期，无障碍设计发展的弊端进一步显现。由于过多关注弱势群体，设计思考的过程中常常忽视了主流群体的需求，导致许多设计方案只顾及生理障碍人群，从而造成设计资源的浪费[15]。因此，通用设计的理念应运而生。通用设计的理念首先是在上世纪 70 年代由美国北卡罗莱纳州立大学（Accessible Housing Center）的主任朗·梅思（Ron Mace）提出[16]。他指出无障碍设计在设计思考的过程中仅关注特殊人群的用户需求，从而存在不足之处。通用设计的理念强调以服务大众为基础，并以全体大众为出发点，在设计过程中尽可能考虑到所有人的需求。它鼓励设计的产品和环境设施能够满足不同生理或心理需求能力的人群，并且使所有人都能够参与到社会生活中。

随着通用设计理念的不断发展，出现了一系列关于通用设计的产品。然而，在经济高速发展的现代社会中，通用设计所强调的共通性往往导致设计制造商为了追求经济利益而忽视了弱势群体的具体需求等问题。这暴露了通用设计的一些弊端，因此包容性设计理念应运而生。包容性设计理念最早由欧洲建筑师理查德·哈奇（Richard Hatch）

于 1984 年提出。最初，包容性设计的概念指的是设计可以在一定程度上使用户能够参与并且无差别地使用。1994 年，包容性设计理念首次在加拿大的一次国际会议上被提出，随后开始广泛使用，尤其在英国和北欧国家。

相较于传统的无障碍设计概念，包容性设计不再将功能障碍人群如老年人、残疾人等视作需要特殊设计的群体，而是将他们看作多样化人群的一部分。包容性设计是一个灵活且富有弹性的过程，它重新细分用户的需求和行为，并通过研究不同用户的需求和特点，增加产品对各层用户的包容性，提高产品的适用性。这使得设计更加便捷，适用于大部分人群，并且更容易让大众接近产品。

包容性设计是一种方法和过程。根据国际标准 BS7000-6 的定义，包容性设计是“一种不需适应或特别设计，而使主流产品和服务能为尽可能多的用户所使用的设计方法和过程。”这一定义强调了包容性设计的方法和过程性质[17]。

包容性设计的核心理念是使设计对所有人都具有益处，而非限定于特定群体。许多设计在无意间给老人、儿童、残障人士、外国人等潜在用户带来使用上的困难或障碍。因此，包容性设计从价值观和方法论两个层面指导设计过程，并通过多种方法工具和利益相关者的参与，最大限度地扩大设计的受益人群。

通过包容性设计，我们可以创造更加包容和无障碍的设计环境，为各个群体提供更好的使用体验和便利性。这种设计方法不仅关注当前的需求，还着眼于未来的发展，以确保设计在不同时间段和各种变化条件下都能适应用户的需求。

1.2.2 街道空间

根据《辞海》的描述，街道被定义为“旁边有房屋的比较宽阔的道路”。这意味着街道首先是道路的一部分，作为人们交通的走道，而随着城市的形成，街道也逐渐发展起来。在人类历史中，街道是在建造城市和房屋后为满足人们往来需求而留下的线性空间。街道的物质层面包括底界面、顶界面、侧界面和对景面，这些界面限定了街道空间的范围，并共同构成了街道空间的结构，形成了街道空间的基本物质框架[18]。街道不仅具有交通功能，还承担着许多社会功能。

街道对人们来说是一个集合了生活、商业、休闲和社交等多种功能的开放空间，成为人们公共生活的舞台。正如学者所指出的：“街道是一个包容建筑、人、环境设施等

内涵的集合，是人类社会生活的一种空间组织形式[19]。”在历史进程中，各种城市活动都发生在主要街道上，最繁忙、充满生机的街道与城市中最重要的场所之间似乎天然地存在着联系。从物质实体角度来看，城市街道集循环路径、公共空间和建筑临界区域的角色于一身。从功能角度来看，街道是多种功能的综合体，融合了交通功能以及人们的日常生活、商业、休闲、游憩和社交功能。街道的概念有多重含义，呈现出多功能城市场所的认知和作为城市道路的观点。

总结起来，街道是连接道路与社会功能的多功能空间，它既承载着人们的交通需求，又成为人们生活、商业、休闲和社交等多种活动的场所。街道的重要性体现在其能够满足人们不断变化的需求，促进城市的发展与繁荣。

1.3 研究目标和意义

1.3.1 研究目标

作为城市居民公共生活的重要场所，街道是人们进行交流、休息、娱乐等各种活动的主要空间。街道的设计目标是为了使所有市民都能方便、舒适地进行各种活动。然而，在环境规划和设计、价值认知、经济基础等方面，街道仍然存在许多不足，导致其包容性亟需加强。同时，老年人和残障人士并不需要特别为他们设计的专门设施，而是希望能自由地生活并融入社会。包容性设计为解决户外空间中弱势群体问题提供了一种非常有效的方法。例如，坡道的设计不仅满足了轮椅用户的需求，也极其方便推婴儿车、购物车和拖行李箱的人士。

本论文旨在以广州市越秀区水荫小区为研究对象，通过案例研究构建包容性街道设计的要点和评价标准。随后，将这种包容性设计的新方法和新途径应用于设计过程中，以弥补现有的不足，从而提升街道的包容性，为更广泛的人群提供服务，并为创建包容性城市环境提供参考。

1.3.2 研究意义

研究包容性街道的意义在于关注弱势群体的需求，促进社会融合和提升社会公平。首先，包容性街道设计能够满足弱势群体的特殊需求，如老年人、残障人士和儿童等。通过合理的设计和设施，这些群体可以更自由地参与城市生活，提高他们的生活品质

和社会参与度。其次，包容性街道设计有助于促进社会融合。通过提供无障碍、友好和包容的公共空间，街道成为人们相遇和互动的场所，促进社区内外的交流和联系，加强社会凝聚力。最重要的是，包容性街道设计有助于实现社会公平。通过提供平等的机会和便利，每个人都能享受到城市提供的资源和服务，消除社会中的不平等现象，创造一个更公平和公正的城市环境。因此，研究包容性街道设计对于推动社会的包容性和公平性具有重要的学术和实践意义。

1.4 国内外研究现状

1.4.1 包容性设计

在 1994 年的第 12 届国际人体工程学会-加拿大联合会上，罗杰·科尔曼（Roger Coleman）首次提出了"包容性设计"这一概念。在当时，包容性设计被视为一种帮助制造商认识到产品潜在社会效益的理念。科尔曼指出：“随着人口的老龄化，这种新方法弥合了主流设计与老年用户之间的鸿沟。在老龄化和对残疾的认识不断变化的社会背景下，通过构建故事和场景，包容性设计的理念可以将人们对面向残疾人设计的分支的认知扩展为更加人性化、更广泛人群使用的设计产品”[20]。

2005 年，英国标准协会将包容性设计定义为“针对主流产品或服务的设计，使尽可能多的人能够方便地使用，而无需特别适应或特殊设计”[21]。在设计领域，包容性设计与欧洲大陆常用的“全民设计”（Design for All）以及美国和日本的“通用设计”（Universal Design）概念有一定的相似性和差异：全民设计和通用设计都强调面向人群中的所有人进行设计，而包容性设计更注重服务尽可能多的人群。与传统的无障碍设计相比，包容性设计不再将残疾人、老年人等视为特殊设计的群体，而是将他们视为多样化人群的一部分。

目前，在英国、丹麦、芬兰、挪威、瑞典、美国、加拿大等发达国家，包容性设计已成为被广泛认可的研究方向。此外，世界知名的微软公司将包容性设计作为其设计准则，福克斯公司也推出了备受市场好评的包容性设计产品，类似的案例不胜枚举。

在中国，包容性设计的研究始于 2011 年董华撰写的《包容性设计：英国跨学科工程研究的新实践》一文，该文对包容性设计的发展进行了简要分析，开启了我国包容性设计研究的新篇章[22]。随后的几年里，我国的研究者在产品设计、服装设计、导视

系统设计以及开放空间和公共空间设计等领域进行了探索和尝试，并取得了丰硕成果。2019 年，《包容性设计：中国档案》的出版标志着我国第一本关于包容性设计的学术专著问世[23]。该书从更全面的视角介绍了包容性设计在中国的研究和发展，为我国包容性设计研究提供了重要的理论基础[23]。

1.4.2 街道空间

在国外，街道空间作为日常生活的载体，是建筑设计和城市学科关注的对象。从古希腊的广场到中世纪的市场，街道空间作为城市物质空间整体环境的重要组成部分，承载着城市的内涵。作为建成空间，街道空间既是物质对象，也是人们感受城市意象、体现城市内涵及场域文脉的重要物质空间。因此，简·雅各布斯（Jane Jacobs，1961）提出了“街道伦理”，认为营造良好的物质空间需要强调街道中的人、空间和活动的互动。她认为物质空间的多样性是城市社区街道成功的关键和重要内容[24]。1979 年，日本建筑师芦原义信首次在学术上引入了“街道美学”一词，他认为通过视觉审美的角度研究可以更好地理解街道空间在城市中的角色。相关研究主要集中在建筑和景观设计等领域，侧重于从物质空间品质塑造的角度探讨街道形态和美学范式[25]。扬·盖尔（J. Gehl，1987）在《交往与空间》一书中进一步指出，为了营造良好的城市街道和公共生活，需要提升城市广场、街角等空间的品质[26]。同时，Carr, Francis, Rivlin and Stome [27]针对空间中的城市生活，认为城市空间设计应以人的需求为出发点[27]。

在国内，段进 [28]认为：“城市是由特定的简单要素组成的复杂整体，在城市设计中应该以系统性的方式看待城市，并将其作为有机的整体进行深入观察，以便了解城市内在的演化和发展脉络，指导城市空间的发展。”[28]因此，作为一个有机系统，旧城街道空间可以分为两个部分：一部分是自上而下设计建设的街道空间，另一部分是自下而上依靠日常生活形成的街道空间，包括普通居民、摊贩等自发搭建的空间。朱起鹏[29]从形态学角度分析了街道空间的形态，以街道空间的界面为核心，将界面视为延续“社会化表皮”建筑的意义，注重提取街道空间内在的人文内涵，并依靠“社会化表皮”所承载的空间模式和场所氛围，实现城市文脉的延续[29]。此外，在对典型非正规空间的研究中，肖潇（2020）以上海的缝隙集市为例，选择了典型案例，基于促成集市演化的事件为基础，从研究的动机、缝隙集市的形成、类型、形态、边界、景象等

方面对集市空间进行了系统性研究，专注于非典型的二维城市形态。

1.5 研究方法和框架

1.5.1 研究方法

(1) 文献研究

通过参考相关期刊文章、著作等，对收集的数据进行整理、分类、总结和分析，整合过程中掌握国内外学者在包容性设计和城市街道设计方面的成熟方法和相关理论。

(2) 案例研究

通过研究各国优秀的城市街道设计案例，总结包容设计的方法和策略，并为后续的设计提供依据。

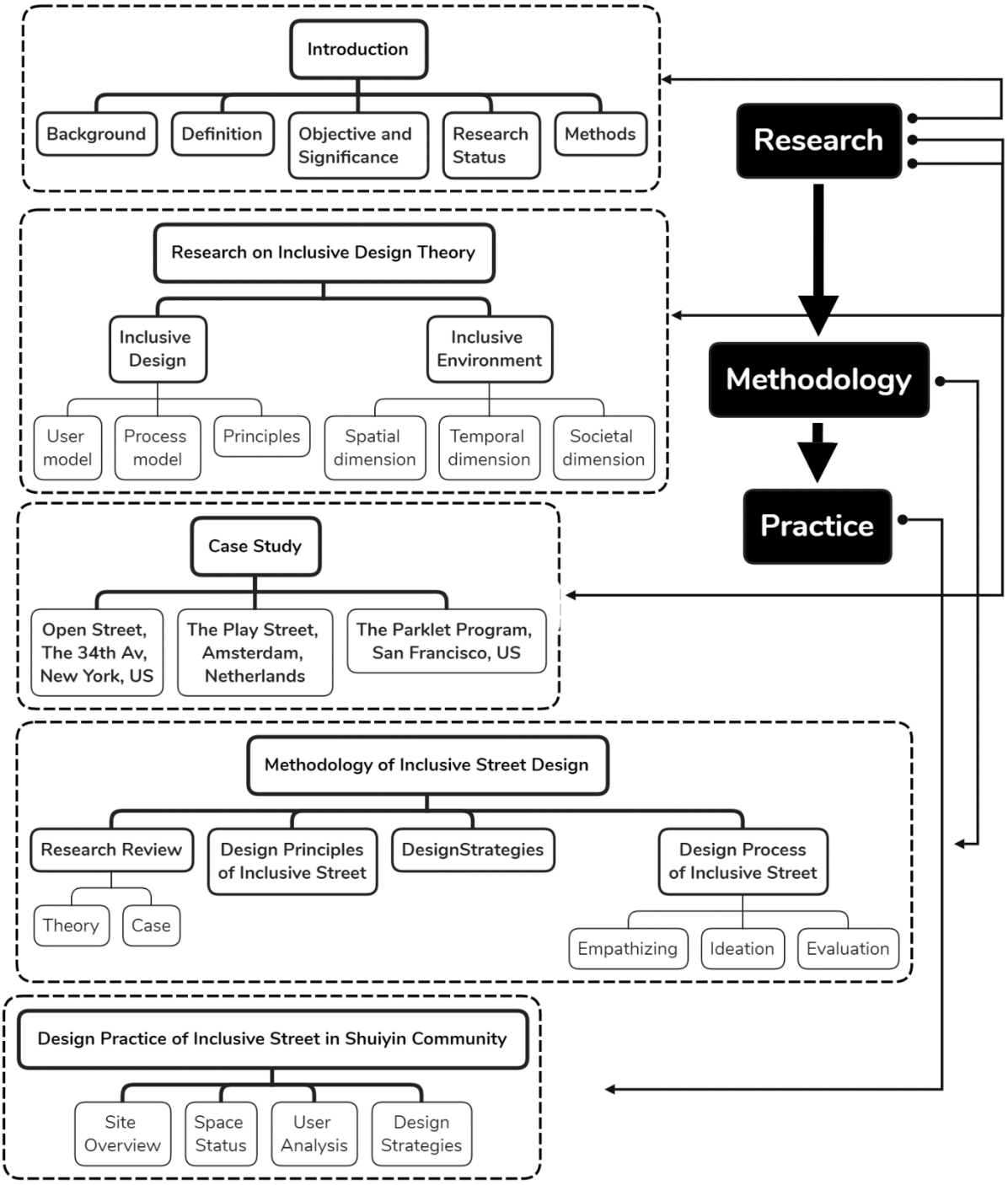
(3) 场地评估

通过现场观察和行为地图绘制，使用包容评估标准对场地进行评估。

(4) 设计应用

选择广州水荫小区作为研究对象，首先根据包容性设计标准对其进行评估，并运用包容设计方法弥补现有不足，同时为同类型的城市空间提供设计参考。

1.5.2 研究框架


Introduction
Background
Definition
Objective and Significance
Research Status
Methods
Research
Research on Inclusive Design Theory
Inclusive Design
Inclusive Environment
User model
Process model
Principles
Spatial dimension
Temporal dimension
Societal dimension
Methodology
Practice
Case Study
Open Street, The 34th Av, New York, US
The Play Street, Amsterdam, Netherlands
The Parklet Program, San Francisco, US
Methodology of Inclusive Street Design
Research Review
Design Principles of Inclusive Street
DesignStrategies
Design Process of Inclusive Street
Theory
Case
Empathizing
Ideation
Evaluation
Design Practice of Inclusive Street in Shuiyin Community
Site Overview
Space Status
User Analysis
Design Strategies

第二章　包容性设计理论研究

2.1 包容性设计理论

2.1.1　包容性设计立方体

包容性设计立方体（Inclusive design cube，IDC）是 Keates, Clarkson, Harrison and Robinson [30]基于 Benktzon [31]的用户金字塔模型（Pyramid model）改进演化而来的包容性理论设计模型。它借鉴了 Card [32]对人类行为能力的分类方式，在性质上将人类的机能分为了感知（Perception）机能、认知（Cognition）机能和运动（motor）机能，由此构成了 IDC 的三个衡量维度。而在测量用户人群不同维度的能力程度方面，IDC 则按照用户金字塔模型的标准将其分为了三大尺度，即严重残障（severely impaired）、中度残障（moderately impaired）和健全（unimpaired）（图 二-1）。

通过设计与使用者能力的不断匹配，为被包容群体进行以用户为导向的包容性设计，再由设计对使用者能力的要求描述出目标使用者群体，即 WINIT 模型。WINIT 模型将目标使用者从所有人中剥离出来，并划分为了 5 个群体，即所有人（Whole population）、理想群体（Ideal population）、可协商群体（Negotiable max population）、被包容群体（Included population）和目标群体（Target population）（图 二-1）。

根据使用者的行动、感知与认知能力可将设计的输入、输出与自明性进行匹配设计，包容性设计可以进一步分解为若干子类型。随着使用者群体的拓展，分别以模块或定制设计（Customizable/modular design）、特殊目的设计（Special）或用户敏感型设计（User-aware design）实现使用者与环境的互动。

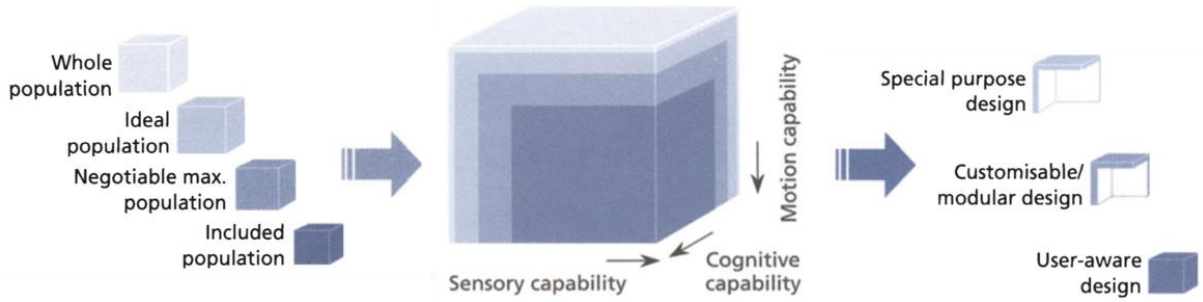


图 二-1 包容性设计立方体

资料来源：[5]

2.1.2 包容性设计的四阶段与八活动

挪威设计委员会提供了一个线性的包容性设计流程，基于以用户为中心的设计理念，在英国设计协会（British Design Council）提出的双钻模型（Double Diamond Model）的基础上开发了包含四个阶段和八个关键活动的设计流程。这一流程的四个阶段分别是探索（Explore）、聚焦（Focus）、发展（Develop）和产出（Deliver）。每一阶段包含了两个关键的活动（表 二-1）。

在探索阶段，研究者和设计团队首先要通过深入理解所面临的问题情境，对市场及用户有个初步概念。接着通过设计调研，与用户群体建立真实的联系，定义设计所要面向的用户人群，尤其是“先导用户”。在包容性设计的语境里，“先导用户”指的是对“产品、系统、服务和环境有更大要求，因此会以超出主流用户和平均用户的方式挑战这些产品、系统、服务和环境的人”。用户使用产品的综合能力缺失越严重，越接近先导用户。如果设计能够满足这类能力弱的先导用户的能力要求，那么也自然能够满足能力更强的其他人群。正如 Bernard Isaacs 所说的：“为年轻人设计你就排除了老年人；为老年人设计你将包容年轻人。”

聚焦阶段则需要让研究者沉浸于用户的生活中，理解他们的问题、需求、渴求和愿望。在挖掘用户需求的活动中，研究者可以采用的研究方法有问卷、观察和访谈等方式。在收集了大量丰富的数据以后，研究者需要将其结构化地组织起来，并按照模式和主题将这些数据进行可视化呈现，以便进行对比和比较，剔除掉无关信息，排序出高优先级的数据信息。

在发展阶段，以前期阶段获取的信息和数据作为依据，研究者即可定义设计目标和需要应对的挑战和克服的问题，并最终选择出一些最具潜力的设计概念进行发展。研究者还可以通过设定评价设计优劣的指标和具体原则，作为筛选和评估设计概念和方案时的标准。在确认了具体的设计概念和方案之后，研究者即可通过前期调研收集到信息和资料还原出不同用户群体的关键性特征，建立一个虚拟的用户与虚拟的情境，以评判设计方案在设立的情境下其好坏如何。

在产出阶段，研究者通过现场或非现场测试等工作方法，接收用户对设计产品的真实反馈，验证设计方案是否能够回应设计问题并满足用户需求，以及发现产品的细节问题和可用性问题。这些反馈资料可以通过结构化的组织和存储形成一个用户数据库，

作为设计迭代和其他项目的后续参考。

Stage	Activity	Method and process
Explore	Context understanding	Literature review, market research, competitive analysis, user insights
	Design research	Formulating research questions, identifying focus areas, establishing frameworks, and selecting participants
Focus	Uncovering user needs	Conducting user research, refining research focus, and adapting research methods.
	Insight mapping	Analyzing and organizing data, visualizing data through various techniques, and prioritizing findings
Develop	Design specifications	Setting design standards, articulating design requirements, and selecting appropriate design solutions
	Creating user scenarios	Developing user personas, defining user roles, and designing user-specific contexts
Deliver	User feedback	Conducting on-site testing, remote testing, and large-scale market testing to gather user feedback
	Resource establishment	Building image libraries, maintaining insight databases, developing user role repositories, and exploring uncharted domains

表 二-1 四阶段八活动设计流程

资料来源：根据[33]整理

2.1.3 包容性设计轮

包容性设计轮（Inclusive design wheel）是基于剑桥大学工程设计中心所提出的三个阶段七大步骤发展而来的，而国内对此的翻译为“三七律”。三个阶段的七个步骤分别是征集用户需求、制定设计功能、输出用户感知、确立方案功能、优化使用体验、清除设计排斥、评估需求匹配[34]。在不断的应用中，包容性设计的三七律逐渐发展并演化为一个迭代的形式，并由剑桥大学工程设计中心发展补充为包容性设计轮的理论模型（图 二-2）。

包容性设计轮包含了中心的“管理”和外围的“探究”、“创造”和“评估”三个轮齿，并嵌合了管理和创新两个循环。管理阶段是为了确保项目在正确的方向上进行，回答“接下去该做什么”的问题；探索阶段是为了获得对需求更清晰的了解，回答“需求是什么”的问题；创造阶段主要为了产生更进一步的解决方案，回答“需求如何得到满足”的问题；而评估阶段则是为了回答“需求得到满足的程度如何”的问题。

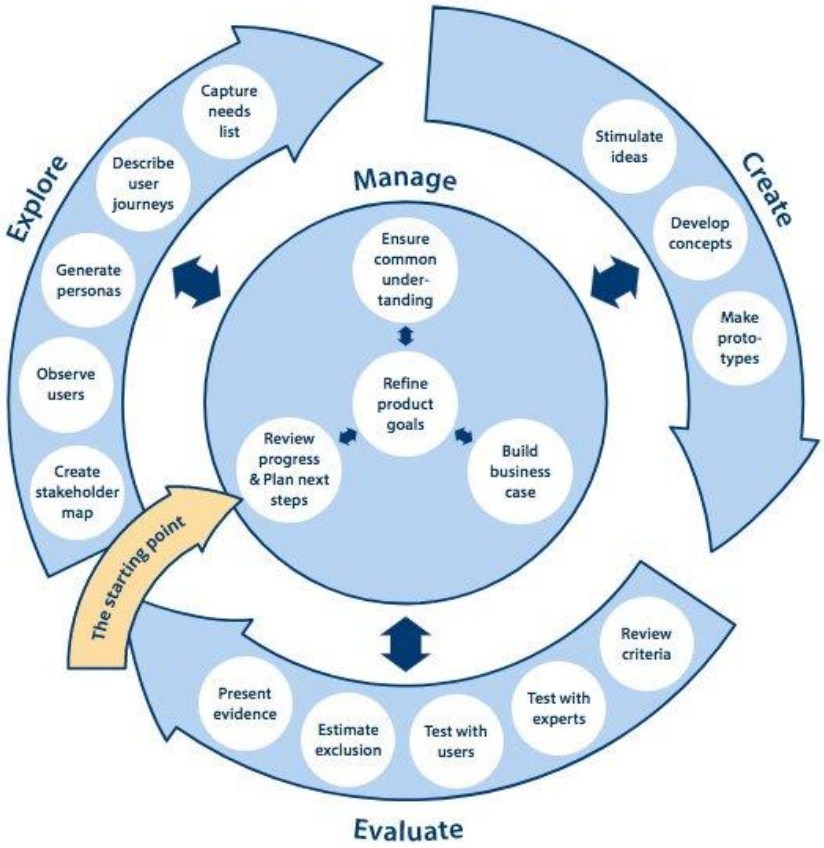


图 二-2 包容性设计轮

2.1.4 包容性设计原则

不同的组织机构和企业对包容性设计存在着不同的理解，近年来先后总结发表过多个不同版本的包容性设计原则（表 二-2）。

CABE	• Place people at the heart of the design process • Acknowledge diversity and difference • Offer choice where a single design solution cannot accommodate all users • Provide for flexibility in use • Provided buildings and environments that are convenient and enjoyable to use for everyone
TPG	• Provide comparable experience • Consider situation • Be consistent • Give control • Offer choice • Prioritize content • Add value
Microsoft	• Recognize exclusion • Learn from diversity • Solve for one, extend to many

表 二-2 不同组织和机构的包容性设计原则

资料来源：根据[35-37]整理自绘

(1) CABE 的包容性设计原则

英国建筑与建成环境委员会（The Commission for Architecture and the Built Environment，CABE）在 2016 年出版了 Howard Fletcher 主笔的《包容性设计原则》（The Principles of Inclusive Design）[35]，总结了五点包容性设计原则：（i）将人置于设计流程的核心位置；（ii）承认多样性和差异；（iii）当单一设计解决方案无法满足所有用户时提供更多选择；（iv）提供使用上的灵活性；（v）为每个人提供方便、愉悦的建筑和环境。CABE 认为评价建成环境包容性最为简单有力的标准是对每个人都易于使用。

这种易用性不仅仅是物理维度的，同时也是心智和情感维度的。

(2) TPG 的包容性设计原则

美国可及性咨询机构 Paciello 集团（The Paciello Group，TPG）的业务主要集中在软件和交互界面领域，其所归纳的包容性设计原则更像是（界面）设计阶段的提示，总共有以下七点[36]：（i）可比体验；（ii）考虑情境；（iii）保持一致；（iv）给予控制；（v）提供选择；（vi）优先内容；（vii）增添价值。TPG 的包容性设计原则遵循了包容性设计一直以来所坚持的以人为中心，尊重人群和需求多样性的核心理念。

(3) 微软的包容性设计原则

和 TPG 类似，微软（Microsoft）的主要业务领域也是数字产品。微软设计部门多年来积累了大量包容性设计的研究和实践案例，并将其总结成了三点精炼的包容性设计原则：（i）识别排斥；（ii）从多样性中学习；（iii）解决其一，扩及其余。微软的包容性设计原则并非要求设计师应该在设计方案中注意和做到什么，而是指明了如何进行包容性设计的方法。他们认为包容性设计不仅为更多具有广泛能力差异的人提供产品和经验，也反映了人们的真实情况：所有人每天都在成长、改变和适应周遭的世界，他们希望设计能够反映这种多样性[37]。

结合前文来看，包容性设计的原则总体可以被划分为两大类：一类反映出原则所代表的价值取向和目标；另一类则可以认为是达成目标价值的方法和手段。在价值观层面，包容性设计原则在主张对每个人的关照之外，更关注人群和情境的多样性，并从承认多样性和差异的存在，进而发展为从多样性中学习和洞察。此外，包容性设计尤其强调以人为中心，将用户的能力和需求视为设计的根本决定因素。在方法论层面，简单易用和具有灵活性是包容性所强调的重要原则，同时，包容性设计也更注重用户的良好体验而非仅仅在意可及性。

2.2 包容性环境

包容性环境，指的是个体被环境与环境中个体良好接纳的环境。换言之，包容性是环境对个体接纳能力的体现。这里的环境即包括个体之外的物质环境，也包括由其他个体共同建立起的社会或精神环境[38]。

认识包容性环境的角度和维度很多，而本文着重从空间、时间和社会维度解释包容

性环境的内涵。

2.2.1 空间维度——生活性街道

建成环境是包容的物质载体。从空间维度解读建成环境的包容性，即是建成环境的功能和形态可以满足多样使用者的不同需求，尤其是先导用户（Lead-user）。公平（Equity）是物质空间包容性的核心，它体察不同使用人群的多样性与差异性，让每个人都有使用空间的权利与机会。

传统的城市街道空间环境一直缺乏对弱势群体的包容，尤其是老年群体。已经有研究表明，城市街道环境对老年群体的包容性程度能够显著影响老年群体使用街道的意愿和频率[4, 39]。在 *Inclusive Urban Design: Streets for Life* 一书中，Burton and Mitchell [4] 提出了生活性街道（Streets for life）的概念，作为一种实现邻里尺度下建成包容性街道空间环境的手段。Burton and Mitchell [4]认为，室外环境设计有六项基本的设计原则：即街道空间的熟悉性（Familiarity）、易读性（Legibility）、独特性（Distinctiveness）、可达性（Accessibility）、舒适性（Comfort）和安全性（Safety）[4]。街道的易读性首先体现在街道的路标与标识性设计上。它能够帮助认知能力下降的老年群体定位自己的位置，明确自己的路线；可到性满足了老年人到达、进入、使用和走动的需求，如宽阔平整的人行道、步行距离较短的服务设施和高差处的无障碍设计，都能保证老年人顺利、不受影响地到达目的地；良好的空间感官、步行道旁的休闲座椅能提高街道的舒适性；安全性则指人们在享受和使用外部环境的时候可以不必担心被绊倒、被超速或遭到袭击。上述几项原则都从街道的物质空间层面体现了对老年群体的包容性。

2.2.2 时间维度——通用设计与战术都市主义

从时间维度解读环境的包容性，侧重于研读在变化的时间中建成环境的使用者与环境之间的相互影响，在变化的时间中使人感受到环境的包容或排斥。共时（Synchrony）与历时（Diachrony）是在时间维对建筑包容性思考的关键词。共时性视角是某一时间节点横向展开，侧重环境在某个特点的时刻的包容性，即当下的空间状态能否满足多样化的功能要求，即空间的通用性（Universality）；历时性视角是对时间维度的纵向展开，注重动态地考察环境对人的包容性，其探讨的重点是人或环境随着

时间的变化而导致环境对人的包容性发生改变，而历时性对空间的设计要求可以理解为空间的弹性（Flexibility）和可适应性（Adaptability），即空间是否能够以很小的成本和代价实现功能转换，以适应未来的使用需求。

(1) 空间的通用性——通用设计（Universal design）

通用设计（Universal design）的概念是由无障碍设计（Barrier-free）的概念演化而来的。与它相似的设计理念有很多，例如英国的包容性设计（Inclusive design）和欧洲的为所有人设计（Design for all）。Steinfeld [40]将通用设计定义为:：“通用设计是一个过程，通过提高人类使用产品时的表现、健康和福祉以及社会参与，使各种人群能够获得更多的能力和自主权[41]。”

从人体对设计产品的使用效率的角度出发，对通用设计的考虑可以分为以下四点，即人体工学、生物力学、感知能力和认知能力。通用设计理念下的产品应尽可能照顾到更多的使用人群的需求，为他们在使用产品时提供多样化的选择，并且考虑到使用的极端情况[41]。

(2) 空间的弹性——战术都市主义（Tactical urbanism）

战术都市主义（Tactical urbanism），指的是实施者在社区建造的过程中，采用一系列短期、低价、可拓展的建造手段或政策来干预城市空间。战术都市主义的设计结果是迭代化的，通过在设计过程中对设计结果进行评估来不断迭代和优化设计成果[3]。战术都市主义的核心思想之一是采用低成本的手段搭建临时的城市设施，而这种思想在历史早已出现，从罗马军队临时驻扎的军营，到 16 世纪法国巴黎塞纳河畔的临时书店（les bouquinistes）[42]，再到1893年在芝加哥举办的哥伦比亚世界博览会上的“白城”（White City）[43]。但战术都市主义真正出现的标志则是一场由新都市主义者（New Urbanist）于2010年在美国新奥尔良举办的一场会议，以及在会议之后所成立的一个开源的城市项目“Tactical Urbanism: Short-term Action for Long-term Change”[44]。

在 *Tactical Urbanism: Short-term Action for Long-term Change* 一书中，Campo [3]将战术都市主义的实施步骤划分为了五步，而最后一步“测试”（Test）则最能反应战术都市主义思想对空间弹性的考虑。测试步骤的核心是“建造——评估——学习”（build-measure-learn）步骤。通过快速建造设计原型，采取问卷、访谈等一系列调查手段对结果进行评估，并用评价标准去甄别设计的瑕疵，不断迭代，直至优化出相对成功的设

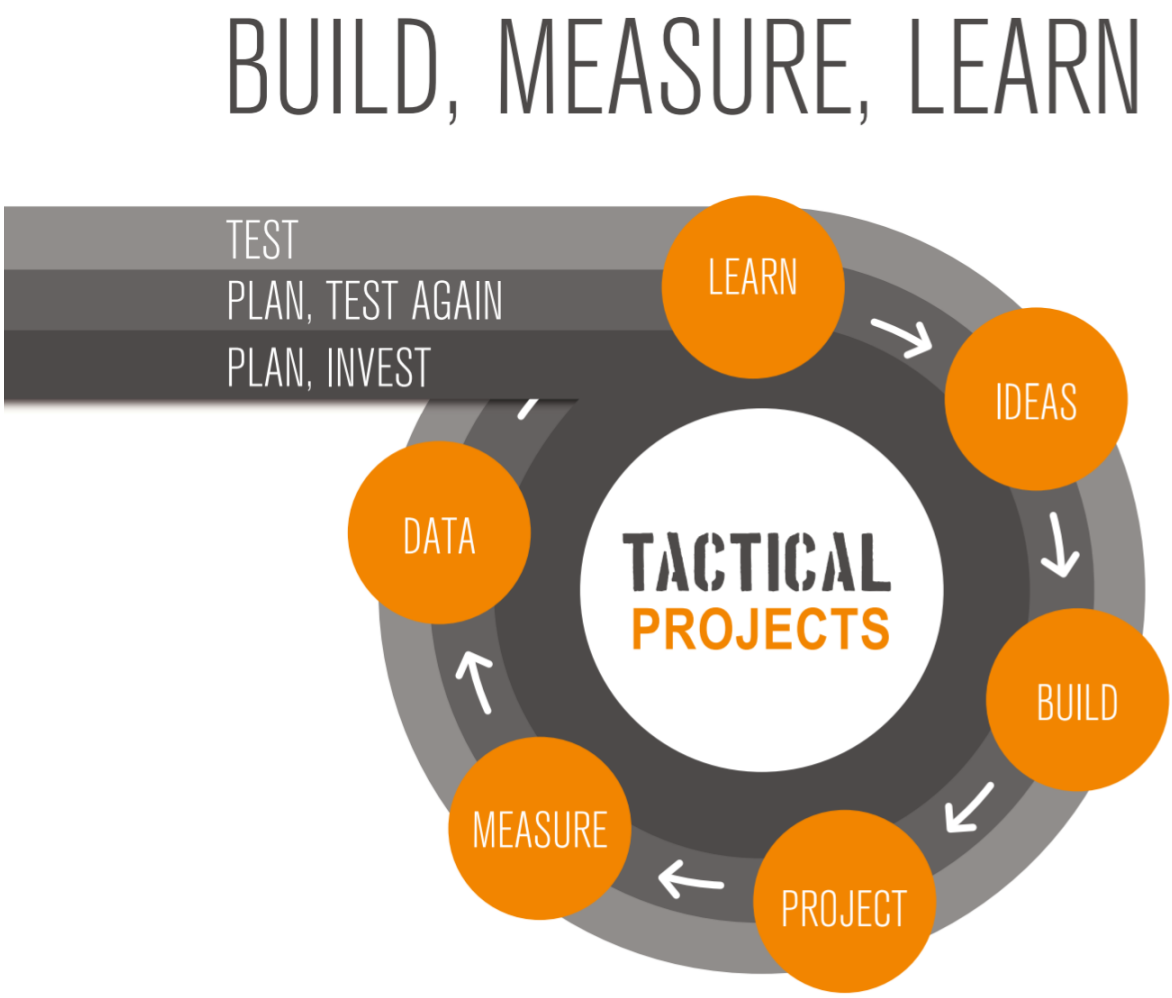


图 二-3 “建造——评估——学习”步骤

资料来源：[3]

计成果，在时间层面动态地满足使用者的需求。

2.2.3 社会维度——社会包容理论与建筑的社会意象

建成环境是人们进行社会活动的物质空间载体，同时也代表了历史、文化、人文与

地域审美。对建成环境包容性的社会维度解读可以分为两个方面：一是在建成环境中人与人之间社会关系的包容和排斥，二是建成环境所代表的社会意象对个人的包容和排斥。

(1) 建成环境中社会关系的包容性

对社会关系包容性的解读可以追溯到社会包容（Social inclusion）理论。社会包容是一个社会政策领域关于弱势群体的概念，指社会对具有不同社会特征的社会成员及其社会行为平等与宽容对待的状态[45]。它的提出源于欧洲学者对社会排斥（Social exclusion）的研究，其目标是为了消除任何形式的社会排斥。弱势群体是社会排斥的主要对象。弱势群体是由于个体生理、心理或基本素质的缺陷和外在条件以及自然资源、社会权利、文化观念等不可控因素而处于困境的部分人[46]。他们通常是没有与其他人享有同样机会的人群，如儿童、老年人、孕妇、残疾人等。

社会排斥有两大主要理论框架[47, 48]（表 二-3）。Burchardt, Le Grand and Piachaud [47] 对 1990 年代的英国展开了大量的实践与调查，并总结出评价社会排斥程度的四个维度：一是消费（Consumption）能力，即购买物资和服务的能力；二是生产（Production）能

Burchardt, Le Grand and Piachaud [47]	• consumption: the capacity to purchase goods and services; • production: participation in economically or socially valuable activities; • political engement: involvement in local or national decision-making; • social interaction: integration with family, friends and community.
Saunders, Naidoo and Griffiths [48]	• Impoverishment, or exclusion from adequate resources; • Labor market exclusion; • Service exclusion; • Exclusion from social relations: - Non-participation in common activities; - The extent and quality of social networks; - Support available in normal times and in times of crisis; - Disengagement from political and civic activity; - Confinement, resulting from fear of crime, disability or other factors.

表 二-3 社会排斥的评价维度
资料来源：根据[47, 48]整理绘制

力，即参加具有有价值的经济或社会活动；三是政治参与（Political engagement）能力，

即参与当地社区或全国政治决策的能力；四是社会互动（Social interaction），即主体与家庭、朋友和社区关系的融洽程度。而 Saunders, Naidoo and Griffiths [48]对社会排斥的评价则可以归纳为如下几类：一是很难或者无法获得充足的资源，即金钱收入和掠夺资源能力上的羸弱；二是被就业市场所排斥，包括生活在一个失业家庭中；三是社会生活服务上的排斥，包括公共交通、游乐设施、青年俱乐部和其他居家基础设施，例如水、电、通信等；四是社会人际关系的排斥。社会人际关系排斥的评价标准又可以细分为五点，即正常社会活动的参与程度、人际关系网的质量与广度、获得社会帮助的及时性、政治与公民活动的参与程度以及自由行动能力。

(2) 建成环境的社会意象的包容性

建成环境中的建筑因为文化、艺术、审美、历史等特性，成为一种可引发大众意识形态方面回应的环境意象。它是人们改造环境、表达对世界认知的一种方式，又同样可以反过来唤起人们对环境的再认知。Burton and Mitchell [4]在包容性街道的熟悉性原则中提到，人们对自己的周遭环境的样子都有一定的心理预期，而当环境的样式和外观不符合他们所熟悉的视觉类型，他们往往会感到困惑，并且无法理解其功能用途。这种现象在老年痴呆患者身上尤为明显。对痴呆症护理设施设计的调查结果显示，老年痴呆患者通常不能理解现代的设计，或者会曲解其用途。例如，痴呆症患者可能会认为所有的玻璃门都是窗户。所以，大部分的老年群体都更喜欢传统的设计元素（图 二-4），这不仅仅是因为传统的设计看起来更为熟悉，也是因为他们能够根据自己过去的经验理解设计的用途。例如，他们更愿意使用具有传统风格的街道小品；当向他们展示一张螺旋条纹相见的照片柱的照片时，痴呆患者都能够辨认出这是理发店的标志[4]。所以，采用传统的历史样式可以增强具有认知困难人群的熟悉感，从而避免它们的困惑、焦虑情绪，并且帮助他们更好地认知和使用设计功能。

图 二-4 老年人更喜欢传统的设计样式

资料来源：[4]

空间同样具有社会属性。例如，空间的领域性表现了拥有者对空间的所有权，可以代表一定的社会地位；空间的使用权体现了不同人群间的社会关系的亲密和疏离，排斥代表着疏离，而共享代表着亲密[41]。空间的公与私，即是空间中所存在的小型的社会环境对外来人群，是接纳还是排斥，是亲密还是疏离。所以空间的共享属性，在一定程度上能反映社会环境对人群的包容性。

2.3 小结

包容性设计最初是一个设计学的概念，其理论模型可以分为三类：一是前期描绘用户画像、确定设计语境的包容性设计用户模型；二是有着具体解决方案与线性流程的包容性设计程序模型；三是用于设计迭代创新的包容性设计知识传递模型。前文探讨了包容性设计用户模型与包容性设计程序模型，可以为城市环境设计的包容性提供参考与指导。而后又将包容性设计的概念拓展到了建筑和室外空间层面，即建成环境的包容性。本文从空间维度、时间维度和社会维度探讨了建成环境的包容性，并罗列出建成环境包容性的几个重要特征与设计原则，为后续的方法论研究奠定了理论基础。

所以，什么是包容性街道？从街道的空间物理属性来讲，街道的环境要消除一切会对人身安全造成的伤害的危险的物理因素，并且空间环境要尽可能地舒适宜人，例如干净整洁的地面、街边摆放的休息设施和令人舒心的绿化植物等；从街道的时间维度来看，当下的空间应尽可能满足多样化群体的使用需求，做到通用化设计，而街道空间同样要考虑到未来可能发生的变化与改造，为其留出充足的设计空间并尽力减小迭代成本；从街道的社会环境来看，创造出和谐友好、富有活力的街道氛围能提升市民的亲和感、归属感和幸福感，而空间的共享则是创造这一氛围的必要前提。综上所述，包容性街道是“能够包容不同群体当下和未来物理使用需求和社会交往需求的街道空间”。

第三章　案例研究

3.1 开放街道——美国纽约第 34 大道

3.1.1　项目背景

杰克逊海茨（Jackson Heights）是美国纽约市人口密度最高的社区之一，每平方英里大约有四万人。该社区同时也是种族最为多样化的社区之一，约有 167 种语言被使用。而第 34 大道是社区的主要道路，其长度约 1.3 英里，横跨 30 个街区。

在过去，第 34 大道不仅承担了城市交通功能，还是社区居民经常停留的户外活动场地。但是，社区居民对室外开放空间的需求往往与城市车辆通行的功能相抵触，机动车对于占据着车行道进行各种户外活动的人群有着安全隐患，所以第 34 大道也是车辆安全事故发生次数最多的道路之一。其中一场导致 9 岁儿童死亡的车祸引发了社区居民对纽约市道路规划的极端不满，并要求为社区提供更多、更安全的户外活动空间[6]。

3.1.2　设计策略

(1) 安全的街道空间

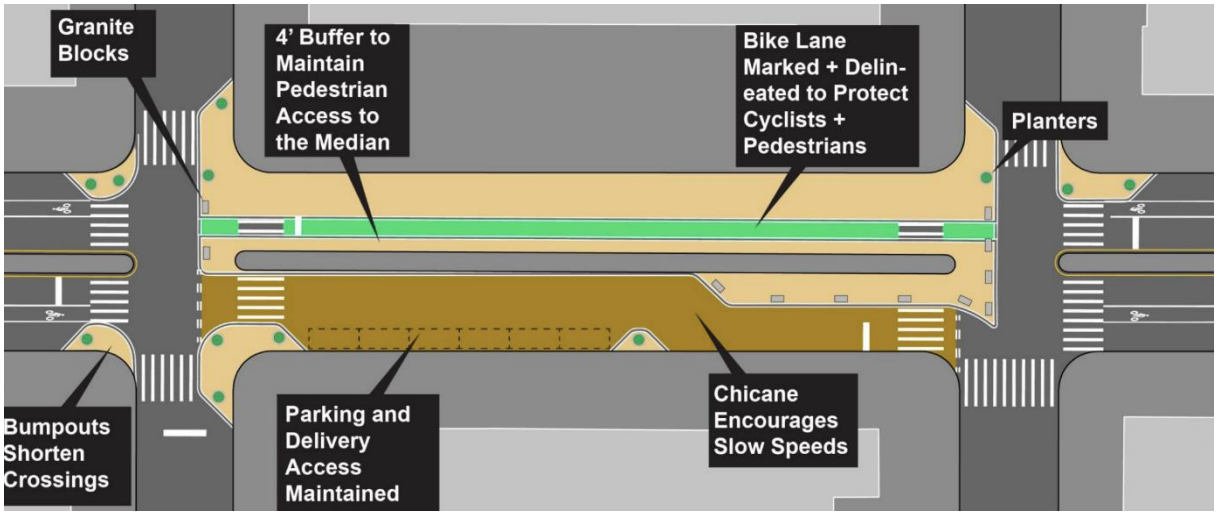


图 三-1 道路安全性措施

资料来源：[1]

为了创造更安全的街区，纽约市交通运输部门（Department of Transportation，DOT）采取了一系列保护措施限制和阻止外来车辆驶入街区。例如，在道路路口设置强制车

辆转向的障碍物来决定车辆的行进方向；东西向的车辆交通组织被强制从人行道偏移开，从而确保行人通行的高优先级与安全性；街区的部分道路还设置了路障以限制车辆驶入；在车行道与人行道的地面铺砖的选择上则采用了两种高对比度的绿色与灰色涂料，帮助具有视觉和认知困难的群体更好的区分和辨别路面；在过长的道路中断设置转向和变道以提醒司机降低车速[1]（图 三-1）。这些举措让该地区涉及行人的交通事故下降了 41%以上。“知道儿子上下学走路更安全，这对我们父母来说更令人欣慰。”杰克逊高地居民、两个孩子的父亲 Steven McIntosh 说道[49]。

(2) 全龄化的公共空间

Travers Park 是社区内的一块小型公园（图 三-3）。这个公园空间干净，色彩丰富，维护良好，但相对实用，没有保安和监控，也没有张贴规则。换言之，设计者只为公园布置了基本设施，例如各类休息座椅和丰富的植物景观等，剩下的空间用途需要居民自己定义。也正是如此，这个社区成为了各个年龄段活动的交汇点。在这里，你可以看到成年人休息交流，也可以看到孩童对各类公共设施富有创造力的改造，使其成为游乐场地。Travers Park 的经验表明，“非设计”的公共空间可以促进多种创意的使用，而不是预先设置好的活动。富有弹性、可变性和适应性的空间设计可以促进不同类型人群的交往[8]。

(3) 提升街道舒适性

照顾到不同人群的身体机能，以及为了创造更多样的交往空间，第 34 大道沿途设置了很多休息设施，例如景观花池的坐台、街边的桌椅（图 三-3）。社区居民也在自发

图 三-3 路边的休息设施

资料来源：[6]

图 三-3 社区内的 Travers Parks

资料来源：[8]

性地定义着整个街道的功能，路边的高台铺上帆布即可成为家庭庆祝生日的小型空间。这类多样化的休息设施不但减少了单次行走的距离，为行动不便的老人或残疾人提供可以休息的地方，同时它们也是社区极具交往活力的小型微空间，增添了社区生气，从而提高了街道的舒适性。

3.2 游乐街——荷兰阿姆斯特丹

3.2.1 项目背景

波特吉特街（Potgieterstraat）位于荷兰阿姆斯特丹的一个社区中，是社区的主要街道。由于城市规划的历史原因，早年的街区设计已经无法满足当下社区对公共空间的需要。波特吉特街被大量的交通所占据，并且相当缺乏公共广场和绿化。为了增加公共活动场地，提升街区活力，Carve 景观建筑事务所采用了“游乐街”（The Play Street）的概念，计划将街道打造为儿童游玩的线性公园[2, 50]。

3.2.2 设计策略

(1) 空间回收

在征得了超过 70%社区居民以及当地政府的同意后，Carve 移除了社区内的四个停车场和和社区中的车行道，并将它们同道路分隔带及人行道相结合，使其成为较大的社区活动场地。Carve 还通过限制车辆的进入来确保场地内的活动安全。

(2) 空间活化

Carve 通过添加游玩要素至街道空间和景观小品，以此促进街道空间的儿童游乐行为（图 三-4）。可游玩的街道物件很多，由可涂鸦的路面材质、洒水器、蹦床、滑梯、旋转器、爬行隧道和可以传声的管道。此外，儿童活动场地旁还设置了许多休息设施，家长们经常坐在场地旁的长凳上一边闲谈一边看护孩子，这在一定程度上促进了社区间的邻里交流以及代际融合。

图 三-4 空间中的游玩元素

资料来源：[2]

3.3 微型公园——美国旧金山

3.3.1 项目背景

微型公园（The Parklet Program）是由美国旧金山城市管理部门（City of San Francisco）在 2010 年发起的一项城市街道微型改造项目（图 三-5）。20 世纪中期的道路设计为了满足工业化时代汽车快速通行的需求，城市的人行道的空间被大量的车辆所占据。而从人本主义的视角来看，旧金山的城市街道缺乏对居民和行人的关怀。而微型公园项目的设立就是为了减少汽车对城市空间的占据，将街道还给市民。

任何社区里的居民都可以向城市管理部门提交申请表，将路边停车位改造成微型公园。申请通过审核后，申请者需要自行设计并自费购买建造材料。场地的建造材料必须足够轻量化，以确保它能随时适应未来需求的变化并以最小的成本做出改变。建成后的微型公园可以释放城市空间的潜力、提升街区舒适性和促进邻里交往[7]。

图 三-5 微型公园项目

资料来源：[7]

3.3.2 设计策略

(1) 弹性空间

微型公园项目鼓励设计者使用轻量化、可拆卸的环保木质材料。一方面是为了尽量减少对环境的负担，另一方面是在未来市政道路维修的时候场地设施能够被轻易地拆除。在家具方面应尽量选择可移动的桌椅，这样能在必要的时候方便地腾出空间以作它用。空间能满足自行车停车、种植、休息、就餐等多种不同的功能需求，它们都由市民自行定义（图 三-6）。

(2) 空间易用性

微型公园设计导则相当重视对弱势群体的关怀和无障碍设计（图 三-7）。设计导则中规定，进入微型公园空间必须考虑到无障碍设计，空间入口与人行道的接驳应尽量平齐，入口的宽度应满足轮椅通行；场地的铺面必须平整、防滑；空间内需要留足轮

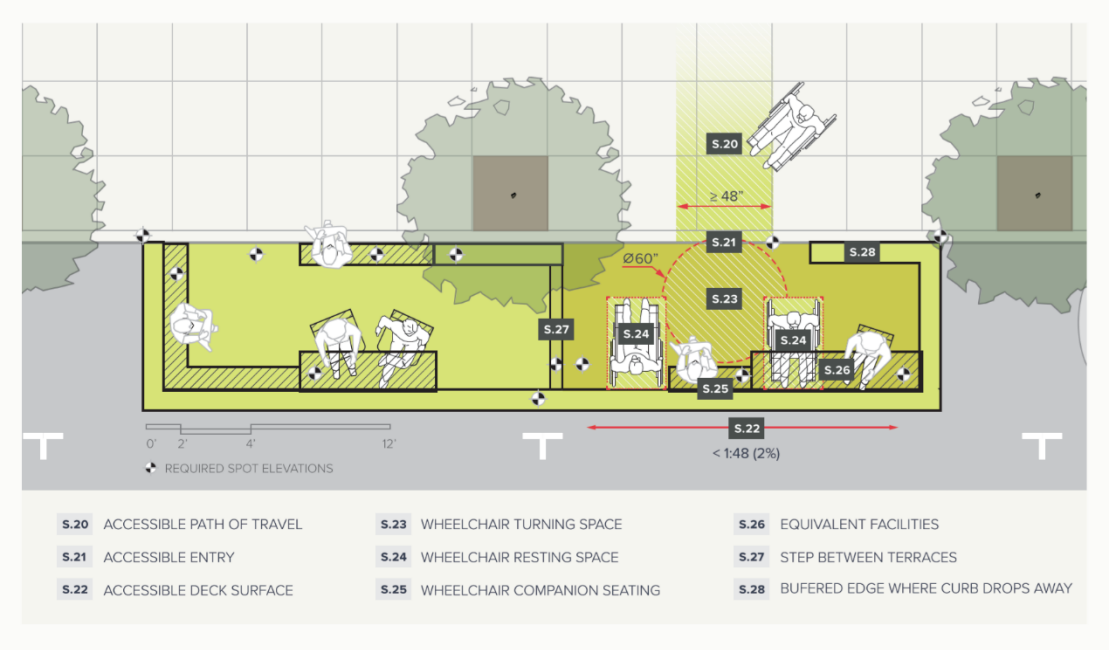


图 三-7 微型公园的空间包容性设计

资料来源：[7]

图 三-6 对微型公园不同的功能定义

资料来源：[7]

椅的回转空间和供轮椅使用者休息的空间；空间内设施的高度需要考虑到轮椅使用者和儿童。

(3) 空间可持续性

为了减少对环境污染和碳足迹，微型公园的建造材料大部分都来自当地的木材（图三-8）。使用当地材料建造的微型空间有着与当地环境相近的样式、立面，在街区中显得自然而不突兀，可以提升它对社区居民的亲和感，尤其是那些具有认知障碍的老年群体。

图 三-8 使用当地材料建造的桌椅

资料来源：[7]

3.4 小结

前文分析了三个包容性街道设计的案例，而每个项目的侧重点也各不相同。

美国纽约第 34 大道的开放街道项目起源于社区居民对更多开放的街道空间和街区安全性的需求。政府部门采取了一系列措施减少了社区内的机动车交通流量，保证了街区的安全性，体现了对儿童、老年群体和残障群体的人身安全的包容性；社区内的街道空间和公共场地也在居民的自发使用和改造下，逐渐成为不同年龄、不同种族、不同文化的交流场所，体现了社会环境对使用人群的包容性；街边设置的桌椅、花池，可以为行动不便的群体在行走时提供休息功能，体现了包容性环境的舒适性要求；设计者考虑到使用人群动态的、随时间变化的使用需求，为公共场地留有充足的空间余量，方便使用者自己定义场地的功能，体现了包容性环境时间维度的要求，即空间的可适应性、灵活性与弹性。

荷兰阿姆斯特丹波特吉特街的游乐街项目则将儿童的游乐需求置于街道空间设计的首位，在空间中加入了许多游玩元素；并且为保障游玩区域的安全性，街道也同样做

了无车化设计。这体现了对儿童群体的包容。而游玩区域旁的休息设施又成为了监护家长们闲谈和交流的区域，一方面促进了代际融合，另一方面促进了邻里和谐，也体现了社会环境的包容性。

美国旧金山的微型公园改造项目则考虑到了时间维度上动态变化的空间使用需求，以及对行动不便人群的关怀。从共时性的角度来看，微型公园的空间设计能够满足多样化的需求，使得空间功能的转换成本很低；从历时性的角度来看，空间的建造材料轻量、环保、易拆卸，考虑到了未来可能发生的市政管道维修工作、停车位不足、道路维护等状况；空间设计上体现了对弱势群体的关怀；空间材料对于认知能力较低的使用人群有熟悉感；市民可以在这闲谈聊天，增加了街区氛围的亲和度。总体而言，微型公园改造项目体现了包容性设计的弹性、易用性和熟悉性原则，以及社会环境的包容。

第四章　包容性街道设计方法论

4.1 研究回顾

这一章将基于前文的文献资料、设计实践、模型理论和实地案例，总结出一套适用于广州市包容性街道空间设计的方法论。但在总结方法论之前，由必要对前文所提及的研究做一次总体回顾，阐述它们在本次研究的参考价值，为后续方法论的形成提供理论依据和实践基础。

包容性设计程序模型，如挪威设计委员会的四阶段八活动和剑桥大学工程设计中心的包容性设计轮，描绘了通用性的设计流程方法。其步骤大致可以分为三步，即前期阶段的调研、中期阶段的设计与后期阶段的评估。前期阶段主要是为了了解设计问题的语境，并定义设计所面对的用户群体，了解他们的需求。这一阶段可以参考的方法和理论有 Keates, Clarkson, Harrison and Robinson [30]的包容性设计立方体模型、Benktzon [31]的用户金字塔模型和利益相关者地图（Stakeholder analysis）、WINIT 模型等；中期阶段则是对前期收集到的调研资料进行汇总、筛选、整理和排序，基于这些数据制定设计的评价标准和探讨可行的设计方案；后期阶段则是在设计成果初步落地后，交给用户和专家等评测，得到具体的使用反馈，将这些反馈整理成数据库，作为之后设计迭代和其他项目的参考。这种设计实践的流程和方法同样适用于城市街道设计（表 二-1，表 四-1）。

Design Stage	Specification
Initial Stage	• Understand the contextual aspects of the design problem and define the user groups that the design will address, gaining insight into their needs • Approaches - Inclusive Design Cube - User Pyramid - Stakeholder analysis - WINIT model
Middle Stage	• Consolidating, filtering, organizing, and prioritizing the research data collected during the early stage

	• Based on this data, evaluation criteria for design and feasible design solutions are developed and discussed
Late Stage	• The preliminary implementation of the design outcomes, subjecting them to evaluation by users, experts, and other stakeholders to gather specific feedback on usability. • The feedback is then compiled into a database, serving as a reference for subsequent design iterations and other projects

表 四-1 包容性设计流程的三大主要阶段

资料来源：根据前文整理

包容性环境的章节则从空间维度、时间维度和社会维度三个方面论述了包容性环境的具体内涵和本质，阐明了包容性环境的重要特征，并回答了什么是包容性街道的问题。诸多组织和机构，例如 CABE、TPG 和 Microsoft，也从方法论视角和价值观视角提出了包容性设计原则。这些都为之后的包容性街道的设计原则和评价标准的构建提供了重要参考。

Dimension	Specification
Spatial Dimension	• Principles of Street for Life theory - Legibility - Accessibility - Comfort - Safety
Temporal Dimension	• Synchrony - Universality of Universal Design • Diachrony - Flexibility and adaptability of Tactical Urbanism
Societal Dimension	• Social relationship in built-environment - Social Inclusion theory - Social Exclusion theory • Social imaginary from built-environment - Familiarity principle of Street for Life theory - Shared space

表 四-2 建成环境包容性的三大维度

资料来源：根据前文整理

	Location	Background	Design Strategies
Open Street	The 34th Av., New York, US	• Community with diversity • Dweller's need for public space and safety • Car accident on a child	• Safe street - barriers to divert cars - roadblock - high-contrast pavement - turning for the slow-down • Space for all-age - Non-design space • Comfortable Street - rest facilities - amicable atmosphere
The Play Street	Potgieterstraat St., Amsterdam, Netherlands	• Reclaim space from vehicles • Consideration for children	• Reclaim of space - removal of parking lot - combination of lanes and sidewalks - Ban on car-pass • Activation of space - play elements in the street - playground with rest facilities
The Parklet Program	San Francisco, US	• Reclaim space from vehicles • Led by citizens, designed by citizens, built by citizens and maintained by citizens	• Flexibility - lightweight, movable, detachable components - space function defined by citizens - inclusion for diverse needs • Accessibility - barrier-free design • Sustainability - constructed with local materials - affinity

表 四-3 案例分析汇总

资料来源：根据前文整理

案例分析的章节选取了美国纽约第 34 大道的开放街道、荷兰阿姆斯特丹的游乐街

和美国旧金山的微型公园，进一步论述了包容性设计在城市街道空间的具体实践。尽管每个案例的项目背景并不相同，但设计均体现了对弱势群体的关注。这些时间项目为后续社区街道的包容性改造提供了具有启发性意义的设计手法和改造手段（表 四-3）。

基于上述文献、资料和实践，在此提出包容性街道的设计方法论（图 四-1）：

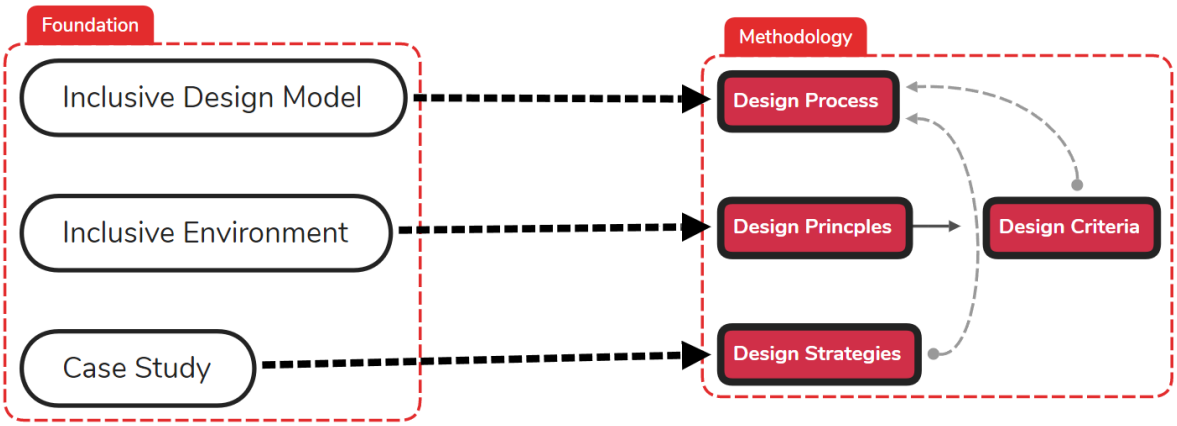


图 四-1 方法论构建依据

资料来源：作者自绘

4.2 包容性街道的设计原则

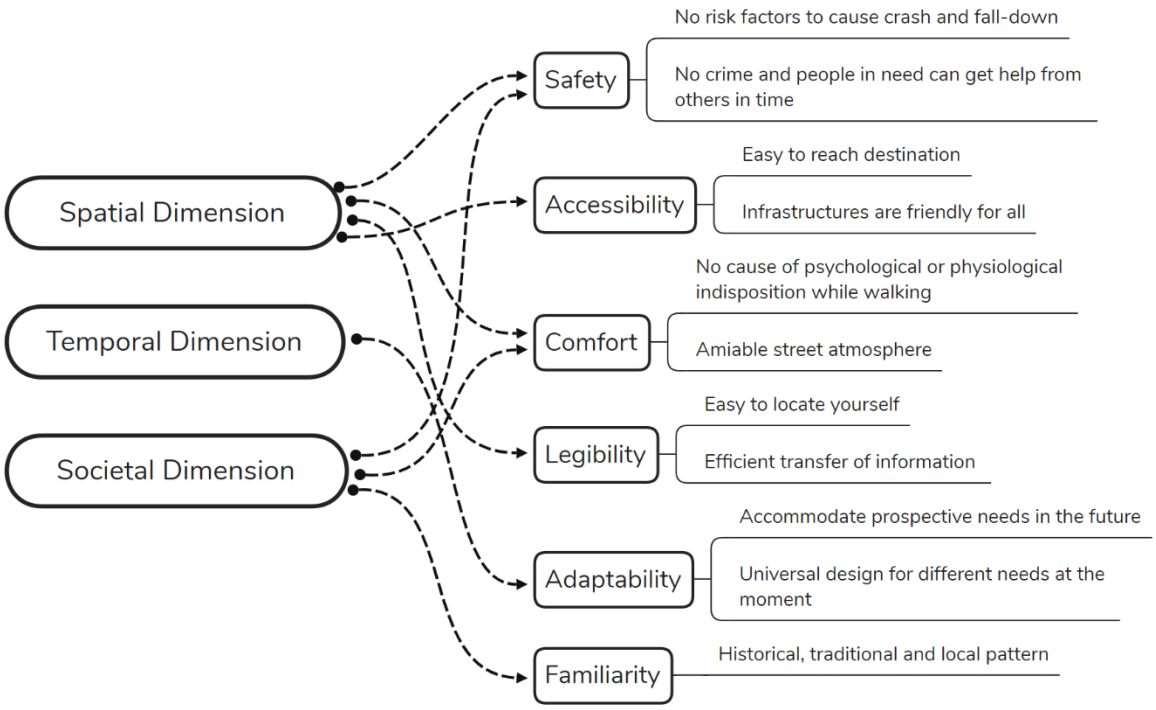


图 四-2 包容性街道的设计原则

资料来源：作者自绘

街道不但具有物理空间属性，同样还具有时间属性和社会属性。因此，对包容性街道设计原则的拟定将从空间维度、时间维度和社会维度出发，提出六大设计原则：（i）安全性（Safety）；（ii）可及性（Accessibility）；（iii）舒适性（Comfort）；（iv）易读性（Legibility）；（v）可适应性（Adaptability）；（vi）熟悉性（Familiarity）。各项设计原则和三大维度并不是一对多或者多对一的关系，而是相互紧密联系、相互包含的多对多的关系。此外，基于前文研究，每项设计原则在优先级上有所差异。其优先级由高到低依次排序，即安全性原则的优先级最高，熟悉性原则的优先级最低（图 四-2）。

4.2.1 安全性

安全性指的是，人们使用街道环境、享受街道环境和在街道环境步行时可以不必担心被绊倒、被撞到或遭到袭击。它一方面包含了空间安全，即场地内是否会有容易导致行人被绊倒或被撞到的危险因素，例如高差、不平的铺砖和过快的车流。另一方面则是社会安全，即社区内的治安是否良好，是否有防范犯罪发生的手段，是否能为处

于危险情况的人群提供及时的援助等。

安全性是包容性街道优先级最高的指标。它对社区内的安全感的氛围营造具有重要作用，是其他指标成立的基石。

4.2.2 可及性

可及性有两方面的含义：一是人们在街道中行走时能够高效地抵达目的地；二是街道设施对所有的人群，尤其是弱势群体，都做到了公平易用。以街区中的老年人为例，受限于身体机能，老年群体在街道中步行的舒适距离是 500m 左右，极限距离是 800m 左右，所以社区的5分钟生活圈范围里应囊括了居民日常使用的基础公共服务设施（食品店、邮局、银行、公交车站、药店、社区医院等），而10分钟生活圈范围里应包含了主要的次级公共服务设施（休闲设施、市级医院等）。而街道设施的易用性最直观的例子就是街道中的无障碍设计。

可及性代表了公共设施的使用门槛，使得身体能力不足的使用人群也能够独立自主而不依赖于他人的帮助。

4.2.3 舒适性

舒适性是当人们在街道里停留或行走时，没有身体或精神上的不适，并且能够享受街道上的户外生活。街道的舒适感一是来自于街道的空间观感，即空间尺度是否宜人、绿化景观是否舒适、街道环境是否干净整洁；二是源自于街道的设施是否齐全，例如消解步行乏累的休息设施、应急的公共卫生间；三则是来自于街区氛围，亲切友好、和睦友善的街区氛围能够显著提高街区的归属感和幸福感。

舒适性关乎使用者的使用体验，它是衡量街道的空间设计在何种程度上满足了使用者的需求。

4.2.4 易读性

易读性是指街道环境是否能在一定程度上帮助行人明确自己的位置、确定自己的路线，以及街道的标识设计的信息传递是否高效。独特的地标与空间功能、清晰的路网结构有助于创造易于理解的心智地图（Metal map），帮助具有认知障碍的群体获得清晰

的路线规划。而街道中的标识应采用大字体、高对比度的图底颜色关系，方便他人辨认。

街道的易读性可以为路线提供清晰的指引，创造易于理解的城市环境，防止迷路。

4.2.5 可适应性

可适应性指的是街道空间的设计，在当下的空间可以满足各类人群通用化的使用需求，并且考虑到了使用群体对于随时间动态变化的使用需求，能够以低成本的代价实现功能的置换与迭代。对于功能的置换与迭代，重要的理念与策略是要采用模块化设计，并为未来的需求留有足够的余地。

4.2.6 熟悉性

熟悉性是指人对社区环境、街道、建筑、设施等的辨认和理解程度。这些空间要素的设计形式符合老年人的传统认知，避免因为设计形式而产生对使用功能的困惑与误读。所以在进行街道空间设计之前，应对当地的历史传统和文化语境有足够的了解，并将这些传统元素运用到街道的空间设计之中。

4.3 包容性街道的评价标准

确定包容性街道的评价标准的意义在于对空间现况有一个系统性的阐述和描绘，帮助研究者发现空间中存在的问题与缺陷并加以改进。包容性街道的评价标准源自于包容性街道设计原则中的每一点对应到街道空间中的具体问题。本文将街道空间分为了 5 个大类与 13 个子类，并总结了不同空间类型的评价标准（附录 1）：

i. **交通空间：人行道；人行横道。**

ii. **绿化景观：绿地；植被；水体。**

iii. **口袋空间：店面；入户空间；街角。**

iv. **服务设施：标识；休息点；照明；停车场；公共卫生间。**

4.4 包容性街道的设计策略

设计策略是指在创造、规划或解决问题的过程中，为达成特定目标或愿景而制定的一系列有组织的行动和决策。它通常涉及到在资源有限的情况下，根据预定的目标和价值观，选择最佳的方法来实现设计目标。 所以，基于前文所提到的包容性设计六大原则，在此提出城市街道语境下的包容性设计策略。

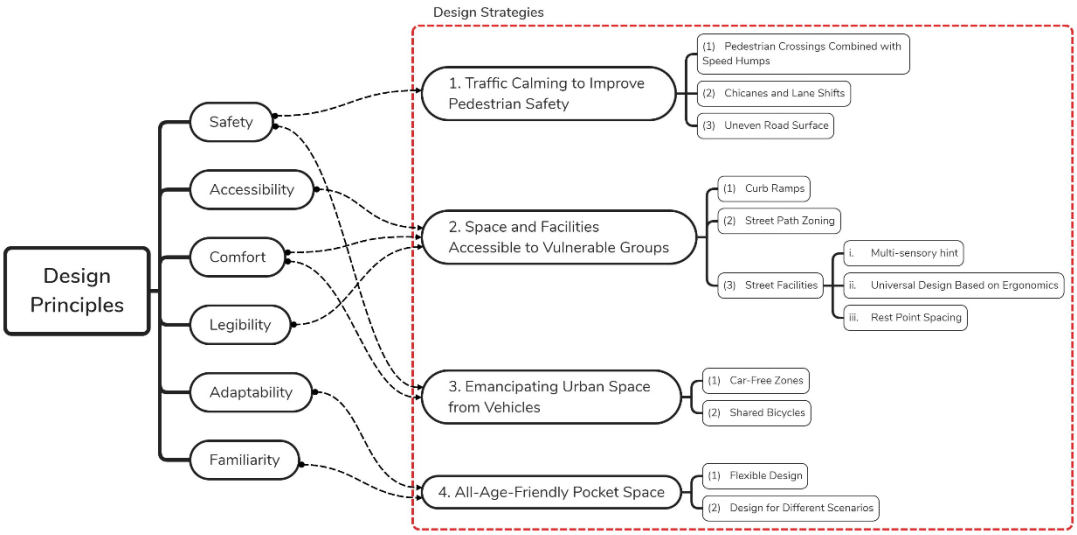


图 四-3 包容性街道设计策略与设计原则的联系

资料来源：作者自绘

4.4.1 提升步行安全性的交通缓行策略

安全性是街道包容性设计原则的根本，而限制机动车在街道中的车行速度是提升街道安全性的有效手段。而在老旧小区的街道中，大部分的弱势群体是老人、孩子和行动障碍者。通过实行交通缓行策略，降低车速，能够保障弱势群体步行的安全性。

(1) 与缓冲路拱相结合的人行横道

缓冲路拱和减速带是常见的减速措施。通过路面起拱，一方面能够引起司机注意，另一方面司机为了降低车辆的颠簸感而会主动降低车速。而缓冲路拱则可以和街区中的人行横道相结合，使得行人能够在抬起的道路基面上穿行。路拱上穿行的人群因为抬升高度和地面材质不同的缘故，而更容易被司机所注意到。

(2) 车道扭转和变道

扭转车道和车道变道通常会导致车道宽度的减小，这会迫使司机减速。当车道变窄时，司机感到空间更为有限，因此他们会自然而然地减速，以适应新的道路条件。它常伴随着弯道或曲线的设计。这种设计要求司机在转弯时降低速度，以确保安全通过曲线。司机必须减速以适应曲线的半径和曲率，从而减少可能的侧滑和失控风险。

(3) 不平的路面铺砖

不平的路面铺砖会导致车辆在行驶过程中产生颠簸和震动，使驾驶变得不舒适。这种不舒适感会促使司机减速，以降低车辆在不平路面上的颠簸感，提高驾驶体验。同时它还会对车辆的操控性产生负面影响，使车辆在行驶过程中更加不稳定。驾驶员可能会感受到方向盘的抖动和失稳感，因此会自然而然地减速以降低操控的风险，以应对路面的不平和突发状况。

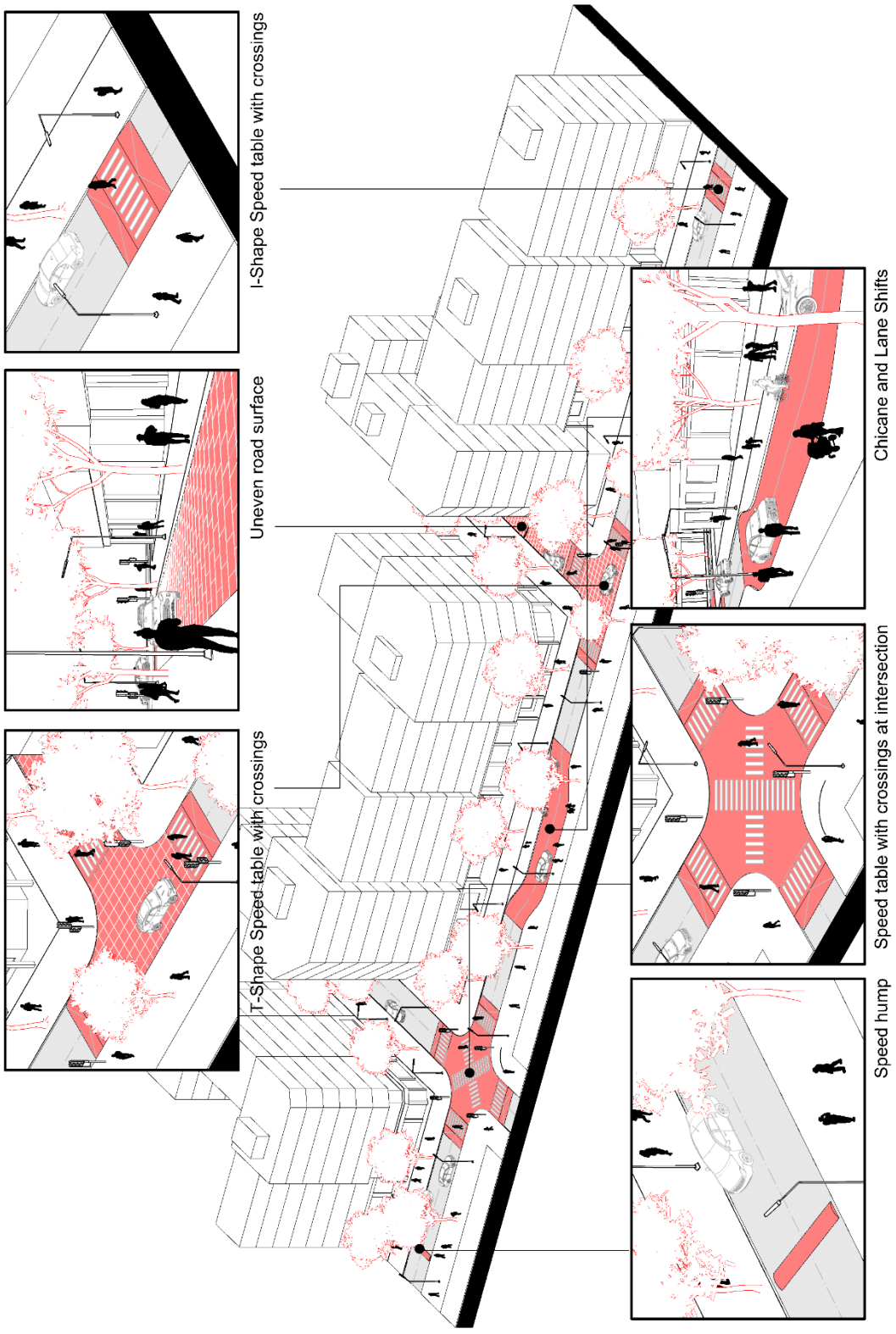


图 四-4 交通缓行策略

资料来源：作者自绘

4.4.2 弱势群体可及的街道空间与设施

(1) 缘石坡道

缘石坡道布置在人行道口和人行横道两端，以方便行人及乘轮椅者、婴幼儿等通行。根据在人行道中所处的位置的不同，缘石坡道有不同的类型。常见的种类有单面坡和三面坡。坡面坡度一般不超过 1:12；通行宽度应大于 1200mm（图 四-5）。

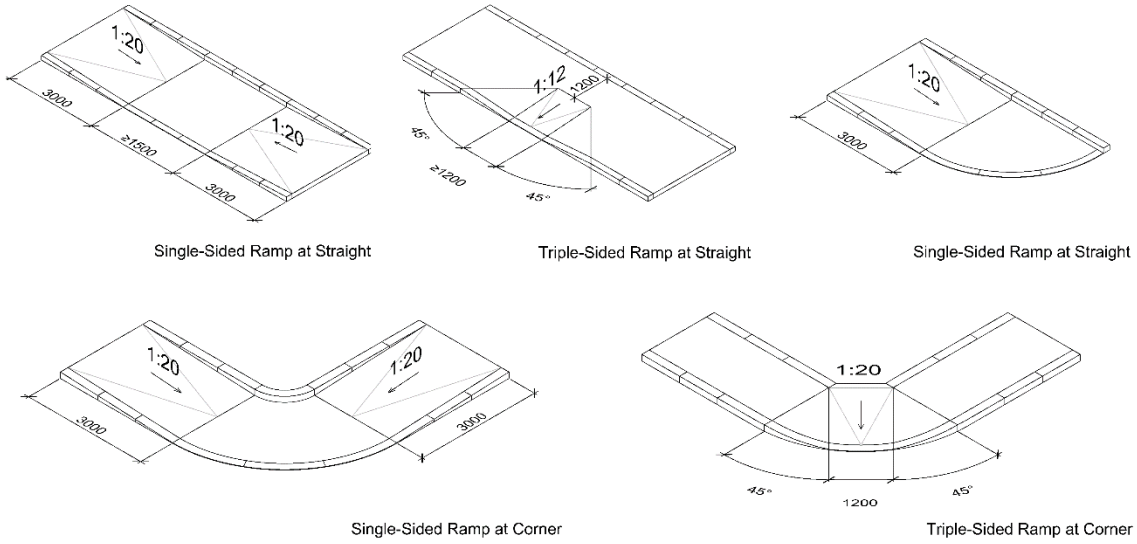


图 四-5 缘石坡道的类型

资料来源：作者自绘

(2) 街道路径分区

街道中整洁的路径分区不但能提升空间观感，还能优化街道的空间使用效率。根据路径不同的功能和作用，街道中的路径可以分为四类：店铺门面、畅通路径、非设计区和缓冲区（图 四-6）。店铺门面属于建筑界面的一部分，是街道风貌和空间品质的重要因素；畅通路径是供行人和弱势群体无障碍通行的路径，宽度一般在 1.8~2.4m；非设计区则是随空间需求动态变化的区域，它可以是临时的停车位、共享单车设施、街道家具摆放处或者小型休息的交往空间（图 四-7）；缓冲区则是用于隔绝人行步道和机动车道的绿化带，用于保障行人安全和提供安全感。

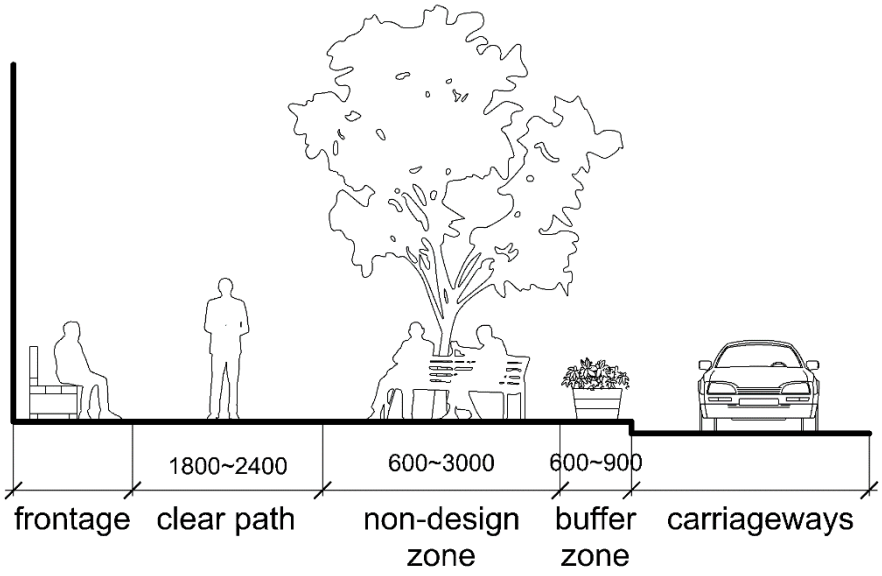


图 四-6 人行道分区

资料来源：作者自绘

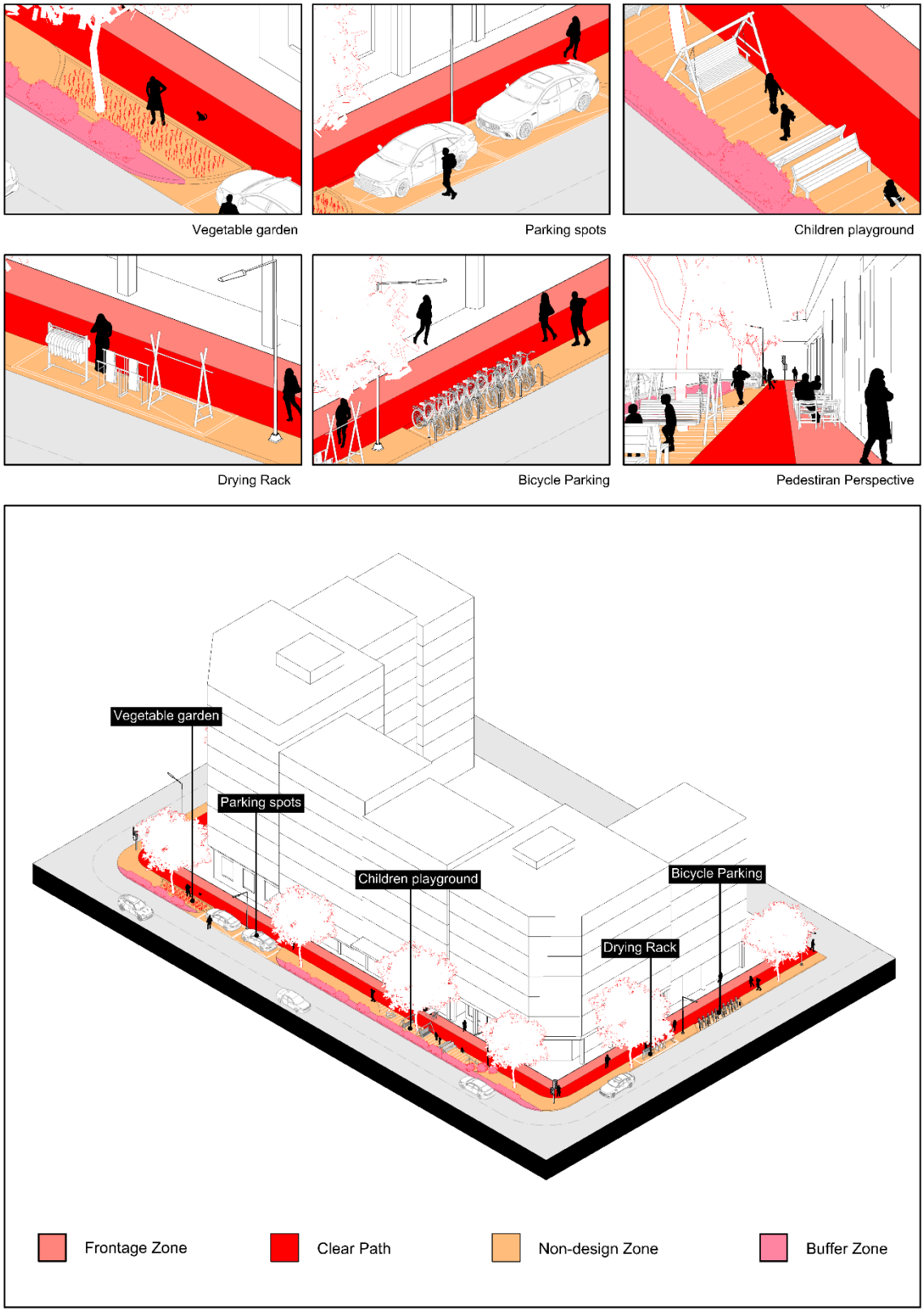


图 四-7 街道分区中的非设计区　　资料来源：作者自绘

(3) 街道设施

i. 多感官提示

为了保障盲人、听力障碍者、视觉障碍者等弱势群体的正常出行，街道可以采用多种感官提示的设施。视觉提示设施包括视觉指示标志和标线，用于指示行人通行方向、行人信号灯、斑马线等。这些标志和标线应具备明确的对比度、色彩和形状，以便于视觉障碍者辨认。听觉提示设施包括行人信号灯和倒计时声音提示，用于提供交通信号的声音提示。这样，盲人可以根据声音来判断信号灯的状态并安全过马路。此外，一些交通设施如交叉路口、斑马线等可以设置声音导向系统，通过发出声音指示行人的方向和安全提示。盲道则用于引导盲人行走，盲道应采用凸起或不同纹理的材料，以便盲人通过触觉感知路径和障碍物。除了盲道外，还可以在街道设施上设置触觉标识，如凸起的指示按钮、刻有文字或图案的触摸板等。这些设施可以通过触觉感知帮助盲人和视觉障碍者识别并操作（图 四-8）。

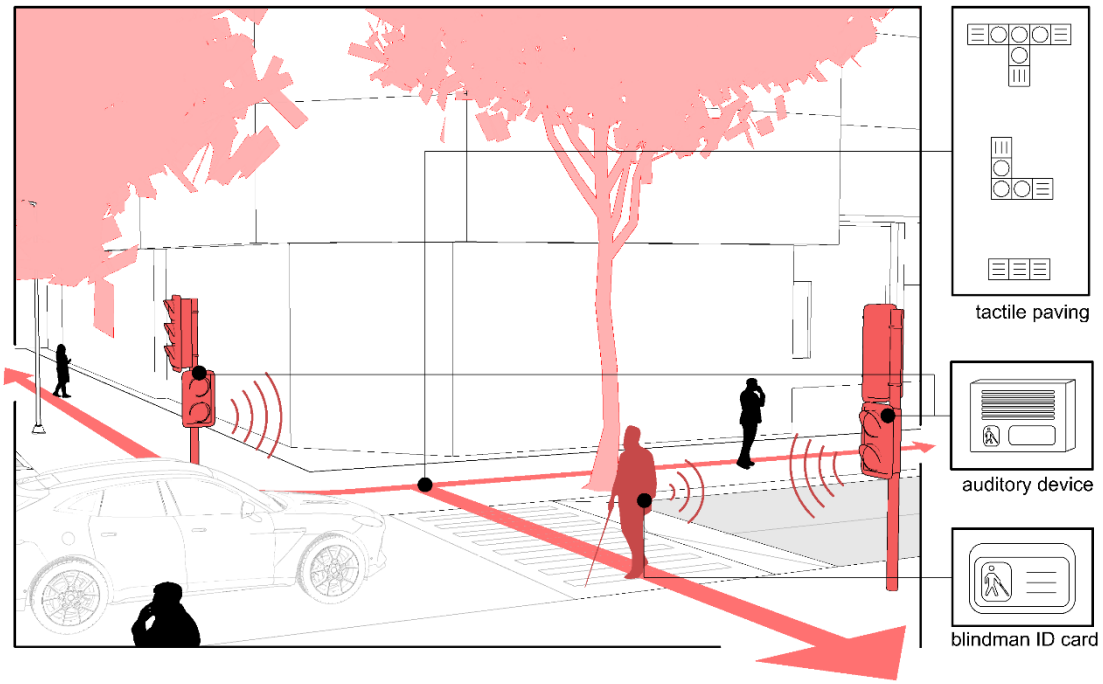


图 四-8 多感官提示的街道设施

资料来源：作者自绘

ii. 基于人体工程学的通用化设计

街道设施的日常使用需要考虑到多种群体的特征，并采用通用化的设计理念。笔者整理了街道中常见使用人群和弱势群体的人体尺度，包括停留和行进所需要的空间、操作设施人手能触及的高度和范围、人眼高度和可视范围，通过筛选出这些数据中的最大值和最小值，来做为街道设施设计的参考依据（图 四-9）。停留和行进所需要的最小宽度在 900mm，所以街道中所有的路径设计不应小于这个值；不同人群的视线高度在 850~1550mm 的高度范围内，所以设施信息的高度位置应处于这个范围内；街道设施还需要考虑到不同人群的身高和手所能触及的范围，确保设施的使用高度不论对于成年人还是儿童都是可及的。

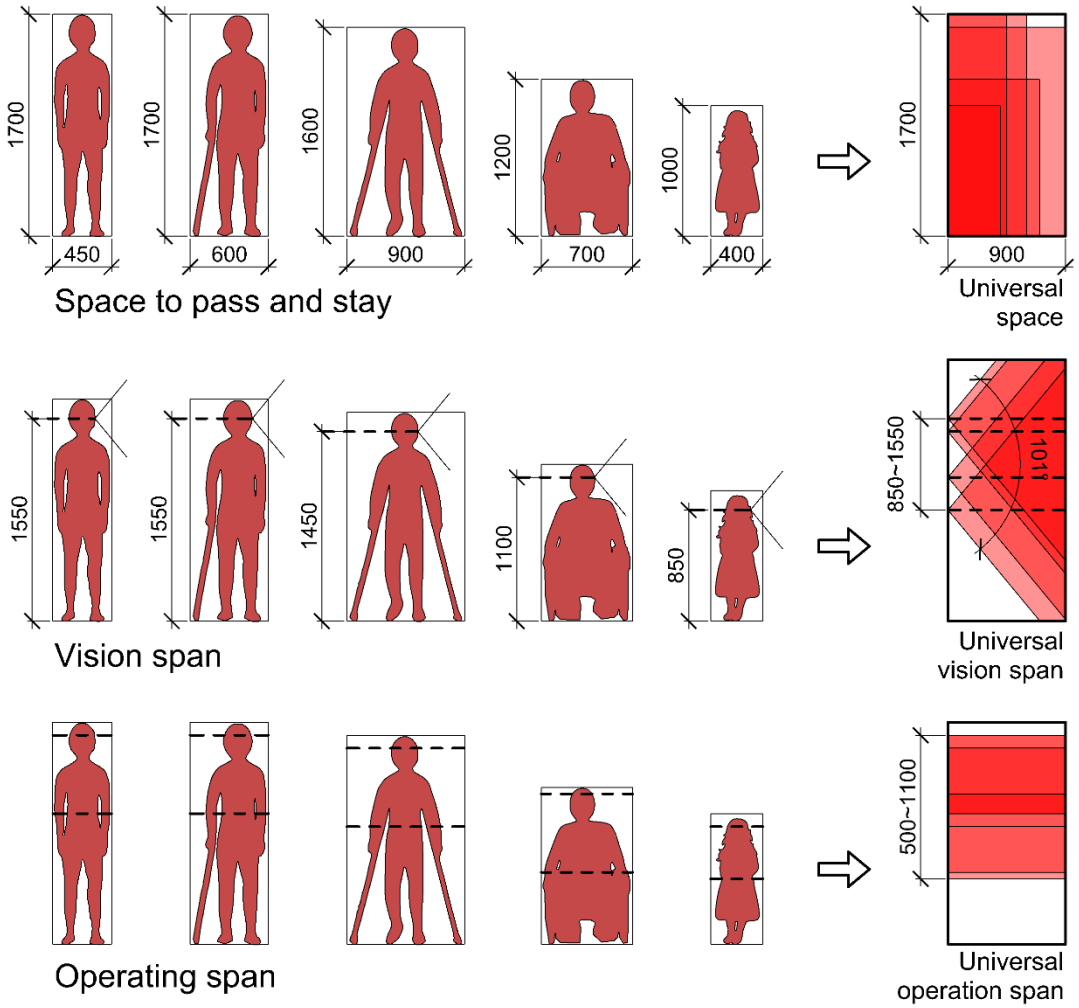


图 四-9 通用化的空间使用设计　　资料来源：作者自绘

iii. 休息点的间距

不同人群行动能力的不同意味着步行舒适距离的不同。对于正常人而言，街道舒适的步行距离一般在 200-300m，而老年人建议的步行距离则在 100-150m。但对行动阻碍最大的孕妇群体来说，其舒适的步行距离在 50-100m。所以为了兼顾街道中行动能力最差的群体的休息需求，休息点的间距应以 75m 为宜（图 四-10）。

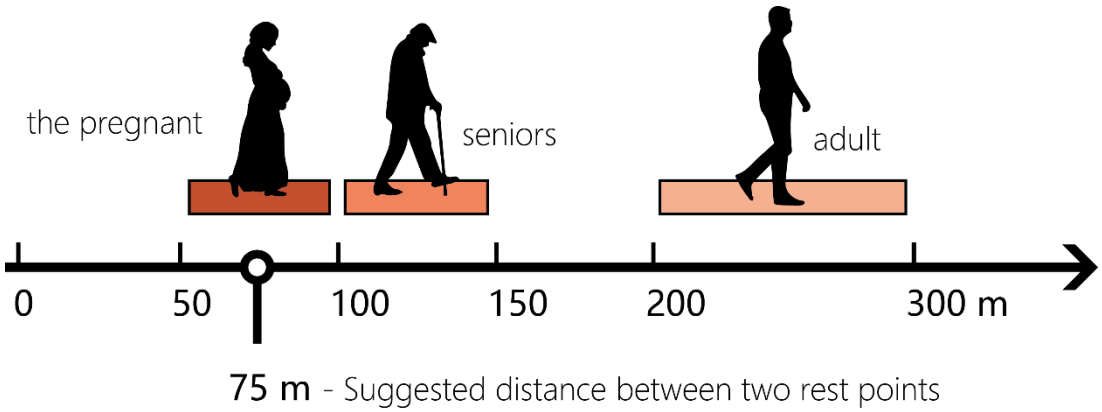


图 四-10 不同群体的舒适步行距离

4.4.3 释放被机动车占据的城市空间

(1) 车辆禁行区域

由于过去城市设计对机动车交通的过分重视和对人性化需求考虑的不充分，导致现有的城市空间被大量的机动车所占据（图 四-11）。而为了给行人提供更多的可以活动的城市空间，可以在街区中设置车辆禁行区域。通过政策管制、时间管制或者空间设计的手段限制机动车通行，来创造无车的街道环境。

车辆禁行区域的改造方式有很多。对于具有一定人流量、店铺繁多但机动车通行量并不大的街道而言，最好的改造方式是设立一条步行街（图 四-13）；而对于小区内部的街道，则可以将其改造为线性的游乐公园（图 四-12）。

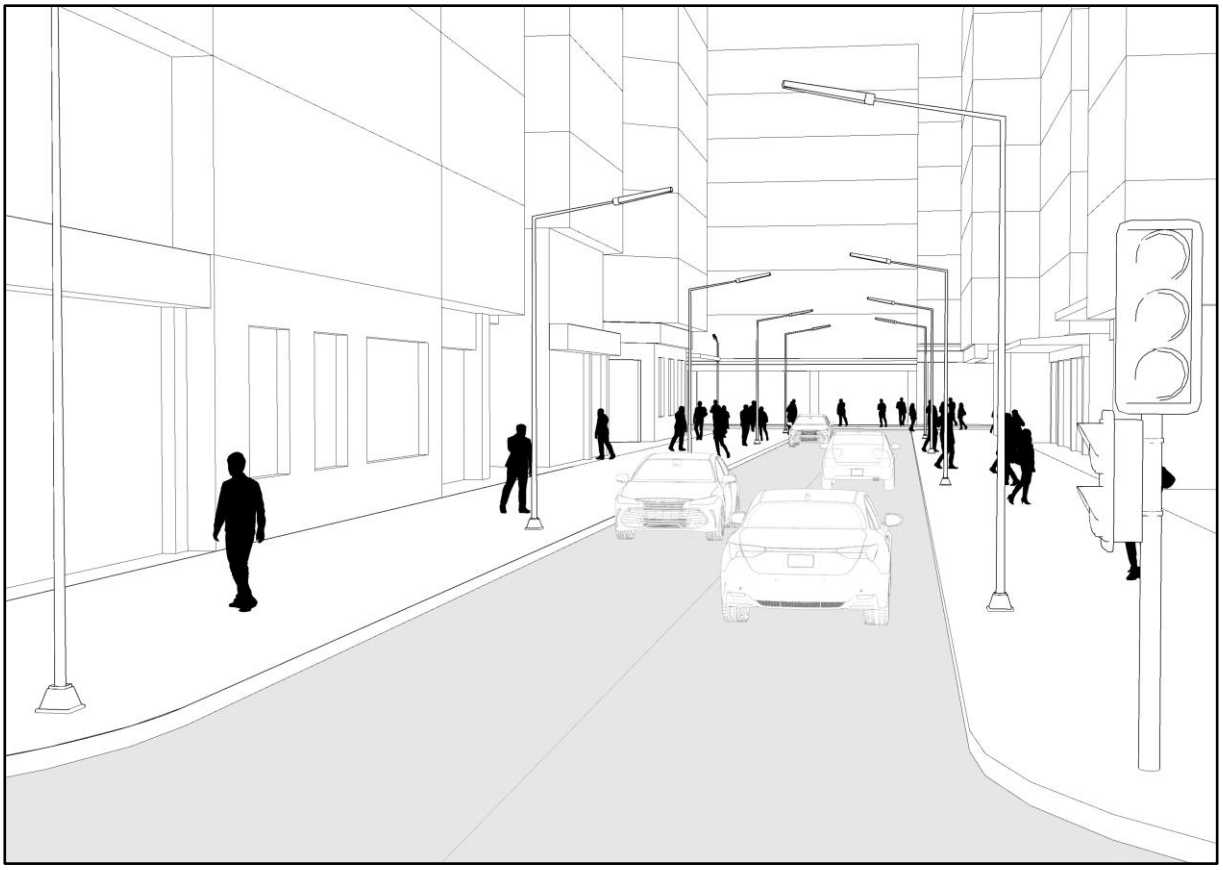


图 四-11 改造前的街道

资料来源：作者自绘

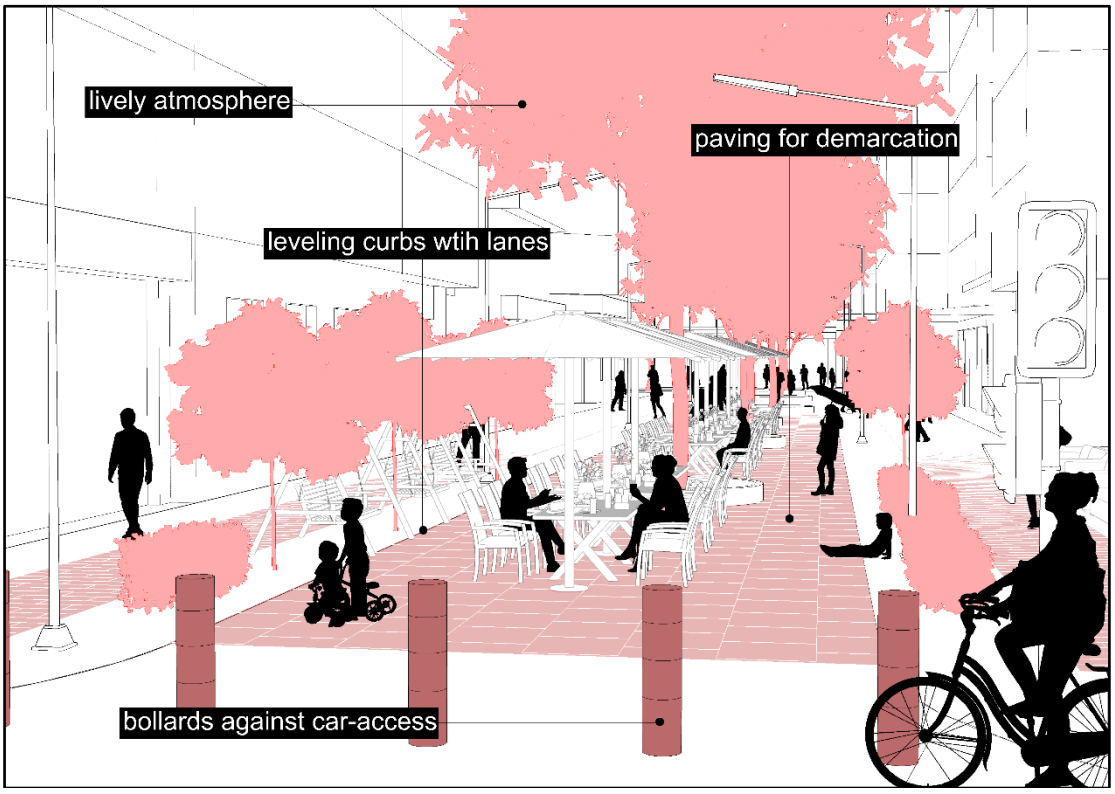


图 四-13 改造后的步行街　资料来源：作者自绘

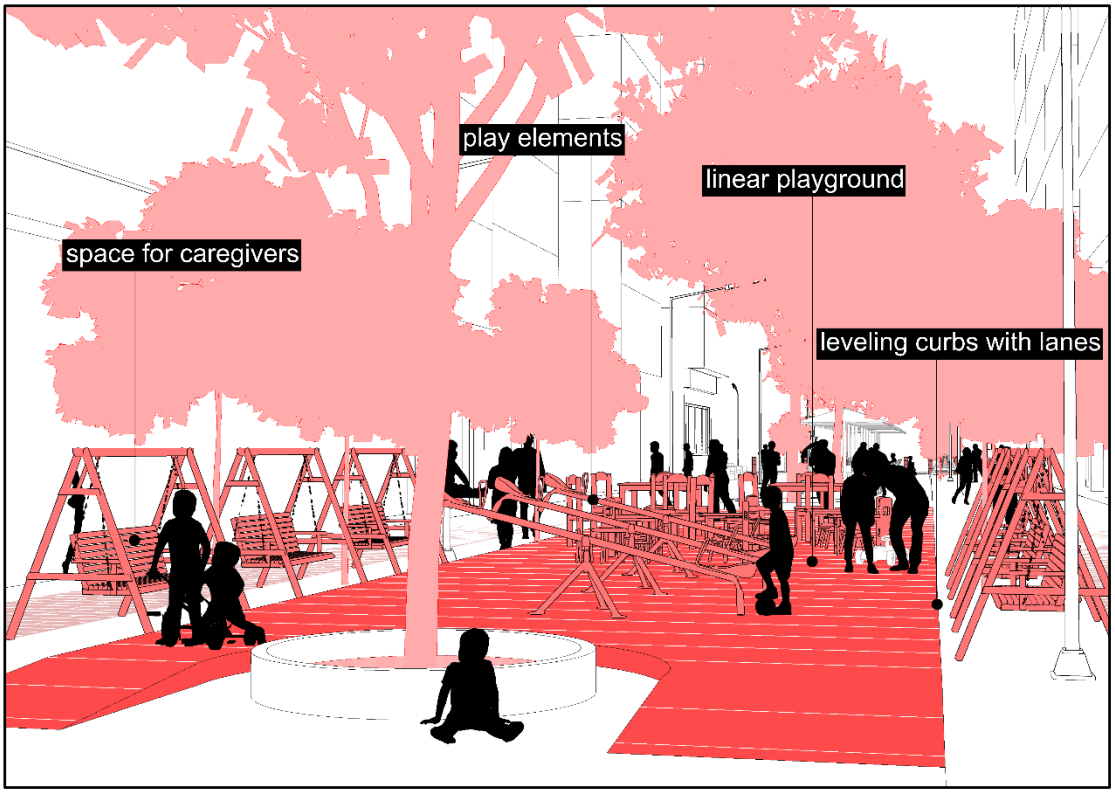


图 四-12 改造后的线性公园　　资料来源：作者自绘

(2) 共享单车

共享单车同样可以作为一种辅助的出行手段，缓解人们对机动车的依赖，从而减少机动车在街道中的数量。它为人们提供了一种方便快捷的短程交通工具。在短距离的出行需求上，人们可以选择骑共享单车代替开车，从而减少对机动车的依赖。机动车的过度依赖往往导致交通拥堵问题。通过鼓励人们使用共享单车，特别是在繁忙城市区域，可以减少私人汽车的数量，从而缓解交通拥堵。

为了提高人们使用共享单车出行的意愿，共享单车站点应该足够便捷，并且覆盖范围足够广。通常来说，人们愿意步行 300m 到达一个共享单车站点，所以共享单车在社区和城市中的分布间距不应超过 300m（图 四-14）。

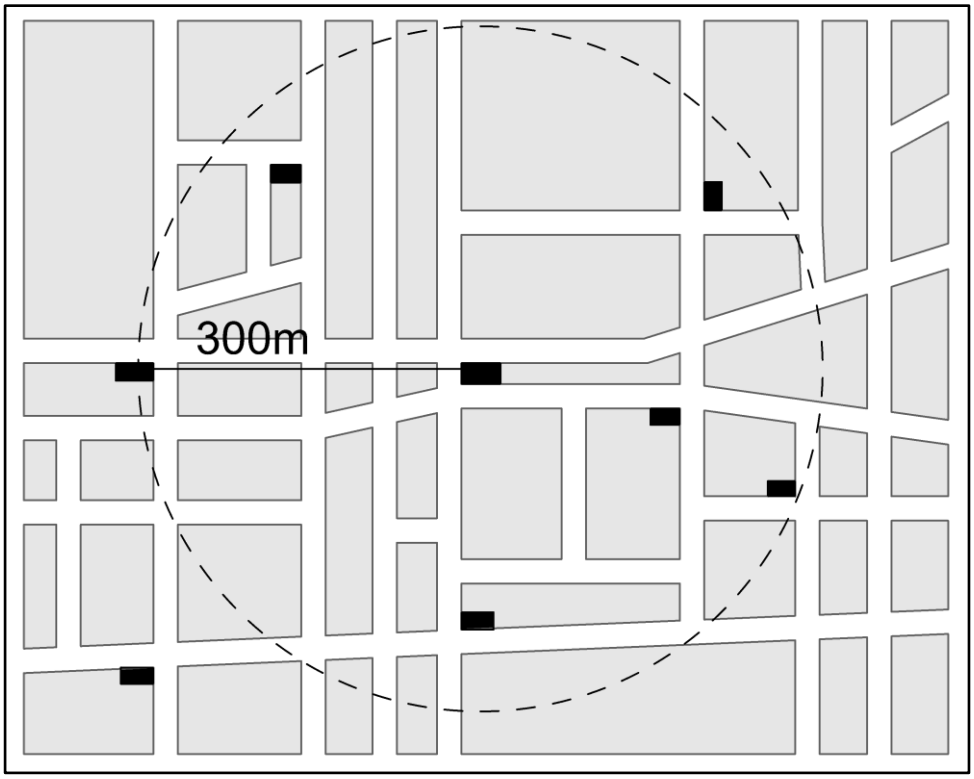


图 四-14 共享单车站点的最大间距

资料来源：作者自绘

共享单车站点应尽量靠近人行道和自行车道，方便行人取用。常见的站点设置地点有人行道、路边的停车区域、公共空间（图 四-15）。

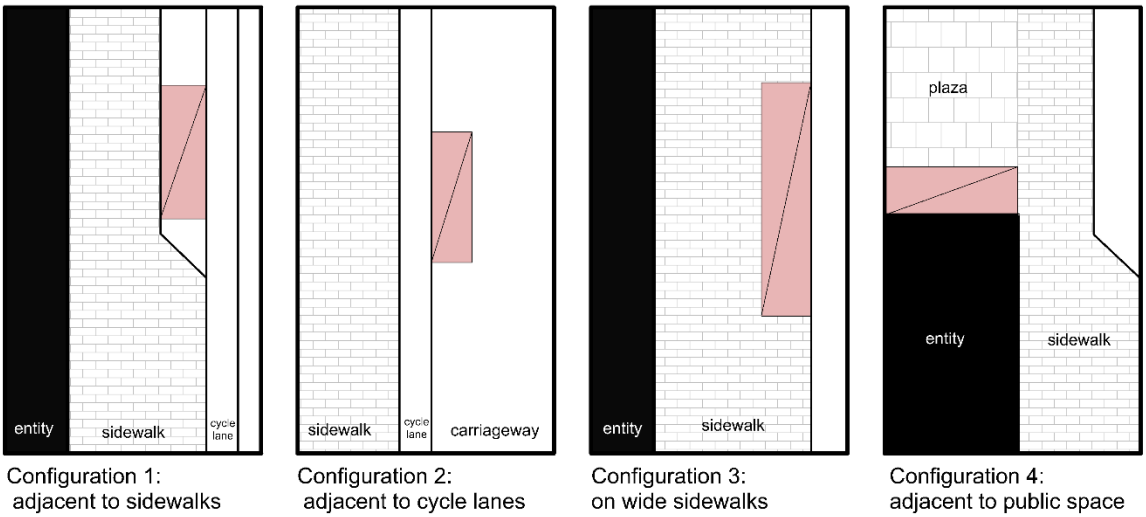


图 四-15 共享单车站点的配置地点

资料来源：作者自绘

在道路宽度充裕的情况下，共享单车骑行的单车车道应与机动车道相区分，并设置缓冲区确保骑行者的安全。常见的骑行车道的设置方法有绿化带隔离、路面抬高、与机动车道相邻以及与机动车共用车道（图 四-16）。

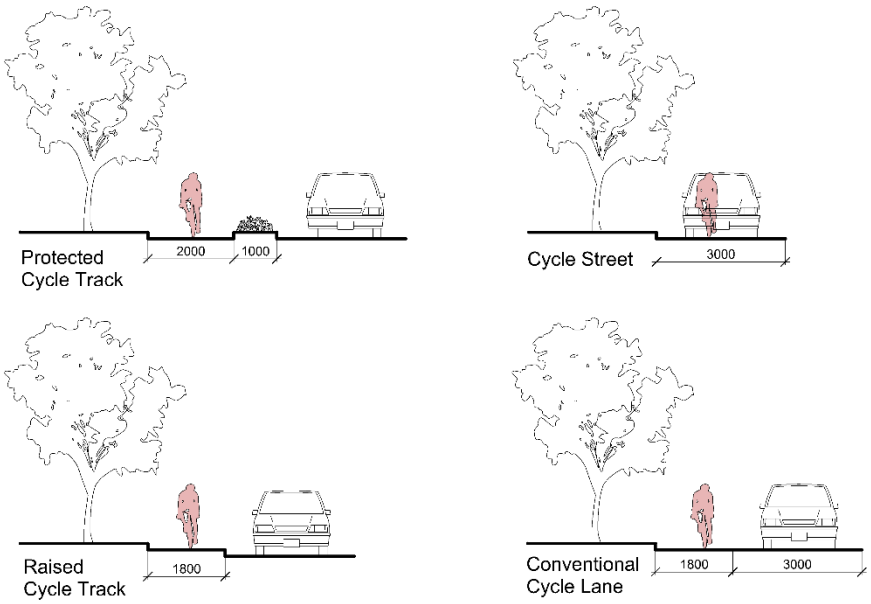


图 四-16 骑行车道的设置方式　资料来源：作者自绘

4.4.4 全龄友好的口袋空间营造

(1) 弹性设计

街区的口袋空间不仅要尽可能照顾到所有群体的需求，还应该考虑不同人群随时间变化的空间需求。因此，口袋空间中的设施和家具应采用模块化的设计理念，方便单元之间的拆解和重组。家具的选材应轻质、易移动、容易拆卸，能以最小的时间成本和经济成本实现空间功能的置换，来满足不同年龄群体的需要（图 四-17）。

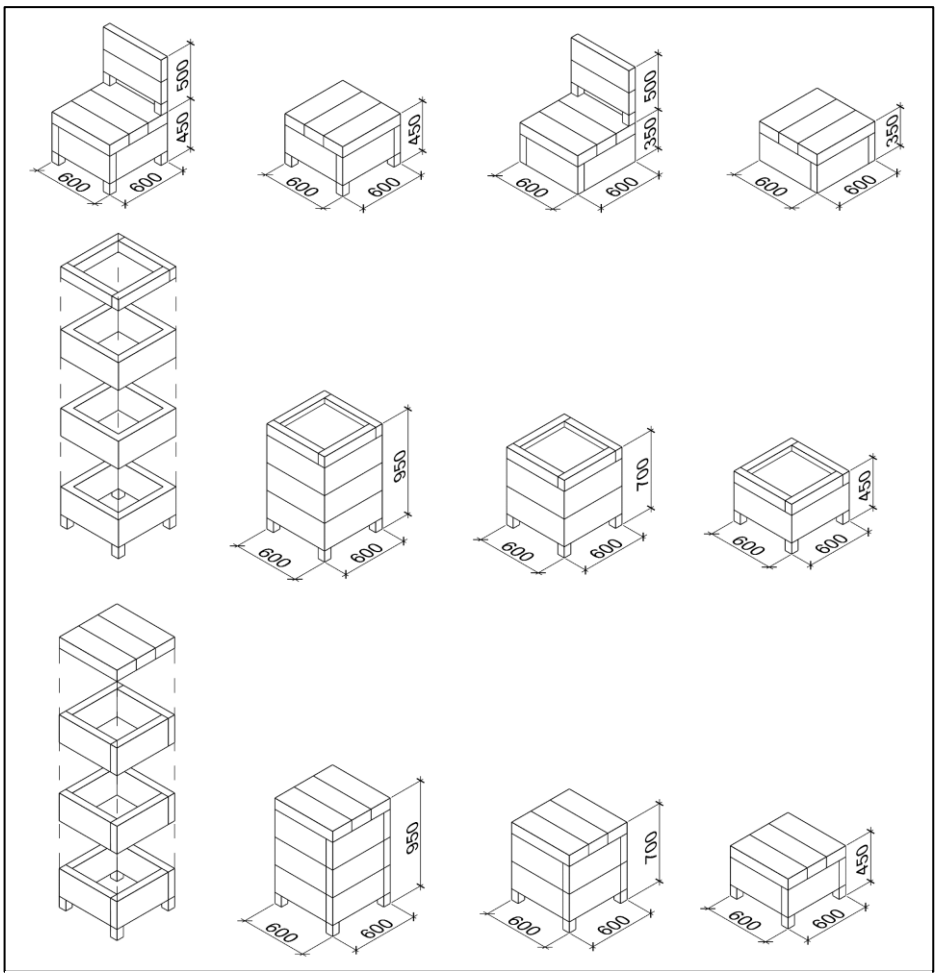


图 四-17 模块化设计

资料来源：作者自绘

(2) 考虑不同的社区情境

口袋空间的设计需要考虑到生活在社区中的居民对空间的日常使用情境。不同的使用情景代表着空间不同的组合方式，而模块化的街道家具设计则使得空间功能与对应情境的快速转变成为可能。笔者设想社区街道中的口袋空间可能发生的日常使用情境，并设计出了不同的空间组合方式（图 四-18）。

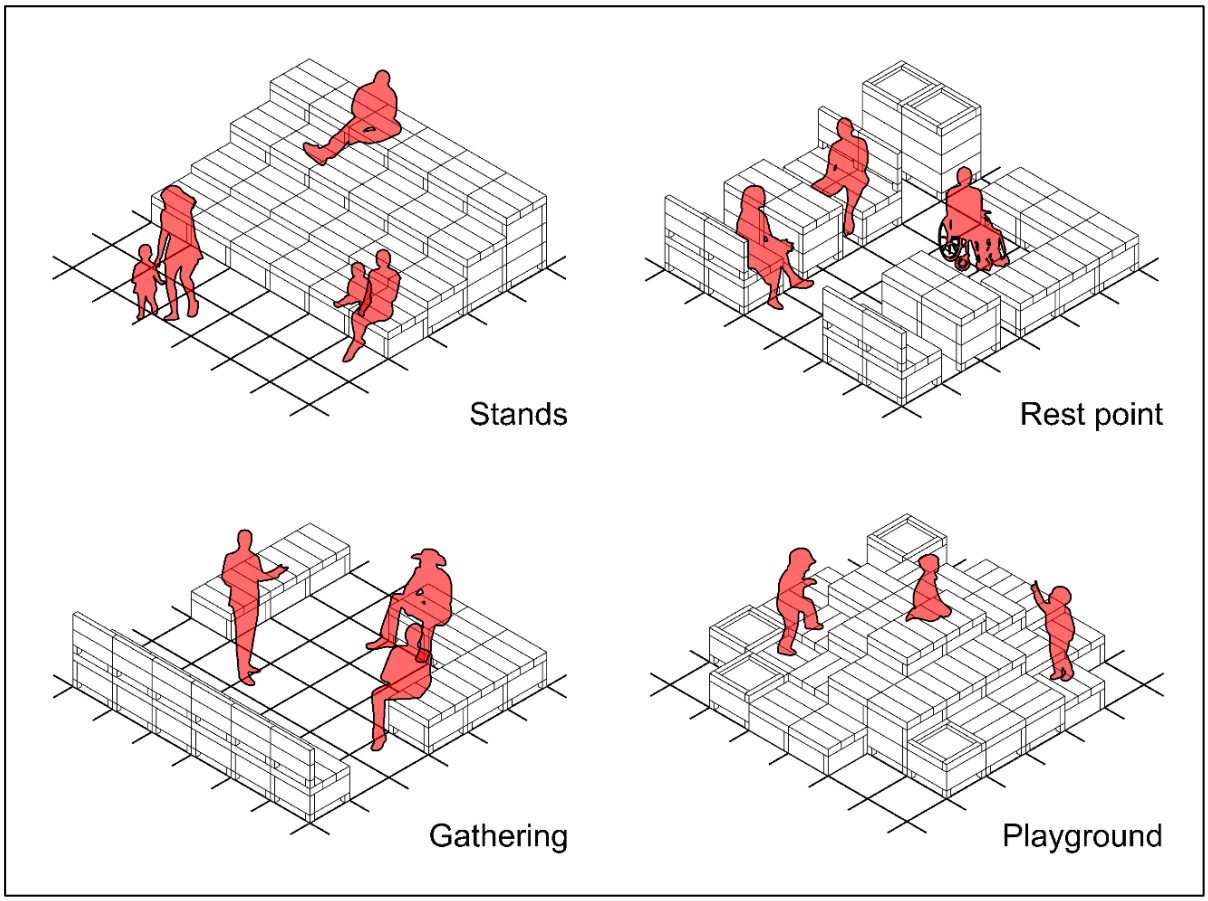


图 四-18 口袋空间使用的不同情境

资料来源：作者自绘

4.5 包容性街道的设计流程

包容性街道的设计流程在这里分为了三个步骤，即共情（Emphasizing）、构思（Ideation）和评估（Evaluation）（图 四-19）。

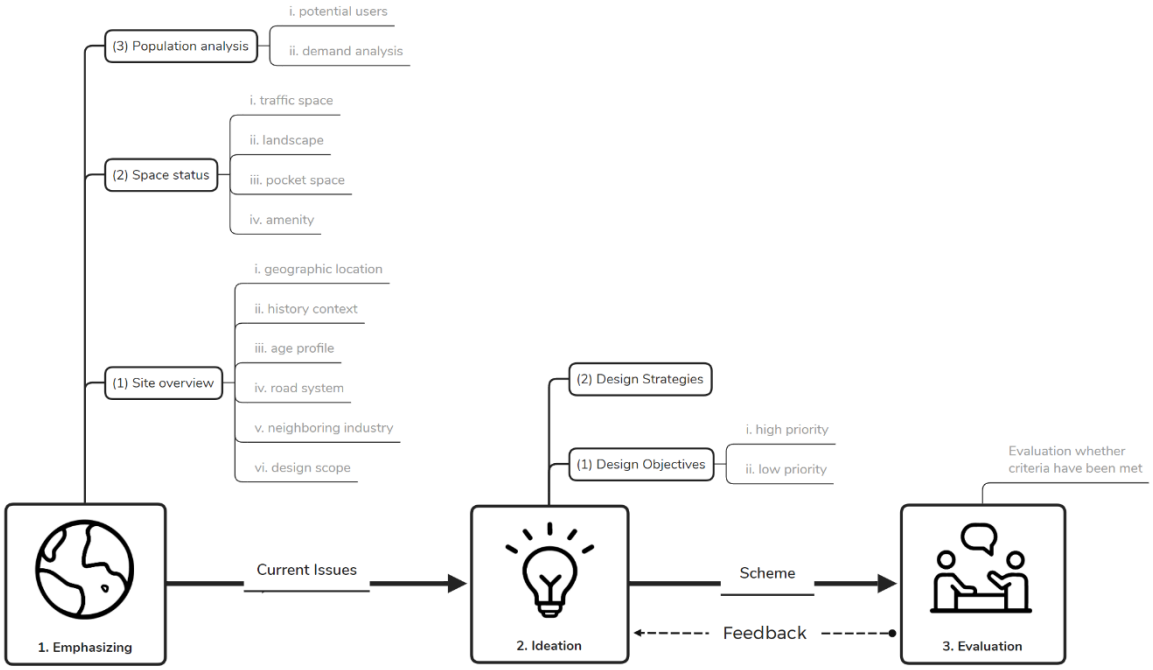


图 四-19 包容性街道设计流程

资料来源：作者自绘

4.5.1 共情

(1) 场地概况

了解场地概况是设计的第一阶段，旨在让研究者对关注的问题情境有更好的理解，是设计研究活动的开端。研究者可以通过文献收集、案例对比、实地考察、调研访谈等方式，了解设计对象所处的城市空间的背景，包括但不限于历史文脉、气候特征、人口结构、发展演变、业态分析等。通过对场地有一个概括性的了解之后，研究者才能形成对场地的初步印象。这是后续设计步骤进行的基础。

(2) 空间现况

在掌握场地的大致情况和基础资料以后，研究者需要实地考察设计中所涉及到的空间对象，亲身体验、感受和评估空间现况。通过拍照、手绘和笔记等方式，记录下空

间的类型与特征，以及所存在的问题。这是之后确定设计目标与策略的基础。

城市街道包含的空间类型很多。本文将其分为了 5 个大类与 13 个子类，并总结了不同空间类型的设计要点（附录 1）：

i. **交通空间：人行道；人行横道。**

ii. **绿化景观：绿地；植被；水体。**

iii. **口袋空间：店面；入户空间；街角。**

iv. **服务设施：标识；休息点；照明；停车场；公共卫生间。**

(3) **人群分析**

i. **定义用户群体**

有了对场地情境的初步了解之后，研究者应当明确设计的面向对象，即用户人群。通过 IDC 模型、WINIT 模型等方式将用户群体归类，并且针对不同的目标人群采用不同的设计策略。在这一步中，最重要的是识别先导用户，即使用空间的弱势群体。

ii. **挖掘用户需求**

在这一步中，研究者需要走进真实的用户。可以通过文献研究总结出不同用户群体的特征，也可以通过问卷调查或者访谈等形式了解用户的需求，例如生理需求、心理需求、空间需求等。在得到了足够多的数据支撑后，研究者需要对收集到数据进行筛选、整理、可视化并排序，确定各项需求的优先等级。

4.5.2 构思

(1) **设计原则**

设计原则是指导后续设计进行的一般性指导原则，通常基于文献分析、案例调研与项目详细情况总结得出。需要注意的是，在实际项目情况中不同因素的影响下，设计原则有先后之分。例如，前文提及的包容性街道设计原则中，安全性是其他原则成立的基础。

设计原则同样可以作为最后评估阶段的评价指标，用于验证设计方案的好坏。

(2) **设计策略**

根据项目的实际情况，研究者需要提出针对性的设计策略。它是一种系统性的方法，

包含了一系列的决策和行动。从不同的研究尺度来看，设计策略可以分为宏观尺度、中观尺度和微观尺度。宏观尺度涉及城市规划、交通流量、城市形态等问题，包括交通网络、用地布局、城市景观等方面；中观尺度关注的是街道的功能、活动空间和场所意义等问题，如路面宽度、车行道、人行道、停车位等方面；微观尺度关注的是细节、材料选择、色彩搭配等问题，包括路面材质、街灯风格、广告牌设计等方面。

4.5.3 评估

评估阶段是包容性街道设计的最后阶段。评估阶段是指在完成设计方案之后，对设计方案进行评估和审查的过程。这一阶段旨在确认设计方案是否符合包容性设计原则，并识别可能存在的问题和改进的机会。评估阶段与构思阶段是循环往复的，直至研究者迭代中相对较优的设计方案。

第五章　水荫小区包容性街道设计实践

5.1 场地概况

5.1.1　地理区位

水荫小区位于广州市越秀区内广州市动物园旁，东接水荫直街。小区的西面和南面均为城市主干道，车流量大，其中西面为高架桥。水荫小区内的居住建筑层数不高，至多 7 层，属于 1980 年代兴建的小区住宅楼，楼龄普遍在 30 年以上。

水荫区的 5 分钟生活圈内的基础公共服务设施比较完善，包含了银行、公交站、食品店、幼儿园、药店和邮局等。在 10 分钟的生活圈范围内则有一所小学、两处城市公园及一家市级医院（图 五-1）。

5.1.2　历史背景

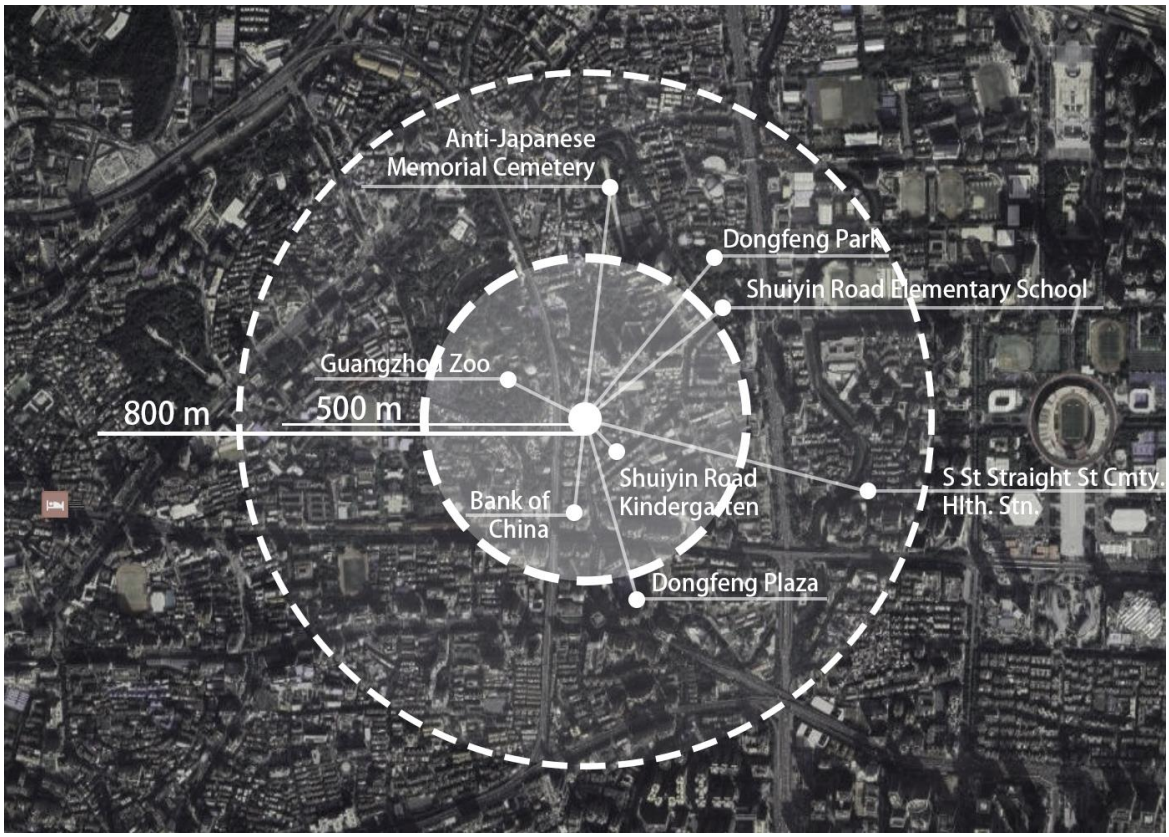


图 五-1 地理区位

资料来源：作者自绘

按照《广州市志》所载，水荫路原名十九路军坟场路。1932 年“淞沪抗战”中，十九路军将士英勇抗击敌人侵略。为表纪念，广东籍华侨于 1933 年在水荫路建十九路军淞沪抗日阵亡将士陵园[51]。十九路军坟场路在 1982 年改名为水荫路。在 1920 年代的水荫路一带都是农田，没有太多人在这里居住，同时周围都是山岗[52]。

水荫路还是广州文艺的摇篮。1957 年，星海音乐学院的前身——广州音乐学校在水荫路正式招生，水荫路开始驻扎广州交响乐团、广东民乐团、广东影像出版社、中国唱片广州分社、天天音乐书店、和谐琴行等多个跟音乐有关的地标。20 世纪 90 年代

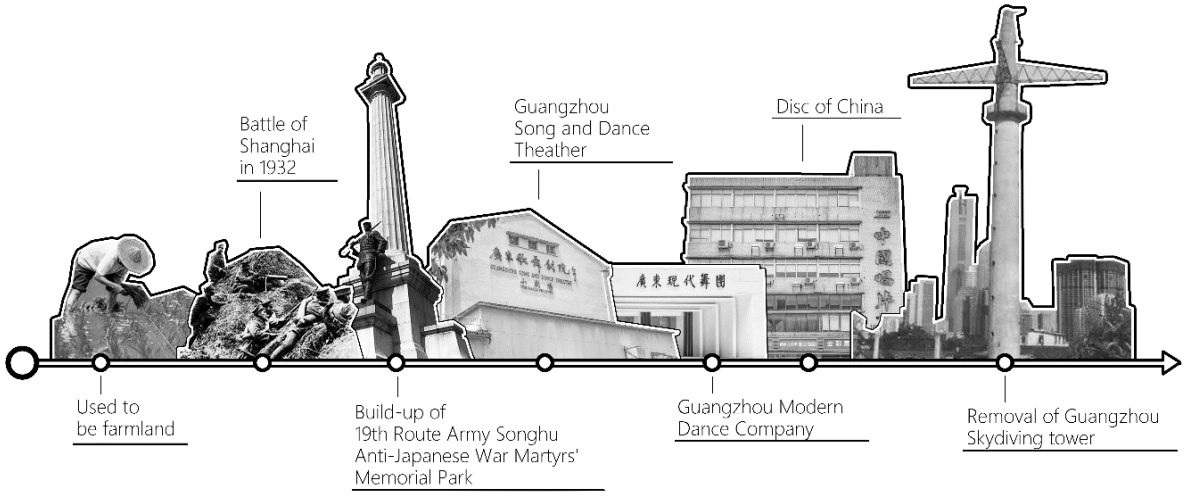


图 五-2 历史背景

资料来源：作者自绘

刚开始，中国第一个现代舞团在水荫路成立（图 五-2）。

5.1.3 年龄结构

据统计，广州已经步入中度老龄化社会。越秀区、海珠区和荔湾区是广州市内老龄化人口最多的三个老城区[53]。但根据大数据的显示，水荫小区内人口的年龄结构还算均衡。青少年人口和儿童人口在小区内的所占比重最多，约为 22.77%，其次是 19-34 的青年人群。由于周边教育产业发达，办公楼多，由许多青年租借在水荫小区内。而 55 岁以上的老年人口占比达 13.86%，所以小区属于是轻度老龄化的状态（图 五-3）。

5.1.4 道路系统

小区大致呈由南向北的矩形片状，且东边的水荫直街为小区的主要交接道路，故水

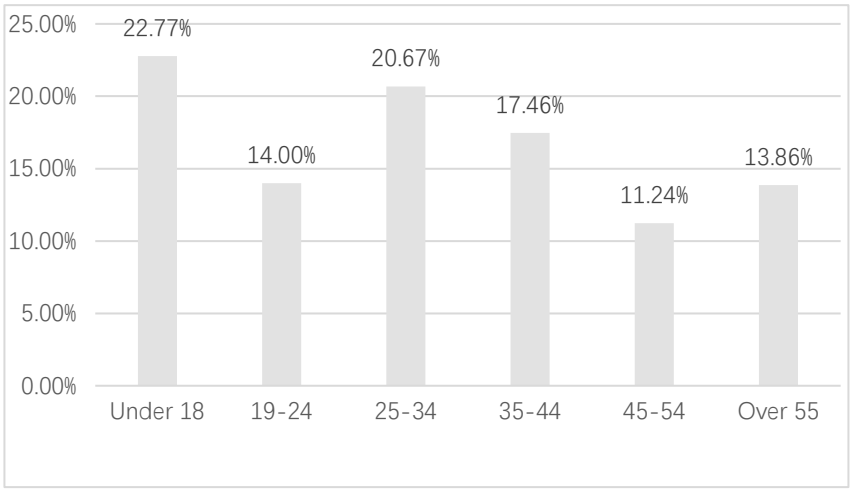


图 五-3 水荫小区人口年龄结构

资料来源：https://www.szshuwei.com/

荫小区的整体路网系统呈现由南至北的梳形结构。南面的环市东路为城市的主要干道，道路层级最高，车道配置最多，分为中间路段的快车道与边路旁的慢行车道，中间用绿化带阻隔。而与环市东路在交叉口斜街的水荫路则为居民主要生活的商业街道，周边商铺配备齐全，商业气息浓厚。水荫路宽约 10m，中间有两条各 3m 宽的双向车道，道路两旁配有路边停车位。而水荫直街南起水荫路的转折交叉口，是水荫小区居民的生活街道，其宽度相比水荫路较窄，取消了道路两旁的停车位。人行道通行宽度也较窄，且路上常有种植树木阻挡。小区的内部道路仅支持单车道，路况较差，人行步道

图 五-4 道路系统

资料来源：作者自绘

的连续性常被障碍物打断，也不利于轮椅通行（图 五-4，图 五-5）。

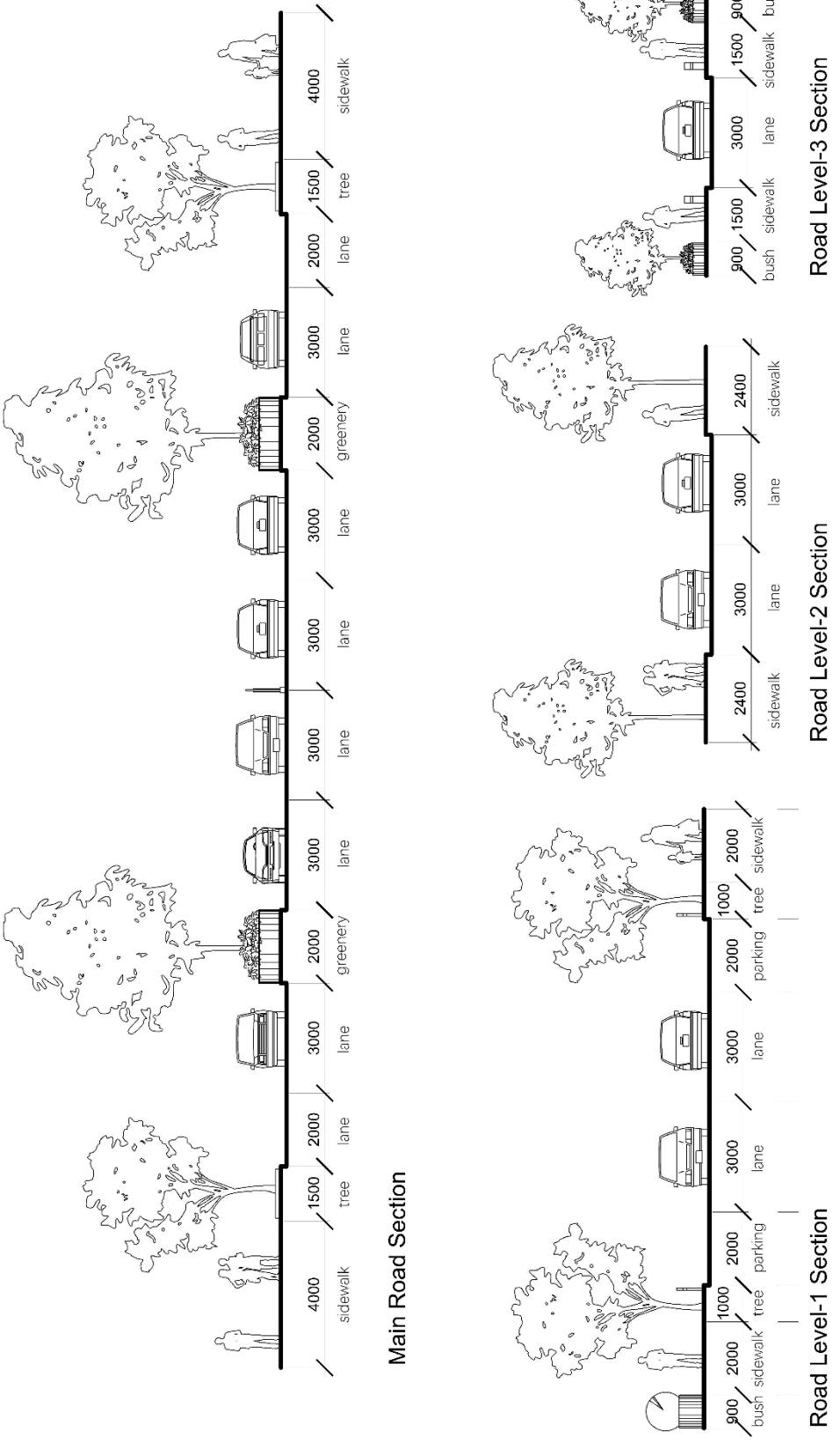


图 五-5 水荫小区道路剖断面

资料来源：作者自绘

5.1.5 周边业态

小区周边业态种类较多，但数量占比最多的业态为零售、餐饮以及生活服务，分别为31%、15%和23%。各类的店铺主要聚集在城市道路两侧，尤其是水荫路上。道路层级越低，业态的分布密度也随之下降。综合来看，水荫小区周围的服务设施能较好地满足居民的日常需求。

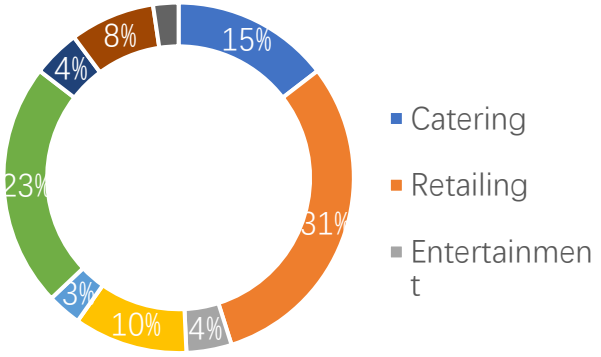


图 五-7 周边业态比例　资料来源：https://www.szshuwei.com/

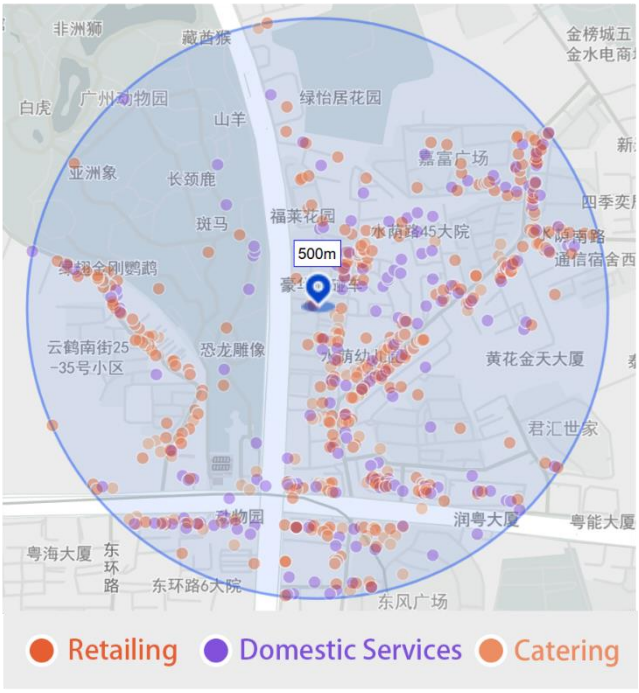


图 五-6 业态分布图　　资料来源：https://www.szshuwei.com/

5.1.6 设计范围

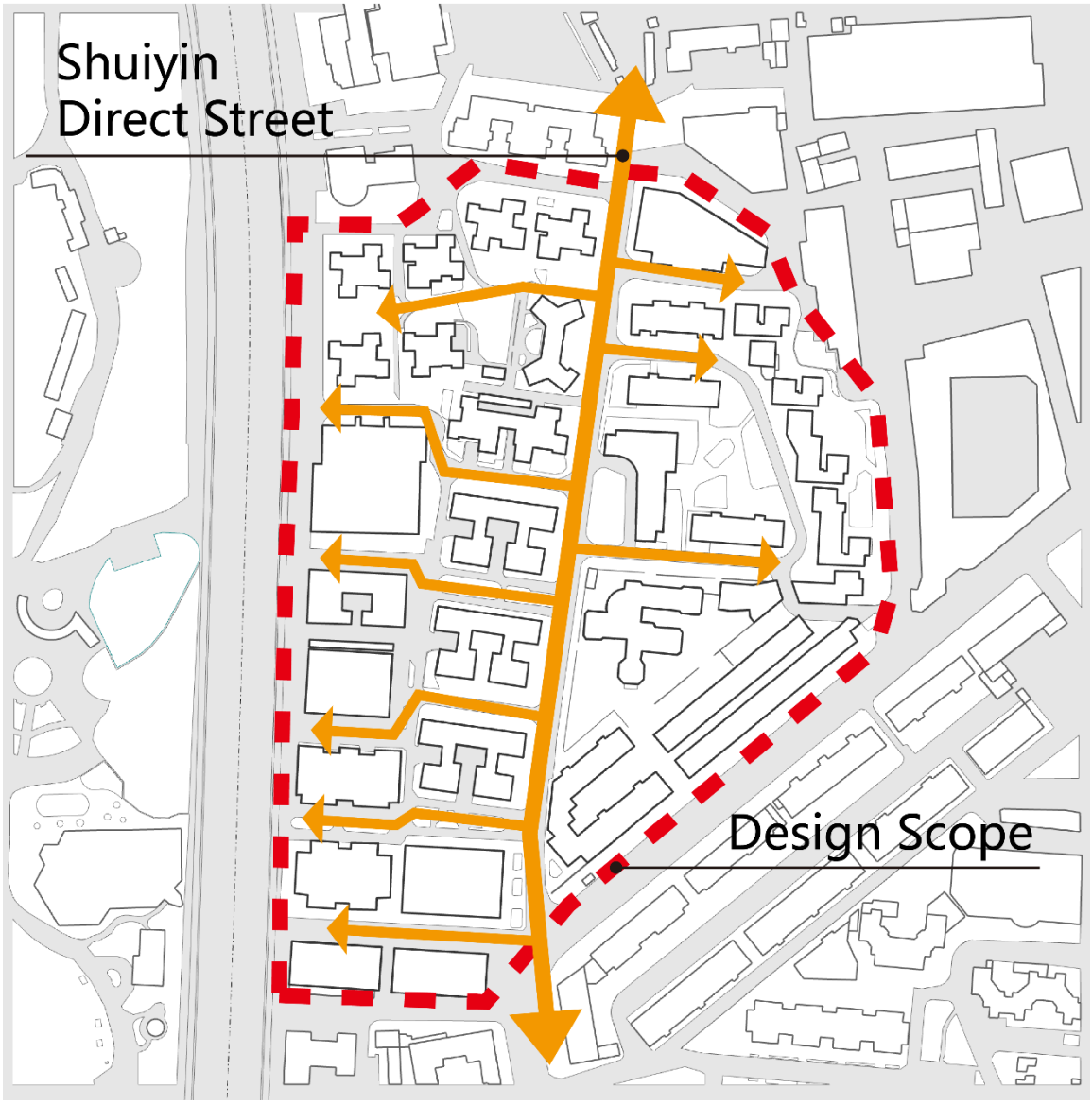


图 五-8 设计范围

资料来源：作者自绘

5.2 现状评价

5.2.1 交通空间——人车矛盾突出

总体而言，小区的交通空间路况较差。从安全性方面来看，道路中的铺砖凹凸不平，容易绊倒，也不利于轮椅通行；大部分铺砖表面没有做防滑设计，雨天容易滑到；铺砖样式混杂，缺乏维护，缺口处常用水泥和砂浆填平，道路可辨识度很差。除了城市主干道和次要干道之外，其他道路尤其是小区内部道路的夜间照明十分缺乏，可见度极差。此外，在水荫路与环市东路交叉口不远处的人行横道与与周边人流量较大的道路直接交接，缺乏等候与缓冲空间；给予行人穿行的时间较短，对于老年群体来说较为匆忙。幼儿园大门前的集散空间较少，与周边车辆、行人缺乏缓冲空间。

图 五-9 交通空间现况

资料来源：作者自摄

5.2.2 绿化景观——养护不佳

道路层级、人流量越大的区域，绿化景观的维护程度越好。但水荫小区内部的绿化景观长期缺乏维护，例如，植被底部的基座出现破损，路边灌木没有修剪导致长势越过了人行道，影响通行。此外，场地绿化景观的植被色彩、层次搭配相对单一，丰富度不足，难以具有观赏性（图 五-10）。

水体对局部范围的温度调节具有重要作用，还能增加场地的丰富程度，为居民提供游玩、观赏等功能。但水荫小区的绿化景观设计几乎没有水体景观。

图 五-10 绿化景观现况

资料来源：作者自摄

5.2.3 口袋空间——空间活力不足

在本文中，口袋空间特指那些城市街道旁由建筑界面或设施围合而形成的可供行人停留的小型公共空间。而在水荫路上，口袋空间大致有三类：一是由居民楼凹凸的建筑界面围合而形成的入户空间；二是商铺前的空间；三是道路转角处的空余场地。

这些口袋空间具有成为社区交往空间的潜力，但依据现况来看，这些空间普遍缺乏规划和设计。首先从空间观感的角度来看，大部分口袋空间都被机动车辆所占据，且停车位缺乏设计和规划，乱停车的现象严重；空间的材质、铺砖比较混杂，整洁程度较低。从社会交往的视角来看，这些口袋空间缺乏发生交流的硬性设施条件，即休息设施的缺乏。

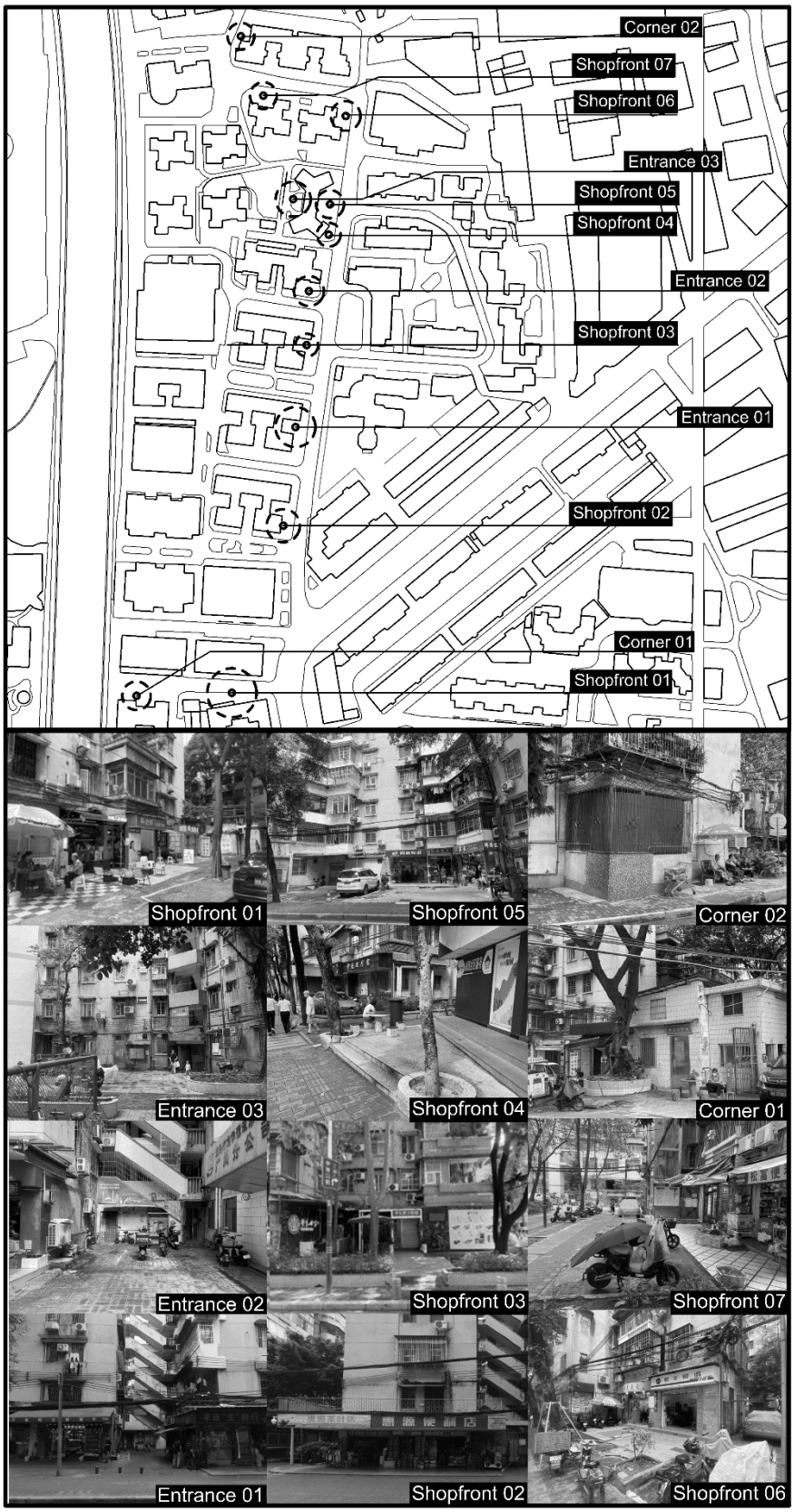


图 五-11 口袋空间的分布及现况　　资料来源：作者自绘

5.2.4 基础设施——数量欠缺

水荫小区周边的基础服务设施相对比较完善，并且大多数基础服务设施的入口处有基本的无障碍坡道设计，方便老年群体使用和通行。小区的南面有一处社区卫生所，可以满足老年群体基础的诊断和治疗服务。而在水荫路上也有许多药房。水荫直街两侧均分布有果蔬商铺、肉铺，东面则有一个规模相对较大的地下菜市场，是居民日常购物的主要去处（图 五-12）。

图 五-12 社区医院（左） 果蔬商铺（中） 地下菜市场入口（右）

资料来源：作者自摄

图 五-13 住宅楼的加装电梯

资料来源：作者自摄

此外，水荫小区内的大部分老旧住宅均配有电梯设施（图 五-13）。电梯均属于居民楼建成后加装，其入口处一般直接向外，基本没有过渡空间。

然而，小区的停车位相当紧缺。在小区内走访调查时，最影响空间步行体验的因素应该属于区域内的停车乱象。小区的人行道上经常占有各类家用车和电动车，给步行带来很大阻碍；尤其是水荫直街东侧的光影时代大楼前的集散广场，占满了私家车（图 五-14）。这也侧面反映出小区内部的停车位数量十分缺乏。尽管小区的北面有 3-4

处停车场，但均非对水荫小区内的居民开放。

图 五-14 集散广场停满了机动车辆

资料来源：作者自摄

在水荫小区的东面有一所幼儿园。单从外部来看，幼儿园两处的大门与周围道路直接交接，集散场地不足，缺乏缓冲区，在人流量较大的上下学高峰可能会带来很大的安全隐患。此外，门口的其他设施配备，如供家长休息等待的空间，也基本没有。从幼儿园建筑的外立面来看，整体建筑比较陈旧，表面有许多因雨水冲刷而形成的污渍，缺乏幼儿园建筑应有的活力感和辨识性（图 五-15）。

图 五-15 水荫幼儿园入口

资料来源：作者自摄

小区内有几处休息点，设置有公共座椅。但这些休息设施大部分都缺乏维护，并且缺乏无障碍设计。例如，在邮局门前的座椅是设置在台阶之上的，没有无障碍坡道，

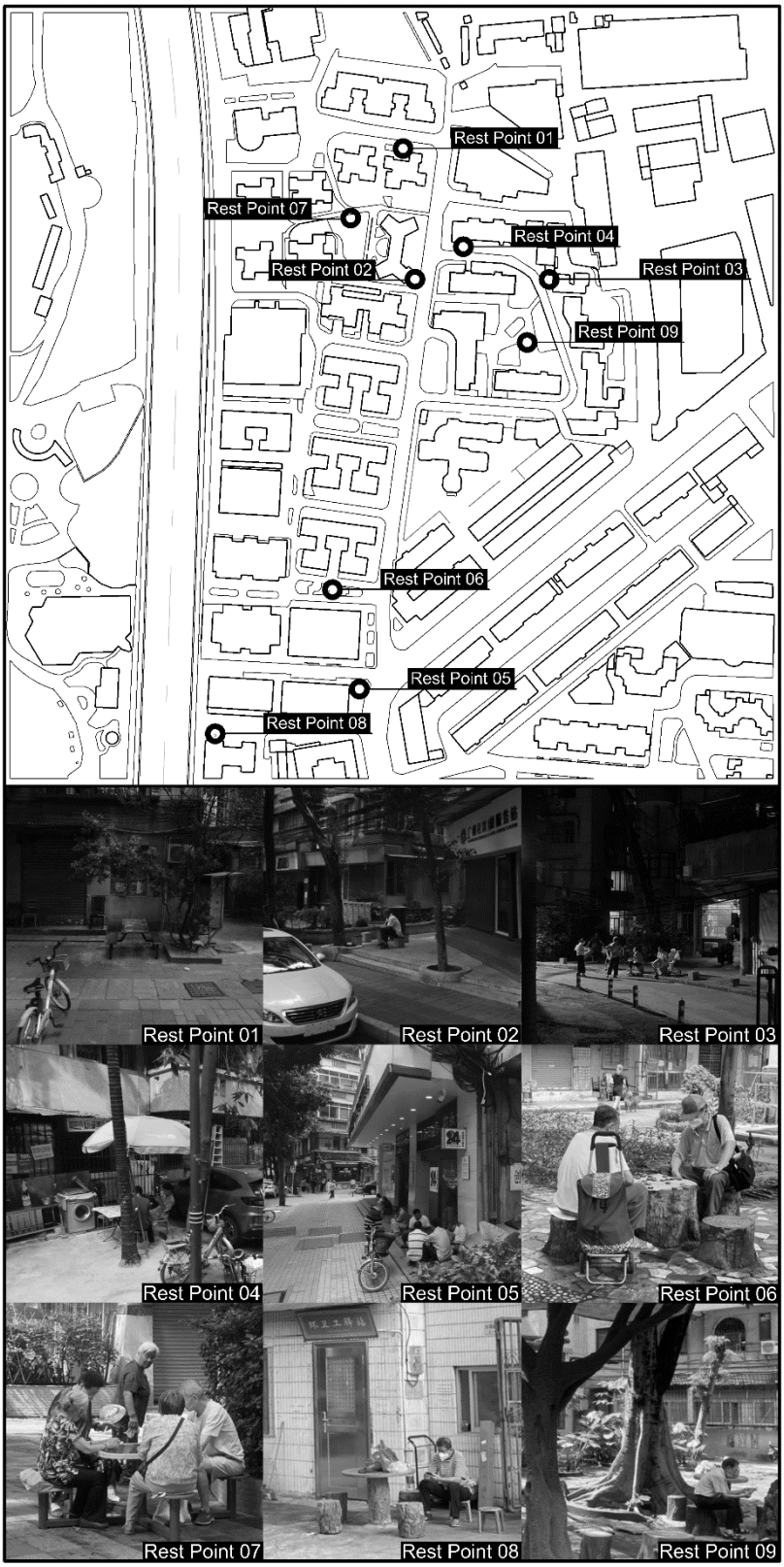


图 五-16 休息点的分布和现况

资料来源：作者自绘

导致身体机能不便的人群使用非常困难。而且，就休息点的服务半径在水荫小区内也并没有做到完全覆盖。对于成年人而言，休息设施的设置间距一般在 200-300m，老年

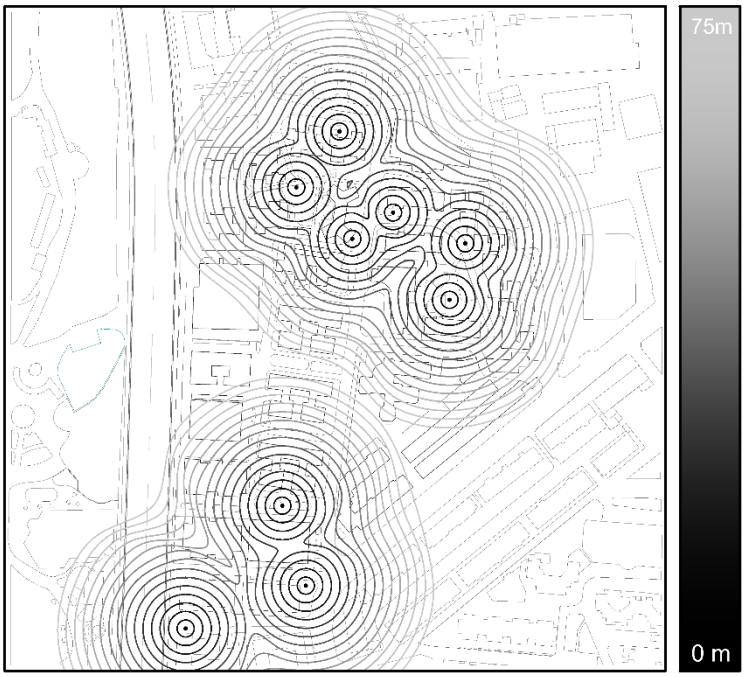


图 五-17 休息点的可达性分析

资料来源：作者自绘

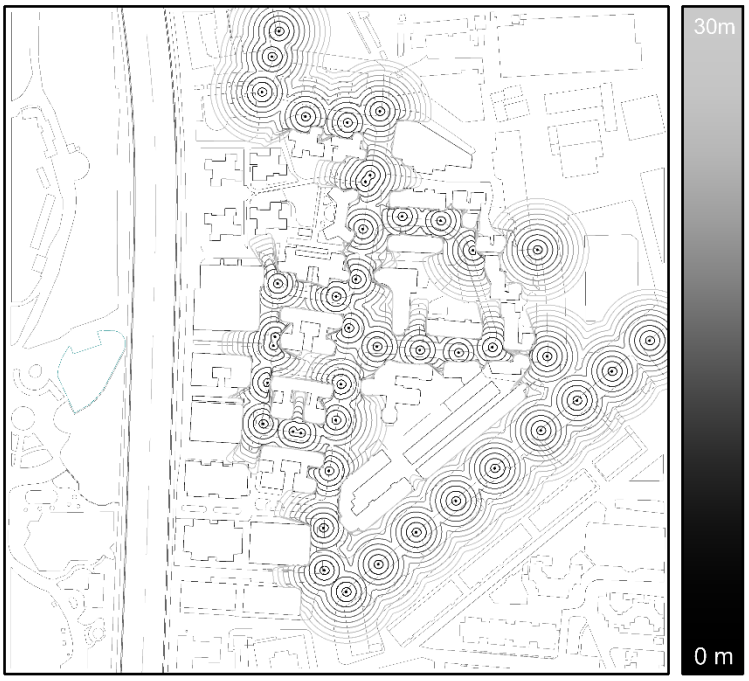


图 五-18 照明设施的分布

资料来源：作者自绘

人为 150-200m，而对于孕妇这类特殊群体，设置间距一般建议在 50-100m。笔者将小区内现有的休息点的服务半径设为 75m，并检验休息设施是否能对整个小区实现全覆盖（图 五-17）。根据分析可知，水荫路中段有块较大的空白。该处最近的两个休息点

距离大致在 150m 左右。此外，现有的休息点设置都颇为隐蔽，没有路牌的知识和显眼的标识设计使得人们很难找到这些休息点（图 五-16）。

而在道路关键的交叉口几乎没有相关的标识设计。小区内的建筑首层也并没有设置公共卫生间。而对水荫小区内现有的照明设施分析来看，水荫路上的照明十分充足，使得夜晚的人流量很旺。但是，社区内部道路的夜晚照明缺乏，除了零星的社区居民，几乎没有行人（图 五-18）。

5.2.5 问题总结

空间类型	水荫小区街道空间主要问题
交通空间	属于行人的街道空间被大量机动车辆占据，不仅影响行动障碍和视觉障碍人群的出行，还阻挡了儿童观察街道车流的视线。
	人行道上有许多步行阻碍，如直立在人行道上的灯柱、树木，随地摆放的杂物等，不利于视觉障碍和行动障碍人群的出行，也打断了步行空间的连续性。
口袋空间	在传统印象中，街道的口袋空间应是老年人茶余饭后小憩和闲聊交谈的活力点，但水荫直街的口袋空间由于缺少发生交流的硬性设施条件，氛围冷清，空间利用率低。
基础设施	照明、休息设施设置不到位，对于行动不便和有视力障碍的人群而言街道的使用舒适性较低；社区内的停车位缺乏，导致街道中乱停车的现象，空间观感差。

表 五-1 水荫小区街道空间主要问题

资料来源：作者整理

5.3 人群分析

人群分析是共情阶段的最重要一步，其目的是挖掘空间场地内的先导用户群体，并分析他们的需求。笔者首先通过文献调查与实地观察的方法，罗列出了水荫小区内潜在的用户群体，之后从用户数量与使用能力两个维度构建了设计优先级矩阵，确定场地中需要重点关注的先导用户群体。接着通过文献调查、问卷、访谈和实地观察的研究方法，分析了这些先导用户群体的特征、需求和行为，作为后续设计推进的依据（图 五-19）。

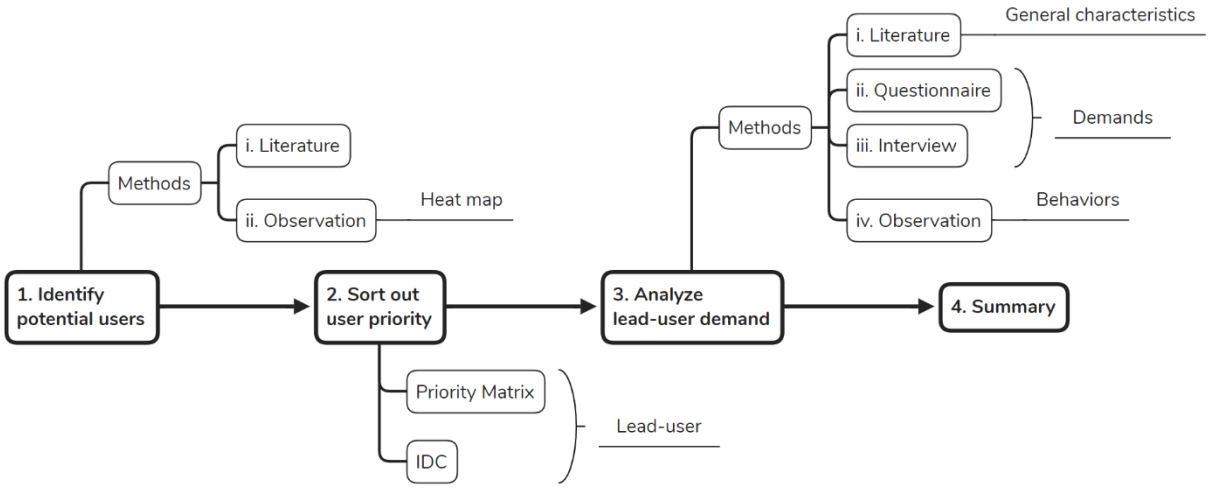


图 五-19 人群分析的工作方法

资料来源：作者自绘

5.3.1 识别用户群体

为了确定水荫小区内的人群主体，笔者采用了实地观察的研究方法记录了小区内重要节点空间的主要人群类别。在早上 9 点-12 点、下午 15 点-18 点、晚上 19 点-21 点三个不同时段，在每个节点停留 3 分钟并记录下过往人群的数量、类别与行为（图 五-20）。

通过在水荫小区不同日期、不同时间段、不同地点的实地观察发现，小区内街道的主要人群为中老年人、儿童以及年轻租户（图 五-22）。中老年群体的身体状况差异性也很大，有的身体硬朗，有的使用轮椅或拐杖。而携幼成年人的出行方式也很多样，如单手环抱的、推婴儿车的和携手的。

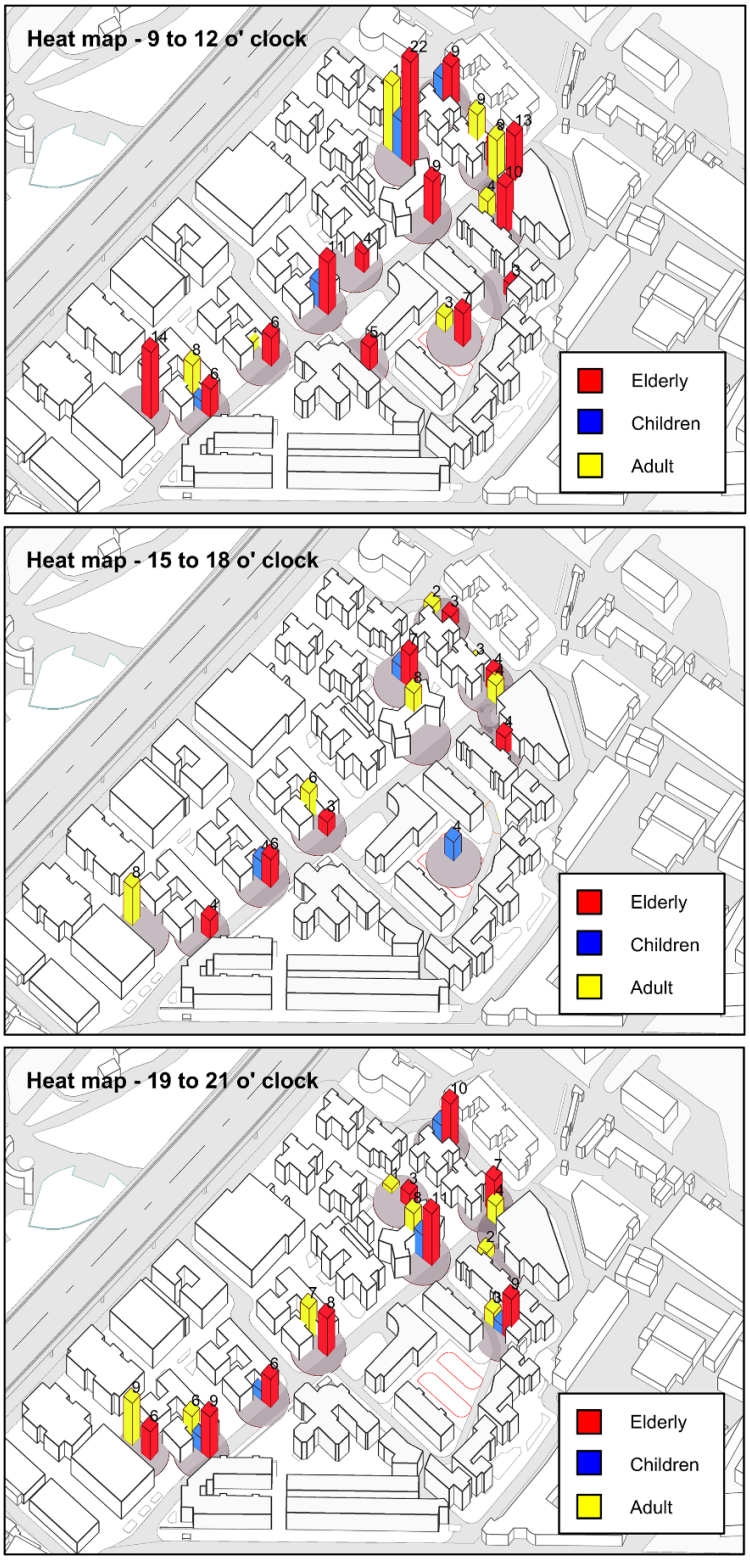


图 五-20 不同时段不同节点的人流量统计

资料来源：作者自绘

在结合了实地考察和文献调研[54]两种研究方法，笔者尽可能地罗列出了水荫小区中使用街道的潜在群体，并通过对这些人群感知能力、认知能力、运动能力的三个维度的评估，将它们置入包容性设计立方体中。各个维度的量化程度被分为三个等级，即健全、中度残障和重度残障。根据三个维度不同等级的残障，各个人群可以被归纳为 27 种子类，以此确定不同的针对性设计策略（图 五-21）。

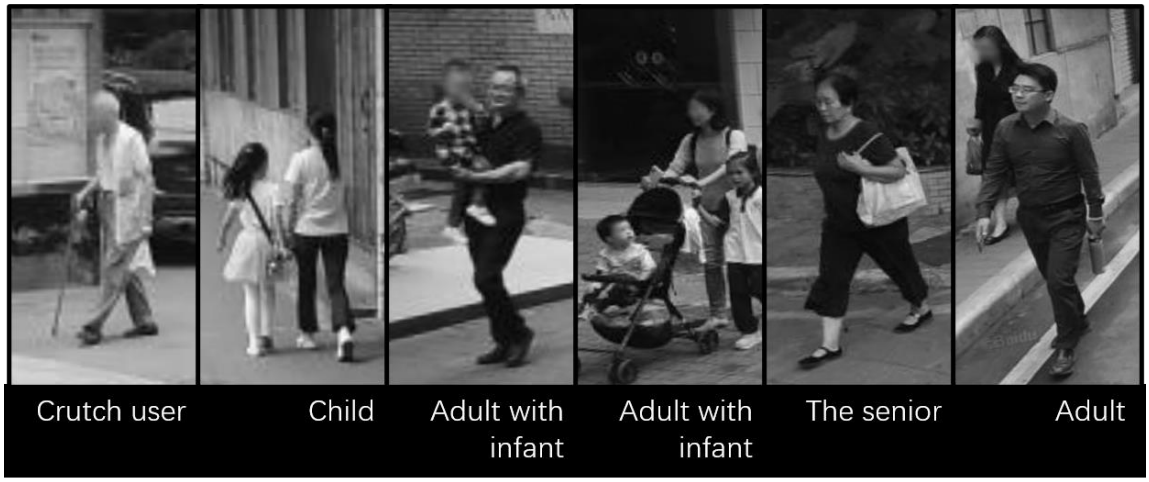


图 五-22 水荫小区内的主要人群

资料来源：作者自绘

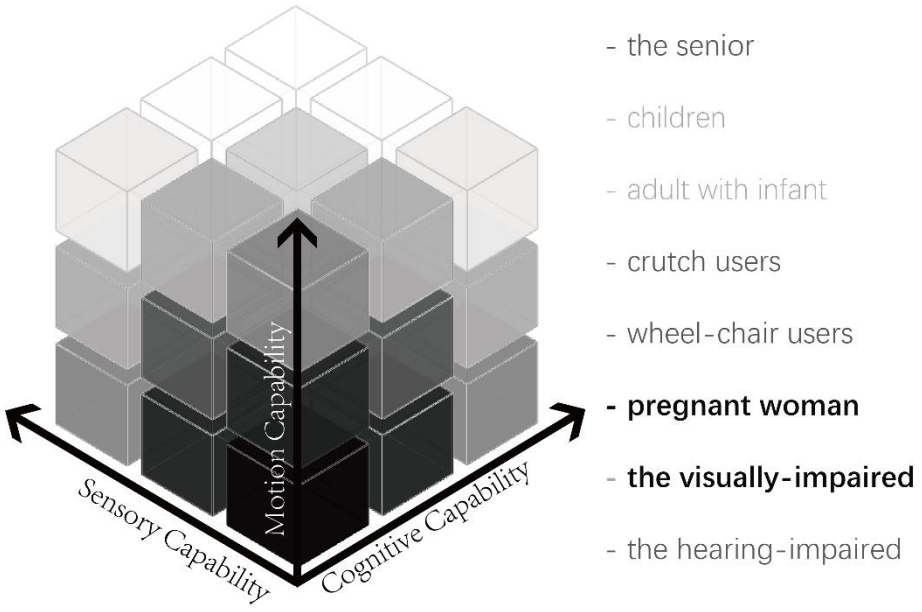


图 五-21 包容性街道设计立方体模型

资料来源：作者自绘

最终，根据街道使用人群身体机能的好坏与人群数量的多少，可以确定出水荫小区包容性街道对于不同人群的设计优先级（图 五-23）。人群数量最多、身体机能较差的

群体是设计最优先考虑的群体，其次则是身体机能较差、人群数量较少的群体。以这些先导用户的需求作为包容性街道设计的最低门槛，同样能顾及到身体机能健全的普通人。

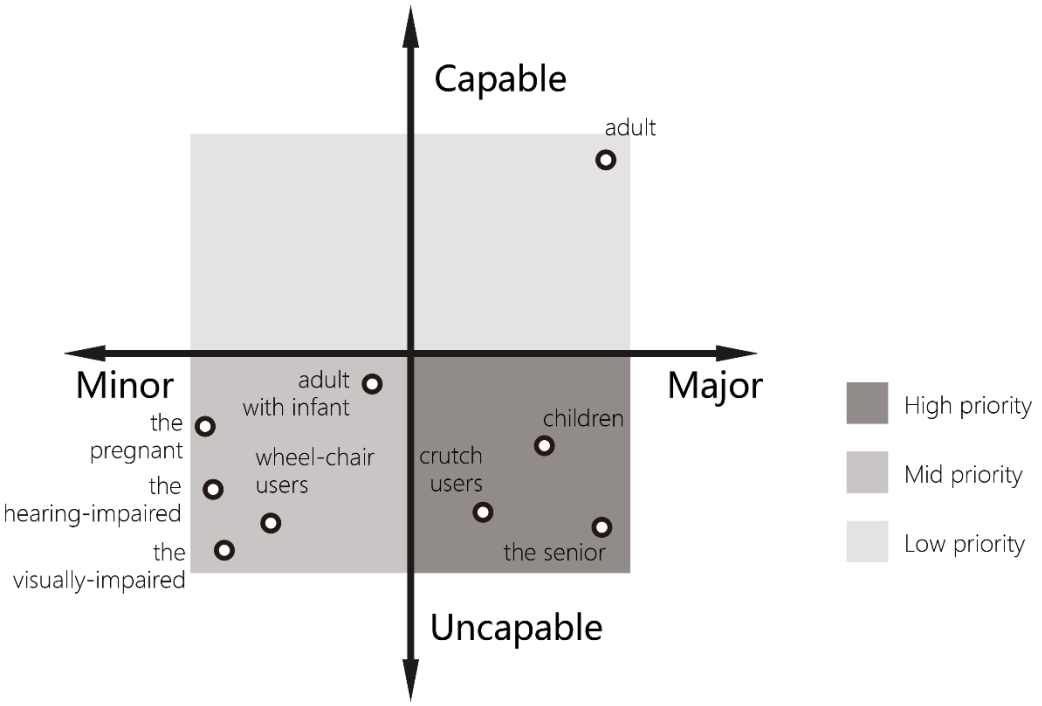


图 五-23 设计优先级矩阵

资料来源：作者自绘

5.3.2 挖掘用户需求

(1) 人群特征

i. 老年群体

随着年龄的增长，身体开始出现生理衰老的现象。进入老年阶段后，视觉的衰退使得老年人对形象和颜色的辨识能力下降；听觉能力的下降导致难以接收到关键的警报信息；嗅觉的退化让老年人对空气中的异味或有害气体不够敏感；神经功能的减弱让部分群体出现记忆力下降、认知能力降低等情况，甚至出现智障症状；运动功能降低则主要表现在肢体灵活度降低、肌肉力量下降、骨骼变脆等，使得扭伤、骨折、易跌倒等损伤发生的概率增加。

老年群体同样也是对社会交往需求最大的群体。老人从工作岗位上退休以后，活动

范围从社会转向了家庭，与外界的社会联系逐渐减弱。但由于中国当代家庭结构的变化，老人与子女的交流机会并不多。社会交流的缺失使得孤独、落寞成为老年群体中常见的负面情绪特征[55]。

ii. 儿童群体

不同年龄段的儿童具有不同的发展特征，因此对外界环境的需求也不一样 。3 岁以前是儿童大脑发育的重要时期，包括了基础感知功能、语言功能和高级认知功能。在这一阶段中，生动的外界环境可以有效刺激儿童大脑的发育；在 3-8 岁，他们已经可以跟随看护者一同出行，并独立完成一些活动。儿童与看护者的情感联系对于儿童之后社会交往与情感功能的发展具有重要作用；在 8-13 岁，大部分情况下他们已经能够独自出行，但受限于身高、体能等因素，许多公共设施的使用对他们并不友好。

大部分情况下，儿童都是在看护者的带领下出行，因此街道的空间与设施设计应考虑到多种可能得出行情况，例如自行车、婴儿车、携手、抱扶等。对于儿童而言，幼年时期的主要任务就是玩和学习，所以街道中应当设置游乐场地，或加入其他一些游玩元素。而传统的街道对于儿童的健康与安全并不友好，磕碰、车祸、尾气污染等情况时常发生，所以街道的安全性是第一要义。充分的视线交流能让看护者和周边居民及时发现危险情况，并提供帮助。最后，考虑到儿童的身高，许多街道设施对于他们而言是够不到的。而且身高导致的视线阻碍使得他们相比与成年人更难发现附近的车流情况并及时避让[50]。

iii. 残障群体

残障群体共包括以下七类：视力障碍、听力障碍、言语障碍、肢体障碍、智力障碍、精神障碍和多重障碍。本文则主要考虑行动障碍者和视力障碍者的街道空间需求。

对于视力残障的不同程度，视力障碍者又可以分为全盲者和低视力者。低视力人群的无障碍设计可以参照老年群体。而全盲者由于不能利用视觉获取信息，需要借助许多外力来辅助他们的日常生活，例如导盲犬、盲道、扶手、盲文、音响信号灯。行动障碍者，又可以称为下肢障碍者，包括了拐杖和轮椅的使用者。轮椅所占用的空间较大，且无法适应台阶和地面的高差。拐杖使用者由于下肢障碍，行动缓慢，攀登困难，水平推力差，容易摔跤。所以，包容性街道的设计要关注空间使用的安全性、舒适性和无障碍，为行动不便的群体留有足够的通行空间，设置适宜的扶手辅助行进；在高

差变化处应设置缓坡，必要时可以安装电梯、扶梯灯设施解决垂直交通问题；地面应当平整、防滑、坚固、不积水，防止跌倒或滑倒[54]。

(2) 问卷访谈

通过文献资料对先导用户群体有了一个粗略的了解以后，研究者还需要深入到场地内部，了解个体情况。在选取了不同日期、不同地点、时间段以后，笔者发放了 31 份调查问卷，获得有效问卷数量为 30。问卷调查主要面向水荫小区内的居民和街道的日常使用者。其内容有三部分，一是个人基本概况，二是街道空间的现况评价，三是开放性的访谈环节（附录 2）。

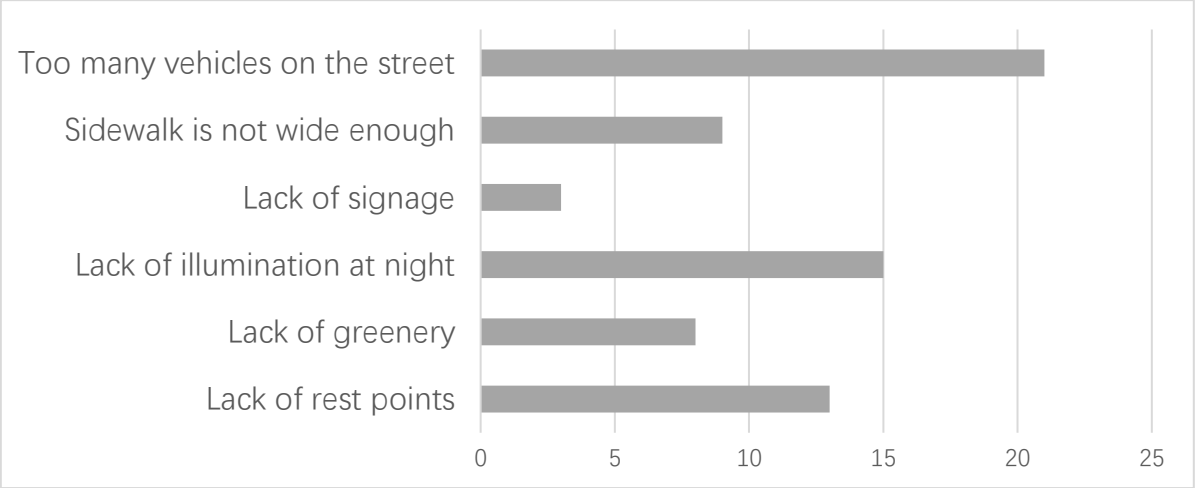


图 五-24 街道空间的不足之处

资料来源：作者自绘

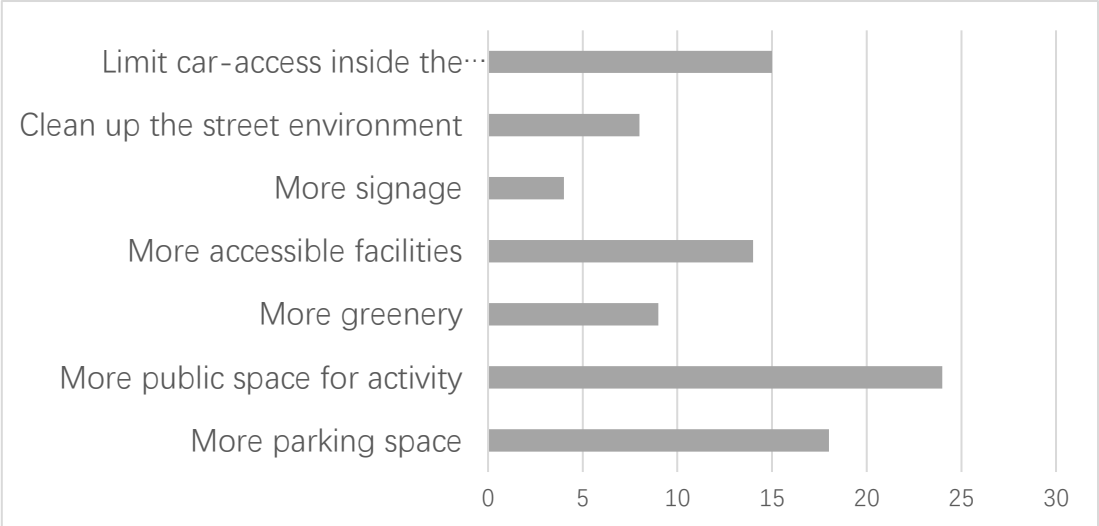


图 五-25 街道空间的改进措施

资料来源：作者自绘

接受调查访谈的大部分人群都是社区内的居民，以中老年人为主，还有一些年轻租户。在水荫小区的街道空间评价方面，多数人认为最为突出的问题是街道内的机动车过多，占满了街道空间，甚至阻碍了步行的连续性。而小区内部道路缺乏夜间照明、街道上休息设施的缺乏也是访谈人群比较关注的问题（图 五-24）。在谈及如何改进街道空间时，多数人希望小区内拥有更多的公共空间，更多的停车位。半数人也同样支持机动车在小区内限行，减少空间占用。

在开放性的访谈环节，访谈对象的回答仍旧聚焦在对公共空间的需求上，但不同人群的空间需求也有着细微的差异。例如，孩子希望能有更多玩耍的场地，而母亲并不放心街道的安全；老年人更喜欢在街边和邻居一边乘凉一边聊天；而年轻租户则想要更多可以结交朋友的场所。

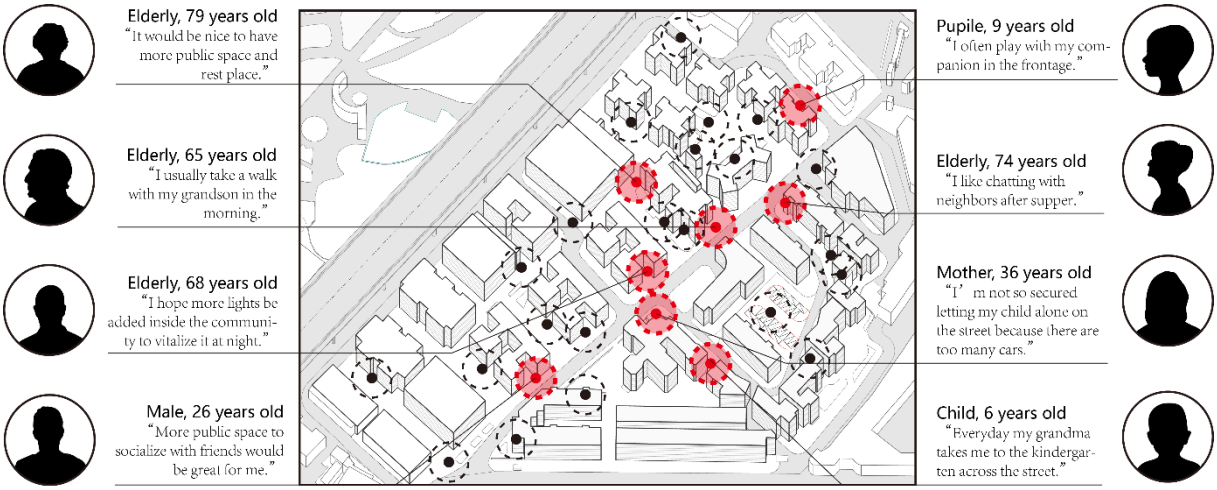


图 五-26 访谈内容

资料来源：作者自绘

(3) 行为观察

在统计场地人流量和主要人群类别的时候，笔者还观察了不同人群在街道内的日常

图 五-27 儿童群体的日常行为

资料来源：作者自摄

行为活动。街道上有不少儿童在家长的陪同下练习骑自行车；店铺前也能观察到他们在写作业和玩耍；同样还有不少前往补习班的学生。而对于老年群体来说，买菜、闲谈、带孩子则是他们的主要生活日常。

图 五-28 老年群体的日常行为

资料来源：作者自摄

(4) 需求总结

结合前文的文献资料、问卷访谈结果和实际观察到的内容，可以总结出先导用户群体的主要需求（表 五-2）。

Group		Special Demands
The senior		- Social interaction - Vision guidance - Multi-sensory hint - Barrier-free
Children		- Space to play and learn - Access to facilities - healthiness and safety - Visual access
The handicapped	the visually-impaired	- Space for guide dogs -Tactile paving - Braille - Auditory hint
	the mobility-impaired	- Enough space to pass through - Smooth, anti-slip ground - Elevator - Handrail

表 五-2 群体需求

资料来源：作者整理

5.4 设计策略

前一节的内容分析了水荫小区内的街道上的不同空间类型与存在的问题（表 五-1），以及使用包容性街道设计立方体模型（图 五-21）和设计优先级矩阵（图 五-23）确定了场地中的先导用户人群，并根据人群特点归纳了他们的需求（表 五-2）。结合上述现况问题和人群需求，现提出以下几大设计策略（图 五-29）。

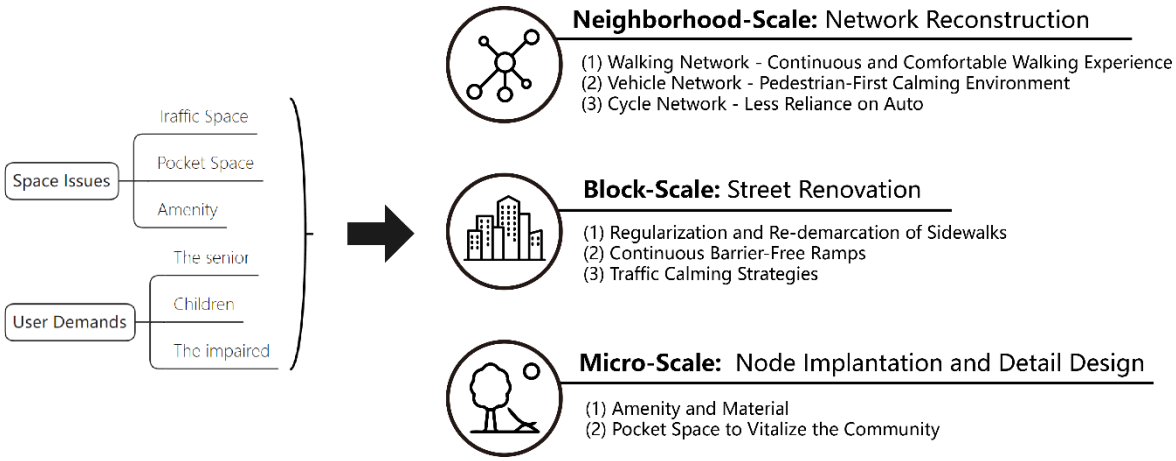
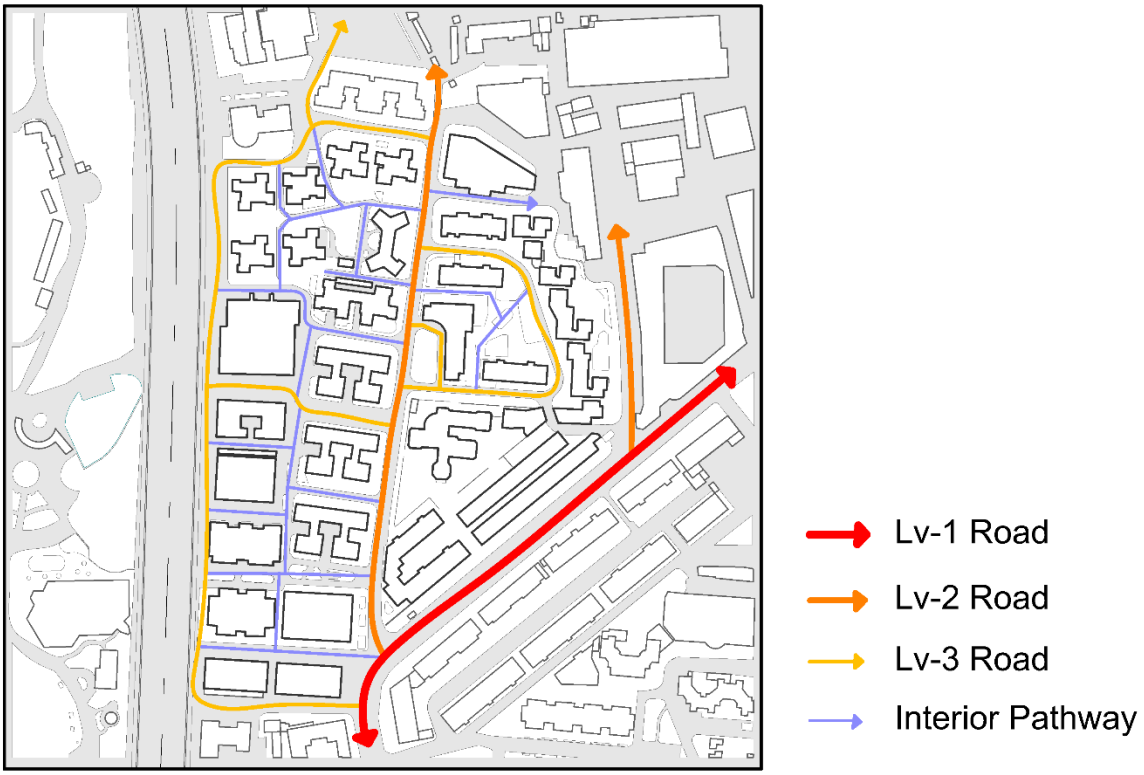


图 五-29 设计策略

资料来源：作者自绘

5.4.1 邻里尺度——交通网络重构



在原先小区路网的基础上，笔者重新进行了道路系统层级的规划与设计。原先小区内的路网分级的目的性不够明确和清晰，导致小区内部的大量居民活动和行走的空间被机动车所占据。为了解决这一问题，小区被分为南北两个组团，通过一条二级道路隔开。组团内部是仅供居民和行人使用的宅间道路，禁止车辆通行。

(1) 步行网络——连续舒适的步行体验

水荫小区的街道空间在提升步行体验方面还有很大的改进空间。根据前面的空间现状分析可知，街道步行空间的主要问题在于小区内的人车矛盾，以及无障碍坡道的缺失、路径上障碍物的阻挡而导致步行的连续性被经常打断。此外，街道上的基础设施的数量也难以满足包容性街道设计的要求。

为了提升步行网络的连续性，笔者首先研究了小区内的兴趣点。这些兴趣点是社区内居民日常出行的主要目的地，包括了社区医院、菜市场、幼儿园、公共活动场地以

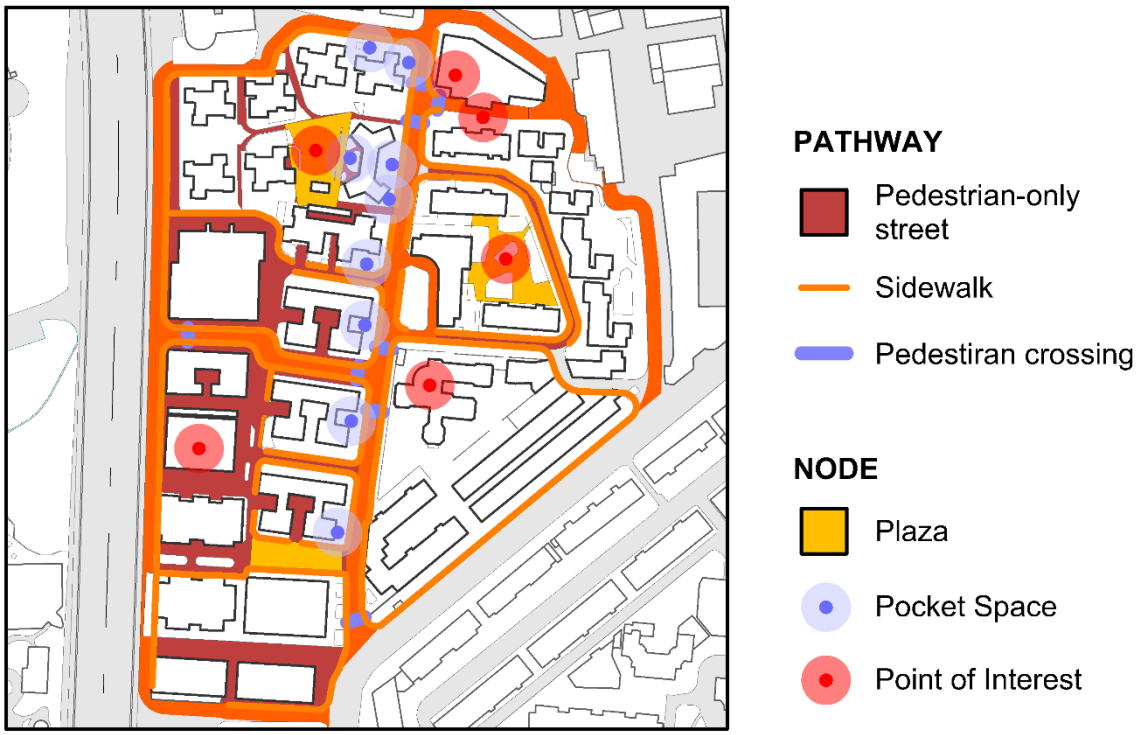


图 五-30 水荫小区步行网络

资料来源：作者自绘

及一些口袋空间。这些兴趣点被小区内一条由南向北的主要道路所隔开，但道路上却没有人行横道的设置，在一定程度上阻碍了步行的连续性。所以通过在南北向的主要干道上设置了3个供行人穿行的人行横道来弥补东西地块步行连续性割裂的问题。为了进一步提高行人通行的优先级，小区内部的道路则被设置成了仅供行人使用的街道，以创造安全无车的社区内部环境（图 五-30）。

根据前面对社区内休息点的辐射范围的分析可知，休息点在小区中段出现了比较大的空缺为了提高街道休息设施的数量，笔者在街道中段结合口袋空间设置了两处休息点，以照顾到行动不便的群体，例如孕妇、行动障碍者和老年人等（图 五-32，图 五-31）。

而照明设施在主干道的分布较为充足和均匀，但在社区内部却寥寥无几。社区内部夜间照明的缺失是街区活力缺乏的因素之一，因为街坊和邻居们更倾向于在照明条件充足的地段休息和闲聊。在考虑了路灯高度、原有街道上路灯的间距等因素，笔者在社区内的道路每隔 30m 间距布置一个路灯，以满足社区内的夜间照明要求，提高道路的可见度（图 五-34，图 五-33）。

此外，水荫小区内的指引设计基本没有，尤其是在交叉路口和重要节点处。在分析

了小区内部重要的兴趣点后，笔者在小区入口、道路交叉口和口袋空间处设置了道路指引，并分析了各个指引标识间的联系，来提升街区的易读性。

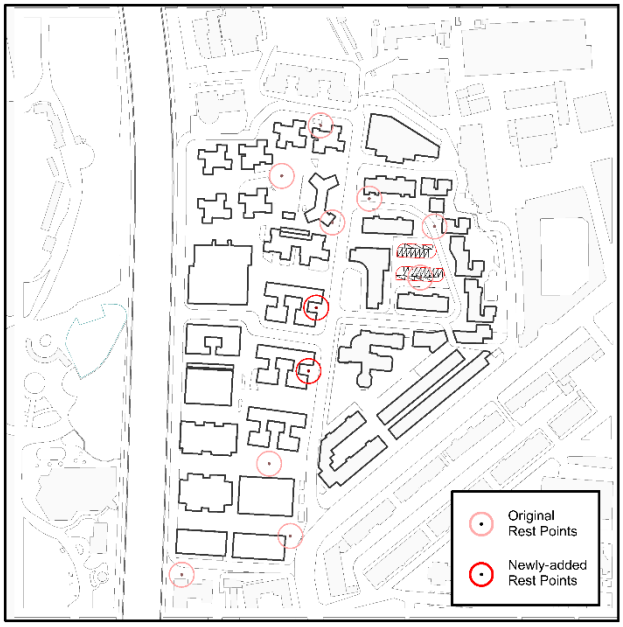


图 五-32 新增休息点

资料来源：作者自绘

图 五-31 休息点的辐射范围分析

资料来源：作者自绘

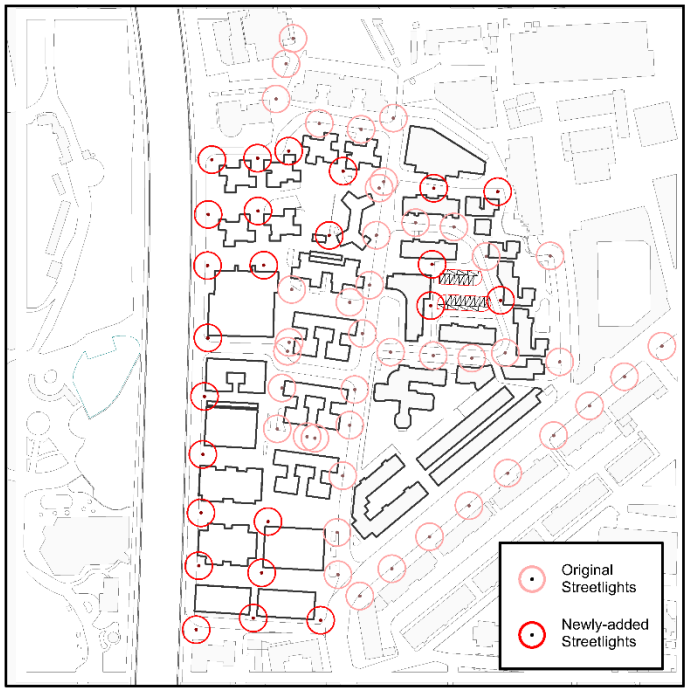


图 五-34 新增照明设施

资料来源：作者自绘

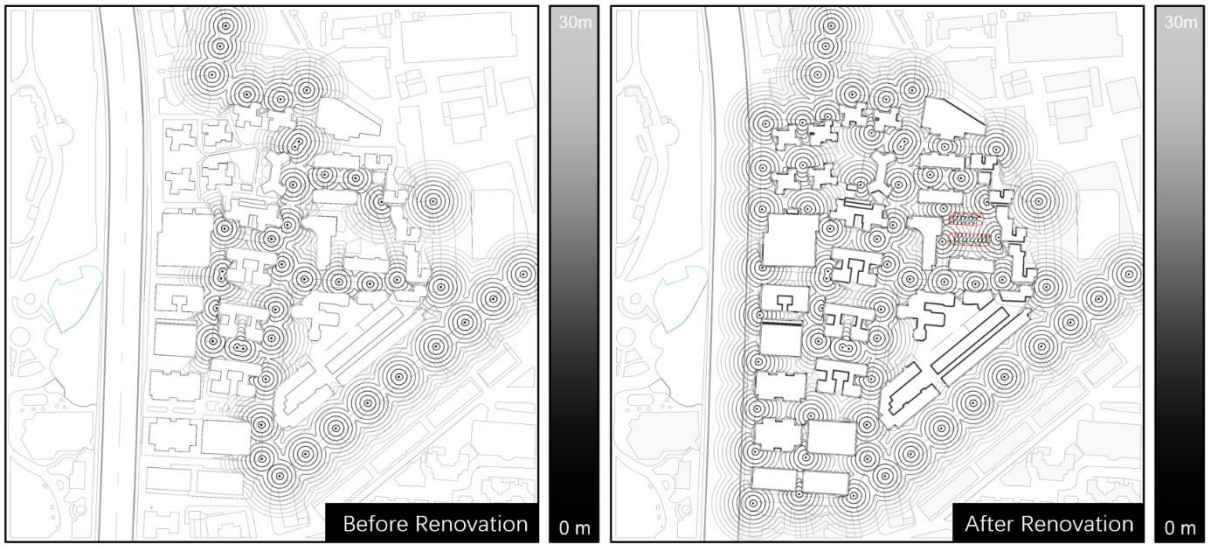


图 五-33 照明设施的辐射范围分析

资料来源：作者自绘

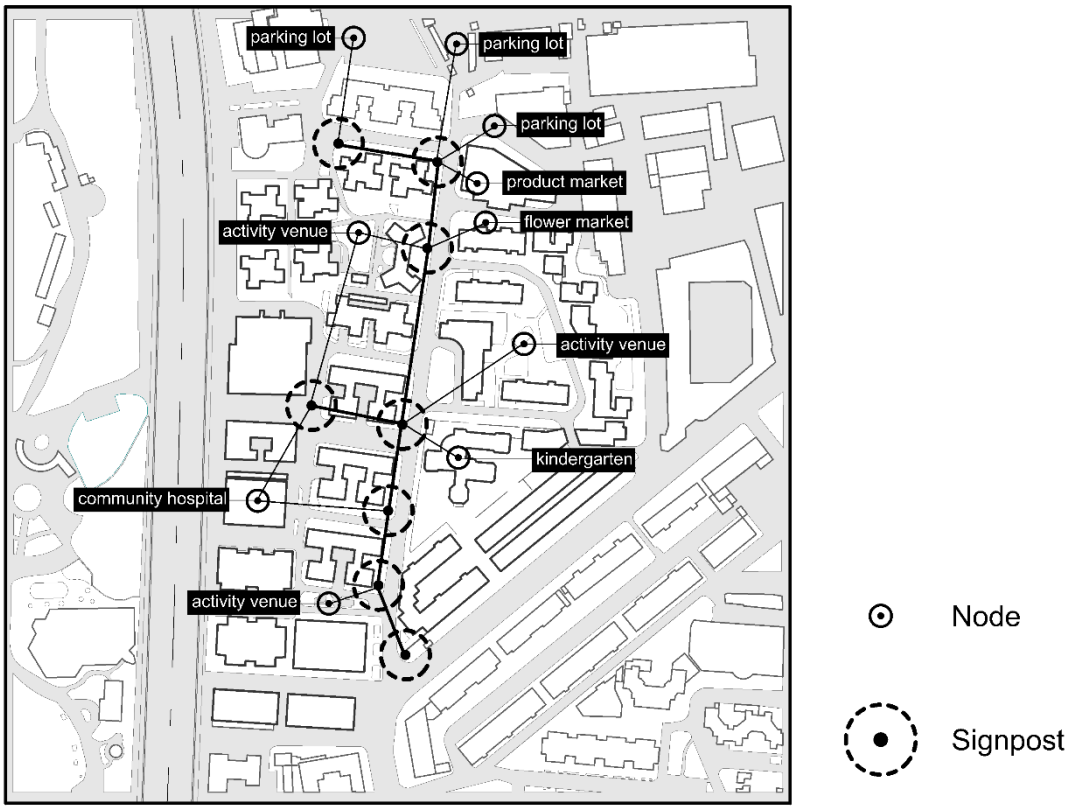


图 五-35 道路指引系统

资料来源：作者自绘

(2) 交通网络——行人优先的慢行环境

机动车与行人的矛盾在社区内尤为显著，主要体现在街道空间被机动车辆大量占据而留给行人的空间不足、步行在街道中的交通优先级不高等。

小区内机动车辆的类别无外乎三种：一是社区居民自由的私家车辆，停放在社区内部的公共场地和路边；二是临时停留的后勤车辆；三是借过穿行的其他车辆。在考虑了这三类机动车辆对于小区道路不同的使用目的和所经过的路径之后，笔者重新梳理了机动车辆的车行流线。通过在部分社区入口处设置路桩，以限制部分车辆进入社区内部。但道路还保留了一定程度的通行能力，以满足主要出行点和停车场地的可达性（图 五-36，图 五-37，图 五-38）。通过对机动车流线的重新规划和梳理，社区内部行人的使用空间得到了保证，并且并不会对社区内的停车问题和出行问题造成太大影响。

为了降低机动车在社区交通网络中的优先级，社区内可供机动车通行的道路均被设计为了慢行路段，以提升街区的安全性（图 五-38）。降低车辆速度的设计手段有设置减速带、缓冲路拱和凹凸不平的地面铺砖等，以提醒司机减速慢行。

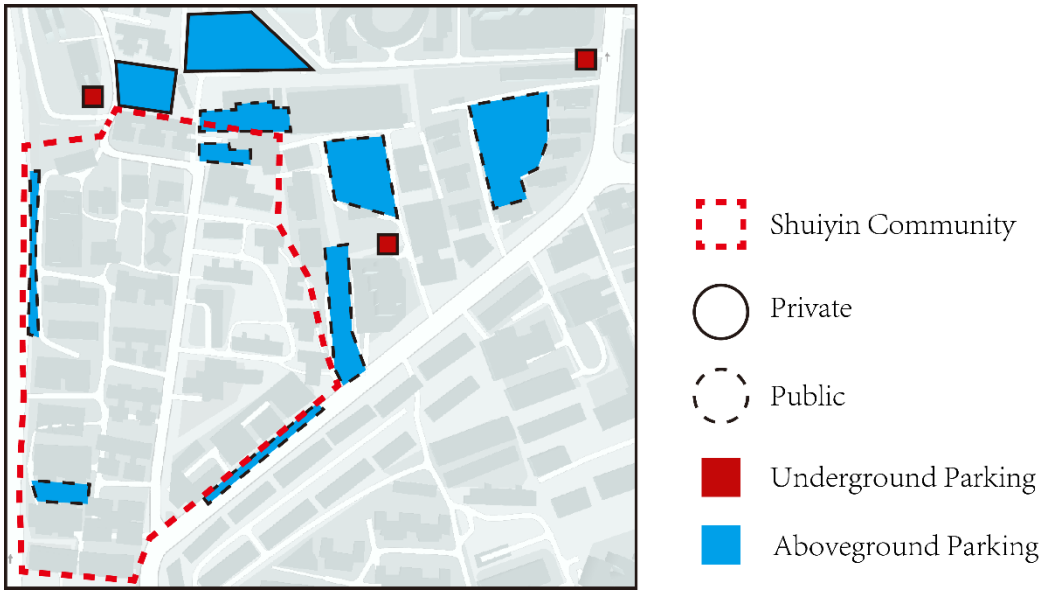


图 五-36 社区周围的停车场地

资料来源：作者自绘

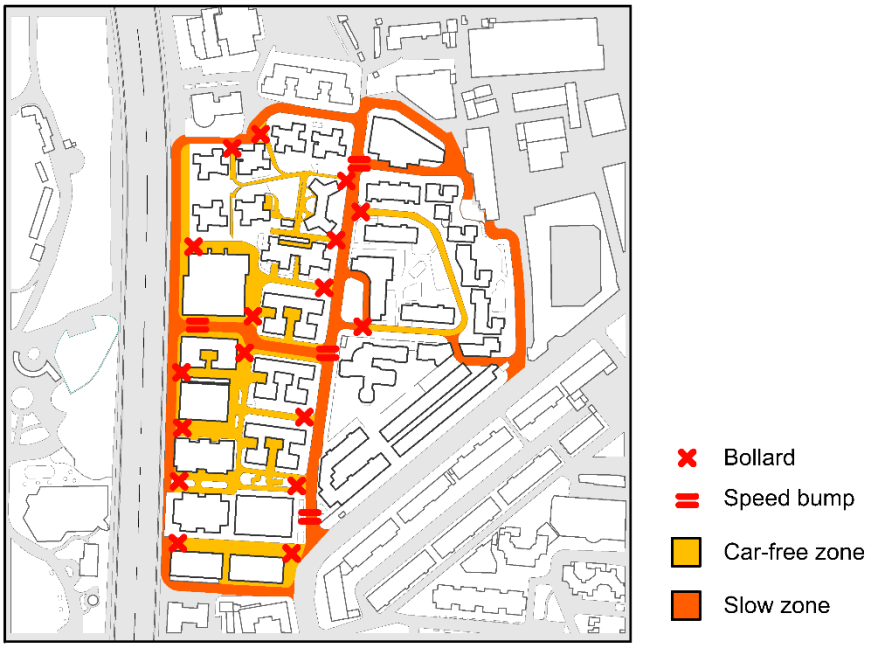


图 五-38 限制机动车的道路措施

资料来源：作者自绘

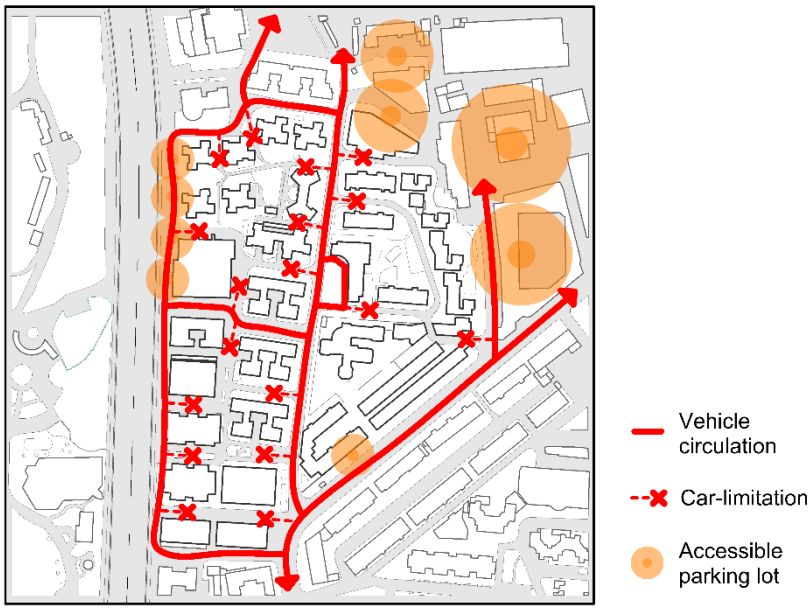


图 五-37 改造后的机动车流线分析

资料来源：作者自绘

(3) 骑行网络——降低机动车依赖

为了进一步减少人们对机动车辆的使用依赖，多样化的出行方式应该被提倡。在 5-10 分钟的路程范围内，可以选择共享单车作为出行模式。笔者在社区主要道路的三个节点处置入了共享单车设施，保证社区中的任何一处抵达最近的共享单车的时间不超过 3 分钟（图 五-39）。

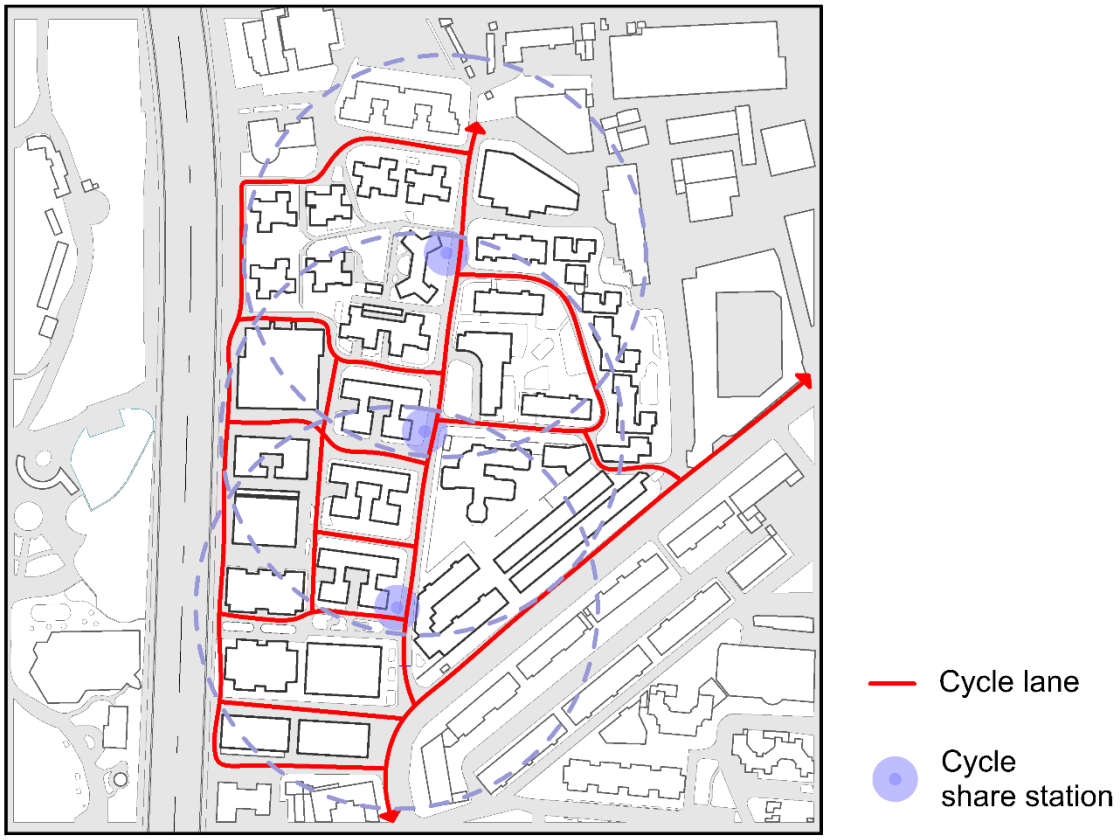


图 五-39 骑行网络和共享设施

资料来源：作者自绘

5.4.2 街区尺度——街道改造

(1) 步道规整与再划分

街区步行连续性不足、舒适性欠缺的主要原因之一在于社区内部的道路没有清晰的区域划分。在空间现况的调研结果中有提到，人行步道上的阻碍过多，例如直立在步行道中间的灯柱、树木、随意堆放的杂物等。这使得原本并不宽阔的步道更加拥挤，步行的连续体验更差。部分道路甚至无法满足轮椅通行的要求。

笔者先根据功能对道路区域做了分类，并重新划分了不同层级道路的区域。人行道上的道路区域可以被划分为四类，一是店铺门前的空间，二是净空的通行区域，三是放置街道家具的区域，四是阻隔人流和车流的缓冲区域。净空的通行区域是街道连续性和舒适性的保证，是人行道设计中优先级最高的。缓冲区域则对行人安全有着重要作用。在道路宽度能够满足基础的通行需求后，若空间还有余量，则可以增加街道家具区域以提升步行的舒适性。

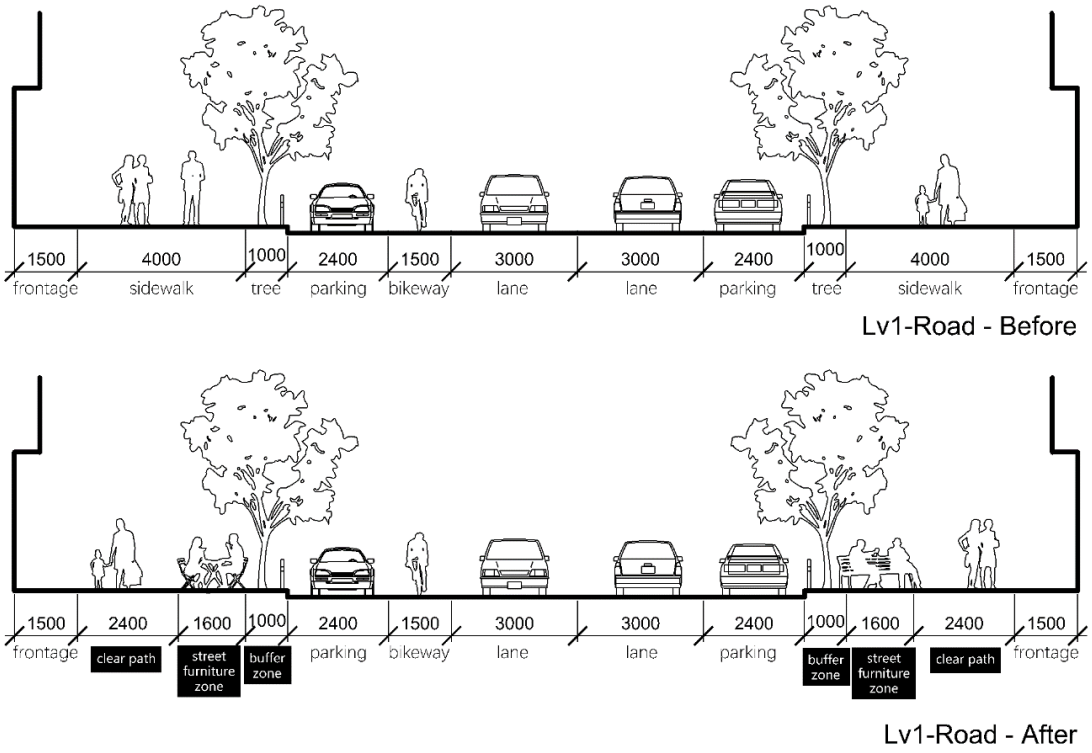


图 五-40 一级道路剖断面

资料来源：作者自绘

水荫小区内的人行步道宽度并不充裕，因此优先满足通行需求和安全需求。净空通

行区域的宽度保证在 1.5m 以上，满足轮椅的通行宽度。另外还设置了 0.6m 宽的缓冲区，通过放置绿化和路桩来阻隔车流与人流，保障行人的安全（）。

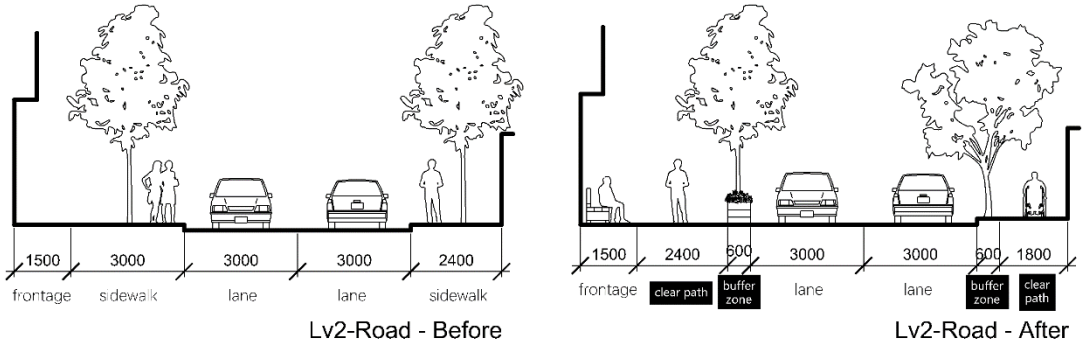


图 五-41 二级道路剖断面

资料来源：作者自绘

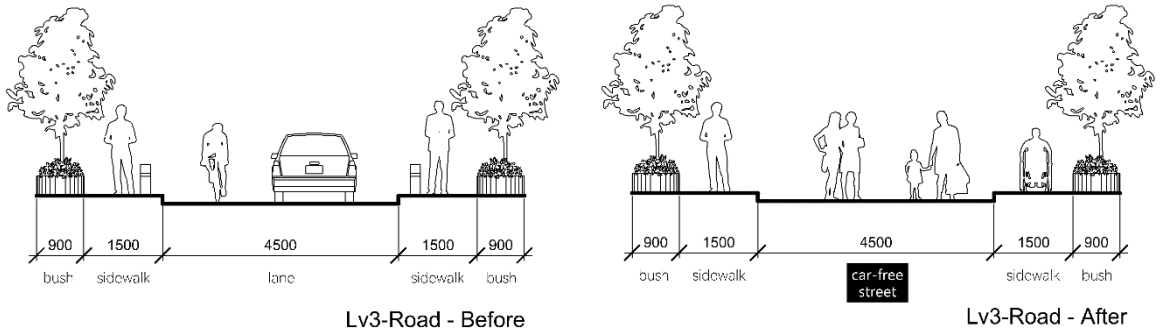


图 五-42 三级道路剖断面

资料来源：作者自绘

(2) 连续可达的无障碍坡道

在人行道与车行道的交接处存在高差，需要增加无障碍坡道来满足货物运输、行动不便群体的出行需求，同时还能增加步行的连续性。笔者根据不同的步道边缘形式，整理出了5种无障碍坡道的类型，即直行路段的单面坡、双面坡与三面坡以及拐角路段的双面坡和三面坡，并布置在水荫直街中的人行步道中。

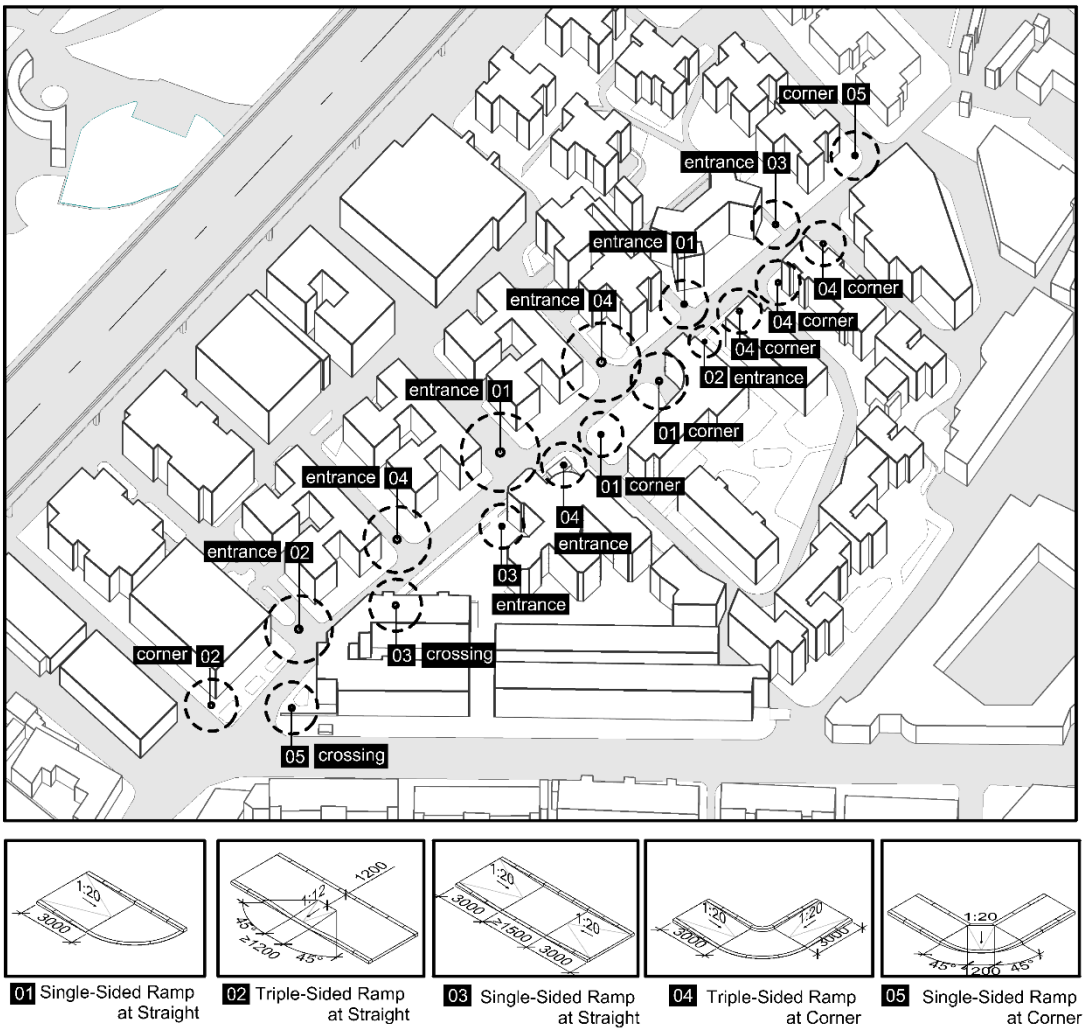


图 五-43 人行步道的无障碍坡道设计

资料来源：作者自绘

(3) 交通缓行策略

为了限制车辆在街区内部的车速，提高步行安全性，街区内的慢行道路区域采取了交通缓行的策略。实现交通缓行的手段有设置减速台、缓冲路拱和凹凸不平的车道铺砖。减速台可以与社区内的三处人行横道结合起来布置，一方面它抬高了路面高度，使得行人更容易被司机观察到；一方面它提醒和迫使机动车辆减速通过，保证了行人安全（图 五-44）。

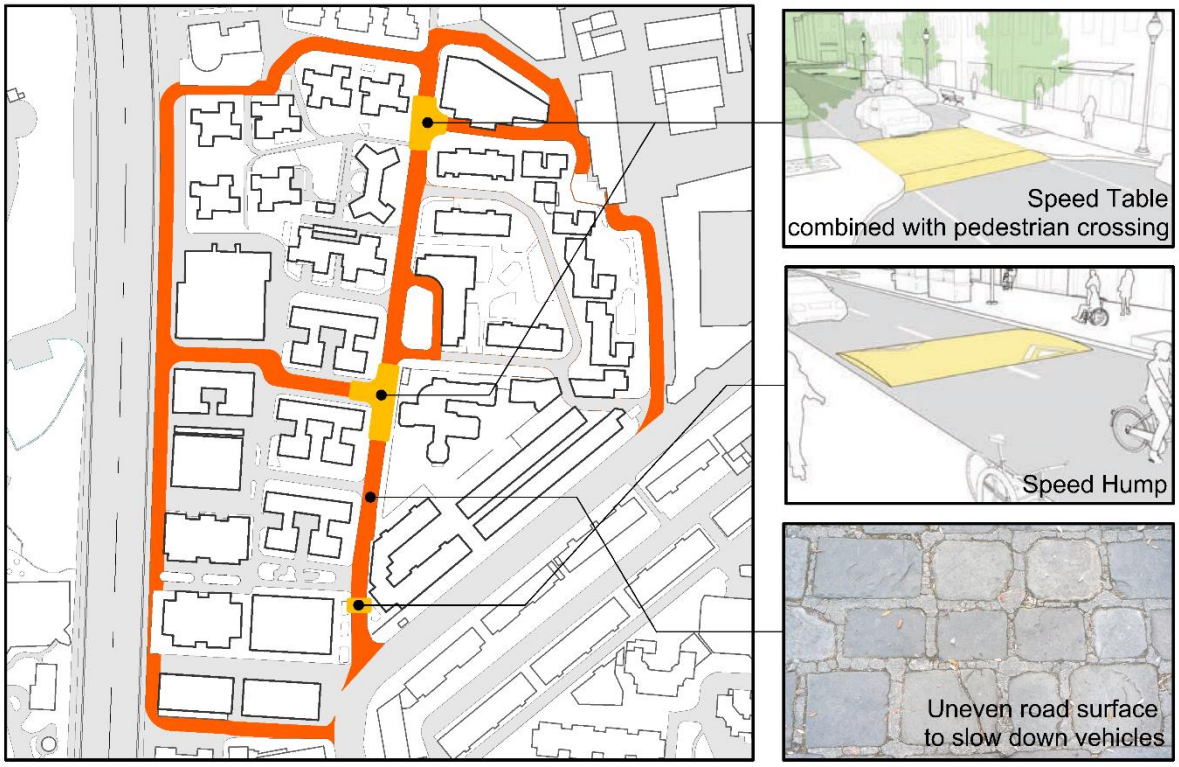


图 五-44 交通缓行策略

资料来源：作者自绘

5.4.3 微观尺度——节点植入与细部设计

(1) 街道设施和空间材质

i. 空间材质

街道空间的材质应该要具有很高的辨识度，使得那些有视觉障碍的群体可以很容易地分辨出通过材质划分的空间区域，满足易读性和安全性的设计原则；此外还要考虑到与街区内已有材质的相容程度，做到和谐统一；采用街道居民熟悉的空间材质可以方便具有认知障碍群体的辨认，并且提高空间对于人们的亲和程度；交往和休息的空间应该采用暖色，给老年群体带来温馨的空间体验。

街区内最常见的路面材质是花岗岩和红砖。依照包容性街道设计的熟悉性原则，改造后的街道空间的人行道铺面仍采用了红砖，而部分停留的小型广场则使用了平滑的花岗岩。红砖路面的盲道被设计成了黄色，增加对比度与辨识程度。而室内外衔接的过渡空间与家具材质则使用了暖木色（图 五-45）。

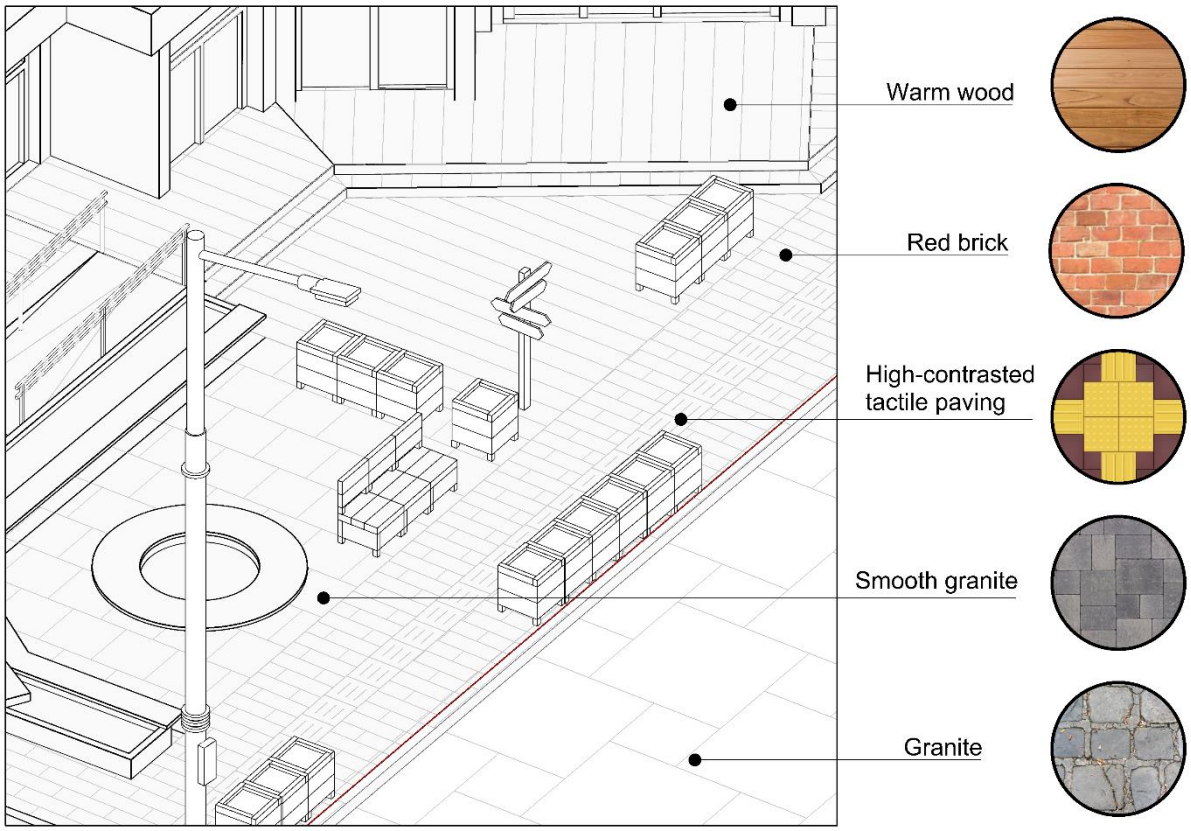


图 五-45 空间材质的选择

资料来源：作者自绘

ii. 道路标识

街道中的标识设计旨在为行人提供指引，提升街道空间的易读性和可达性，防止行人迷路。标识牌的设计同样要遵循包容性设计原则，例如其使用高度应考虑到不同群体的身高特征，关键地点的图例与文字需要有盲文等（图 五-46）。

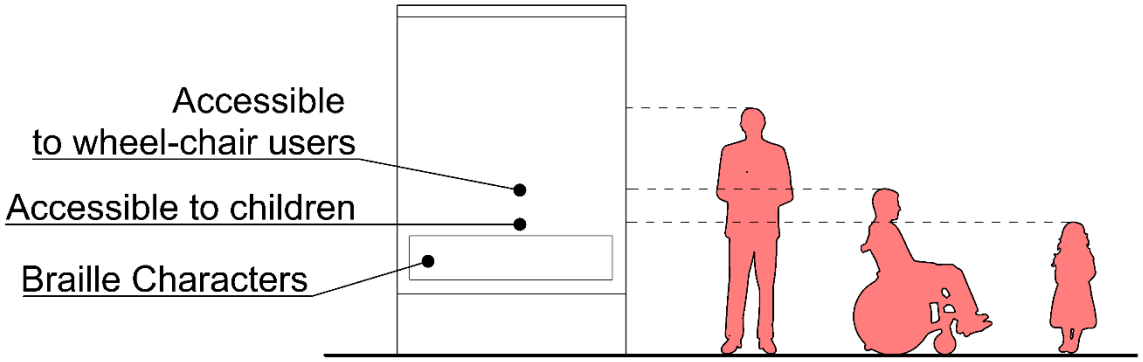


图 五-46 道路标识牌的包容性设计

资料来源：作者自绘

iii. 街道家具

为了适应不同人群对于街道空间的空间需要以及随时间动态变化的空间需求，街道的家具设施应采用模块化的弹性设计理念。在模数选择上使用了 600mm、300mm、150mm。家具的高度还要兼顾到儿童的使用，如座椅的高度应为 300mm~350mm 左右。街道家具还应当足够轻质、可移动、易拆卸以及高组合自由度（图 四-17）。

街道家具在水荫小区内主要面向的使用群体为老人和孩子。结合前文的用户特征和需求分析，可以设想出以下几种使用场景，来迎合不同人群不同的空间使用需求。例如，可以作为儿童的游乐设施、年轻人的聚会空间和老年人的交流地点。另外，家具的布局还要考虑轮椅使用者的通行，并为他们留出足够的使用区域和回转区域（图 四-18）。

(2) 激活街区活力的口袋空间

口袋空间是街道中潜在的社区活力激活点，但水荫小区的口袋空间由于缺乏硬性的设施条件和相应的空间品质，导致其空间利用率一直不高。水荫小区的口袋空间可以分为三类，一是店前空间，二是居住单元的入口处，三是街道拐角处由周围建筑围合形成的小型空间。笔者选取了水荫小区内最具有代表性的三个口袋空间进行细部的节点设计（图 五-47）。

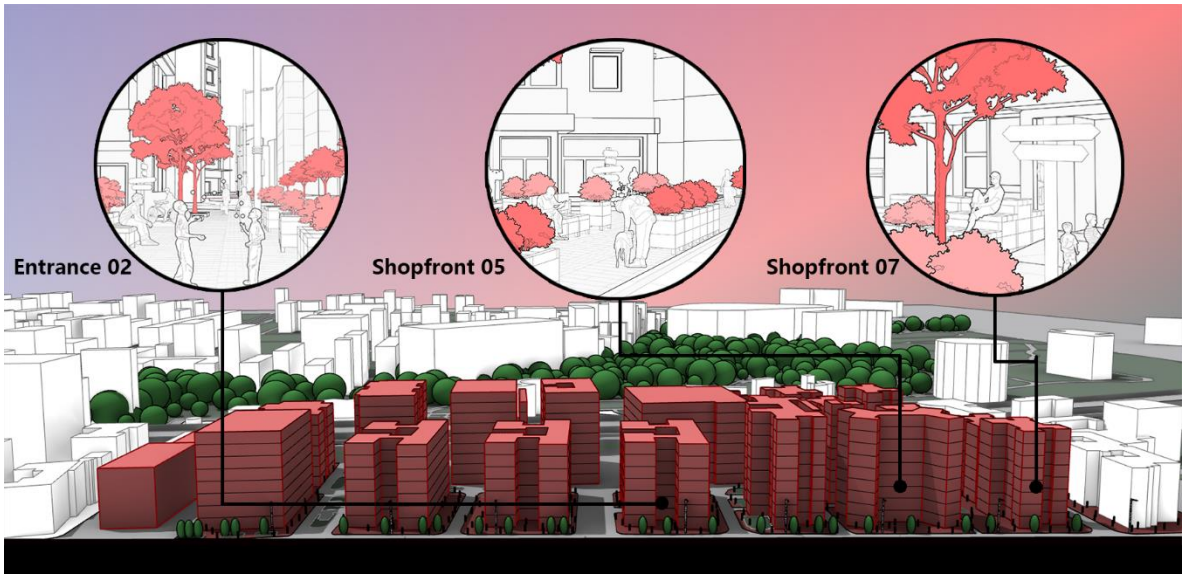


图 五-47 街道剖透视

资料来源：作者自绘

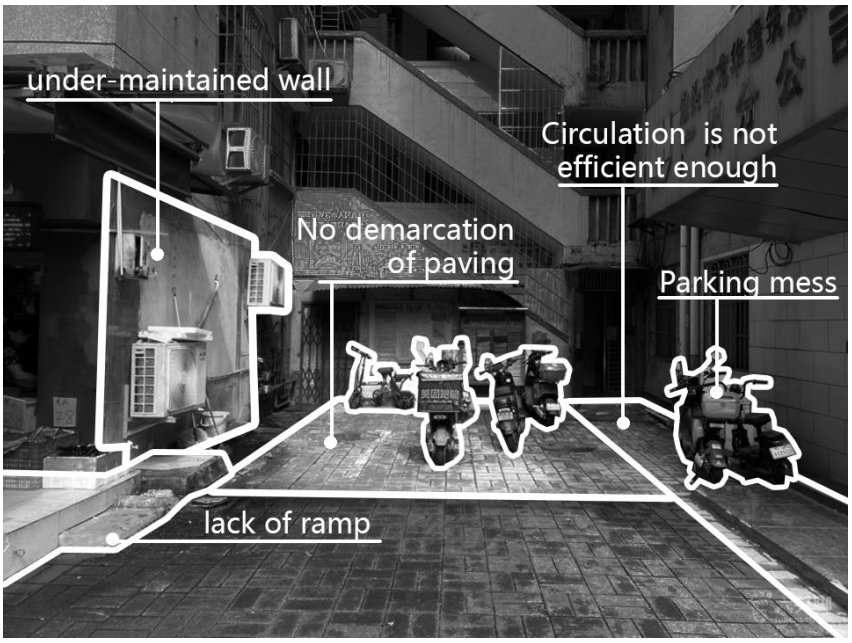


图 五-48 Entrance 02 空间现况

资料来源：作者自绘

i. Entrance 02

Entrance 02 位于水荫直街中段的入户空间处，周围实体界面呈内凹形态，围合感较好。周边商铺较多，与水荫幼儿园仅有一条街之隔。Entrance 02 的主要空间问题在于停车问题、空间品质和包容性设计考虑不足等（图 五-48）。

为了增强入户空间的空间感，入口处的上方设置了木质栅格架，并在下方划分出休息的区域；店铺门口和入户单元处的高差都做了无障碍坡道的处理；此外还设置道路标识，增强街区易读性和空间辨识性；店铺门前也结合景观绿化做了休息设施，并且还设置了符合儿童身体尺度的座椅；在车道汇聚的交叉口采用了减速台的设计，一方面作为口袋空间与水荫幼儿园之间的人行横道，另一方面则是强迫过往车辆减速，以提高行人优先性，保证行人安全（图 五-49，图 五-51，图 五-50，图 五-52）。

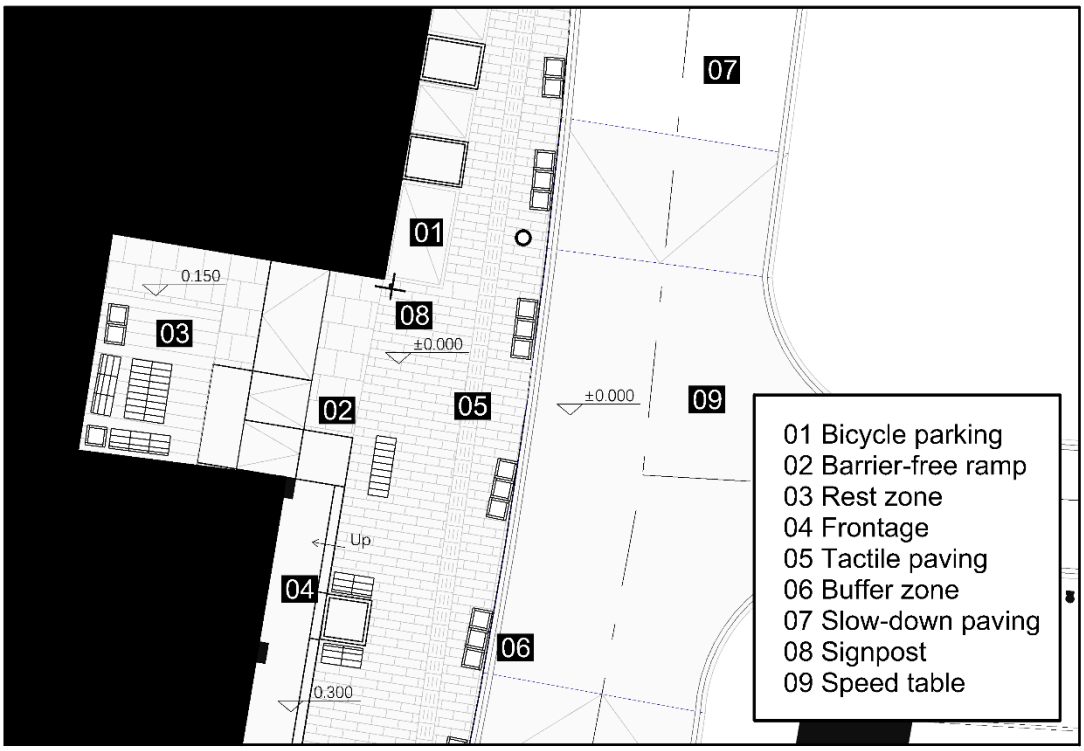


图 五-49 Entrance 02 平面图

资料来源：作者自绘

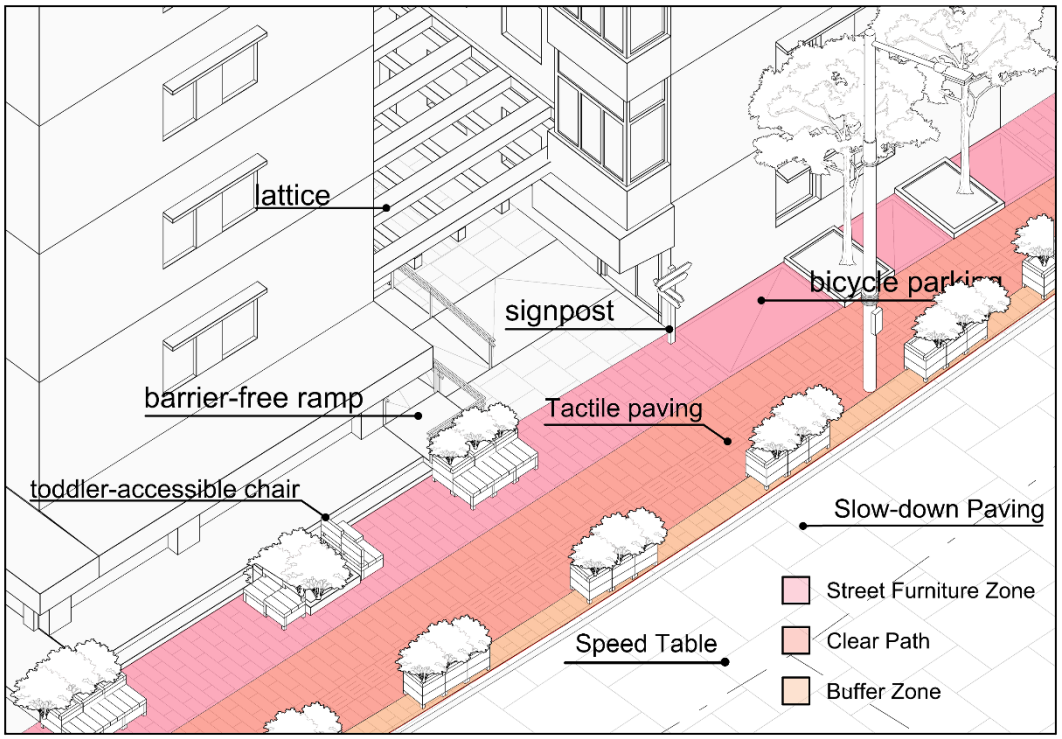


图 五-51 Entrance 02 鸟瞰图

资料来源：作者自绘

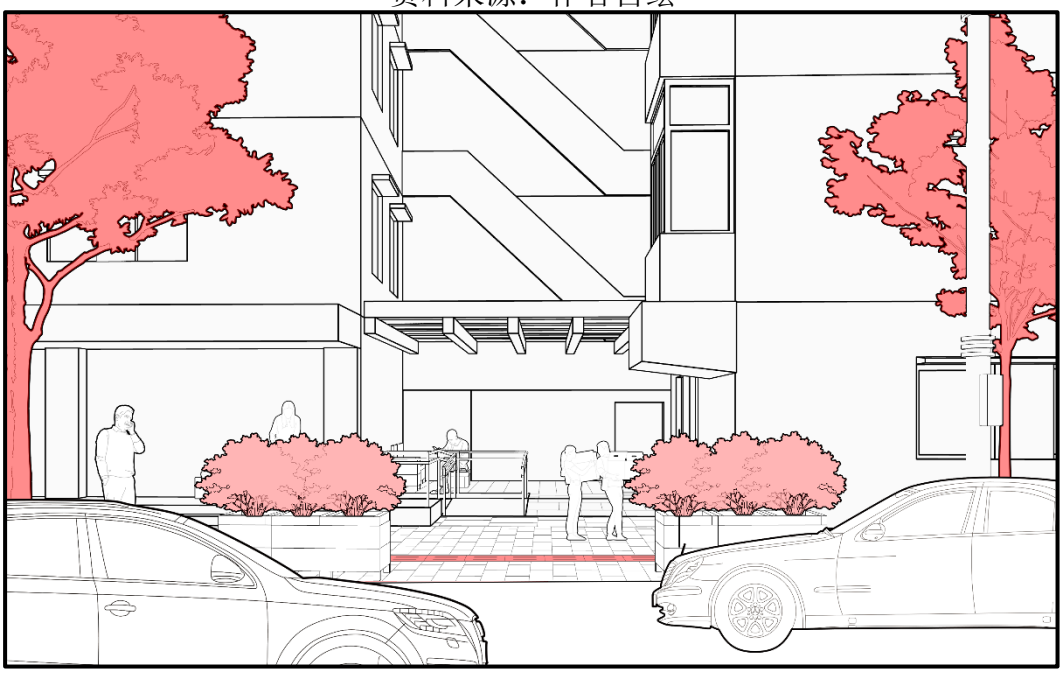


图 五-50 Entrance 02 入口处透视

资料来源：作者自绘

图 五-52 Entrance 02 街道透视

资料来源：作者自绘

ii. Shopfront 05

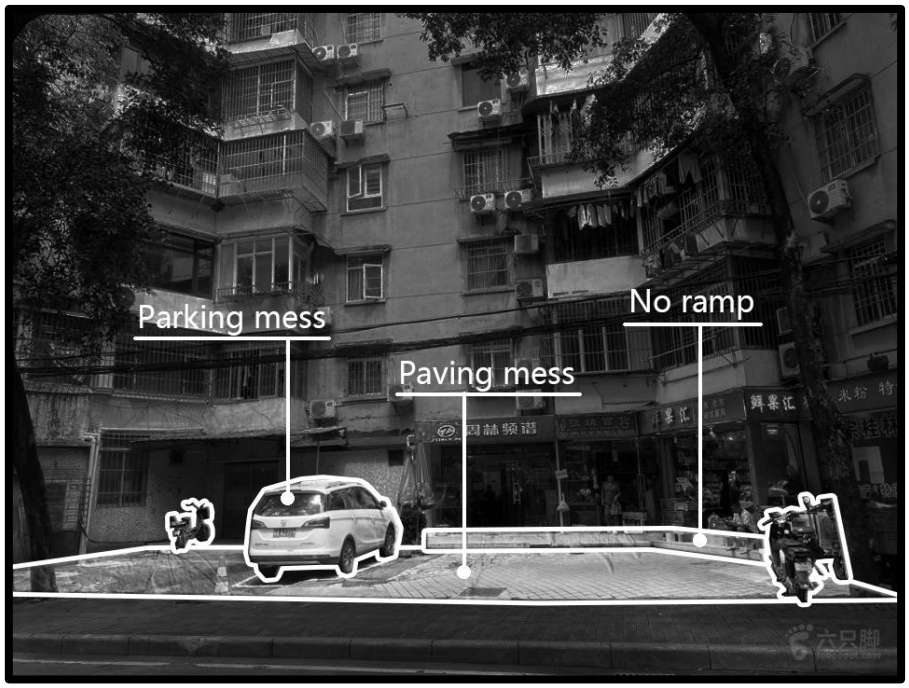


图 五-53 Shopfront 05 空间现状

资料来源：作者自绘

口袋空间 Shopfront 05 位于社区北面，东边是花鸟市场和地下菜市场。其空间界面

形态呈梯形，向外开放。该口袋空间同样存在停车矛盾、铺砖混乱不清、无障碍设计缺失的问题（图 五-53）。

在置入无障碍设计坡道后，笔者重新布置了空间流线，并重新划分了空间区域。通过在口袋空间中置入一个小广场，来使其成为居民交往的场地。半室外空间使用了暖

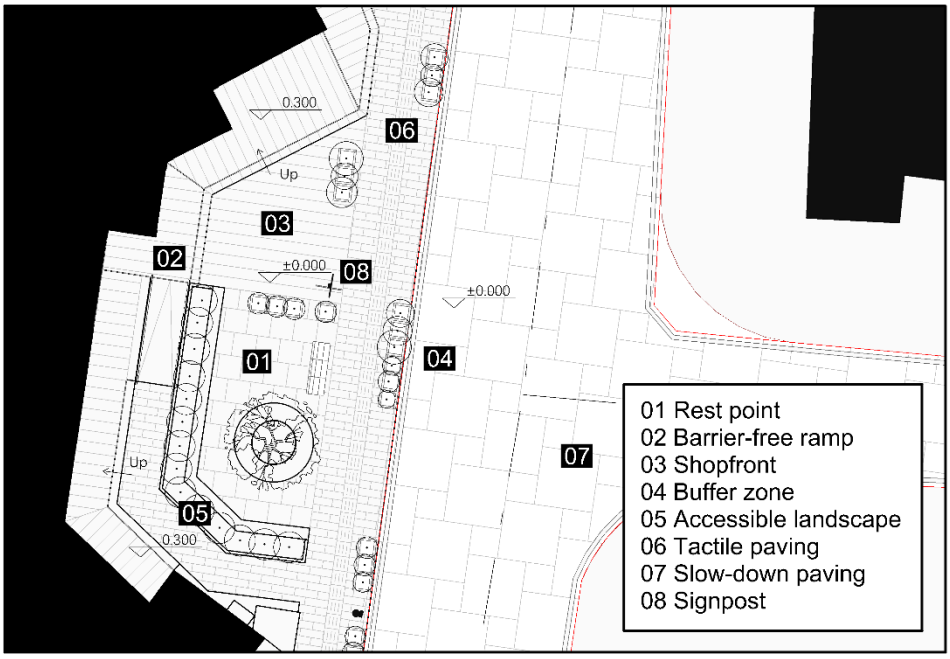


图 五-55 Shopfront 05 平面图　资料来源：作者自绘

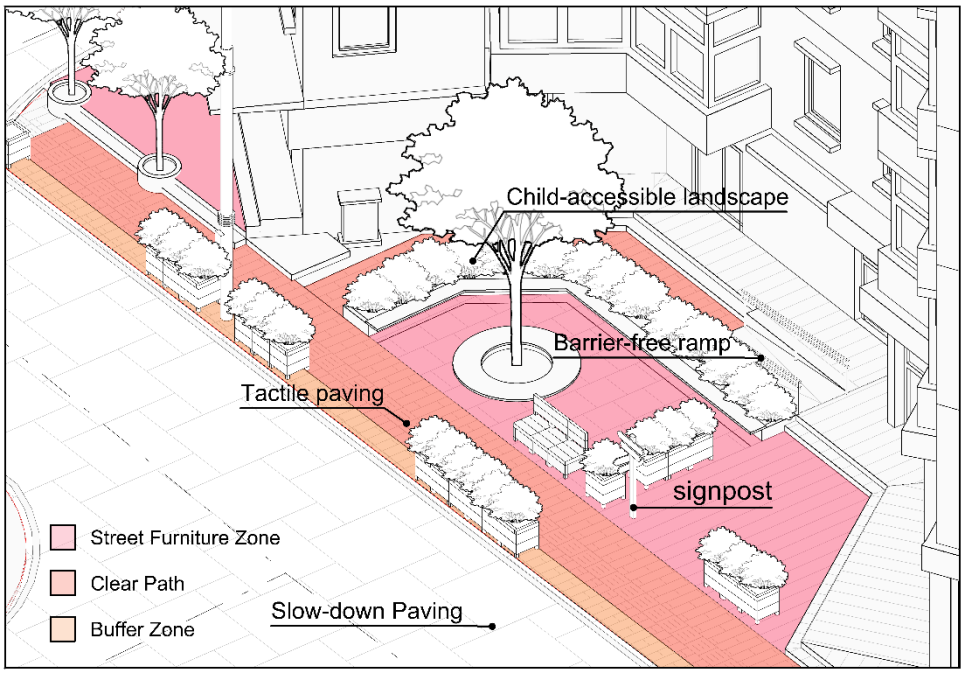


图 五-54 Shopfront 05 鸟瞰图　资料来源：作者自绘

木色材质。

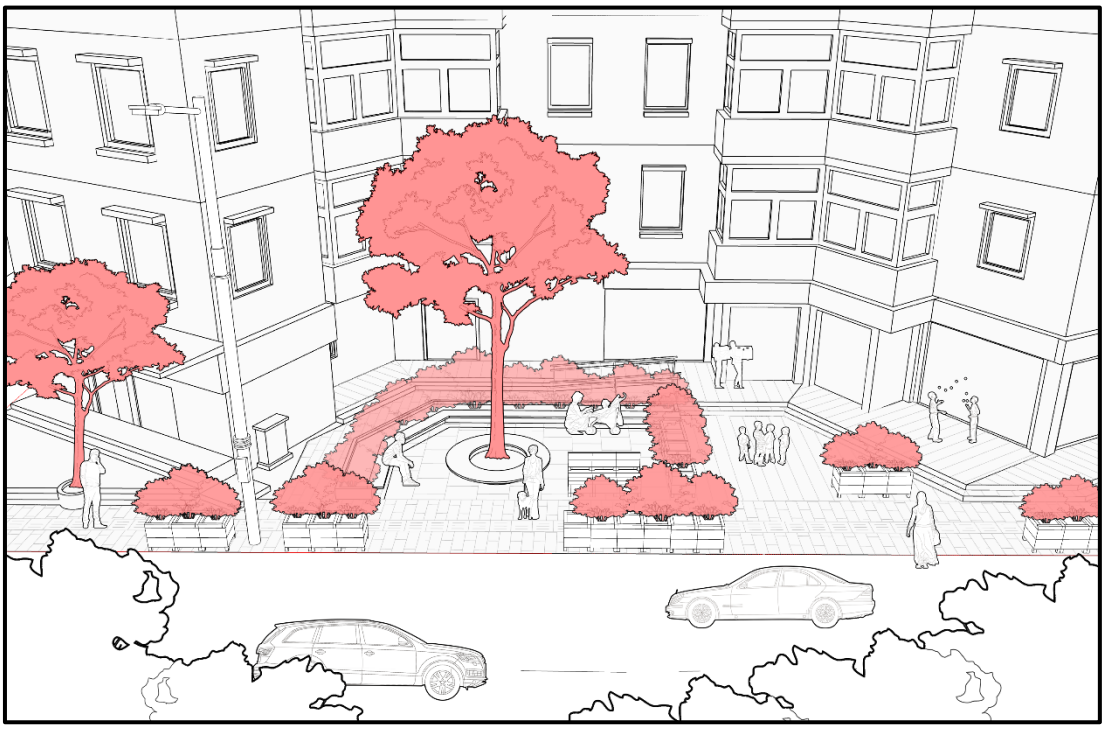


图 五-57 shopfront 05 局部透视

资料来源：作者自绘

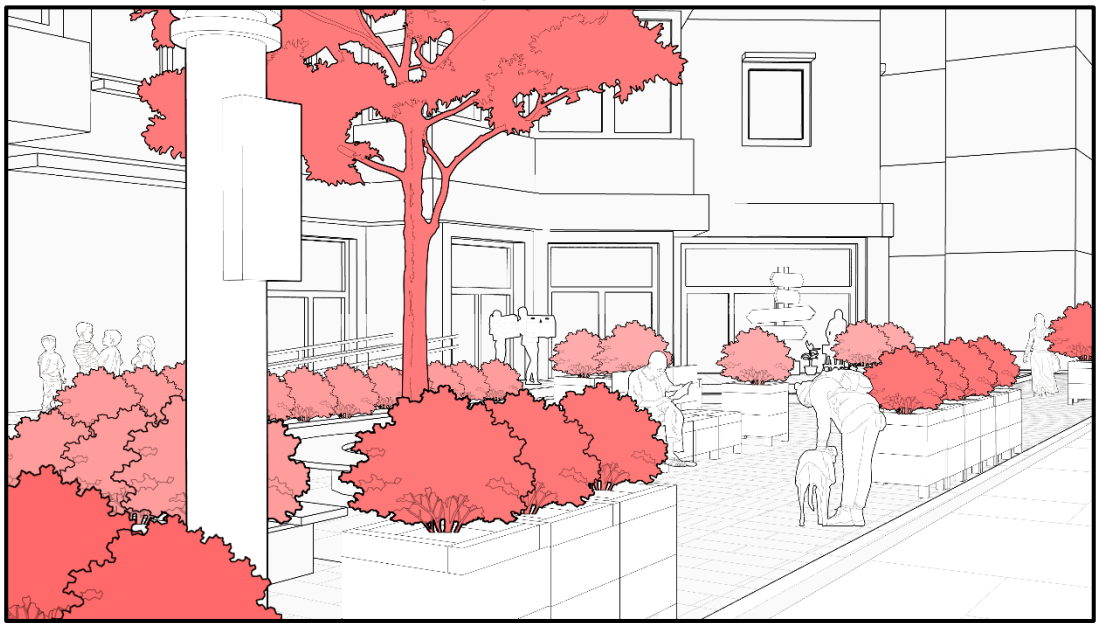


图 五-56 shopfront 05 街道透视

资料来源：作者自绘

iii. Shopfront 07

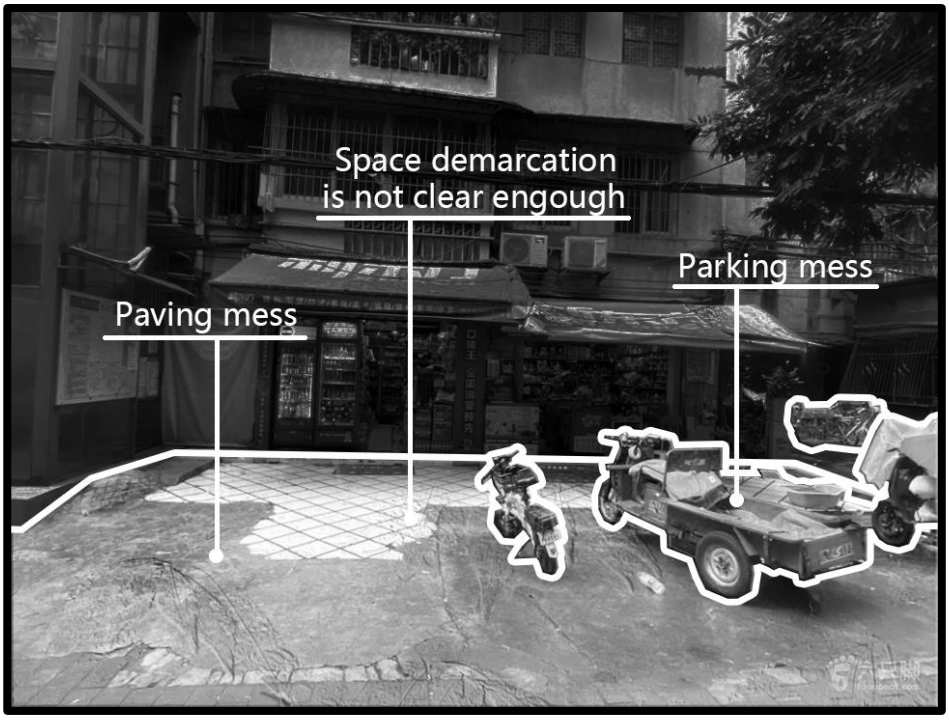


图 五-59 shopfront 07 空间现况　　资料来源：作者自绘

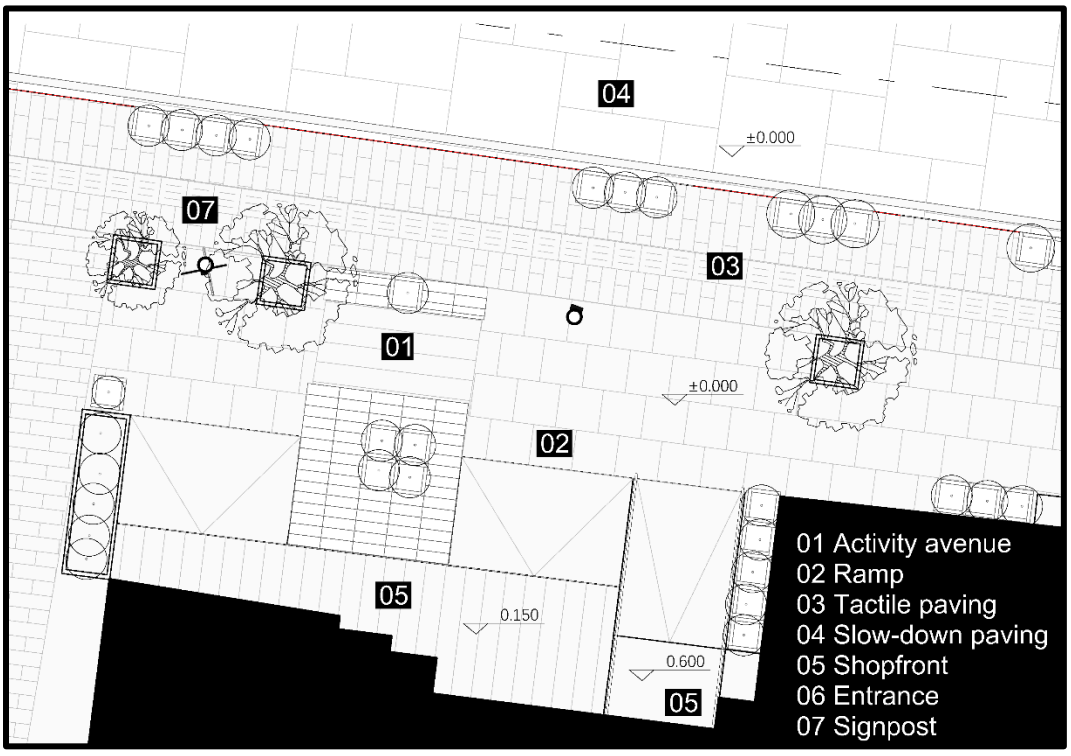


图 五-58 shopfront 07 平面图

资料来源：作者自绘

Shopfront 07 位于社区北端的活动场地入口处，是一处店门前的口袋空间（图五-59）。

在划分街道空间区域后，店铺门前设置了一个小型的空地，用于放置街道家具。家具可以灵活组合，满足不同人群的需要。

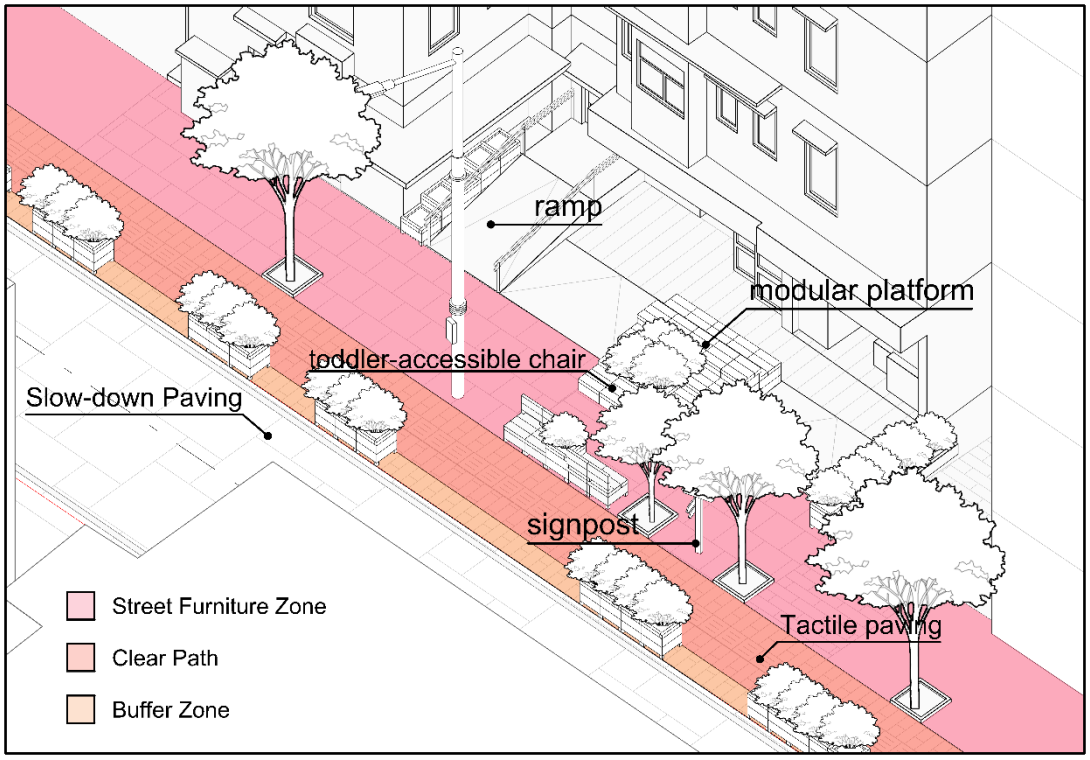


图 五-61 shopfront 07 鸟瞰图

资料来源：作者自绘

图 五-60 shopfront 07 透视图

资料来源：作者自绘

图 五-62 shopfront 07 局部透视

资料来源：作者自绘

第六章　结论

6.1 结论

通过文献研究和案例分析，本文将包容性设计与城市街道空间结合在了一起，探讨了包容性街道设计的方法论。其主要结论如下：

(1) 包容性街道的设计原则与评价指标

从时间、空间和社会维度对建成环境包容性的论述为包容性街道设计原则的构建提供了理论基础，并以设计原则为指导制定了街道空间的评价标准。包容性街道的设计原则包含六点：安全性、舒适性、可及性、易读性、可适应性与熟悉性。这六点原则较为全面和系统地涵盖了包容性街道的设计要点。而评价指标则是在设计原则的把控下提出针对街道中不同类型的空间可定性、可量化、具体、客观的设计标准，它是发现街道空间现况问题的重要工具。

(2) 包容性街道的设计策略

基于对现有的三个街道改造案例的研究可以发现，街道空间的包容性不足主要来自于行人在街道中的使用空间不足、安全性得不到保障、设施的无障碍设计和通用设计不到位等。通过对案例针对的问题、制定的目标和提出的策略进行总结，包容性街道的设计策略包括如下四项：提升步行安全性的交通缓行策略、弱势群体可及的街道空间与设施、释放被机动车占据的城市空间和全龄友好的口袋空间营造。

(3) 包容性街道的设计流程

包容性街道的设计流程有三个阶段：共情（Empathizing）、构思（Ideation）和评估（Evaluation）。它源自于对包容性设计用户模型和程序模型的提炼，为包容性的街道空间设计提供了切实可行的技术路线。共情阶段鼓励研究者采用文献研究、实地考察、问卷访谈等方式，了解场地现况问题，挖掘用户需求；构思阶段需要对空间问题和用户需求做出全面和系统的回应，制定不同层级的设计策略；评估阶段则体现了设计成果与时俱进、随时间动态演进的特征，通过收集用户的测试反馈不断迭代和优化设计方案。

6.2 创新点

(1) 理论创新——从时间维度对包容性环境内涵的补充

过去的包容性环境主要关注于建成环境的物质环境与社会环境，但在时间维度对其包容性内涵的解释却很少。而本文通过对战术都市主义和通用设计的理论的提炼，提出了包容性街道在时间层面的设计原则，即空间的可适应性。它强调建成环境应能满足使用者在不同时间段动态变化的空间需求，体现了时间维度的包容性。

(2) 方法论创新——包容性设计与城市街道空间的融合

建成环境的包容性设计的相关探讨有很多，但关于街道空间的包容性设计的相关研究却很少。本文将包容性环境的内涵本质与实际的街道改造案例相结合，进一步将包容性环境的研究对象具体化至街道空间，并提出了相应的设计方法论，为后续的街道空间的包容性研究提供了可行的技术路线和理论基础。

6.3 不足之处

(1) 主要研究对象为社区街道

基于不同的城市空间和地理区位，街道的形态、功能与人群不尽相同，所以包容性设计的要求也不尽相同。而笔者主要关注于来就社区中的街道空间，对于其他城市语境下（例如城市商业区）的街道空间的包容性设计不能完全照搬。未来对包容性街道的深化和补充应当选用不同城市区域的街道空间作为研究对象，减小研究的偶然性。

(2) 评估阶段在设计实践中的缺失

由于是研究型设计，水荫小区的包容性街道改造并不能得到实践，所以获取来自于用户对设计结果的反馈便无从下手。并且迭代化的设计模式意味着需要对项目进行长期跟踪，需要耗费大量的时间成本。碍于能力有限，包容性街道设计流程的评估阶段并未能在实践中得到落实。

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附录1　包容性街道的评价标准

		Safety	Accessibilitty	Comfort	Legibility	Adaptability	Familiarity
Traffic Space	Sidewalk	- Contrasting pavement - No bump - Anti-slip paving - Adequate illumination - Transparent street façade - Separate sidewalks from lanes - Monitors	- Barrier-free - Mix-used functions of block - Basic infrastructures within 5 mins and secondary infrastructures within 10 mins - Efficient and clear road system	- Proper ratio of street width to building height - Clean and odorless	- Lucid route planning	-	- Historical, traditional and local pattern
	Crossing	- Limited car-pass - Enough time to cross	-	-	-	-	
Landscape	Lawn	- No harm and odor	- Interactable	- Pleasant	-	-	
	Vegetation						
	Water						
Pocket Space	Entrance	- Away from vehicles	- Barrier-free	- Children playground with benches	-	- Space allowance - Diverse functions	
	Shopfront						
	Corner						
Amenity	Signage	- Harmless materials	- Accessible height - a rest point every 50m to 100m - public toilets within 250m	-	- Landmark - Pattern speaks for function - High-contrast color - Succinct diagram	- Modular furniture and facility - Universal design	
	Rest points						
	Illumination						
	Parking lot						
	Public toilets						

附录2　水荫小区包容性街道设计调查问卷

您好，我是华南理工大学建筑学院的研究生，正在以水荫小区作为实践案例进行课题研究。希望您能抽出几分钟时间填写一下调查问卷，十分感谢！问卷结果仅用作于学术研究。

一、基本情况

1. 【单选题】您的年龄是？

☐ 18 岁以下　☐ 18 - 35　☐ 36 - 60　☐ 60 以上

2. 【单选题】您的性别？

☐ 男　☐ 女

3. 【单选题】您是否住在水荫小区？

☐ 是　☐ 否

二、街道使用调查

1. 【多选题】在日常生活中，您认为水荫小区内街道的使用有哪些不足之处？

☐ 缺少休息地点　☐ 缺少标识和路牌

☐ 缺少绿化　☐ 人行道不够宽

☐ 缺少夜间照明　☐ 小区内的机动车数量太多

☐ 道路凹凸不平，容易摔倒

2. 【多选题】您认为水荫小区内的街道有哪些可以改进的地方？

☐ 更多的停车位　☐ 增加标识设计

☐ 更多的公共活动场地　☐ 提高街道整洁度

☐ 更多的绿化　☐ 限制机动车

☐ 无障碍设施

3. 【访谈】除了上述改进措施以外，您对小区街道还有什么期望和诉求？

攻读硕士学位期间取得的研究成果

一、已发表（包括已接受待发表）的论文，以及已投稿、或已成文打算投稿、或拟成文投稿的论文情况**（只填写与学位论文内容相关的部分）：**

序号	发表或投稿刊物/会议名称	作者（仅注明第几作者）	发表年份	与学位论文哪一部分（章、节）相关	被索引收录情况

注：　1.请在“作者”一栏填写本人是第几作者，例：“第一作者”或“导师第一，本人第二”等；

2.若文章未发表或未被接受，请在“发表年份”一栏据实填写“已投稿”，“拟投稿”。

不够请另加页。

二、与学位内容相关的其它成果（包括专利、著作、获奖项目等）

致谢

谢谢莫浙娟老师、戚冬瑾老师的悉心指导。

3.答辩委员会对论文的评语

（主要内容包括：1.对论文的综合评价；2.对论文主要工作和创造性成果的简要介绍；3.对作者掌握基础理论、专业知识程度、独立从事科研工作能力以及在答辩中表现的评价；4.存在的不足之处和建议；5.答辩委员会结论意见等）

论文聚焦包容性设计理念及实践，通过三个案例提炼出包容性设计的6大原则，安全性、可及性、舒适性、易读性、可适应性、熟悉性，进一步利用广州水荫小区案例包容性设计对以上6大原则进行回应。在具体策略的提出中绘制大量设计图纸进行表达，较为生动。论文总体逻辑较为清晰，但创新性方面仍需要进一步提升。

该生能较好地运用所学理论和专业知识，按期圆满地完成任务书所要求的设计内容和毕业论文，有一定的独立工作能力。

论文设计方案正确，分析合理，层次分明，文字通顺，图表规范，格式符合要求，但论文水平一般。

该生在答辩的过程中，表达清晰，能基本正确地回答答辩委员提出的主要问题。

答辩委员会认为该生已具备硕士学位水平，一致同意通过该生的毕业论文答辩，并建议授予硕士学士学位。

论文答辩日期：2023 年 9 月 4 日　　答辩委员会委员 5 人

表决票数：同意毕业及授予学位（5）票

同意毕业，但不同意授予学位（0）票

不同意毕业（0）票

表决结果（打"√"）：同意毕业及授予学位（√）

同意毕业，但不同意授予学位（ ）

不同意毕业（ ）

答辩成员签名	（主席）		Mauro Berta（线上签名，秘书代签）
		王	
答辩秘书签名			

申请人姓名：林瑞昊