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东莞老旧小区儿童活动空间需求分析及改造策略——以花园新村为例

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Demand Analysis and Renovation Strategies of Children's Activity Spaces in Old Residential Complex in Dongguan
——Taking Huayuan Village as an Example

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摘 要

随着国家人口老龄化问题的产生以及三孩生育政策的放开，儿童相关议题受到社会持续关注。近年来，我国城市发展逐渐进入“存量更新”的优化阶段，老旧小区改造工程变成了重要的城市命题。东莞老旧小区的居住环境问题日益凸显，儿童活动空间的需求矛盾复杂多样。基于此，本文从儿童友好的视角出发，以东莞老旧小区为研究对象，通过实地调研和数据分析，探讨了老旧小区的儿童活动空间的供需关系。

文章首先概述了国内外儿童友好理论研究的进展，并深入解析相关理论，从儿童机体、心理、行为和需求研究其特殊性，并总结归纳了儿童活动空间的四个儿童友好要素：可达性、安全性、多功能性、舒适性。通过分析国内外住区儿童活动空间建设的相关案例，总结可供借鉴的策略，为研究提供理论及实践依据。

在此基础上，通过对东莞三个老旧小区进行系统研究，记录儿童活动空间的物理状况与儿童行为，总结出儿童友好要素的供给现状与特征。构建包含 4 个准则层和 13 个方案层的需求指标体系，并运用 Kano 模型对需求进行分类及优先级排序。结合实地调研结果，对三个小区进行横向与纵向分析，识别儿童需求的差异性和共性，以及当前儿童活动空间的供需关系。

根据需求分析结果，提出适宜东莞老旧小区的儿童活动空间的改造优化策略，提升可达性，确保儿童能够便捷地到达活动空间；增强安全性，保障儿童在活动中的安全；注重多功能性，满足儿童多样化的活动需求；提高舒适性，创造宜人的活动环境；并提出改造实施方法：循序渐进、因地制宜、儿童参与。针对不同类别及优先级的需求，提出针对性的建议，如对于减少机动车穿行等基本型需求及期望型需求，深入研究并提出多角度、多样化具体做法；对于增加看护空间等无差别需求，则探讨寻找儿童需求与社区发展之间平衡点的做法策略。

本研究为老旧小区儿童活动空间的改造提供了有益参考和实践案例，推动儿童友好城市的建设，同时为东莞老旧小区焕发新活力开辟新的思路。

关键词：东莞老旧小区；儿童活动空间；儿童友好；空间需求

Abstract

With the emergence of the aging population in China and the relaxation of the three-child policy, children's issues have garnered continuous attention in society. In recent years, the urban development of China has gradually entered a "stock renewal" optimization stage, and the renovation of old residential compounds has become a significant urban proposition. The residential environment problems in Dongguan's old residential compounds have become increasingly prominent, and the demand for children's activity spaces presents complex and diverse challenges. Based on this, this paper, from the perspective of child-friendliness, takes Dongguan's old residential compounds as the research object, conducting field research and data analysis to explore the supply-demand relationship of children's activity spaces in these areas.

The research first summarizes the progress of child-friendly theoretical research domestically and abroad, and delves into relevant theories, studying the particularities of children from physiological, psychological, behavioral, and needs perspectives. It summarizes and generalizes the four child-friendly elements of children's activity spaces: accessibility, safety, multifunctionality, and comfort. By analyzing relevant cases of children's activity space construction in domestic and international residential areas, it draws on strategies that can be referenced, providing theoretical and practical foundations for the research.

On this basis, the research conducts systematic studies on three old residential compounds in Dongguan, documenting the physical conditions of children's activity spaces and children's behavior. It summarizes the current state and characteristics of the supply of child-friendly elements. A demand indicator system is constructed, consisting of four criterion layers and 13 solution layers. The Kano model is used to classify and prioritize needs. Based on the field survey results, horizontal and vertical analyses of the three compounds are conducted to identify differences and commonalities in children's needs, as well as the current supply-demand relationship for children's activity spaces.

Based on the demand analysis results, optimization strategies are proposed for the renovation of children's activity spaces in Dongguan's old residential compounds, focusing on enhancing accessibility, safety, multifunctionality, and comfort. Implementation methods are

proposed, including gradual progress, local adaptation, and child participation. Targeted suggestions are provided for different categories and priorities of needs, such as conducting in-depth studies and proposing specific measures for basic and expected needs like reducing motor vehicle traffic. For indifferent needs, such as increasing caregiving spaces, strategies are explored to find a balance between children's needs and community development.

Finally, Huayuan Village in Dongguan is used as a practical example, applying the research to the overall planning and improving point, linear, and planar spaces, to create safe and comfortable children's activity spaces.

This study provides valuable references and practical examples for the renovation of children's activity spaces in old residential compounds, promoting the construction of child-friendly cities and offering new ideas for revitalizing old residential compounds in Dongguan.

Keywords: Old residential compounds in Dongguan; children's activity spaces; Child-friendliness; Space needs

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Chapter 1 Introduction

1.1 Research Background

1.1.1 Renovation Needs of Old Residential Compounds

As the basic unit of urban composition, old residential compounds witness the development and changes of cities and contain profound historical and cultural significance. However, many of these old communities can no longer meet the basic living needs of residents. According to statistics released by the Ministry of Housing and Urban-Rural Development, there are nearly 160,000 old residential compounds across the country, involving over 100 million residents and more than 42 million households, with a total construction area of approximately 4 billion square meters. In 2020, 39,000 old residential compounds were newly renovated, affecting nearly 7 million households.

In February 2016, the "*Several Opinions of the Central Committee of the Communist Party of China and the State Council on Further Strengthening Urban Planning, Construction, and Management*[1]" was issued, incorporating "orderly promotion of comprehensive renovation of old residential compounds, renovation of dilapidated houses and non-standard housing, and acceleration of supporting infrastructure construction" into the framework of "improving urban public services". In 2022, the Housing and Urban-Rural Development Bureau of Dongguan City released the "*Implementation Plan for the Renovation of Old Residential Compounds in Dongguan City*," promoting the construction of safe, healthy, well-facilitated, and orderly residential communities[2].

Currently, due to their long establishment time, many public spaces in old residential compounds have significantly declined in quality due to a lack of necessary management and maintenance. Meanwhile, societal developments and changes have led to various shifts in residents' daily life needs, population structure, and lifestyles. As a result, some public spaces in old residential compounds can no longer bear the diverse demands of modern life, and the contradiction between the quality of public space and residents' growing aspirations for a better life has become increasingly prominent.

1.1.2 Growing Attention to Child-Friendly City Construction

With the development of society and technology, the issue of national population aging, and the relaxation of the three-child policy, the way modern children grow up has changed significantly, leading to increased discussions and concerns around child-related topics. A child-friendly city will inevitably be friendly to everyone, and the construction of child-friendly cities is an important consensus and bond in the stage of high-quality urban development.

As foreign theories and practical methods for child-friendly city construction gradually enter China, the country's focus on child-friendliness has been continuously increasing. In the "*Notice of the State Council on Issuing the Outline for the Development of Women and the Outline for the Development of Children in China*," issued in 2021, one of the main goals in the chapter on "*Children and Environment*" is to "build child-friendly cities and child-friendly communities," aiming to create a child-friendly city with Chinese characteristics that reflects child-friendliness in social policy, public services, rights protection, growth spaces, and development environments[3]. The "*Overall Solution for the Elderly and Children During the 14th Five-Year Plan Period in Dongguan City*" mentions creating an environment friendly to both the elderly and children, actively participating in national pilot activities for child-friendly city construction[4]. Given the current situation of insufficient green spaces and public spaces in old communities, which hinders outdoor activities for children, Dongguan has been exploring the construction of child-friendly cities, striving to implement the concept of "child-friendly" in all aspects of urban life.

1.1.3 Outdoor Activities Promote Children's Physical and Mental Health

For children who are in the critical stage of physical and mental development, their experiences profoundly influence their personality formation, and outdoor activities become an indispensable part of their growth. Outdoor activities benefit children's physical health and also promote their psychological well-being.

Children who frequently engage in outdoor activities typically have stronger physical fitness and better adaptability to changes in their external environment. According to the recommendations in the "*Guidelines for Physical Activity for Chinese Children and*

Adolescents[5]", children should engage in at least 2 hours of outdoor activities daily, including at least 1 hour of vigorous physical exercise.

Outdoor activities are equally important for children's mental health. Studies have shown that exposure to outdoor environments has significant potential protective effects on children's mental health, particularly in improving emotional well-being. Outdoor activities provide children with rich sensory experiences and social opportunities, helping to enhance their psychological resilience and better cope with challenges and difficulties in life.

1.2 Research Objectives and Significance

1.2.1 Research Objectives

In response to Dongguan's call for the construction of a child-friendly city with "friendly social policies, public services, rights protection, growth spaces, development environment, and technological innovation," this study aims to explore renovation strategies for old residential compounds in Dongguan, based on the theoretical framework of child-friendly theory and child behavior studies. The specific research objectives are as follows:

(1) Analyze the current environment of old residential compounds in Dongguan and the behavioral characteristics of children. Through field surveys, this study will analyze the current state of children's activity spaces in old residential compounds in Dongguan, identify existing child-friendly elements, pinpoint problems, and understand the characteristics of different types of activity spaces, providing empirical support for the subsequent construction of renovation methods.

(2) Establish a demand system for children's activity spaces and conduct demand analysis. Based on relevant literature and field interviews, this study will extract activity space demand indicators that reflect the true needs of children in old residential compounds in Dongguan. Using the Kano model and Better-Worse Coefficient Analysis, the demand indicators will be classified and prioritized, clarifying the focus and direction for future renovations.

(3) Explore renovation strategies for children's activity spaces in old residential compounds in Dongguan. Based on the survey results and demand analysis, the study will propose renovation strategies for children's activity spaces in old residential compounds, using

Huayuan Village in Dongguan as a case study for renovation practice. This will provide valuable references for better meeting children's needs during the renovation of old residential compounds.

1.2.2 Research Significance

Theoretical Significance: This study provides a foundational compounds-level research and theoretical support for Dongguan’s efforts to build a child-friendly city by conducting a detailed analysis of the supply and demand situation of children's activity spaces in Huayuan Village. It explores how compounds activity spaces can be integrated with children's individualized needs and behavioral characteristics, contributing theoretical insights into the creation of inclusive urban community environments.

Practical Significance: The renovation strategies and specific implementation methods proposed in this study offer practical guidance for the design and renovation of children's activity spaces in old residential compounds in Dongguan. The application of these strategies and methods not only improves childre’s quality of life and happiness but also provides a new perspective and case study for China’s exploration of child-friendly city construction.

Social Significance: From the perspective of community cohesion, optimizing children's activity spaces fosters social interaction within the community, with children acting as catalysts for building a sense of community, revitalizing old residential compounds. Creating a supportive community environment helps alleviate the burden of parenting, which is important for addressing the challenges posed by China’s aging society and low fertility rates, as well as promoting the country’s long-term sustainable development.

1.3 Research Objects

1.3.1 Old Residential Compounds

The State Council's General Office issued the “*Guiding”Opinions on Comprehensively Promoting the Renovation of Old Urban Residential Compounds*,” which defines old urban residential compounds as those built in earlier years in cities or county towns (including town centers), characterized by poor maintenance, inadequate municipal facilities, incomplete

community service facilities, and strong residents' willingness for renovation. Issues such as damaged exterior walls affect the overall image of the city; outdated facilities pose safety risks; and significant vacancy rates restrict regional economic development[6]. These problems have a direct impact on residents' quality of life and the construction of harmonious communities. The management models of old residential compounds vary, and their current conditions are inconsistent. This study focuses on old residential compounds constructed from the 1980s until the housing reform period, most of which have transitioned from dormitory complexes or commercial housing, lacking professional property management, and are currently managed by community neighborhood committees.

1.3.2 Child Friendliness

There are certain differences in the definitions and scopes of "children" within the international community and academia. *The United Nations Convention on the Rights* of the Child defines a child as any person under the age of 18[7]. Based on definitions from the fields of medicine, law, and education, children aged 0-14 exhibit travel behavior while lacking sufficient physical ability or mature minds, necessitating external environments such as streets to accommodate their special needs. This study limits the age range of the research subjects to 0-14 years, focusing on their physiological, psychological, and behavioral characteristics.

The concept of Child Friendliness has developed based on *the United Nations Convention on the Rights* of the Child, aiming to optimize children's living environments to meet their physical, psychological, cognitive, social, and economic needs and aspirations, reflecting the development principle of prioritizing children.

1.3.3 Children's Activity Spaces

In urban residential areas, children's activity spaces refer to areas specifically designed for children, aiming to provide a safe, inclusive, interactive, and stimulating environment that promotes the development of children's physical, cognitive, emotional, and social skills. This environment not only focuses on children's physical activities but also emphasizes their psychological, emotional, and social growth. In this study, children's activity spaces specifically refer to external environments within old residential compounds in Dongguan that are

characterized by openness, shareability, and suitability for children. These spaces provide areas for play, rest, socializing, exercise, entertainment, and learning, forming a comprehensive ecosystem that encompasses a series of design principles and functional requirements, including safety, diversity, educational value, and interactivity.

1.4 Literature Review of Child Friendliness

1.4.1 Development of Domestic and International Theoretical Research

With the progress of industrialization in the West, urban environments gradually deteriorated, threatening children's living conditions. From the late 19th to the early 20th century, playgrounds gained popularity in the United States, prompting scholars to focus on the design of children's activity spaces, such as playgrounds and kindergartens. Major cities began establishing relevant organizations, such as playground associations and committees. From the 1920s to the 1970s, scholars concentrated on child-friendly urban planning. Clarence Perry's 'neighborhood unit' theory thoroughly considered children's needs within communities, proposing that the safety of children walking is one of the core elements of neighborhood unit design. From the 1970s to the 1980s, as multiple disciplines increased their attention on children, a series of studies emerged exploring the interaction between children and their environments. Starting in the 1970s, the research perspective expanded beyond specialized and functional spaces to the 'fourth environment,' referring to informal activity spaces. Kevin Lynch initiated the project Growing Up in Cities in the 1970s, analyzing how urban environments shape children's experiences and growth from a children's perspective and pioneering research on the 'informal' spaces used by children[8]. Berg and Medrich pointed out that children tend to freely explore informal play spaces, including streets, cafes, and buses[9].

The 1989 United Nations Convention on the Rights of the Child unified economic, social, cultural, civil, and political rights, emphasizing comprehensive protection of children's rights. This convention has influenced global legal protection and policy-making concerning children's rights[7]. Around the 2000s, research began emphasizing the importance of children's participation in community planning, advocating for children's empowerment. Roger Hart analyzed the positive impacts of children's participation on their personal development and the

community and environment, discussing specific strategies to promote children's involvement[10]. With technological advancements, various emerging technologies have been applied in building child-friendly communities, such as GIS and accelerators used by Anna Timperio et al. to analyze the correlation between external environments in residential areas and children's outdoor activities[11].

Research on child friendliness in China began relatively late. Guided by traditional hierarchical concepts[12], traditional Chinese residences tended to favor ‘inward’ and ‘enclosed’ forms, lacking external public spaces and giving little attention to interactive areas for children. With the rise of modern residential areas, children's activity spaces began to receive attention. In 1992, Fang Xianfu edited Planning and Design of children's Playgrounds in Residential Areas, proposing design strategies based on the behavioral characteristics of children at different ages and emphasizing reasonable layout and artistic space[13]. This work opened the door to domestic research on children's play areas. During this period, playgrounds were analyzed in isolation from the urban environment, focusing solely on their design techniques without considering the perspective of urban space.

Entering the 21st century, with the dissemination of the concept of ‘child-friendly cities’ domestically, attention to children's spaces expanded beyond playgrounds to encompass the overall urban environment, leading to more diversified research on the concept of child friendliness. Some scholars explored the relationship between children and urban structures. Kinoshita Isamu, Yang Lili, and others compared children's play activities in four regions of Beijing and Tokyo, discussing the impact of urban planning on children's play spaces[14]. Yao Xin et al. summarized the characteristics of children's activity spaces in Tianjin and their influence on children's activities, proposing planning and design recommendations[15]. Li Zhipeng provided suggestions for achieving child-friendly spaces in Chinese cities based on international case studies, including the construction of point and line spaces[16].

Research on child-friendly residential environments has been approached from various perspectives and theories. Some scholars have studied the relationship between behavioral activities and spatial elements starting from children's behavior. Yin Xiaobo explored the interaction between children and activity spaces and the relationship between these spaces and residential areas based on the characteristics of children's activity areas, conducting in-depth

analyses from the perspectives of children's psychological development needs, behavioral development needs, and the adaptability of children's activities[17]. Chen Qifei, in her paper Children and Community Environment — A Case Study of Sandeli Community, employed methods such as observation, interviews, and workshops to explore children's perceptions of community environments, sense of belonging, outdoor life, and the impact of community environments on children's social interactions, proposing corresponding community-building strategies and measures[18]. Wang Lan discussed the diversity of children's activities based on the differing needs of children at various ages, elucidating design principles from the perspectives of satisfying children's behavioral and psychological needs, the value of adaptive activities, the characteristics of adaptive activities, and site safety[19]. Additionally, Wu Shuang[20], Liu Chang[21], and others proposed public space renovation strategies for old residential compounds from a safety perspective; Zhang Qianqian et al. explored children's outdoor play spaces as catalysts for the renewal of old communities, suggesting that improving children's play spaces can revitalize and enhance the quality of the entire community[22]. Moreover, many studies have constructed evaluation systems for outdoor children's spaces from the perspectives of evaluation factors, criteria, and methods, providing reference for the design of outdoor activity spaces.

In recent years, scholars have also extended their research focus to children's participation. Liu Bei, from the perspective of children's participation, achieved full-process involvement of children in community planning and renewal through various engaging activities[23]. Several provinces and cities have formulated relevant policies to promote children's participation in urban planning. For example, in Changsha, the child-friendly planning initiative established a workshop centered on ‘planners + children,’ prioritizing the participation rights of space users[24]. However, most research on children's participation has remained at the level of discussing its importance and providing guiding suggestions, with few studies addressing how to implement these concepts in design[25].

In summary, theoretical research on child friendliness at home and abroad has evolved from focusing on single research activity locations to expanding perspectives to encompass the overall urban environment, and now to multifaceted and diverse studies. Research abroad, having started earlier, has provided valuable references for domestic studies in terms of both

theoretical framework construction and methodological innovation. Domestic research began in the 1980s, focusing on specific types of spaces. As research has deepened, explorations of the relationship between children's behavior, psychology, and space have increased. Subsequently, participatory research and the application of emerging technologies, such as GIS and virtual reality, have injected new vitality into research on child friendliness theory. Additionally, research methods have shifted from primarily qualitative to a combination of qualitative and quantitative approaches, enhancing the scientific rigor and practicality of the research. Overall, both domestic and international research on child friendliness theory is continuously advancing, providing a solid theoretical foundation for creating more suitable environments for children's growth.

1.4.2 Development of Domestic and International Practical Research

Many child-friendly practices have already been established in developed Western countries, each based on its own cultural background and national conditions, actively constructing child-friendly cities (Table 1-1). In Denver, USA, the “Learning Landscapes” model has been pioneered, where children learn through play by utilizing educational and natural elements[26]. This has made beneficial attempts to expand the urban child-friendly open space system. Copenhagen has established multi-level spot playgrounds, using residential community spaces as a base, with public spaces as the backbone (community playgrounds and parks) and institutional auxiliary spaces as supplements, providing diverse and vibrant public spaces[27]. In Toronto, Canada, the “*Growth Guidelines*” researched seven key areas of the city and proposed guidelines for neighborhood communities, architectural spaces, and residential units based on children's growth[28].

Name	Region	Goals and Strategies
Learning Landscapes	Denver, USA	Improve playgrounds to enhance their appeal and encourage outdoor activities among children
Child Safety Enhancement Program	Delft, Netherlands	Connect children's daily locations into pathways to ensure safe travel for children
Walking Bus	London, UK	Respect children's rights, recognizing their entitlements and contributions

Bendigo Mining Town Planning	Bendigo, Australia	Base urban planning on children's needs, ensuring their safety
Forest Kindergarten	Japan	Create small biomes in kindergartens to increase children's exposure to natural environments
Spot Playgrounds	Copenhagen, Denmark	Consider the needs of other age groups while ensuring children's activity spaces are adventurous and educational
"Lantern" Project in Kongti Community	Bangkok, Thailand	Transform small community spaces to provide attractive playgrounds and performance stages for children in impoverished areas
Growth Guidelines	Toronto, Canada	Neighborhood community guidelines, architectural space guidelines, and residential unit guidelines

Table 1-1 International Child-Friendly Related Practices
(Source: Drawn by Author)

China's child-friendly construction started relatively late, with the establishment of children's activity areas originating in urban parks. The development of children's activity spaces within residential areas has lagged behind urbanization. With the acceleration of urbanization, children's activity spaces in residential areas have gradually gained attention. In the 1980s, Beijing was the first to include the construction of children's playgrounds in residential area planning. Since then, there has been preliminary development of children's activity spaces in newly built residential areas, achieving a leap from "non-existence to existence."

To better clarify the future direction of child development in China, several policies have been issued to ensure children's rights (Table 1-2). In 2016, child-friendly communities were incorporated into community development plans at all levels of government, and a Child-Friendly Community Working Committee was established to ensure children's healthy growth through community self-governance. In 2017, the committee released the '*Guidelines for the Construction of Child-Friendly Demonstration Communities*,' providing references for creating child-friendly communities from three perspectives: space friendliness, service friendliness, and policy friendliness. In 2020, the "*Standards for the Construction of Child-Friendly Communities*" stated that community construction and renewal should emphasize children's rights, engage with children and parents for feedback, and involve children in the design process

to express their ideas and feelings, creating outdoor activity spaces that children love.

Year	Document/Conference	Content
1992	"Outline for children's Development Planning in China in the 1990s"	Protection of children's legal rights listed in the 19th National Congress report
2011	"Outline for children's Development in China (2010-2020)"	Proposes main goals and strategies for children's development in health, education, legal protection, and environment
2016	National Two Sessions	Proposed incorporating "Child-Friendly Communities" into community development plans at all levels of government
2020	"Standards for the Construction of Child-Friendly Communities"	The primary basis for assessing whether a community is child-friendly, providing technical guidance for child-friendly community construction
2021	"Guiding Opinions on Promoting the Construction of Child-Friendly Cities"	The first strategic document at the national level to comprehensively guide the construction of child-friendly cities in China
2021	"China children's Development Outline (2021-2030)"	Encourages the creation of child-friendly cities with social policy, public services, rights protection, growth space, and developmental environment friendliness unique to China

Table 1-2 Relevant Documents on the Construction of "Child-Friendly Cities" in China
(Source: Drawn by Author)

Currently, multiple cities are actively responding to the construction goals of “Child-Friendly Cities,” considering children's needs as an important aspect of urban development planning. Cities such as Shenzhen, Changsha, Beijing, Hangzhou, and Nanjing have successively proposed the slogan of striving to create “Child-Friendly Cities,” and are actively promoting the construction of these cities from various aspects, including policies and practices[29]. Shenzhen has incorporated child-friendly concepts into the key points of its 2016-2035 urban master plan and announced the strategic planning and action plan for building child-friendly cities in 2018[30]. Changsha aims to enhance children's participation and improve the environment around schools to improve living conditions for children, integrating this goal into the “*Changsha 2050 Vision Development Strategic Plan*”[31]. Community renovation projects in areas such as Shuangjing Street[32] in Beijing and Siping Road[33] in Shanghai, as well as the involvement of various non-profit organizations and research institutions, have further enriched practical cases of building child-friendly environments, providing valuable

experiences and references for future construction of child-friendly cities.

Overall, research directions in China primarily focus on proposing strategies, with child-friendly perspectives regarding residential area renewal largely emphasizing safety, improving spatial continuity, and enhancing natural conditions. Practically, current initiatives are mostly concentrated in cities such as Shanghai, Changsha, and Shenzhen, with most spatial renovations focusing on sporadic point-like spaces rather than forming a comprehensive system.

1.5 Research Methods and Framework

1.5.1 Research Methods

(1) Literature Induction

A systematic collection and in-depth reading of domestic and international research literature on children's activity spaces in urban residential areas have been conducted, providing a solid theoretical foundation for subsequent practical discussions. By studying core theories such as child behavioral science and cognitive development theories, the uniqueness and demand characteristics of children's outdoor activities have been thoroughly understood, allowing for the extraction of child-friendly elements in old residential compounds, thereby constructing the theoretical framework of this thesis.

(2) Case Study

This study selects representative cases of children's activity spaces at the residential area level from both domestic and international contexts for detailed analysis. By deeply exploring these cases, successful experiences have been summarized, and core elements suitable for designing children's activity spaces in old residential compounds have been extracted along with a series of implementable measures. This lays a solid foundation for subsequent empirical research and strategic conceptualization.

(3) Field Research

The method of field observation can provide direct, vivid insights and authentic first-hand data. In this study, field visits and non-participatory observations were conducted in old residential compounds in Dongguan to record the physical environment’s current status and

children's daily activity behaviors, summarizing the potential relationships between children and space.

(4) Interviews and Questionnaire Surveys

Through preliminary semi-structured interviews and targeted interviews during the questionnaire collection phase, a deeper understanding of children's subjective preferences for space and the underlying logic of their behaviors was achieved. Questionnaire surveys were used to outline the general usage of children's activity spaces and gather children's satisfaction with these spaces, providing comprehensive and multidimensional references for subsequent strategy proposals and design optimizations.

1.5.2 Research Framework

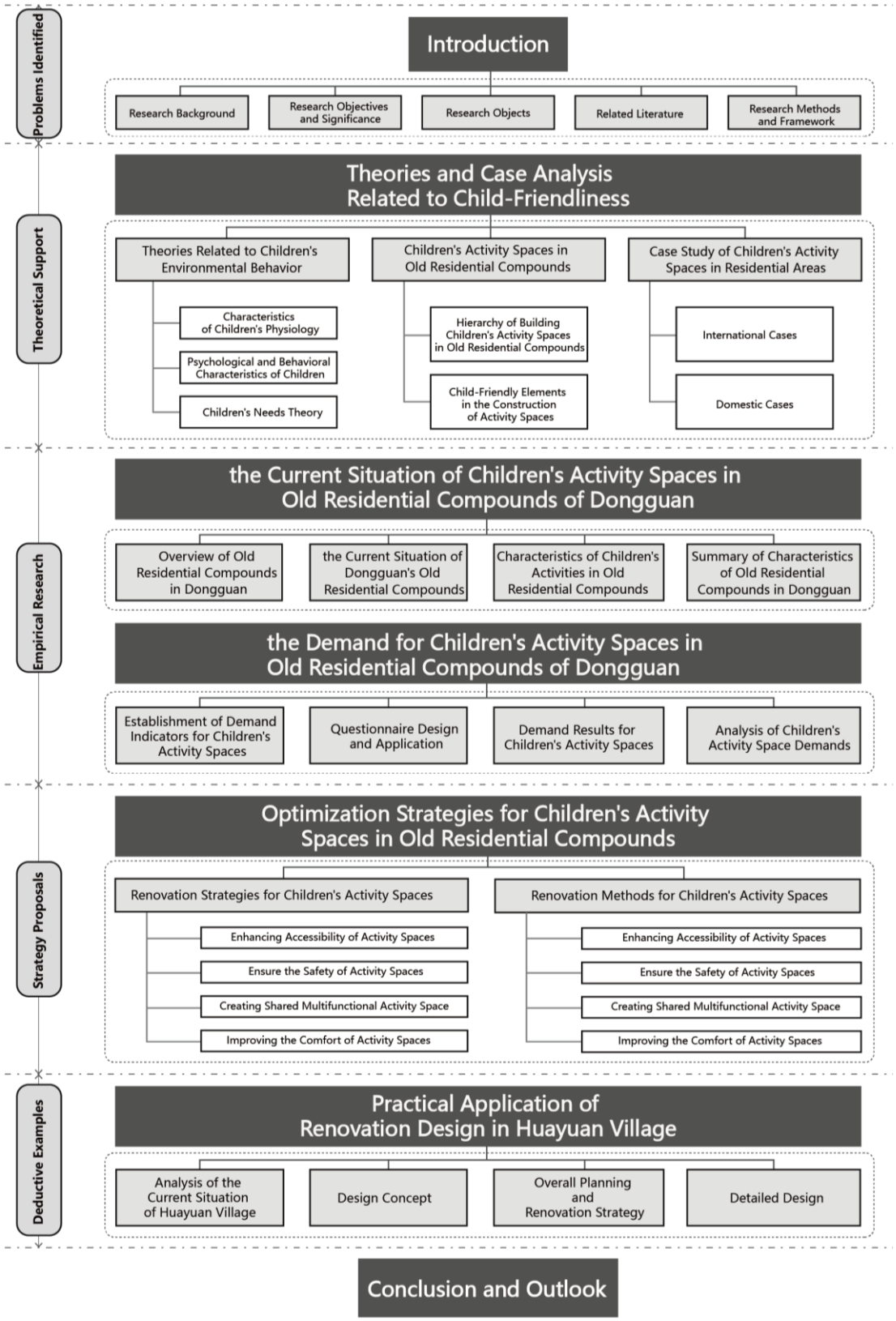


Figure 1-1 Thesis Framework

(Source: Drawn by Author)

Chapter 2 Theories and Case Analysis Related to Child-Friendliness

This chapter begins by exploring relevant theories in environmental behaviorism concerning children, examining the relationships between children's perception, psychology, physiology, and needs. Subsequently, from a child-friendly perspective, it analyzes the composition of activity spaces for children in old residential compounds, discussing the various levels involved in designing these spaces. By combining literature reviews with theories from child behavior studies, the chapter summarizes key elements of child-friendly activity spaces, laying a theoretical foundation for the subsequent questionnaire survey and strategy development.

2.1 Theories Related to Children's Environmental Behavior

2.1.1 Characteristics of Children's Physiology

Children, being in a growth period, have physiological dimensions that are much smaller than those of adults, and there are significant differences in physiological dimensions among children of different age groups. The height of children aged 3~6 years ranges 96~122 cm[33], for those aged 7~10 years, it ranges 124~141 cm, while children aged 11~14 years have heights between 146~165 cm, showing a smaller gap compared to adults.

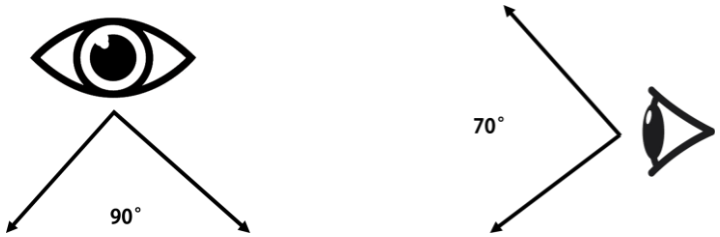


Figure 2-1 Children's Horizontal and Vertical Field of Vision
(Source: Drawn by Author)

The field of vision for children is smaller than that of adults. Generally, adults have a visual field of about 120° vertically and about 150° horizontally, with an average eye level between 145~165 cm. In contrast, 3~6-year-old children's vertical viewing angle is only about 70°, and their horizontal viewing angle is approximately 90° (Figure 2-1), with an average eye level

between 80~ 105 cm[34], demonstrating significant differences from adults. The narrow field of vision causes children to focus more on immediate objects, allowing for a more acute and detailed perception of their surroundings. On the other hand, children's various perceptual abilities are rapidly developing; by age 3, children can already distinguish colors and use touch to perceive characteristics such as hot and cold, soft and hard, and shapes, categorizing objects based on sensory experiences.

2.1.2 Psychological and Behavioral Characteristics of Children

2.1.2.1 The Process of Cognitive Development in Children

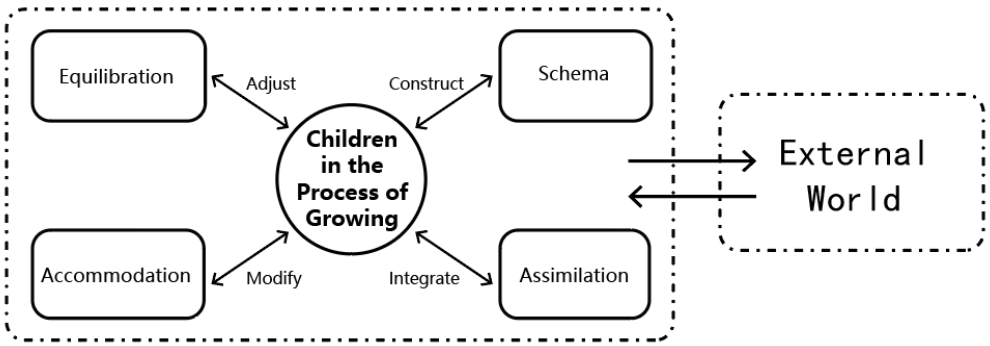


Figure 2-2 Piaget's Theory of Cognitive Development
(Source: Drawn by Author)

Jean Piaget posits that cognitive development is the result of the interaction between innate abilities and environmental factors (Figure 2-2). Children are not passive recipients of environmental information; they actively explore and interact with their surroundings. Piaget proposed the theory of cognitive development[35] and divided the cognitive development process of children into four stages: the sensorimotor stage (0-2 years), the preoperational stage (2-7 years), the concrete operational stage (7-11 years), and the formal operational stage (11 years and older) (Table 2-1).

Age	Development Stage	Characteristics
0-2 years	Sensorimotor Stage	During this stage, children recognize the world through sensory experiences and movement. They begin to explore the relationship between themselves and the environment and have a strong perception of intuitive objects. They have the ability to imitate simple actions and attempt to solve problems through trial and error.

2-7 years	Preoperational Stage	In this period, children start using symbols (such as language) to represent objects and events, but their thinking is still egocentric and lacks logical operational ability. This stage is critical for the formation of personality, as children begin to exhibit individuality while their psychological activities remain unstable.
7-11 years	Concrete Operational Stage	Children begin to understand logical concepts and classification and can perform concrete logical operations, although they still require concrete objects to understand abstract concepts. As they age, they start to form spatial concepts.
11 years+	Formal Operational Stage	Children possess basic logical reasoning and abstract thinking abilities, understand hypothetical-deductive reasoning, and their psychological development gradually matures. However, this stage often leads to oppositional behavior and extreme emotions.

Table 2-1 Cognitive Development Stages of Children at Different Ages
(Source: Drawn by Author)

2.1.2.2 Psychological Characteristics of Children

(1) Dependency Psychology

In the early stages of development, children do not yet possess the ability to independently handle problems and cope with complex situations. Their dependency on adults is reflected not only in their material needs, such as care and the fulfillment of basic survival needs, but also in their psychological needs, such as emotional communication, the construction of a sense of security, and the shaping of values. Dependency can alleviate the tension and fear within children, and appropriate reliance allows them to feel that they are doing things independently.

In addition to depending on family members, children gradually develop dependencies on peers, which is a critical period for learning social skills and building interpersonal relationships. Peer partners can become sources of emotional support for children, and the feedback and evaluation from friends are crucial to the formation of their self-concept.

(2) Exploration of the Unknown

Children possess a natural curiosity and desire to explore. They are filled with interest in the surrounding world and are willing to try new things and explore unknown areas. This exploratory nature is an important driving force for children's learning and cognitive development, helping them gradually establish their understanding of the world. In the process

of exploring the unknown, children learn how to observe details, engage in logical reasoning, and think creatively.

(3) Egocentrism

Egocentrism refers to the tendency of children in the early stages of cognitive development to view the world entirely from their own perspective, centering everything around themselves while rarely considering the limitations of the external environment or the needs of other children's activities. During this period, children's behaviors are often driven by emotions and preferences rather than rational judgments. They frequently struggle to understand others' viewpoints and feelings, lack rational judgments about their surroundings, and may fail to recognize potential dangers.

Additionally, children have a strong sense of ownership and prefer to play with peers, often showing a degree of rejection toward those who are different from themselves. This exclusivity somewhat limits their social range and affects their communication and interaction with children from different backgrounds. However, as children grow older and accumulate social experiences, they gradually learn to be inclusive and understanding, allowing them to establish good relationships with people from diverse backgrounds.

(4) Recognition from Others

Recognition from others serves as an extremely important source of motivation for children, inspiring them to present their best selves when faced with challenges. Children often desire to showcase themselves in front of others and enjoy the moments of being the center of attention. When they engage in challenging activities and achieve success, the sense of accomplishment and satisfaction significantly enhances their confidence. At the same time, their abilities in various areas, such as problem-solving skills, decision-making, coordination, and perseverance, are honed and strengthened in the process of overcoming difficulties.

(5) Conformity Psychology

Children enjoy imitating the behaviors of family members, older children, and even strangers in their daily lives. This imitation is one of the important ways for them to learn and adapt to society. Due to their incomplete understanding of things, children often find it challenging to make accurate judgments when selecting behaviors and may overlook their

individuality and judgment due to blind conformity, potentially imitating negative behaviors. Additionally, in their interactions with peers, children gradually form a sense of identification with a particular group or culture. They may mimic the behaviors, interests, and values of their peers to establish their own identity. This tendency to conform helps children integrate into groups, build social relationships, and is also a crucial aspect of their socialization.

2.1.2.3 Behavioral Characteristics of Children

According to different categories, the influencing factors of children's behavioral activities can be divided into three types[36]: material environmental factors, individual factors, and social environmental factors（Figure 2-3).

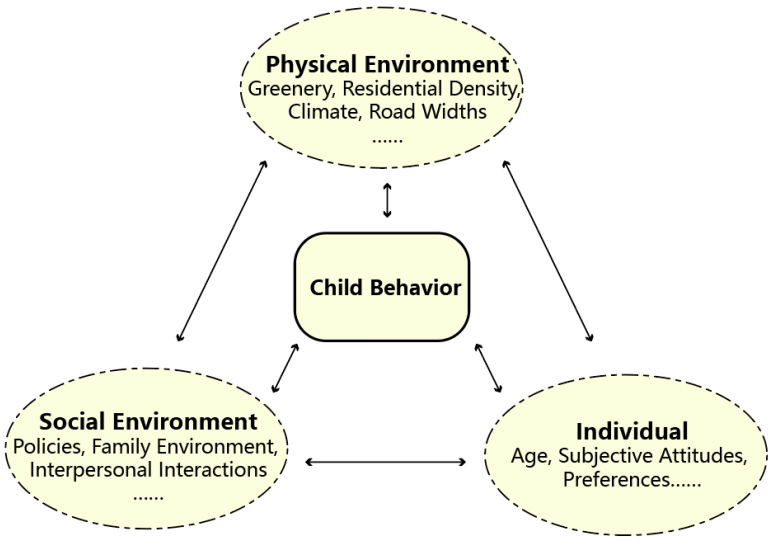


Figure 2-3 Influencing Factors of children's Behavior
(Source: Drawn by Author)

Material environmental factors include natural environments (such as climate and topography) and built environments (such as the level of urbanization and population density), which together influence children's opportunities for going outside and their activity experiences. Individual factors involve children's physiological, psychological, and capability levels, such as age and interests, which affect their behavior choices and types of activities. Social environmental factors encompass policies, family environments, interpersonal interactions, etc., covering macro, meso, and micro levels. Among these, the family environment, as a sub-factor, has a direct influence on children's behavioral patterns.

Multiple factors work together to shape children's behavioral characteristics, which

include small social distances, limited activity ranges, random movement trajectories, and diverse types of activities.

（1）Small Social Distances

	Adults	Children		
		0-3 years	4-7 years	12 years and older
Close distance	＜0.45m		-	
Personal distance	0.45~1.2m		＜0.15m	
Social distance	1.2m~3.6m	0.46m	0.61m	1.2m
Public distance	3.7~7.6m		1~3m	
Distant distance	＞110m		＞20m	

Table 2-2 Differences in Social Distances Between Children and Adults
(Source: Reference[37], Redrawn by Author)

In the book "*The Hidden Dimension*," Edward T. Hall explores human perception and its role in interpersonal communication[38]. He categorizes human sensory organs into two major types: distance-based receptors (eyes, ears, and nose) and direct-contact receptors (skin and muscles), and defines four different social distances: intimate distance, personal distance, social distance, and public distance.

Children's psychology is more sensitive compared to adults, yet due to their height and size, they exhibit shorter social distances in social interactions. According to Table 2-2, the social distance of a 3-year-old child is about 0.46m, increasing to 0.61m by age 7. As children grow older, their social skills and self-awareness mature, leading them to require more personal space for comfortable social interactions. For children over the age of 12, the social distance increases to 1.2m, similar to that of adults.

Overall, children's social distances gradually increase with age, but even in early adolescence, their social distances are typically still less than those of adults.

（2）Regularity of Activity Time

children's activity times are more regular compared to adults and are also more influenced by guardians. According to relevant studies (Figure 2-4), the outdoor activity time for infants and toddlers is primarily concentrated between 8:00-10:00 and 14:00-16:00, generally led by parents for simple outdoor activities. Activity times for preschool and school-age children are often after school, mainly concentrated between 16:00 and 18:00. The frequency of outdoor

activities for children is also related to weather and seasons; outdoor activity frequencies are lower during inclement weather compared to sunny days, and frequencies also decrease during extremely cold or hot temperatures in winter and summer.

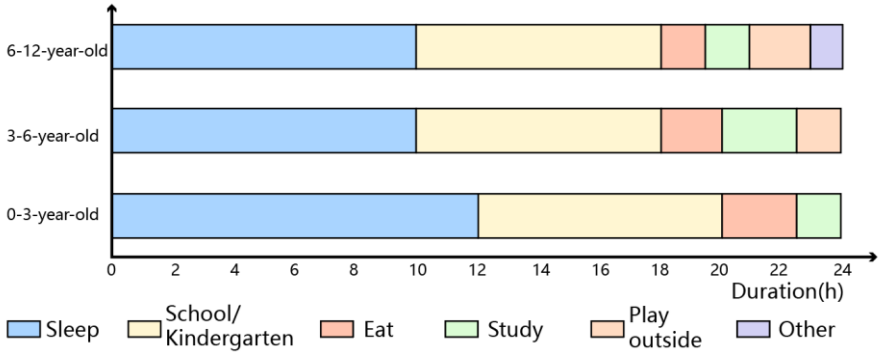


Figure 2-4 Differences in Outdoor Activity Time Among Children of Different Ages
(Source: Reference[39], Redrawn by Author)

(3) Differences in Activity Abilities

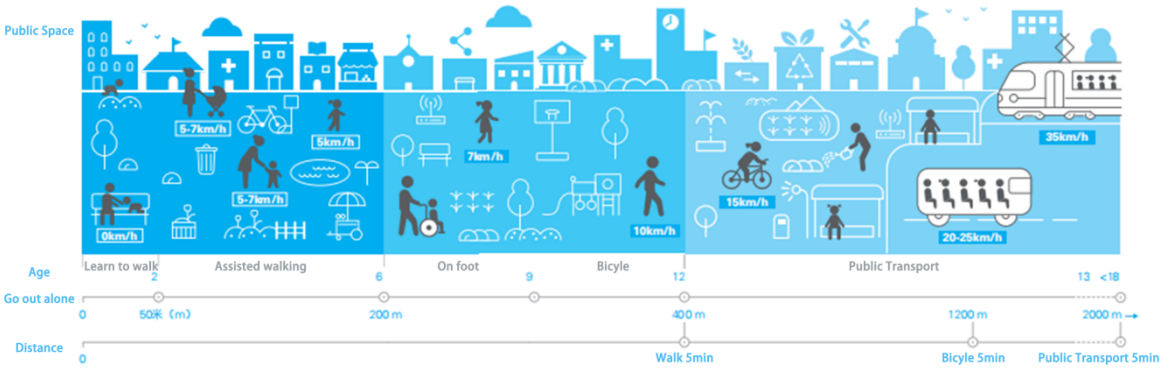


Figure 2-5 Differences in Outdoor Activity Times Among Children of Different Ages
(Source: Reference[40])

Children of different age groups have varying activity abilities. From ages 0~2, children are learning to walk, and their activity capabilities are limited, with independent travel ranges of only about 50m, primarily relying on guardians for activities. At ages 3~6, they can run and jump independently, with a walking speed of 5 km/h. Children aged 7~12 have improved body coordination and can engage in walking for a certain amount of time. By ages 12~14, children can independently use bicycles or public transport for travel(Figure 2-5).

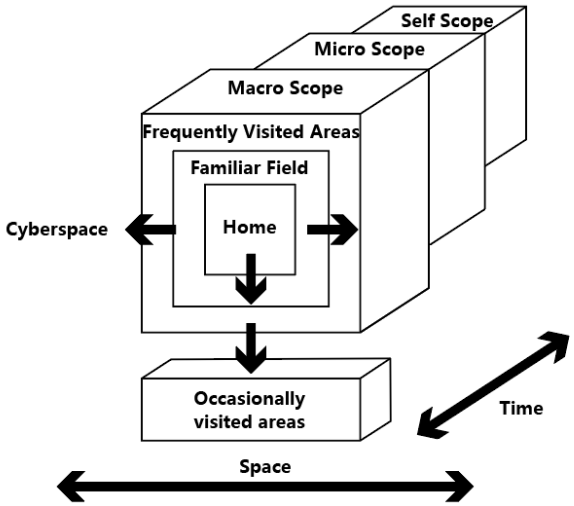


Figure 2-6 Model of children's Activity Domains
(Source: Reference[41], Redrawn by Author)

Correspondingly, children's activity ranges also differ by age group. Children's activities are centered around family and gradually expand from familiar and habitual domains to outer layers, demonstrating a characteristic of expanding "self-micro-macro" activity ranges (Figure 2-6). children's familiar domains usually revolve around their home, including nearby streets, neighborhood parks, etc. Familiar domains are less affected by distance or age limitations and serve as the primary locations for daily activities across all age groups. Common domains refer to areas children frequently visit but that are limited by certain environmental constraints, such as parks separated by main roads or neighborhood sports fields with limited accessibility. These areas are influenced by distance and may also be subject to parental restrictions. Occasional domains are places visited by children under specific circumstances and individual needs, such as distant playgrounds.

Growth Stage	Behavioral Ability Characteristics	Activity Domains	Activity Locations
0-2 years	From crawling to independent walking, relying on sensory systems to perceive the world	Familiar Domains	Residence and surroundings: doorsteps, courtyards, streets, community activity spaces, neighborhood parks
3-6 years	Mastering running and walking, beginning to seek peers for play, can leave guardians for short periods	Familiar Domains, Common Domains	Residence and surroundings: doorsteps, courtyards, streets, community activity spaces, neighborhood parks, kindergartens, nearby public service facilities

7-12 years	Enhanced body coordination, preliminary social skills, enjoys adventurous activities	Familiar Domains, Common Domains, Occasional Domains	Activity range expands: doorsteps, courtyards, streets, community activity spaces, neighborhood parks, kindergartens, nearby public service facilities

Table 2-3 Activity Domains for Different Age Groups of Children
(Source: Drawn by Author)

As children's activity abilities improve, their activity domains gradually widen (Table 2-3). The boundaries between common and familiar domains become less distinct, and occasional domains may also become part of children's daily lives. However, residential areas remain the primary locations for children's activities. Research shows that over 50% of 10~12-year-old children have their activity ranges within a 15-minute radius of their communities, with most activities occurring within 500m from home, and over 80% of activities concentrated in residential, school, and transportation areas.

(4) Random Movement Trajectories

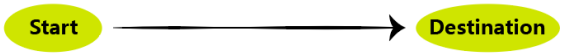
Population	**Illustration**	**Movement Trajectory Characteristics**
Children		Randomness and unpredictability; easily attracted to interesting things.
Adults		Goal-oriented actions; clear activity trajectories.
Elderly		Primarily strolls; slower actions, with pauses.

Table 2-4 Movement Trajectories of Different Populations
(Source: Drawn by Author)

Children often act based on intuition, and their activity trajectories exhibit significant randomness and unpredictability. This characteristic makes it difficult to define children's movement paths using conventional frameworks; they tend to decide their actions based on immediate feelings and curiosity. While exploring their environment, they demonstrate a high degree of freedom. On one hand, curiosity drives them to explore every corner, which can enhance their self-awareness and deepen their perceptions of things. On the other hand, the

irregularity of their movement trajectories may pose certain dangers (Table 2-4).

（5）Diverse Types of Activities

Jan Gehl, in his book "*Life Between Buildings*," categorizes outdoor activities into three types: necessary activities, spontaneous activities, and social activities (Figure 2-7). This classification is equally applicable to children's outdoor activities[42].

Necessary activities are the foundation of children's outdoor activities, undertaken to meet basic life needs, and are rarely influenced by external activities. Children attend school at designated times, which helps them better understand society and cultivate independent living skills. Spontaneous activities are the essence of children's outdoor activities, driven by their interests and needs, including play and recreation, exploration and discovery, artistic creation, and relaxation. Spontaneous activities are easily influenced by weather, time, and location; if the spatial environment is not ideal or fails to fully meet outdoor activity needs, engagement may diminish. Social activities are the links in children's outdoor activities, involving interactions with family, friends, classmates, etc., such as communication and cooperation, gatherings, and team competitions. Social activities are characterized by complexity, richness, and variability, occupying the longest duration in open spaces. Through play and social interactions, young children gradually experience the joy of play and develop good personalities.

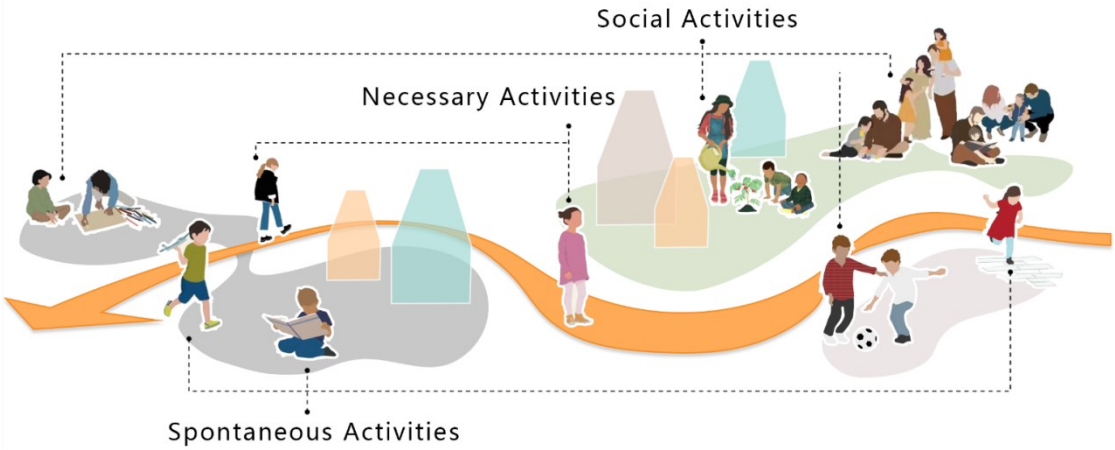


Figure 2-7 Types of children's outdoor activities unde Jan Gehl classification
(Source: Drawn by Author)

The three types of activities have a "chain reaction" relationship, which is important for material planning. Architects and planners can promote more spontaneous behaviors by improving outdoor space environments, thereby laying the groundwork for social activities and

making cities more vibrant. Outdoor activities during children's growth are highly rich. From necessary activities to spontaneous activities to social activities, children's outdoor activities encompass exercise, cognition, emotion, and social aspects. As children age, the types and contents of outdoor activities continue to diversify, meeting the psychological and physiological needs at different stages.

2.1.3 Children's Needs Theory

ERG theory was developed by Clayton Alderfer of Yale University, building upon Maslow's hierarchy of needs[43]. This theory posits that humans have three core needs: Existence needs, Relatedness needs, and Growth needs. These needs differ from the five levels in Maslow's theory. In ERG theory, Maslow's physiological and safety needs are merged into Existence needs; social and esteem needs are merged into Relatedness needs; and the intrinsic part of self-actualization is singled out to form Growth needs (Figure 2-8).

Existence Needs: These address children's basic physiological and safety needs, such as food, water, shelter, and protection from harm. In activity spaces, this translates to providing adequate shelter and protection to prevent children from getting hurt.

Relatedness Needs: These refer to the desire to maintain friendly relationships with others (external factors of esteem needs and love needs). In activity spaces, this is represented by opportunities for interaction with others, such as playground equipment, play areas, or social zones.

Growth Needs: These relate to children's personal development and self-actualization (the intrinsic factors of esteem needs and self-actualization needs), offering opportunities for challenging and creative activities, such as art and music studios, science labs, or sports facilities.

Maslow's hierarchy of needs is presented as a rigid, stepwise structure, emphasizing that lower-level needs (such as physiological and safety needs) must be prioritized and satisfied before higher-level needs (such as esteem needs and self-actualization) can be fulfilled[44]. However, ERG theory is more flexible, positing that different levels of needs can coexist and interact simultaneously. For example, in the process of children's growth, their Relatedness and Growth needs may coexist and influence each other along with Existence needs.

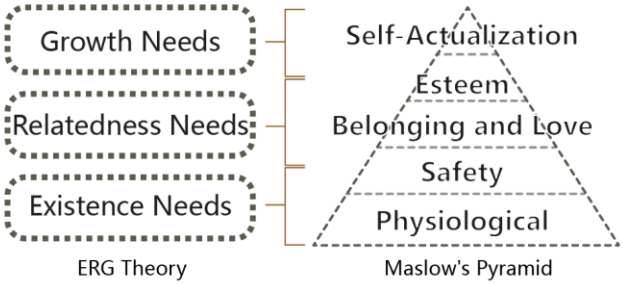


Figure 2-8 Relationship between Maslow and ERG Theory
(Source: Drawn by Author)

（1）Dynamic Needs Hierarchy and Interaction Effects

Children’s needs exhibit dynamic and interactive qualities, meaning that they are not satisfied in a linear, step-by-step fashion; rather, multiple levels of needs can coexist and interact.

Piaget’s cognitive development theory suggests that as children grow, they gradually acquire more complex cognitive abilities. However, throughout this process, their need for security remains constant, particularly when facing challenges and uncertainties. Within the framework of ERG theory, this phenomenon is explained by the frustration-regression principle. When higher-level needs cannot be met, children may intensify their focus on lower-level needs. This regression mechanism is especially common among preschool children. For instance, when children feel isolated in social interactions or are not respected, they may become more dependent on their parents for emotional security. This dynamic structure of needs highlights the importance of considering children’s multi-level needs in the design of children’s spaces, ensuring that while participating in higher-level growth activities, they also feel a sufficient sense of safety and support.

（2）Subjectivity of Needs Fulfillment and Individual Differences

Children’s needs do not develop uniformly according to social or cultural standards. Each child’s hierarchy of needs and the intensity of these needs may vary based on individual background, personality traits, and growth environment. For example, some children may prioritize social needs over other types of needs, while others may focus more on self-achievement.

In the design of children’s activity spaces, it is essential to take into account the diversity of children's needs. Different spaces should be capable of fulfilling various types of needs. For

instance, providing open social interaction zones can satisfy Relatedness needs, while challenging facilities can meet Growth needs, and private spaces for quiet rest and security can address Existence needs. This diverse design allows children to select appropriate activities based on their individual needs, thereby better promoting their physical and mental development.

2.2 Children's Activity Spaces in Old Residential Compounds

2.2.1 Hierarchy of Building Children's Activity Spaces in Old Residential Compounds

According to relevant studies, child-friendly residential areas have four main components: spatial construction, activity operation, community building, and policy support[45]. In terms of spatial construction, it primarily includes formal activity spaces and informal activity spaces, which can be further categorized into point, linear, and planar activity spaces based on the morphology of the activity venues.

(1) Physical Space Construction

In residential areas, activity spaces are mainly outdoor spaces, which can be divided into formal and informal spaces. Formal activity spaces are specifically designed for children, intended for their use, while informal activity spaces may simply be open areas. The goal of activity spaces should be to allow children to play freely, safely, and without barriers, meeting their needs for social interaction, emotional expression, sports, and play.

Drawing from Jan Gehl's *Life between Building*, this study categorizes children's activity spaces in the compound into three spatial levels: aggregated planar activity spaces, linear activity spaces serving circulation functions, and dispersed point activity spaces[42].

Planar activity spaces, such as parks and sports fields within the compound, are the main venues for children's leisure and entertainment. These spacious areas meet children's recreational needs, allowing them to stay for extended periods and engage in various activities. Such spatial designs not only facilitate adult supervision to ensure children's safety but also reduce repetitive zoning through aggregated layouts, making it easier for children to play and

interact. However, centralized layouts may require children to walk longer distances to reach activity sites, which can increase the difficulty of participating in outdoor play. Planar activity spaces must cater to all age groups of children for play, socializing, and other functions. Therefore, under the premise of safety and accessibility, emphasis should be placed on shaping their multifunctionality.

Linear activity spaces include residential roads, group paths, and alleyways, primarily serving children's circulation functions. In these spaces, children's activities are typically brief, mainly focused on passage, with occasional short activities or games taking place. Although these areas are not designated game zones, they provide the necessary connections and transitions for children's daily activities. Consequently, linear activity spaces require strong continuity to support their circulation functions, along with safety, comfort, and fun.

Point activity spaces, such as front courtyards and vacant land between houses, are characterized by their scattered distribution throughout the compound. These small activity spaces offer children convenient access for nearby activities, allowing them to easily engage in brief games or rest during their daily lives. The dispersed layout enriches children's outdoor activity experiences and provides opportunities for interaction among neighborhood children. The design of these spaces requires shared use, safety, comfort, and accessibility.

Current old residential compound layouts are relatively compact, primarily featuring point and linear activity spaces.

(2) Activity Operation

Community staff need to possess the ability to guide and promote children's correct and positive play, organize residents and children to participate in community building, and carry out daily updates and maintenance of relevant infrastructure and playgrounds. The operation and maintenance of activities are the final components of the design; only when these activities are implemented can the friendliness of the residential area truly function. In the activity construction of child-friendly residential areas, activities can be divided into daily activities and celebratory activities. Daily activities typically take place in daily life, such as routine games, maintenance activities, and planting. Celebratory activities are held during specific holidays, such as community harvest festivals for children's Day.

(3) Community Building

The construction of resident-neighbor relationships mainly involves nearby businesses, similarly disadvantaged elderly individuals, community residents, schools, and care or educational institutions. Nearby businesses can provide material support for children, such as toys and stationery, organize various child-related activities, and offer potential surveillance effects to subtly deter violence against children. Relationships between children and the elderly can foster mutual assistance and harmony. Establishing good neighbor relationships can cultivate a culture in the community that cares for and values children, reducing conflicts between children and residents.

(4) Policy Support

According to the "*Standards for the Construction of Child-Friendly Communities*" published by the China Community Development Association, the main components include promoting the establishment of cross-departmental cooperation structures, providing financial support, establishing mechanisms for children's participation, and creating follow-up guidance and feedback mechanisms. These policy frameworks aim to ensure that various departments can coordinate to achieve the goals of child-friendly communities. Additionally, by providing financial support and establishing mechanisms for children's participation, children's voices and influence in community construction can be enhanced. Furthermore, follow-up guidance and feedback mechanisms help evaluate the effectiveness of policy implementation and make corresponding adjustments based on feedback.

2.2.2 Child-Friendly Elements in the Construction of Activity Spaces

Children's perceptions of the need for outdoor activity spaces in residential areas are diverse. With ongoing research, the academic understanding of children's spatial needs is gradually deepening, and the grasp of its constituent elements and characteristics is becoming increasingly mature and refined. Scholars have conducted in-depth discussions on children's needs for outdoor activity spaces in residential areas from various perspectives(Table 2-5).

Author	Publication Year	Child-Friendly Elements

Liang Yunbo[46]	2010	Safety: site location, safety of facilities, ground materials, etc.; diversity of play activities: targeted, spontaneous, etc.
Xu Nan[47]	2013	Accessibility: residential planning, site accessibility; safety: social supervision, sense of territory, site safety; comfort: spatial quality, quality of small facilities, quality of green environment; functionality
Liu Zican[48]	2014	Accessibility: macro, meso, micro; safety: spatial visibility, sense of territory, site safety, children's travel; comfort: physical, psychological; multifunctionality: functions of space, value to children; playfulness: fun in community space, children's activity conditions
Hou Yuzhu[49]	2018	Accessibility; functional usability: spatial function, site facilities; safety: community supervision, site safety; comfort: behavioral comfort, perceptual comfort; pleasure: interaction, visual aesthetics; economy
Zhang Qi[50]	2019	Multifunctionality: playfulness, cultural significance; comfort: spatial quality, facility quality, green quality; accessibility: location selection for activity spaces, barrier-free design; safety: social supervision, safety of sites and facilities, clear zoning
Liu Mengyuan [51]	2019	Children’s participation, comfort, playfulness, safety
Meng Xue[36]	2022	Recreational usability: diverse recreational venues, age-appropriate play facilities, diverse play equipment, etc.; transportation; travel comfort: well-designed pedestrian facilities, adequate crosswalks, etc.; travel support: low street speeds, moderate traffic; service availability: convenient commercial services, proximity to medical facilities; neighborhood atmosphere: neighbor interaction and familiarity; neighborhood safety: perceived traffic safety, perceived public safety

Table 2-5 Study of Child-Friendly Elements in Residential Areas by Domestic Scholars (Source: Drawn by Author)

Based on a summary of existing research, this article concludes that accessibility, safety, multifunctionality, and comfort are key elements for child-friendliness. These four factors contribute to constructing child-friendly activity spaces in residential areas, enhancing children’s participation in activities and promoting their healthy growth (Table 2-8).

2.2.2.1 Accessibility

Accessibility is an important factor in measuring the convenience of children’s activity spaces. A highly accessible activity space ensures that children can engage in various outdoor activities in a safe and convenient environment, promoting their physical and mental health

development. The accessibility of an activity space includes two aspects: first, the accessibility of the space itself, meaning whether children can easily reach and use that space; second, the internal accessibility of the space, which refers to whether the layout within the space meets children's activity needs and provides sufficient room for free movement. For children, lower levels of independent activity result in smaller activity ranges, making residential areas and surroundings more familiar. High accessibility in these spaces can ensure their outdoor travel safety and increase travel frequency. Therefore, the layout of children's activity venues must fully consider their activity characteristics and needs, improving accessibility based on proximity to homes and providing a safe, comfortable, and enjoyable environment for children.

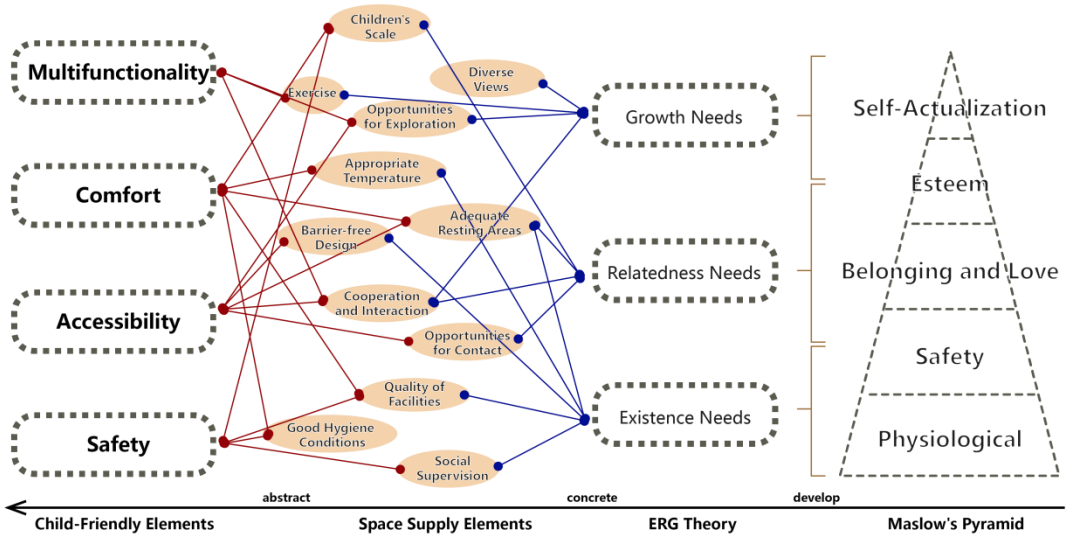


Figure 2-9 Children's Activity Needs Diagram
(Source: Drawn by Author)

2.2.2.2 Safety

Safety is a crucial consideration in children's activity spaces within old residential compounds. children's physiological and psychological development is not yet mature, and their abilities to recognize, judge, and handle dangers are weaker than those of adults, making children's safety issues a priority. Safety considerations involve two main aspects: physical safety and psychological safety. Physical safety focuses on whether the activity space poses potential risks for physical injuries, such as slippery ground and obstacles, which may cause bodily harm to children. Psychological safety addresses whether the activity space can provide a sense of security for children and meet their activity and psychological needs, thereby

ensuring their mental health. Therefore, when renovating children's activity spaces in old residential compounds, both aspects of safety must be fully considered to eliminate potential risks of physical injury while creating an environment that can provide children with psychological security. This not only ensures children's safety during activities but also promotes their physical and mental health development and increases their participation.

2.2.2.3 Multifunctionality

Multifunctionality requires that activity spaces meet children’s diverse activity needs, which not only involves improving space utilization efficiency but also enriches children's outdoor activity experiences. Multifunctionality demands that children’s activity spaces possess flexible and variable characteristics, achieved through reasonable planning of activity areas and adequate provision of activity facilities, allowing for an organic combination of play, learning, and exercise functions. This facilitates a more diverse activity experience for different groups of children within a limited space. Multifunctionality helps increase the attractiveness of children’s activity spaces, promotes interaction and communication among children, and cultivates their teamwork and social skills. In the renovation practice of old residential compounds, it is essential to emphasize the multifunctionality of activity spaces to achieve efficient, harmonious, and sustainable use.

2.2.2.4 Comfort

Comfort is an important factor in measuring the quality of children’s activity spaces. A comfortable space can provide children with a good environment for play and learning, facilitating immersive play and unlocking their potential. The comfort of a space primarily manifests in environmental conditions, including the regulation of physical factors such as temperature, humidity, and noise, ensuring that children can be in a physiologically comfortable environment while engaging in activities. In designing children’s activity spaces in old residential compounds, attention should be paid to children’s physiological and psychological needs, such as the scale, material, and shape of facilities, which should all meet children's growth characteristics and usage habits. High comfort levels can reduce children’s fatigue during activities, increase enjoyment, and thus improve the frequency of space use. Therefore,

comfort not only relates to children's direct usage experience but also affects the social value of the space and the vitality of the community.

2.3 Case Study of Children's Activity Spaces in Residential Areas

2.3.1 International Case: Pearl District, Portland, USA

The Pearl District, located in the northwest of Portland, comprises over 120 blocks and has a rich history, transitioning from a traditional heavy industrial town to a vibrant high-density mixed-use urban district. During the development process, as the birth rate of children in the area and the demand for children's infrastructure services have increased, the construction of child-friendly cities has garnered more attention.

(1) Policy Support

In 2001, the local government enacted the "*Pearl District Development Plan: A Future Vision for a Neighborhood in Transition*", emphasizing the importance of children's rights[52]. The Plan mentions the need to increase the number of playgrounds and pocket parks to address the deficiencies in accessibility and safety considered in previous planning. In 2008, the local government further advanced the improvement of related policies by issuing the "*North Pearl District Plan*," which introduced the concept of a "complete community." This concept focuses on the needs of district residents, particularly families with children, regarding community housing, public service facilities, and commercial services. On this basis, specific guidelines for high-density housing for families with children were further developed, addressing project planning and design.

(2) Overall Planning

The outdoor activity space in the area centers around Jamison Square, with other courtyards and green spaces scattered around it, forming the public space system of the region. These spaces provide diverse options for children's activities, and the complete spatial sequence allows children to safely reach parks or different areas (Figure 2-10).

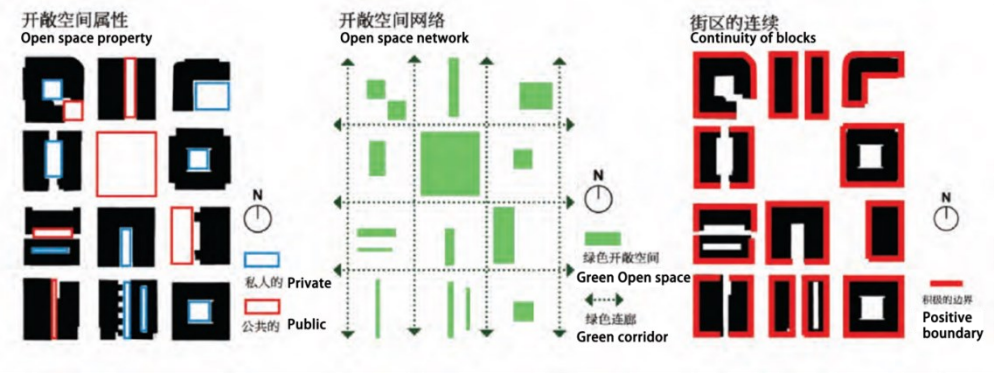


Figure 2-10 Public Space Analysis
(Source: Reference[53], Redrawn by Author)

(3) Detailed Design

① Community Square Park

The community square park is one of the important places for children to interact with natural elements. Jamison Square is the first completed community square park in the Pearl District, serving as a significant gathering and activity space. It introduces a variety of vegetation, allowing children the opportunity to play in a natural environment. At the center of the square is a semicircular interactive fountain that stimulates children's curiosity through the changes in water flow, encouraging spontaneous exploration in the square and providing parents with a chance to observe their children (Figure 2-11).

Figure 2-11 Jamison Square
(Source: Reference[53])

② Street Space

As a necessary route for daily travel, children's safety in street spaces must be a key consideration. Measures such as speed limits for vehicles, designing speed bumps and road markings, and reasonably planning the layout of ground parking spaces are implemented in the

area to improve the observation and avoidance distance for both drivers and children, minimizing potential threats and reducing possible harm to children.

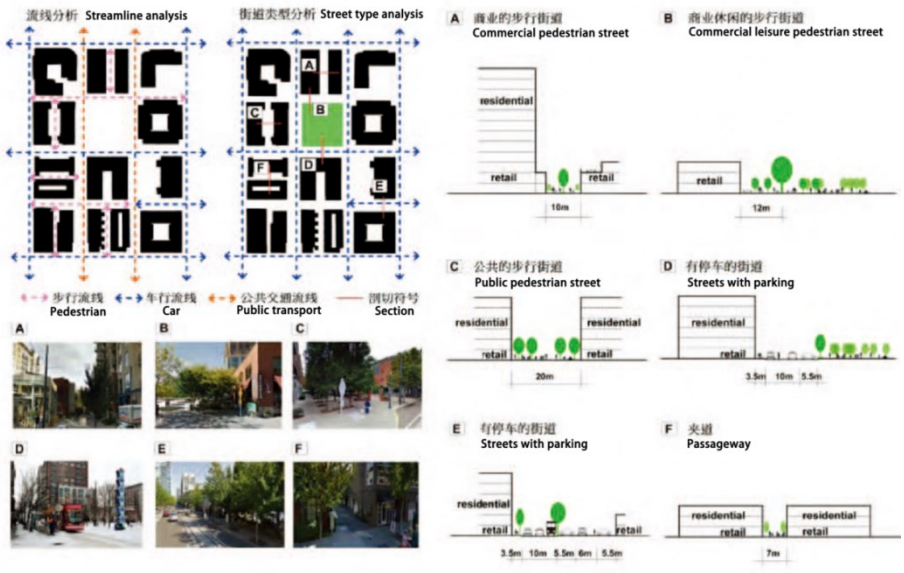


Figure 2-12 Street Space Analysis
(Source: Reference[53], Redrawn by Author)

In addition to fulfilling transportation functions, street spaces are also important activity areas for children. The district adopts a mixed land-use model, providing gathering spaces in front of commercial shops on both sides of the street, where children can gather and play without concerns (Figure 2-12).

③ Courtyard Space

The enclosure of courtyards provides privacy while also creating a space that offers children a sense of security and belonging. Children are more inclined to gather in courtyard spaces, and the potential “eyes on the street” from neighbors provide protection for them. In the Jamison Square area, the varied enclosure levels of courtyard layouts (Figure 2-13) enrich the spatial forms of the district and enhance its recognizability.

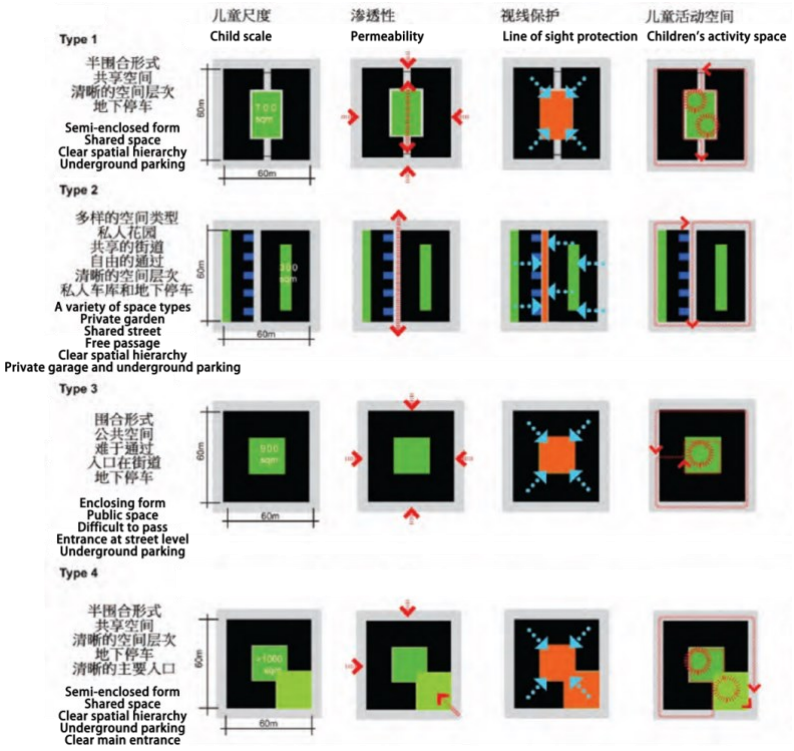


Figure 2-13 Courtyard Space Analysis
(Source: Reference[53], Redrawn by Author)

(4) Summary of Key Points

Thescope of the project ranges from the macro to the micro level, focusing on enhancing children's activity spaces from policy and spatial utilization perspectives. The following summarizes the corresponding measures:

Element	Renovation Purpose	Renovation Strategy
Accessibility	Improve park accessibility	Increase the number of pocket parks and community parks developed
Safety	Ensure children's travel safety	Implement vehicle speed limits, design speed bumps and road markings, plan ground parking layouts reasonably
	Ensure children's play safety	Create various courtyard forms to provide potential eyes on the street
Multifunctionality	Improve street usage efficiency	A mixed land-use model provides spaces for children to pause and play
	Enrich children's play activities	Introduce water features, play facilities, sculptures, and food stalls in the square
Comfort	Provide more opportunities to connect with nature	Introduce diverse vegetation and design interactive fountains in parks

Table 2-6 Renovation Measures in the Pearl District, Portland
(Source: Drawn by Author)

2.3.2 Domestic Case 1: Jinglong Community, Shenzhen

(1) Overall Planning

① Micro-Activation, System Shaping, Multi-Mixing

The Jinglong Community Children-Friendly Demonstration Site project aims to create a community environment that fully respects and meets the rights and needs of children. The project adopts planning strategies of micro-activation, system shaping, and multi-mixing, positioning children-friendly spaces as key catalysts, aimed at reconstructing and activating community public spaces. The project emphasizes a child-centered perspective, compiling a children's map specifically designed for Jinglong Community and its surrounding areas, intended to provide clear guidance for children of different age groups to explore community points of interest and activity spaces (Figure 2-14).

Figure 2-14 Children's Map of Jinglong Community
(Source: mp.weixin.qq.com/)

In addition, the project deeply implements the concept of "space as an educator," aiming to actively guide children in forming positive values and behavioral patterns through spatial design, thereby fostering and improving the community's internal development dynamics. This project provides a new research example for urban design interventions in community governance in high-density built areas, demonstrating the significant role of urban design in promoting sustainable community development.

② Shaping Child-Friendly Walking Paths

Through detailed analysis of children's school routes and daily living paths, combined with future new path demand forecasts, the project uses a 5 to 10-minute walking distance residential community life circle as the planning scale to optimize and transform the main traffic paths within the community, while also creating dedicated paths for play and leisure.

In the surrounding areas of three schools within the community, there are prevalent issues such as congestion at school entrances, chaotic intersections, and narrow and discontinuous non-motorized vehicle lanes and sidewalks. These problems highlight the shortcomings of humanized design in children's activity paths and pose safety hazards. In response to these issues, the design team carried out specialized renovations in key areas concerning street cross-sections, intersection designs, signage, and plant configurations. For instance, they raised the crosswalk at intersections, clearly defined non-motorized vehicle crossing lines, optimized the pedestrian flow on sidewalks with additional channelization facilities, and pushed back the waiting line for motor vehicles. These renovation strategies aim to reduce safety risks for children when crossing streets, creating a safer and more child-friendly community environment.

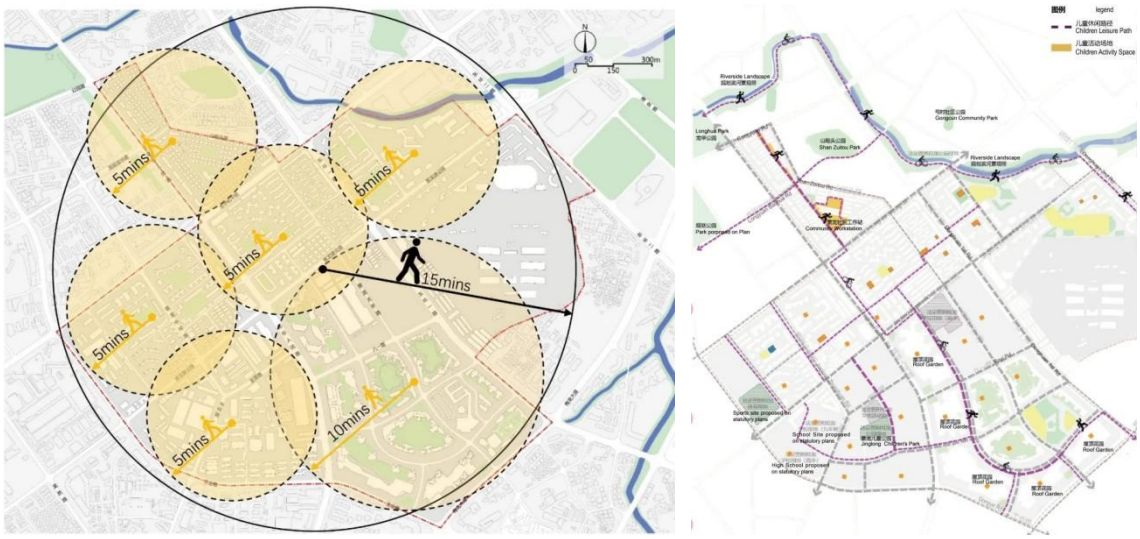


Figure 2-15 Jinglong 15-Minute Life Circle and Children's Leisure Path Planning
(Source: mp.weixin.qq.com/)

The design of children's leisure paths focuses more on connecting landscape spaces and children's playgrounds (Figure 2-15). At the urban level, the main leisure paths link surrounding urban-level green spaces; at the community level, secondary leisure paths connect various

children's activity areas and access the main paths. Additionally, accommodating the needs of both children and residents, three active and pause-friendly street spaces are created to enhance the comfort of leisure paths.

③ Child Participation Promoting Design Practice

The project integrates diverse stakeholders, including children, parents, educators, designers, and community managers, to carry out comprehensive community design practices. The Jinglong Community Children's Council, led by children, has conducted a series of meetings, surveys, and expansion activities, such as discussions and project planning related to walking buses and children's libraries. The participation of children is significant, with a rich diversity of suggestions proposed, effectively promoting children's deep involvement in community governance (Figure 2-16). Moreover, children actively participate in the design practice and project implementation process; the community holds "Little Designers" workshops, inviting multiple groups of children and families to collaboratively build a community garden. This process not only enhances children's awareness and sense of involvement in community affairs but also provides strong support for the diversification and democratization of community governance.

a) Jinglong Community Children's Council b) Children Creating Signs for the Garden

Figure 2-16 Children's Participation in Community Construction in Jinglong Community (Source: mp.weixin.qq.com/)

(2) Optimization Strategy for children's Activity Groups

In the community space remodeling strategy for old residential compounds, the practices in Jinglong Community provide a typical case that integrates shared and diversified concepts. For the transformation of children's activity spaces, Jinglong Community has implemented

measures such as adding play facilities, renovating sites, and transforming green spaces in its three groups located at Jingtong Road, Central Ring Road, and Leyayi Road, aimed at enhancing the comfort and safety of children's play areas. Additionally, to enrich the diversity of play areas, all three groups plan to equip children's play areas with different thematic features and increase the number of indoor activity spaces within the groups (Figure 2-17). This ensures that each compound has at least one designated area for preschool children and that each group has at least one shared space suitable for children over six years old.

Figure 2-17 Design of Children's Activity Spaces in Old Residential Compounds
(Source: mp.weixin.qq.com/)

At the operational management level, to promote barrier-free access to play facilities for children and improve safety assurance, a children's ID card system has been designed and implemented (Figure 2-18). The introduction of this system aims to maximize the sharing of play areas and diversify play experiences, thereby promoting community resource sharing and the construction of child-friendly communities, further deepening the application of shared diversity concepts in community planning and management.

Figure 2-18 Shared ID Design Concept
(Source: mp.weixin.qq.com/)

(3) Expanding Activity Spaces through Shared Concepts

In considering the efficiency of activity space usage, the concept of time-space sharing is adopted, greatly enhancing the functionality of venues and ensuring that spaces can meet the needs of different user groups at different times, such as during weekdays, weekends, and evenings. To maximize spatial utilization, the planning fully leverages existing spatial resources such as schools, community service centers, and community workstations, providing suitable activity spaces for children of different ages at different times. During the daytime, the planning particularly focuses on the needs of younger children while also considering the resting needs of supervising parents. Additionally, some activity spaces for adolescents are designed to be shared with residents. In commercial spaces, for example, the Yicheng Center is guided to provide more diversified and multi-time children's activity spaces to meet the extensive needs of community children.

(4) Summary of Key Points

The study scope of this project encompasses both macro and micro levels, focusing on enhancing children's activity spaces from the perspectives of spatial utilization and children's participation. The following summarizes the corresponding measures:

Element	Renovation Purpose	Renovation Strategy
Accessibility	Maximize spatial utilization	Utilize existing spatial resources such as schools and community workstations to increase the number of activity spaces
	Improve accessibility of surrounding areas	Connect leisure paths to internal activity areas and district-level public green spaces
Safety	Avoid mixed entry and exit of community members	Implement a children's ID card system
	Reduce chaos at intersections	Optimize pedestrian and vehicle flow at intersections, such as clearly defining non-motorized vehicle crossing lines
Multifunctionality	Enhance venue usage efficiency	Allow different groups to share play areas according to time periods
	Adapt to different weather	Fine-tuned design
	Suitable for children of all ages	Set up children's play areas with different themes
Comfort	Upgrade old facilities	Renovate facilities
	Enhance the playfulness of walking paths	Connect landscape spaces and children’s playgrounds

Table 2-7 Renovation Measures in Jinglong Community
(Source: Drawn by Author)

2.3.3 Domestic Case 2: Fengquan Ancient Well Community, Changsha

（1）Overall Planning: “Safety-Continuity-Symbiosis” Spatial System

The micro-renewal of Fengquan Ancient Well Community focuses on creating continuous safe paths, optimizing spatial nodes, and introducing community shared memories. Leveraging the community’s rich historical and cultural resources, it connects multiple children’s play space nodes and historical sites through child-friendly safe walkways, forming a spatial system characterized by “safety—continuity—symbiosis.”[54]

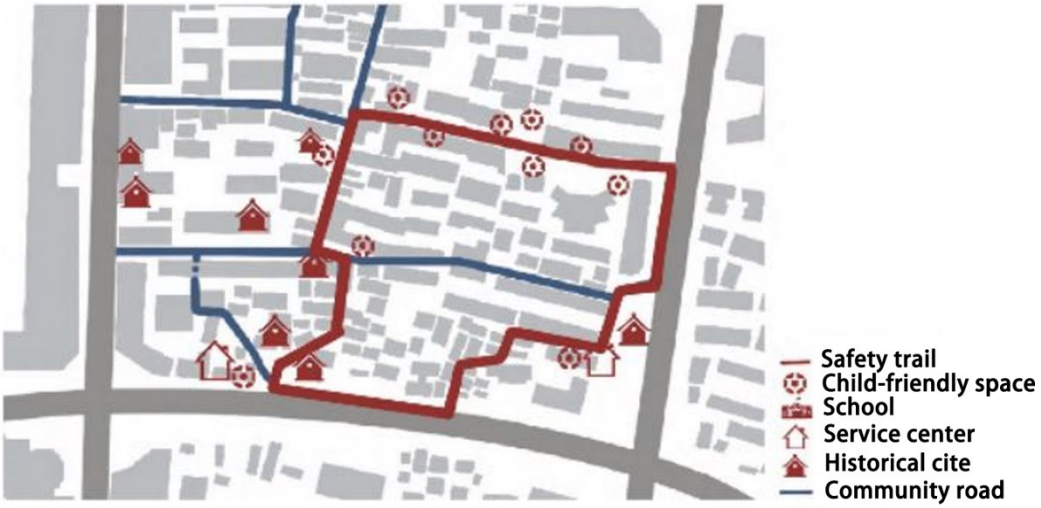


Figure 2-19 Current Spatial Situation of Fengquan Ancient Well Community
(Source: Reference[54], Redrawn by Author)

(2) Spatial Nodes

In creating spatial nodes, the Fengquan Ancient Well Community project integrates community memory points into the scene design by organizing community stories. For example, interactive installations shaped like children in the community, leisure seating, and drying racks modeled after the community park's rocking horse are designed (Figure 2-20). To ensure the safety of children's travel by separating pedestrian and vehicle traffic and regulating resident parking, electric vehicle parking facilities inspired by the community's abbreviation "CFC" are also distributed throughout various areas. Additionally, a child-friendly signage system has been introduced, encompassing guiding signs, street names, community stories, and children's facilities, showcasing a comprehensive child-friendly spatial design to the public.

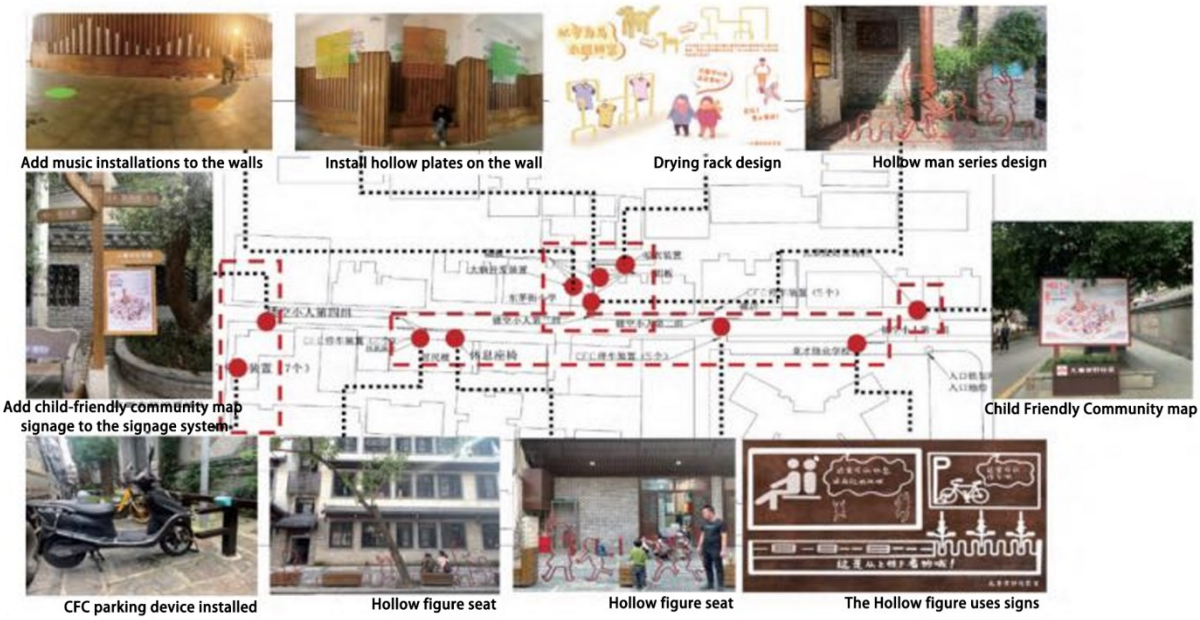


Figure 2-20 Micro-Renewal Plan of Fengquan Ancient Well Community
(Source: Reference[54], Redrawn by Author)

(3) Child Participation

Throughout the project implementation process, emphasis is placed on children's involvement in the design. Through visits, surveys, and collaborative workshops with universities and community children's organizations, the needs of residents and children are fully understood, while also exploring children's community memory points[55]. Moreover, activities such as mural painting and garden planting are used as mediums, combining with pathway landscapes to create playful spaces that coexist with the natural environment and society.

(4) Summary of Key Points

The scope of this project encompasses both the meso and micro levels, focusing on enhancing children's activity spaces from the perspectives of micro-renewal and child participation. The following summarizes the corresponding measures:

Element	Renovation Purpose	Renovation Strategy
Safety	Ensure the safety of children's travel	Facilities for separating pedestrians and vehicles, and traffic calming road designs
	Regulate resident parking	Design parking facilities and reasonably layout parking areas
Multifunctionality	Educate while entertaining	The street signage system includes guiding information, community stories, facilities, etc.

	Enrich entertainment methods	Set up interactive musical installations in public spaces
Comfort	Increase resting spaces	Design leisure seating inspired by community memories
	Educate while entertaining	Combine paths and spatial designs with the community's historical and cultural resources

Table 2-8 Renovation Measures in Fengquan Ancient Well Community
(Source: Drawn by Author)

2.3.4 Summary of the Cases Study

This part summarizes the practical measures of various case studies from both domestic and international contexts that are based on the concept of "child-friendliness" and aim to improve children's activity spaces in residential areas. Through analysis, it was found that these case studies all focus on key aspects such as accessibility, safety, and multifunctionality in their spatial designs, further proving the importance of these elements in creating child-friendly environments. Moreover, most of these cases emphasize spatial design at the meso- and micro-scales, implementing measures that effectively activate individual spaces and establish strong connections between different activity areas.

Chapter 3 the Current Situation of Children's Activity Spaces in Old Residential Compounds of Dongguan

This chapter aims to explore the current situation of children's activity spaces in old residential compounds in Dongguan. First, it briefly outlines the development background and demographic characteristics of Dongguan's old residential compounds. Based on this, three representative old residential compounds are selected for field research, where detailed records of the status of children's activity spaces are documented. Subsequently, based on the field research, the types of children's activity behaviors, the usage of children's activity spaces, and the distribution patterns of activities within the compounds are systematically categorized and summarized. Finally, from the perspectives of accessibility, safety, multifunctionality, and comfort—four child-friendly elements—this chapter provides a comprehensive summary of children's activity spaces in Dongguan's old residential compounds, offering empirical evidence and theoretical support for subsequent needs assessment questionnaire design and renovation strategies.

3.1 Overview of Old Residential Compounds in Dongguan

3.1.1 Geographic Location and Climate of Dongguan

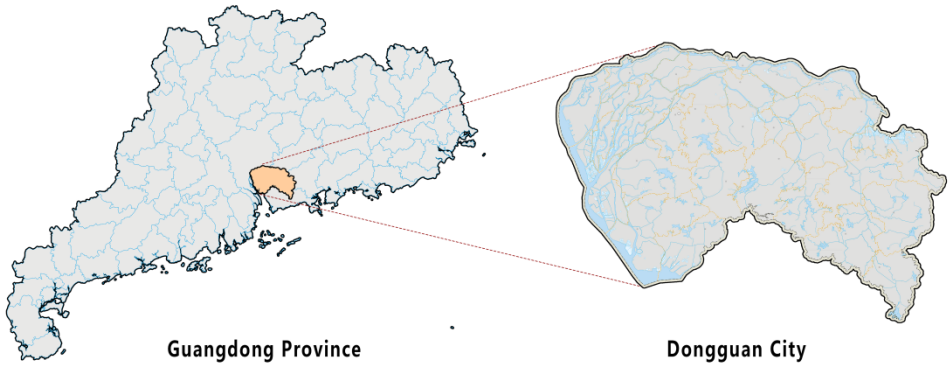


Figure 3-1 Dongguan Location
(Source: Drawn by Author)

Dongguan City is located in South China, situated in the central-southern part of Guangdong Province on the eastern bank of the Pearl River estuary, bordering Guangzhou to the northwest and Shenzhen to the south. As of October 2022, Dongguan has jurisdiction over

4 sub-districts and 28 towns, covering a total area of 2,542.67 square kilometers. Dongguan has a subtropical monsoon climate with distinct seasons and abundant rainfall. Summers are hot and humid, while winters are mild and dry. Due to its coastal location, Dongguan is susceptible to typhoons, especially during the summer seasons.

3.1.2 Development History of Residential Areas in Dongguan

By referring to related literature[56], the development history of Dongguan's residential areas is divided into four stages (Figure 3-2):

(1) After the Reform and Opening Up of China

In the early stages of the reform and opening-up, Dongguan's economy was just beginning, and the urbanization process was slow. It was only after Dongguan was upgraded to a prefecture-level city in 1988 that urban residential construction accelerated. During this period, residential construction in Dongguan consisted of both unit-built housing and individual-built housing, with a small amount of commercial housing beginning to emerge. Most new residential compounds were relatively small in scale, with limited exploration of outdoor activity spaces, and the modern concept of "property" had yet to take shape. Residential designs were simple, primarily featuring 7-8 story multi-story buildings.

The planning and design of residential areas during this period focused on economic development and efficiency, with no relevant regulations in place. Public space design considerations were minimal, and there was basically no design for children's activity spaces[57].

(2) Before and After Housing System Reform

During this period, new residential buildings were primarily driven by real estate development. Due to advantageous locations and abundant resources, there was active participation from Hong Kong developers, which fueled a real estate investment boom in Dongguan. A large number of villas, small high-rises, and high-rise residential areas emerged, greatly changing the residential environment of Dongguan. Simultaneously, the concept of "property" was introduced from Hong Kong to the mainland, and nearly all newly built compounds were equipped with property management, operated and managed by developers.
After 1998, in the context of housing system reform, collectively owned residential units began

to be sold to the public, and a large number of unit dormitories were sold to individuals. This change diversified the resident population in Dongguan's compounds, which now included not only original unit employees but also many private homeowners, thus making the resident demographics more diverse.

(3) Market-Oriented Commodity Housing Dominance Phase

Entering the 21st century, residential construction in Dongguan entered a phase of rapid development, with numerous residential buildings emerging, segmenting the urban residential landscape into multiple blocks. During this stage, local developers rose to prominence, gradually shedding the "Hong Kong" label, and formed a real estate development system suitable for Dongguan, greatly satisfying the residential needs of local residents.

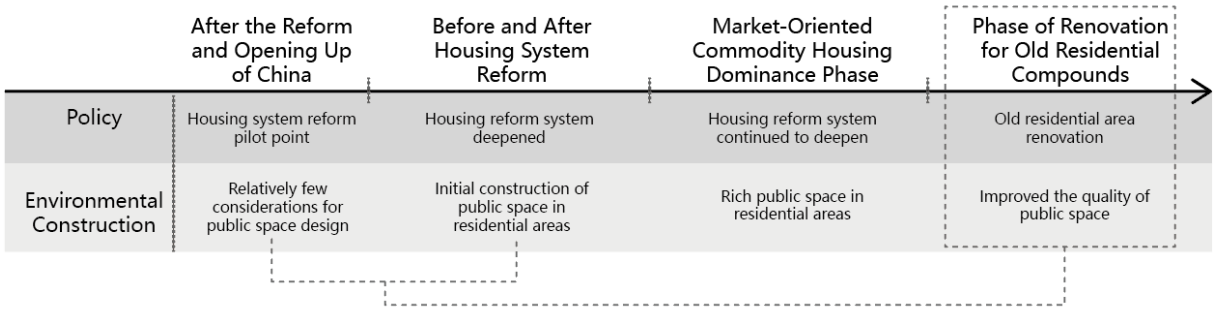


Figure 3-2 Development History of Residential Areas in Dongguan
(Source: Drawn by Author)

(4) Phase of Renovation for Old Residential Compounds

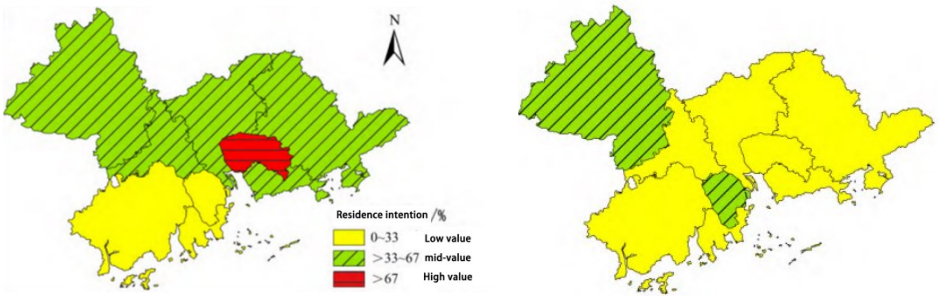
Currently, Dongguan has little vacant land available for development, and land resource supply remains tight. To ensure the development of the real economy, Dongguan has delineated a red line for industrial land use, prioritizing industrial land and leaving extremely limited land for real estate development. At the same time, the real estate sector has entered an era of stock, with a rapidly increasing proportion of old buildings that require maintenance and renovation. In 2022, the Dongguan Housing and Urban-Rural Development Bureau issued the "*Implementation Plan for the Renovation of Old Residential Compounds in Dongguan*," formulating renovation plans based on actual conditions.

3.1.3 Residential Groups in Dongguan's Old Compounds

The residential population of old residential compounds in Dongguan is mainly composed

of two groups. The first group consists of local Dongguan residents, primarily elderly people. These residents typically communicate in Cantonese and have a deep emotional connection and strong sense of belonging to the area they live in. The second group is made up of migrant workers who work in Dongguan. Compared to the local residents, this group often faces certain economic and living standard gaps.

According to data from the seventh national population census, Dongguan's permanent population is approximately 10.4666 million, of which the floating population accounts for 7.9522 million. Due to the relatively low housing costs in old residential compounds, these areas have become the primary choice for most migrant workers. Taking the Huayuan Village community as an example, the permanent population is about 10,000, of which approximately 80% are migrant workers. As these workers settle in Dongguan, their children also move to the city. There are about 1.63 million children in the city, with migrant children accounting for a staggering 54%. For younger migrant workers who have not yet started families, considering their personal income, they are also more inclined to settle and start families in old residential compounds. Combined with the presence of local children, this has resulted in a large number of children in these old residential compounds.



a) Short-term stay b) Long-term stay

Figure 3-3 Distribution of cross-provincial group inflows in the Pearl River Delta (Source: Reference[58])

The coexistence of these two groups reflects the cultural, linguistic, and economic diversity in Dongguan's old residential compounds. However, due to differences in regional backgrounds, there exists a linguistic and cultural divide between these two major groups, resulting in low interaction frequency and relatively weak community cohesion. Currently, the migrant population in Dongguan demonstrates a stronger preference for short-term residence, while their willingness to settle long-term or permanently remains relatively low (Figure 3-3).

Factors influencing this include satisfaction with their place of residence, economic status, and sense of identity. As their networks of family, friends, and professional connections expand locally, the desire for permanent residency tends to increase.

3.1.4 Operation Mechanism of Dongguan's Old Residential Compounds

Due to their early construction, the concept of property management was not widespread at the time, and the initial designs did not fully consider the needs for future management. Currently, the maintenance and management of these compounds are primarily driven by a collaboration between the community and the government. Public area cleaning and maintenance are outsourced to sanitation companies. However, the management of internal spaces, such as stairwells, is often neglected, and infrastructure maintenance lags behind, with inadequate community environment management. To improve this situation, Dongguan City plans to introduce professional property management services to old residential compounds in order to achieve long-term management and enhance residents' living experience. Nevertheless, due to issues related to the collection of property fees and varying levels of acceptance among residents, this plan has yet to be effectively implemented across most old residential compounds.

Given their lack of property management, Dongguan's old residential compounds adopt an open management model. Unlike enclosed compounds, these compounds do not have complete perimeter fencing, with only partial areas featuring iron railings. The fencing serves to a certain extent as a demarcation of "territory," providing residents with a sense of security. However, the open management approach often results in a diminished sense of security among residents. To enhance residential safety, as of the end of 2014, Dongguan had established 6,935 high-definition video surveillance points, achieving full coverage of key areas and road sections.

3.1.5 Renovation and Upgrading of Old Residential Compounds in Dongguan

According to the *Guangdong Urban Old Residential Compound Renovation Implementation Plan (2021-2025)*, approximately 3,000 urban old residential compounds in the nine cities of the Pearl River Delta are planned to be renovated, focusing primarily on micro-renovations aimed at upgrading infrastructure and supporting service facilities. Among these, Dongguan is expected to renovate around 100 old residential compounds (Figure 3-4). At

present, Dongguan is committed to creating child-friendly community-level spaces and advancing the renovation and upgrading of old residential compounds.

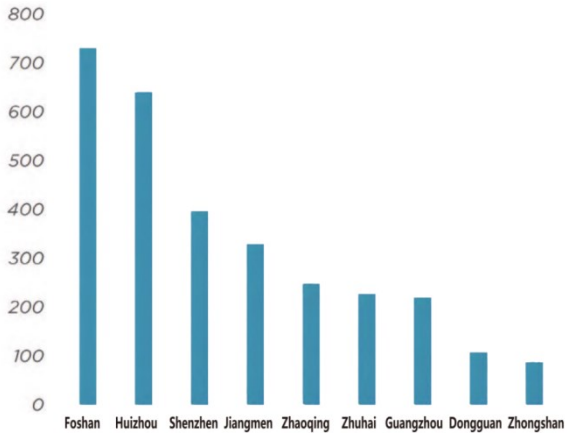


Figure 3-4 Number of old compounds planned to be upgraded in the Pearl River Delta (Source: Reference[59])

Inspection of Old Residential Compounds: In the government's key tasks for 2023, 21 typical old residential compounds across the city underwent inspections and assessments, with common issues identified, such as outdated environments, safety hazards, and the lack of elevators. Additionally, the inspection focused on the facilities and governance conditions of the compounds and their surrounding communities.

Revitalization of Old Residential Compounds: To expedite the elimination of shortcomings in residential communities, Dongguan has proposed utilizing vacant public rental housing and relocation settlement housing as sources for affordable rental housing. Furthermore, large enterprises have been encouraged to adopt an integrated model combining design, construction, and operation (EPC+O) for the renovation projects.

Child-Friendly Development: The *Three-Year Action Plan for Building a Child-Friendly City in Dongguan (2023-2025)* aims to comprehensively enhance child-friendliness across the city. The plan includes upgrading child-friendly communities, promoting child-friendly transformations in some urban villages and old residential compounds, improving community facilities for children, and providing services specifically designed for them.

3.2 the Current Situation of Dongguan's Old Residential Compounds

Currently, Dongguan has a large number of old residential compounds, with nearly 1,000 compounds aged over 20 years. Many of these are remnants from before the housing reforms

of the post-reform and opening-up era. 12 residential areas were built during the 1980s, including Bubugao, Caotang, Daiwu Village, Kehu, Xiangyang Road, Qiantou, Boxia, Xinyong, Wenjiawei, Aonan New Village, Chuangye Village, and Huayuan Village. Some of these areas were originally dormitories for work units, while others were commercial housing, making them representative examples of Dongguan's old residential compounds.

3.2.1 Selection of Research Subjects

This study selects Huayuan Village, Bubugao, and Chuangye Village as research subjects because they are among the earliest large residential areas built in Dongguan, featuring a rich and complex variety of activity space types. Studying these compounds allows for a comprehensive and detailed understanding and exploration of the characteristics and needs of different types of activity spaces in old residential compounds. Bubugao and Chuangye Village were originally welfare housing, while Huayuan Village was a commercial housing project. However, with the implementation of housing reforms, these housing types eventually transitioned to private ownership, leading to similar operational conditions in these compounds.

Among these three compounds, Chuangye Village has been included in Dongguan's renovation project for old residential compounds, and in 2022, changes to its activity spaces were implemented, providing valuable empirical evidence for studying the variations in activity spaces before and after renovation. Although the internal quality of activity spaces in Bubugao is poor, its surrounding facilities are relatively complete; Huayuan Village, on the other hand, has significant improvement potential and is in urgent need of updates. By studying these three compounds, a better understanding of the current state of activity spaces in old residential compounds, existing problems, and potential directions for renovation can be gained, providing empirical evidence for formulating effective renovation strategies.

3.2.2 Huayuan Village

（1）Overview of Huayuan Village

Huayuan Village was established in 1993 and is located next to Xinhe North Road in Dongguan, adjacent to Qiantou and Zhangcun communities.The permanent population of the community to which Garden Village belongs is about 11,000, of which about 2,800 are children.

Due to a large floating population and some collective household registrations, Huayuan Village has not conducted a population census. The streets are lined with shops, totaling over 600. For management purposes, the community is divided into four residential groups: Yuxing, Changhong, Yuxing, and Huayuan, with Huayuan Village encompassing the Yuxing residents' group (southern area) and the Changhong residents' group (northern area). The architectural layout is a combination of point and planar designs, resulting in a rich variety of activity spaces (Figure 3-5).

a) Geographical Location b) Building Layout

Figure 3-5 Geographic Location and Building Layout of Huayuan Village
(Source: Drawn by Author)

(2) Planar Spaces

There are three planar activity spaces in Huayuan Village. The sports field is located in the southwest of the northern area and consists of a basketball court combined with adjacent playground equipment. The space is spacious and suitable for various sports activities (Figure 3-6a). However, vehicles drive around the area and park, posing a risk of collisions with children. The playground equipment is limited, failing to meet the needs of children of different ages, and there are safety and quality issues. The badminton court is situated on the northern side of the northern area (Figure 3-6b), surrounded by a large amount of unkempt vegetation, with a resting pavilion and seats nearby. The community park is located in the northern part of the southern area, consisting of pavilions and fitness facilities (Figure 3-6c). Although the park is close to the urban road, its recognition is low due to the surrounding railings and clutter obscuring it.

The planar activity spaces in Huayuan Village are relatively ample, but their quality varies.

The sports field is the primary activity space for children in the community and is used most frequently for various activities. Additionally, the community service station regularly holds various benefit activities here, increasing the vibrancy of the space. The badminton court is located deeper within the compound and has a relatively low foot traffic, but due to its strong functionality, users include children from both inside and outside the compound. The community park sees fewer children, typically visited for simple fitness activities with caregivers, rarely forming groups.

a) Sports Field b) Badminton Court c) Community Park

Figure 3-6 Planar Spaces of Huayuan Village
(Source: Photographed by Author)

(3) Linear Spaces

Within Huayuan Village, there is a bidirectional two-lane urban road (Figure 3-7a) that runs through, dividing the compound into southern and northern areas. This road serves as an important internal transportation route and is a key link connecting the compound to the external urban environment. However, there are no convenient pedestrian paths between the two areas, limiting interaction and communication between residents of the north and south.

The internal roads adopt a “single slab” cross-section design, with the main road being 10-12 meters wide and other roads ranging 4-7 meters. There are no sidewalks on either side, making the issue of mixed traffic common. The compound lacks an underground parking lot; vehicle parking is reliant on a few roadside spaces and a concentrated parking lot on the northern side. Additionally, vehicle owners often park haphazardly near building entrances for convenience (Figure 3-7b), leading to the prevalent occupation of other public spaces. The road surface is primarily made of concrete, with the courtyards paved in bricks, and a small portion upgraded to asphalt ((Figure 3-7c).


a) Urban Road Running Through b) Random Vehicle Parking c) Upgraded Road Surface

Figure 3-7 Linear Spaces of Huayuan Village

(Source: Photographed by Author)

(4) Point Spaces

The land parcel of Huayuan Village is fragmented, with diverse architectural forms creating a rich variety of point spaces. The condition of courtyard spaces varies; some lack effective boundaries, allowing motor vehicles to easily enter, thus failing to create effective children's activity spaces, while others are enclosed, creating a sense of domain. However, there are almost no child-friendly facilities in the courtyards, and the abundance of unkempt vegetation attracts mosquitoes (Figure 3-8a), resulting in low comfort levels. The vacant spaces between buildings are mostly idle (Figure 3-8b), with walls covered in moss, poor ventilation and lighting conditions, and some areas even used for storage of clutter, further diminishing the utility of these spaces.


a) Unkempt Vegetation b) Idle Space Between Buildings

Figure 3-8 Point Spaces of Huayuan Village

(Source: Photographed by Author)

(5) Summary

Overall, there are many spaces in Huayuan Village that have potential for renovation. Currently, the activity and landscape facilities in these areas are in poor condition, and their comfort and multifunctionality need improvement. Additionally, the connections between activity spaces are weak, with multiple obstacles present on the surfaces, leading to low overall accessibility. Nevertheless, the planar activity spaces are open, the point activity spaces are

diverse, and the terrain is flat without undulations, ensuring basic safety. Furthermore, the user groups of these spaces include children from both inside and outside the compound, indicating that the area has a certain attractiveness for surrounding children and there is a clear demand for usage.

3.2.3 Bubugao

（1）Overview of Bubugao

Bubugao Compound is located in Luosha Community, Guancheng Street, Dongguan, and was built in 1986. The compound is divided into six blocks, with a total of 92 buildings. Initially constructed as welfare housing, it was later transformed into commercial housing during the housing reform period and opened for sale to the public.

a) Geographical Location　　b) Building Layout

Figure 3-9 Geographical Location and Building Layout of Bubugao
(Source: Drawn by Author)

Bubugao Compound is divided by Dongxing Road, a three-lane road running north-south, into two blocks on the east side and four on the west side. The western side is further subdivided by Wanyuan Road and Wanxing Road into a cross-axis layout. The buildings primarily follow a slab-type layout with a mix of point-type structures (Figure 3-9b), arranged in rows. The east-west main road, Wanxing Road, has commercial storefronts along the street, enriching the compound's commercial amenities. A primary school is located on the south side, and the west and north sides are adjacent to large self-built houses in the urban village. Additionally, about a 10-minute walk to the southwest is a 23-hectare People's Park.

（2）Planar Spaces

The primary activity spaces of Bubugao Compound are located along the northern and western edges of the compound, following the roads. The northern activity space primarily features fitness equipment and hard-paved areas (Figure 3-10a), forming a leisure activity zone. However, these spaces are generally long and narrow, and their connections are weak, failing to form a continuous linear space. On the eastern side of the compound, there is a pocket park covering about 5,400 square meters, equipped with pavilions, plazas, and playground equipment (Figure 3-10b), as well as tree pits and a large area of ground-covering plants. The park is well-maintained, with fencing and other safety features ensuring the security of children's activities (Figure 3-10c). Thus, it has become a frequent gathering place for community children. However, overall, the number of children using the planar activity spaces is relatively low.

a) Northern Activity Space b) Park Plaza c) Safety Maintenance Facilities

Figure 3-10 Planar Spaces of Bubugao
(Source: Photographed by Author)

(3) Linear Spaces

The main road of the compound is 12-14 meters wide and has complete sidewalks on both sides, with a central median strip on the east-west main road (Figure 3-11a). The compound lacks a large centralized parking lot, so both motorized and non-motorized vehicles are parked on the roads and in available public spaces, often blocking building entrances (Figure 3-11b). Due to the slab layout, the spaces are relatively uniform, and the roads between the buildings are appropriately wide, neither too wide nor too narrow. The elementary school to the south brings a large number of vehicles during peak hours for drop-offs and pick-ups, causing significant congestion. Parents either ride electric scooters or drive cars to pick up their children, while many children walk to nearby drop-off stations under staff supervision.

a) Main Road b) Congested School Road

Figure 3-11 Linear Spaces of Bubugao

(Source: Photographed by Author)

(4) Point Spaces

The quality of the front courtyards varies. Some are equipped with fitness equipment and brightly colored rubber flooring (Figure 3-12a), providing simple play spaces for children; however, most have only scattered flower beds and benches, with few child-friendly facilities available. Some courtyards have obstacles or height differences to prevent vehicle access (Figure 3-12b), while others allow unrestricted vehicle entry. Residents utilize the vacant front spaces for drying grains and planting vegetables, further occupying courtyard areas (Figure 3-12c). There are few tall plants in the courtyards, ensuring good visual connectivity.

a) Colorful rubber flooring b) Obstacles in front of the courtyard c) Planting in front of the house

Figure 3-12 Point Spaces of Bubugao

(Source: Photographed by Author)

(5) Summary

Overall, the distance between buildings in Bubugao is narrow, making it difficult to expand into diverse children's activity areas. The planar activity spaces are relatively marginalized, with both accessibility and comfort being low. The number of children engaging in activities within the compound is limited; the People's Park, located 800m away (Figure 3-13), offers richer recreational facilities, leading children to prefer visiting there when they want to play.

Figure 3-13 People's Park near Bubugao
(Source: Photographed by Author)

3.2.4 Chuangye Village

(1) Overview of chuangye Village

Chuangye Village is located on Badalu Road in the Guancheng Street of Dongguan, established in 1987, covering an area of 61,313 square meters, with about 23,000 square meters of public environment, consisting of 47 buildings. Initially characterized as welfare housing, it transitioned to commercial housing during the housing reform period and was developed and sold to the public. By 2024, Chuangye Village has been included in the Dongguan Urban Old Compound Renovation Project, and central financial assistance funds have been allocated to the Guancheng Street Finance Bureau specifically for the renovation project of Chuangye Village.

a) Geographical Location b) Building Layout

Figure 3-14 Geographical location and Building layout of Chuangye Village
(Source: Drawn by Author)

Chuangye Village is bordered to the south by Chuangye Road, the main entrance for residents and vehicles. To the right, Guantai Road serves as National Highway 107, creating a relatively enclosed interface. Inside the compound, the main road, Chuangye Heng Road, runs

through it, dividing it into two groups in the east and west. The architectural style primarily features plate-type buildings with point-type buildings as a supplement. The west and south sides along the street contain retail shops, while facilities such as the community police station, judicial branch, and party-mass activity center are distributed along the main road. To the north of the compound, there is a kindergarten providing educational services for preschool children in the community.

（2）Planar Spaces

a)) Colorful mural b) Badminton court c) Sports park

Figure 3-15 Planar spaces of Chuangye Village
(Source: Photographed by Author)

In 2023, Chuangye Village underwent greening renovations, resulting in two larger activity spaces. The children's pocket park is located on the east side of the compound, formed by connecting several front yards, creating a functionally rich activity area (Figure 3-15a,b), albeit relatively narrow. The pocket park is equipped with small sports facilities and some playground equipment suitable for younger children. Fun murals on the walls and elevation changes provide opportunities for running, jumping, and exploration, offering children rich activity experiences. Another centralized recreational area in the compound is the sports park (Figure 3-15c), located on the west side, consisting of a basketball court and fitness facilities, with an open space. The facilities here also focus on sports, with slides and other play equipment distributed sparsely along the edges. Some fitness equipment and seating areas are occupied by bedding and grains drying out, contributing to the area's vibrancy, and the extensive hard pavement provides ample social interaction space, where children often engage in social activities.

Overall, the quality of the planar activity spaces in Chuangye Village is relatively high, creating suitable areas for children to use within the limited space. The areas have been recently renovated, with new facilities that are rarely damaged; however, the facilities do not cover all

age groups. Additionally, issues with visual obstruction due to elevation changes and vehicle parking reduce the visibility and safety of the two activity areas.

(3) Linear Spaces

The main road, Chuangye Heng Road, varies in width from 6 to 12m, with sidewalks on both sides. The road design of the western group causes difficulty in turning around. Most of the other branches are relatively spacious, but there are also some narrow and hidden paths. The road surface has many vehicles parked improperly, even blocking the sidewalks (Figure 3-16a). Due to a lack of management, some social vehicles occupy parking spaces in the compound. The current residents' committee has proposed a plan to regulate vehicle parking, which includes setting up three dedicated entrances and exits for motor vehicles. Some residential buildings have non-motorized vehicle garages on the ground floor, but bicycles and electric bikes are parked haphazardly outside (Figure 3-16b), taking up limited road and activity areas.

a) Vehicles occupying sidewalks b) Electric bikes parked haphazardly c) Obstacles at the entrance

Figure 3-16 Linear spaces of Chuangye Village

(Source: Photographed by Author)

Motor vehicles cannot enter the internal group, achieving separation between pedestrians and vehicles, ensuring safety for children's activities within the group (Figure 3-16c). The pedestrian paths in the group have been repaved, resulting in smooth, undamaged surfaces that improve the safety of walking routes.

(4) Point Spaces

After the renovations, a large number of unmaintained and difficult-to-manage plants in the courtyards were removed, freeing up the public spaces between the residences and increasing the paved areas, providing children with more opportunities for activities and social interactions. The courtyards are primarily filled with low shrubs and ground cover plants, interspersed with one or two evergreen trees. The shade from the trees and the tree pits create

resting spaces where children linger and play (Figure 3-17a). Some of the vacant areas in front of the houses are used by residents for storing items and drying clothes (Figure 3-17b), which affects the overall aesthetics but also reflects the residents' need for planting activities.

a) Tree pit resting space　　b) Vacant area in front of the house

Figure 3-17 Point Spaces of Chuangye Village

(Source: Photographed by Author)

(5) Summary

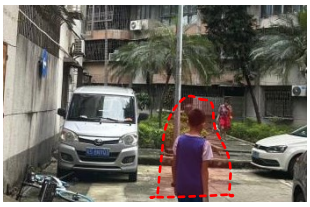
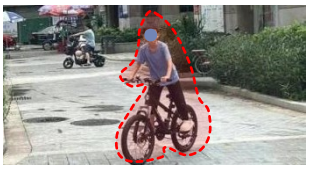
Overall, the condition of children's activity spaces in this compound is relatively favorable. After quality improvements, the planar activity spaces have been significantly optimized, and the point spaces between the residences have been effectively activated. These renovation measures enhance safety and comfort while also increasing the appeal of these spaces for children, making them more willing to engage in games and activities here. However, a problem that remains is the insufficient connectivity between the activity spaces, resulting in low accessibility.

3.3 Characteristics of Children's Activities in Old Residential Compounds in Dongguan

3.3.1 Types of Children's Activities

In Chapter 2, based on Jan Gehl 's classification of outdoor activities, children's activities are categorized into necessary activities, spontaneous activities, and social activities. According to the records from field research, the outdoor activity behaviors of children in these three compounds were summarized, further categorized based on whether children utilized facility-provided amenities. In Dongguan's old residential compounds, children's necessary behaviors include commuting to school; spontaneous behaviors include using playground equipment and

cycling; social activities involve chasing, playing ball games, etc. (Table 3-1).

Type	Activity		Description	Photo
Necessary Activity	Not using provided facilities	Walking	Children commute to school on weekdays or go out during holidays.	
		Waiting for a ride	Waiting for parents' cars or buses near the bus stop below the apartment building.	
Spontaneous Activity	Using provided facilities	Using playground and fitness equipment	Children use playground and fitness equipment to gain sensory stimulation while having fun and exercising.	
		Reading bulletin boards	Obtaining information and knowledge through bulletin boards to satisfy curiosity and promote social awareness.	
		Observing plants	Children spontaneously use items in the environment, forming a series of random activities.	
Social Activity	Not using provided facilities	Cycling/Skateboarding	Engaging in spontaneous sports activities with sports equipment, such as skateboarding, cycling, and rollerblading.	
	Using provided facilities	Using playground and fitness equipment with others	Children use related facilities under the supervision of guardians or interact with other children to learn communication skills, establish friendships, and resolve conflicts.	

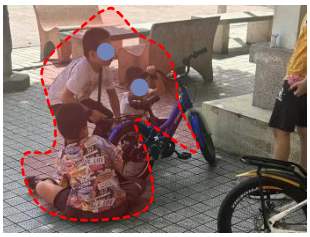
		Ball sports	Children form spontaneous teams to play structured sports games, such as ball chasing and hitting games.	
	Not using provided facilities	Talking	Children converse with friends or parents, listening to and understanding others while expressing their own views and feelings.	
		Chasing	Engaging in random chasing activities with little purpose behind the behavior.	
		Interacting with animals	Children engage with small animals like kittens and puppies, communicating and playing with them.	
		Playing cards/toys	Engaging in structured games using cards and toys, such as playing cards, model toys, and children's electronic products.	

Table 3-1 Types of children's Activities in Old Residential Compounds in Dongguan
(Source: Drawn by Author)

Spontaneous activities primarily involve the use of facility-provided amenities and are greatly influenced by environmental factors such as weather, time, and location; social activities, on the other hand, involve both types. This indicates that the quality of the community environment has a significant impact on children's outdoor activities (Table 3-2).

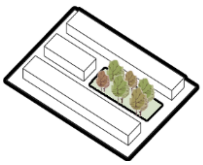
Activity Category	Using Provided Facilities	Poor Material Environment Quality	Good Material Environment Quality
Necessary Activity	Few		
Spontaneous	Many		

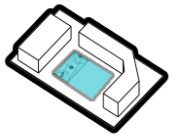
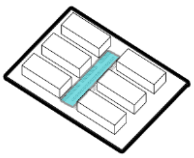
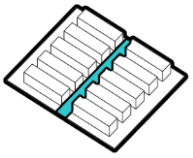
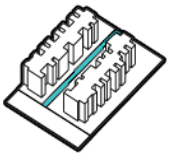
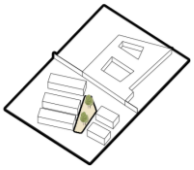
Activity		
Social Activity	Moderate	

Table 3-2 Relationship Between children's Activities and Material Environment Quality
(Source: Drawn by Author)

3.3.2 Classification of Children’s Activity Spaces

In Chapter 2, the hierarchical levels of children's activity spaces were discussed. In this hierarchy, spaces are categorized into three types: planar activity spaces, linear activity spaces, and point activity spaces. Based on this classification, the activity spaces for young children in the three old residential compounds were summarized and analyzed as follows:

Category	Site Name	Model	Site Features	children's Activities	Photos
Planar Space	Community Pocket Park		Composed of resting benches, various play facilities, and small sports areas, the space is relatively small.	Main Participants: Children aged 6-13 Activity Types: chatting, cycling, playing games, using playground equipment, using fitness equipment, playing badminton, chasing and playing around.	
	Landscape Space		Composed of numerous plants and some resting facilities. The plants are unmaintained.	Main Participants: Children aged 6-10 Activity Types: walking, chasing and playing around, chatting, picking plants, hide and seek.	

	Sports Field		Composed of a basketball court, fitness and play facilities; the open area is spacious, providing ample activity space.	Main Participants: Children aged 3-14 Activity Types: chatting, cycling, playing games, using playground equipment, using fitness equipment, playing basketball, chasing and playing around, playing cards, playing with toys.	
	Parking Lot		The parking lot is usually small and crowded, with irregular vehicle parking.	Main Participants: Children aged 6-14 Activity Types: walking, chasing and playing around, chatting, cycling.	
Linear Traffic Space	Main Road		A linear space with heavy traffic, lacking sidewalks or with obstructed sidewalks, and no play facilities.	Main Participants: Children aged 3-14 Activity Types: commuting home after school, chasing and playing around, playing with sticks, cycling, chatting.	
	Alleyways		A narrow linear space with few play facilities.	Main Participants: Children aged 6-10 Activity Types: walking, chasing and playing around, chatting, playing with sticks.	
Point Dispersed Space	School Entrance Space		There is usually a waiting area, but vehicles can also enter, resulting in low safety.	Main Participants: Children aged 3-12 Activity Types: walking, standing and waiting, chasing and playing around, chatting.	
	Front Yard of		Composed of seating, hard pavement, greenery, etc.; it	Main Participants: Children aged 6-10 Activity Types: chatting, playing games, chasing	

	Houses		is relatively narrow and subject to occupation by residents' modifications.	and playing around, resting.	

Table 3-3 Classification of children's Activity Spaces in Old Residential Compounds
(Source: Drawn by Author)

In Dongguan's old residential compounds, the number of children's activity spaces is relatively scarce, and different layout patterns of the compounds also show variations in the composition of activity spaces. Old residential compounds with a row-based layout, such as Bubugao Compound (Figure 3-18b), lead to the main forms of activity spaces being linear spaces formed by alleyways and point courtyards between buildings, which are scattered and functionally singular. In contrast, old residential compounds with a mixed layout, such as Huayuan Village ((Figure 3-18a) and Chuangye Village ((Figure 3-18c), present a richer and more diverse composition of activity spaces, including pocket parks, sports fields, clustered courtyards as planar activity spaces, point courtyards between buildings, and linear spaces such as main roads and alleys.

a) Huayuan Village b) Bubugao Compound c) Chuangye Village

Figure 3-18 Distribution of Different Activity Spaces in Each Compound
(Source: Drawn by Author)

3.3.3 Characteristics of Children’s Activity Distribution

Based on field observations and records, the distribution of children's activities in the three compounds is marked according to necessary activities, spontaneous activities, and social activities (Figure 3-19).

Among these, planar activity spaces have significantly become the core areas where

children gather. The diverse play facilities and spacious areas provided by these spaces enable children to engage in spontaneous activities like cycling and playing on playground equipment. Consequently, the participation of many children to some extent promotes the occurrence of social activities, such as interactions and cooperative games among children. At the same time, there are also some necessary activities like commuting.

Linear traffic spaces mainly support children's daily necessary activities, such as commuting to school, which rarely depend on the material conditions of the space. There are also some social activities, such as children chasing and playing around on the road. However, overall, the number of children in these spaces is relatively small, with a significant increase only during peak school commuting hours.

The distribution of children in point dispersed spaces is also relatively low. Among these, the type of space in Chuangye Village has more distributed children than the other two compounds, which can be attributed to its relatively better conditions for point spaces, where a good outdoor environment stimulates children's interest in activities. In these types of spaces, the activities primarily involve necessary activities and social activities, indicating that social activities are less influenced by material conditions than spontaneous activities; as long as there is a gathering of children, opportunities for social activities will arise.

a) Huayuan Village b) Bubugao c) Chuangye Village

Figure 3-19 Markings of children's Activity Distribution in Each Compound
(Source: Drawn by Author)

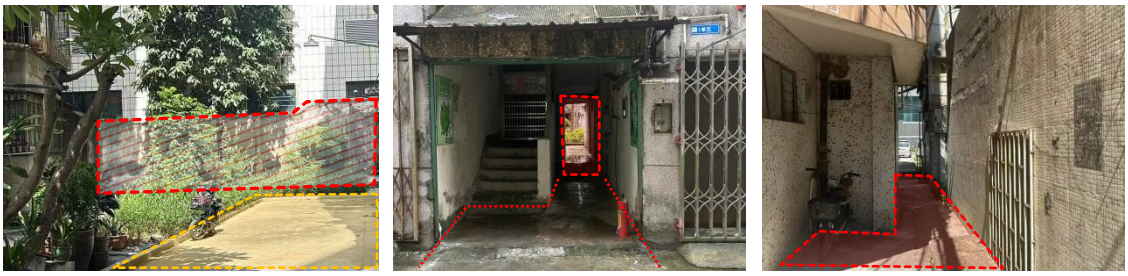
3.4 Summary of Characteristics of Old Residential Compounds in Dongguan

3.4.1 Accessibility

Overall Planning: Old residential compounds have cuted roads, lacking efficient loop roads (Figure 3-21a), which affects the connectivity of children's activity spaces. However, in some old compounds like Huayuan Village, the ground floor serves as storage rooms and is open on both sides, allowing children to pass through the building's ground floor (Figure 3-21b), partially compensating for the lack of a loop road.

Figure 3-20 The relationship between activity spaces and children's sightlines
(Source: Drawn by Author)

Planar Spaces: Most planar activity spaces in old residential compounds are located on the periphery. While this makes it easier for external children to access, it can be inconvenient for children living in certain parts of the compound to use these spaces. There are prominent signs at the entrances, but there is a lack of signage further inside to guide children to these areas. The visibility of activity spaces is insufficient for children; spaces located at higher levels are hard to notice, while those on lower ground are blocked by vehicles, making them difficult to see from a child's height (Figure 3-20). Most activity spaces provide ramps and other accessibility facilities to help children reach them more easily.



a) cuted roads b) Permeable Ground Floor c) Hidden Roadway

d) Accessible Ramp e) Colorful Fencing at Entrance f) Obscured Site

Figure 3-21 Accessibility Analysis of Activity Spaces

(Source: Photographed by Author)

Linear Spaces: The main roads in old residential compounds are usually equipped with signage systems, but smaller roads are often lacking in this regard. Some alleyways are very hidden, reducing their accessibility (Figure 3-21c). However, accessibility facilities are relatively well-developed, with ramps provided beside sidewalks and stairs (Figure 3-21d), enhancing the convenience for children's activities.

Point Spaces: These spaces vary in quality. Some have bright, noticeable signs at the entrance, such as Bubugao Compound (Figure 3-21e), while others are obscured by structures, like in Huayuan Village Compound (Figure 3-21f), making them hard to find. Moreover, there is a lack of continuous walking paths between these point spaces, which affects connectivity.

3.4.2 Safety

a) Police Office in Chuangye Village b)Well-installed Surveillance Cameras c) Open Planar Spaces

d) Complex Elevation e) Mixed Traffic at School Gate f) Overgrown Vegetation Obscuring View

Figure 3-22 Safety Analysis of Activity Spaces

(Source: Photographed by Author)

Overall Planning: Most old residential compounds have security offices and neighborhood committees nearby (Figure 3-22a). Due to the small scale of these compounds, the activity spaces are very close, and the presence of on-duty staff increases children's sense of security. Additionally, surveillance cameras can be seen in public areas (Figure 3-22b), ensuring safety. However, the boundary between public and private spaces is often blurred, and the open management mode allows outsiders to easily enter, which may pose potential safety risks to children.

Planar Spaces: These are mostly open, with good visual permeability (Figure 3-22c), enhancing the "eyes on the street" effect, which helps the neighborhood monitor the spaces. Adequate night lighting improves the safety of these activity areas. However, tall palm trees pose potential hazards, such as falling leaves that could harm children. Additionally, many activity spaces have been renovated in recent years, and the quality of the facilities is generally good, with no sharp edges. However, the lack of ongoing maintenance has led to some damaged facilities being left unattended for extended periods.

Linear Spaces: Most main roads in old residential compounds have pedestrian walkways, providing relatively safe paths for children's activities. However, the roads are narrow, and some pathways are obstructed by vehicles or debris, resulting in discontinuous walking routes. There are also complex elevation changes, such as in Bubugao (Figure 3-22d), which pose difficulties for children's mobility. The main routes for school commutes see a high volume of electric and motor vehicles, presenting traffic risks. Some compounds lack waiting spaces at school entrances for children to wait for their parents, increasing the risk of collisions with passing vehicles (Figure 3-22e).

Point Spaces: Most front yards in old residential compounds allow vehicle access, which increases safety risks for children in these spaces. The vegetation in these courtyards is often overgrown, obstructing views, and making it difficult for residents to oversee children's activities (Figure 3-22f). Additionally, these point spaces often lack lighting, making them dark at night.

3.4.3 Multifunctionality

Overall Planning: The activity facilities in old residential compounds cover various basic

sports amenities, such as badminton courts, basketball courts, and table tennis courts. These facilities are dispersed across different locations and do not form a centralized activity area.

Planar Space: Most concentrated activity spaces in old residential compounds focus primarily on sports, with basketball courts and accompanying fitness and playground equipment, exhibiting a certain level of activity diversity. However, some compounds, such as Bubugao, are limited by the size of the available space and cannot accommodate large sports facilities like basketball courts, thus needing to rely on nearby public facilities. Typically, the areas feature bulletin boards for community culture dissemination, promoting children's knowledge intake (Figure 3-23a). Playground facilities is designed with a focus on younger children, failing to cater to children of all ages (Figure 3-23b). Despite the limited facilities, due to the large space, children can still engage in various social activities such as chasing, playing ball, and drawing, combining both static and dynamic interactions (Figure 3-23c). Additionally, the local residents' committee frequently organizes various events here, enhancing the diversity of children's activities (Figure 3-23d).

a) Bulletin Board b) Playground Facilities for Younger Children c) Children Engaging in Social Activities

d) Committee Activities e) Wall Paintings Along the Street f) Primarily Rest Facilities in Courtyards

Figure 3-23 Multifunctionality Analysis of Activity Spaces

(Source: Photographed by Author, d is from mp.weixin.qq.com/)

Linear Space: The main road interfaces in old residential compounds are usually quite flat, lacking in interest and exploratory features. Some building gables have colorful paintings, adding to the enjoyment of the journey (Figure 3-23e), and a few roadsides have benches for

resting, providing pedestrians with places to pause. However, most linear spaces primarily serve as thoroughfares.

Point Space: The supporting facilities in courtyard spaces are relatively singular, mainly consisting of pavilions, tables, and chairs for resting (Figure 3-23f), with some courtyards featuring interesting installations. These spaces are somewhat enclosed and lack areas for children to interact with neighbors.

3.4.4 Comfort

Overall Planning: The building layout in old residential compounds is relatively dense, with narrow spacing between buildings, creating a sense of oppression.

Planar Space: The space's aspect ratio is appropriate, and lighting and ventilation conditions are good. However, some edges of the site lack green enclosure, resulting in unclear boundaries, making it easy for children to run onto the street. There are instances where facilities and areas are occupied by residents' drying clothes (Figure 3-24a). The plant configuration is rather chaotic, lacking order. The playground equipment in the area features bright and colorful colors, but the overall spatial atmosphere is relatively monotonous (Figure 3-24b), lacking vibrancy and aesthetics that could be added through murals, as seen in Chuangye Village. The gaming facilities are reasonably matched to children's physical scales.

a) Occupying the Space b) Monotonous Color Tone c) Not Considering children's Scale

Figure 3-24 Comfort Analysis of Activity Spaces
(Source: Photographed by Author)

Linear Space: Within the linear traffic space, some pathways between residences are too narrow, which may create discomfort for children. The main roads in Bubugao and Chuangye Village have planted vegetation on both sides, while Huayuan Village's main road lacks this, resulting in a very monotonous streetscape.

Point Space: In many courtyard areas, the planting is too dense, obstructing children's

daily pathways and affecting the lighting for lower-floor residents. For example, some courtyards in Huayuan Village have a large number of trees, and the chaotic vegetation may attract mosquitoes. The facilities in the courtyards are rarely designed for children, thus not considering their applicable scales (Figure 3-24c).

Chapter 4 the Demand for Children’s Activity Spaces in Old Residential Compounds of Dongguan

This chapter will combine the content observed in the previous chapter with a questionnaire survey and the Kano model to analyze the demand for children’s activity spaces in old residential compounds. The questionnaire survey consists of two phases. The first phase involves data collection, where a demand indicator system for children’s outdoor activity spaces is established for the design of the questionnaire, which is then distributed and collected in old residential compounds. The second part focuses on data quantification analysis. Based on the quantification results, along with observations and interview content, the demand for children’s activity spaces will be ranked and analyzed in depth to identify existing problems, thereby laying the groundwork for proposing renewal design strategies in Chapter 5.

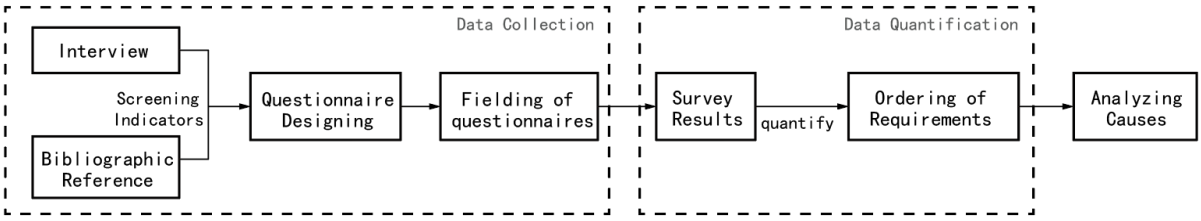


Figure 4-1 Questionnaire Framework
(Source: Drawn by Author)

4.1 Establishment of Demand Indicators for Children’s Activity Spaces

4.1.1 Interview Survey

During the on-site visits to three compounds, semi-structured interviews were conducted, randomly questioning children or parents to preliminarily explore children's needs and discuss the potential motivations behind their specific demands. The interviews posed questions from aspects such as time, location, and the composition of participants, and follow-up questions were asked based on the responses to gain a comprehensive understanding of the users' needs.

The feedback obtained from the interviews reflects the intuitive needs of children in the spaces but lacks systematic clarity and is somewhat chaotic. To better understand the intensity of children's needs and lay the foundation for subsequent survey questionnaires, the frequently mentioned content from the interviews was identified and categorized into child-friendly

elements. The summarized interview data is organized as follows:

No.	Demand Description	Categorization	Frequency
1	There are too many cars, parked haphazardly	Safety	17
2	Playground facilities are not maintained	Safety	13
3	Too many plants and clutter, leading to mosquitoes	Comfort	8
4	There are too few friends; hope for more playmates	Accessibility	6
5	No suitable playground facilities for older children	Multifunctionality	15
6	Lack of a guardianship space for parents	Safety	3
7	Too few sports areas	Multifunctionality	11
8	No suitable play facilities downstairs	Accessibility	7
9	Playground facilities are boring	Fun	11
10	Community activities exist, but I haven't participated	Multifunctionality	4
11	Haven't seen the bulletin board	Multifunctionality	8
12	Residents' drying items occupy the road	Accessibility	3
13	Electric bikes occupy the road	Accessibility	6

Table 4-1 Identification and Summary of Interview Records
(Source: Drawn by Author)

4.1.2 Selection of Demand Indicators

To further explore the usage experience and specific needs of children in old residential compounds in Dongguan regarding public activity spaces, a questionnaire survey was conducted in three compounds to collect quantitative data. This data provides empirical evidence for further analyzing the supply and demand of children's activity spaces and developing renovation strategies.

This study integrates relevant literature, along with preliminary research, to initially determine child-friendly elements of activity spaces in old residential compounds, comprising four primary indicators and 22 corresponding secondary indicators. Given the large number of indicators, a lengthy questionnaire may be difficult for children to understand, potentially reducing the accuracy of the survey. Therefore, a questionnaire was designed based on the Likert scale[60] to investigate the importance of demand indicators for children regarding activity spaces in old residential compounds, filtering the indicators to create a more reasonable demand indicator system for children's activity spaces.

The survey was distributed in person, targeting children residing in old residential compounds in Dongguan, and a total of 30 questionnaires were collected, of which 28 were valid, resulting in a validity rate of 93.3%. The result is as follow:

Secondary Indicator	Level	Average Importance Value
No motor vehicles passing through	Safety	4.82
Safety of play facilities	Safety	4.64
More diverse site forms	Comfort	4.57
Play facilities that are rich and interesting	Multifunctionality	4.36
Facilities appropriately scaled for children	Comfort	4.32
No obstacles on the ground	Accessibility	4.29
Sites suitable for users of all ages	Multifunctionality	4.18
Sufficient guardianship areas	Safety	4.11
More plants providing shade	Comfort	4.11
Incorporation of cultural and educational elements	Multifunctionality	4.04
Short walking distance	Accessibility	4.00
Sites suitable for hosting community activities	Multifunctionality	3.79
Sites located near community service centers	Safety	3.71
No need to cross major urban roads	Accessibility	3.61
Appropriate space size, neither crowded nor empty	Comfort	3.54
Integration of site boundaries with greenery	Comfort	3.54
Soft and hard paving materials combined	Safety	3.39
Transitional area between activity and rest areas	Comfort	3.36
Site entrances and exits are prominent and convenient	Accessibility	3.18
Good lighting and ventilation conditions	Comfort	3.14
High recognition of the site by surrounding neighbors	Safety	3.04
Commercial facilities nearby	Multifunctionality	2.79

Table 4-2 Importance Ranking of Child-Friendly Elements in Activity Spaces
(Source: Drawn by Author)

Based on the analysis of the results, elements that received higher importance rankings were selected as key components for the subsequent study. To ensure that the questionnaire content accurately reflects the actual needs for children's activity spaces, demand indicators were also adjusted in conjunction with findings from preliminary semi-structured interviews. This helped align the questionnaire more closely with the real-world needs of children and parents.

Moreover, the wording of the questionnaire was revised to better align with children's cognitive processes. Since children tend to grasp concrete measures more easily than abstract concepts, the expressions of demand were made more specific and tangible, while preserving the core meaning of the questions. This approach aimed to enhance children's understanding and response accuracy.

The final selection of the demand model for children's activity spaces, incorporating these

adjustments, is presented in Table 4-3.

Primary Indicator	Secondary Indicator	Reference Literature
Accessibility	Increase the number of play areas	Meng Xue[36]
	Improve the openness of the site	
	Reduce road obstacles	
Safety	Reduce the passage of motor vehicles	Zhang Duye[61]
	Improve the safety of facilities	Sun Di[62]
	Increase guardianship areas	
Multifunctionality	Enhance the fun of play Facilities	Zhang Qi[50]
	Suitable for children of multiple ages	
	Suitable for hosting group activities	
	Integrate play with educational and cultural elements	Liu Fang[63]
Comfort	Improve the diversity of site forms	Zhang Qi[50]
	Increase plant coverage	
	Facilities more appropriately scaled for children	

Table 4-3 Demand Indicators for children's Activity Spaces
(Source: Drawn by Author)

4.2 Questionnaire Design and Application

4.2.1 Questionnaire Design

(1) Introduction to the Kano Model

The demand questionnaire for children's activity spaces introduces the Kano model for design and quantitative analysis. The Kano model, proposed by Professor Noriaki Kano from Tokyo Institute of Technology in 1984, is a two-dimensional cognitive model concerning user satisfaction and the characteristics of services or products. Traditional methods for demand behavior survey analysis, such as interviews and questionnaires, often fail to accurately reflect the complexity of demands[64]. The Kano model analyzes data, indicating that the relationship between product functions and user satisfaction is not simply linear; the presence or absence of each indicator has different impacts on satisfaction. The Kano model categorizes demand into five types, as shown in Figure 4-2:

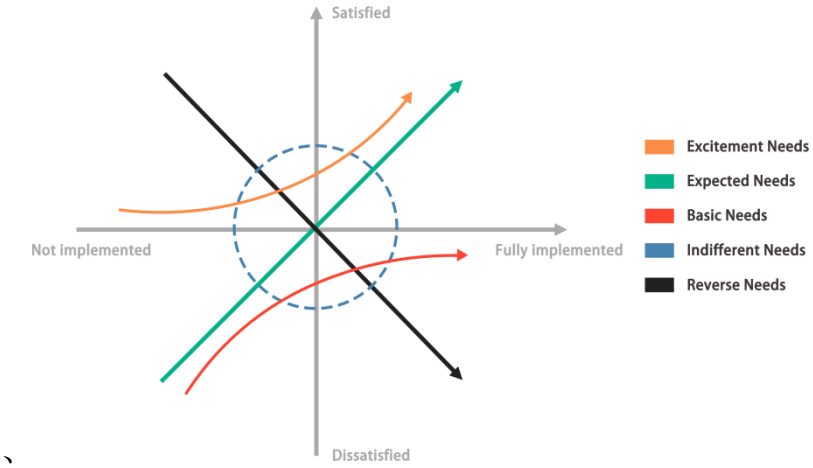


Figure 4-2 Kano Model Diagram
(Source: Drawn by Author)

① Basic Needs: Meeting this demand does not significantly enhance satisfaction, but failing to meet it leads to a significant drop in satisfaction;

② Expected Needs: When this demand is partially met, satisfaction decreases linearly; when fully met, satisfaction increases linearly;

③ Excitement Needs: Low levels of meeting this demand do not significantly affect satisfaction, but high levels lead to significant increases in satisfaction;

④ Indifferent Needs: Meeting this demand does not cause significant fluctuations in satisfaction;

⑤ Reverse Needs: Low levels of meeting this demand increase satisfaction, while high levels decrease it.

(2) Application Process of the Kano Model

The Kano model uses a matrix scale format, with the questionnaire covering both positive and negative dimensions of questions. The evaluation is categorized into five levels: "Like," "Must be," "Neutral," "Acceptable," and "Dislike," as shown in Figure 4-4:

1. Increase the number of sites					
If increased, you think:	Like	Must be	Neutral	Acceptable	Dislike
If maintained, you think:	Like	Must be	Neutral	Acceptable	Dislike

Table 4-4 Kano Questionnaire Example
(Source: Drawn by Author)

Based on the evaluation criteria of the Kano model, demand attributes were categorized, as shown in Table 4-5. The results refer to the priority ranking of the Kano model:Basic Needs >Expected Needs > Excitement Needs > Indifferent Needs. In addition, Reverse Needs should be avoided.

Space Demand		Negative Question					Remarks
		Like	Must be	Neutral	Acceptable	Dislike	M：Basic Needs O：Expected Needs A：Excitement Needs I：Indifferent Needs R：Reverse Needs Q：Questionable Needs
Positive Question	Like	Q	A	A	A	O	
	Must be	R	I	I	I	M	
	Neutral	R	I	I	I	M	
	Acceptable	R	I	I	I	M	
	Dislike	R	R	R	R	Q	

Table 4-5 Evaluation Criteria of the Kano Model
(Source: Drawn by Author)

（3）Advantages of the Kano Model

In existing research, qualitative analyses of children's activity space demands often rely on social survey methods such as questionnaires, interviews, and observations. These methods tend to focus on the objective usage perspective and do not fully consider the implicit preferences and needs of children from a psychological standpoint. Consequently, these studies have limitations in determining the prioritization of improvement measures and in making qualitative judgments about demand factors. In quantitative research methods, such as Chi-square tests and fuzzy comprehensive evaluation methods, although they provide data support for decision-making, their clarity in classifying and prioritizing needs is not as strong as that of the Kano model. Furthermore, many studies on child-friendly evaluations rely on expert empowerment, a method that fails to truly explore children's actual needs from their perspective.

The Kano model is widely applied in product design and has gradually been introduced into the urban field in recent years, exploring the demands of urban residents. Zhang Jian and others used the Kano model to quantify the types and priorities of crowd demands in public

spaces at metro stations and proposed design strategies for improving the quality of station areas based on this[65]. Liang Lihua and others analyzed the functional demand elements affecting the satisfaction of the walking environment in urban waterfront spaces through the Kano model, proposing targeted improvement and maintenance strategies[66]. Wei Shujuan applied the Kano model to quantitatively evaluate the age-friendly environment of community parks in Xi'an from the perspective of elderly demands[67].

The Kano model reveals the complex relationship between the satisfaction of needs and user satisfaction through detailed demand classification, rather than a simple linear relationship. This method helps to delve deeper into children's potential needs and provides more accurate evidence for the renovation of children's activity spaces. Additionally, the Kano model can quantify qualitative functional demands and conduct research from a psychological perspective, enabling the identification of children's real needs. Therefore, the selection of the Kano model as the research method in this study aims to comprehensively and deeply understand the demands for children's activity spaces in old residential compounds, providing a scientific basis for formulating renovation strategies.

4.2.2 Questionnaire Distribution

(1) Questionnaire Recipients

This study selected children aged 0-14 and their parents as the evaluation subjects, focusing on the relationship between children's demands and activity spaces in old residential compounds. The evaluation subjects judged relevant indicator elements based on their past experiences and cognitive perceptions from their daily behavioral needs—such as children's outdoor play and travel safety.

(2) Questionnaire Distribution Timing

Considering the spatiotemporal characteristics of children's outdoor activities, this study selected time periods when children's outdoor activities are more active for the survey, specifically on weekdays 8:00-10:00 AM and 4:00-6:00 PM, as well as all day during holidays as concentrated survey times. During the questionnaire survey, based on real-time feedback from the questionnaires, random in-depth interviews were conducted with some children and

parents to more accurately grasp children's actual needs, thus providing richer and more authentic data support.

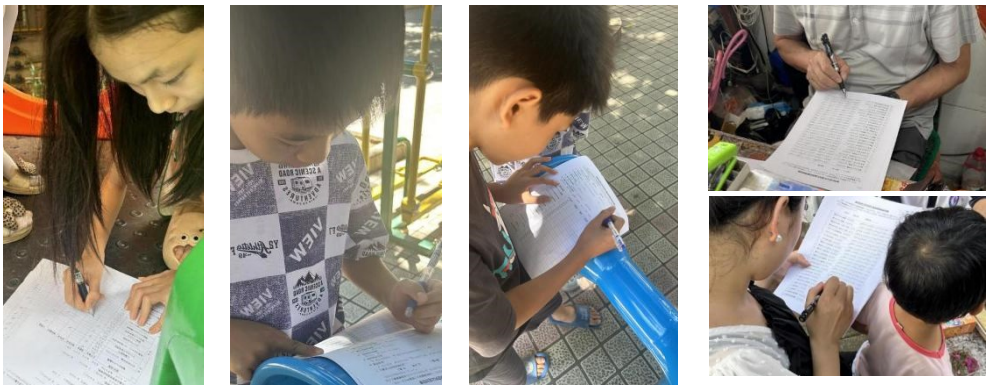


Figure 4-3 Questionnaire Distribution Scene
(Source: Photographed by Author)

4.3 Demand Results for Children's Activity Spaces

4.3.1 Demand Results in Huayuan Village

(1) Reliability and Validity Testing of the Questionnaire

A total of 113 questionnaires were collected from Huayuan Village, with 105 valid questionnaires, resulting in a valid response rate of 93%. To ensure the questionnaire is reasonably and effectively designed and to guarantee the accuracy of the survey results, reliability and validity tests were conducted on the questionnaire results. The SPSS software was used to perform Cronbach's α coefficient reliability analysis on the 105 data points from both positive and negative questions. The analysis results are shown in Table 4-6, with reliability coefficients greater than 0.7, indicating that the research data is reliable and suitable for further analysis[68].

Type	Items	Sample Size	Cronbach's α	KMO Coefficient	Bartlett Test (p-value)
Positive	13	105	0.802	0.759	0
Negative	13	105	0.7	0.653	0

Table 4-6 Reliability and Validity Analysis of the Huayuan Village Questionnaire
(Source: Drawn by Author)

Subsequently, a validity test was conducted. A KMO value between 0.6 and 0.7 indicates that information extraction is possible, while a value between 0.7 and 0.8 indicates good validity[68]. According to the test results, the KMO value for positive questions is 0.759, and for

negative questions, it is 0.653, indicating that the data validity is suitable for extracting information; the p-value meets the significance level requirement of $p < 0.05$ for the Bartlett test, demonstrating that the questionnaire exhibits good validity.

(2) Demand Attribute Classification and Ranking

Using SPSS software, the frequency of each demand in the Kano questionnaire was statistically analyzed, and Kano attributes were classified. Attributes with a large proportion of values were determined as belonging to the respective demand items. The results are shown in Table 4-7.

Function/Service	A	O	M	I	R	Attribute
Increase the Number of Play Areas (A1)	12.38%	43.81%	21.90%	21.90%	0.00%	O
Improve the Openness of the Site (A2)	36.19%	16.19%	19.05%	28.57%	0.00%	A
Reduce Road Obstacles (A3)	23.81%	25.71%	24.76%	24.76%	0.95%	O
Reduce the Passage of Motor Vehicles (B1)	13.33%	30.48%	44.76%	11.43%	0.00%	M
Improve the Safety of Facilities (B2)	16.19%	29.52%	34.29%	20.00%	0.00%	M
Increase Guardianship Areas (B3)	14.29%	7.62%	10.48%	57.14%	10.48%	I
Enhance the Fun of Play Facilitiess (C1)	33.33%	16.19%	14.29%	31.43%	4.76%	A
Suitable for Children of Multiple Ages (C2)	26.67%	34.29%	22.86%	16.19%	0.00%	O
Suitable for Hosting Group Activities (C3)	20.00%	16.19%	27.62%	36.19%	0.00%	I
Integrate Play with Educational and Cultural elements (C4)	15.24%	15.24%	17.14%	47.62%	4.76%	I
Improve the Diversity of Site Forms (D1)	25.71%	15.24%	41.90%	17.14%	0.00%	M
Increase Plant Coverage (D2)	20.00%	5.71%	3.81%	32.38%	38.10%	R
Facilities More Appropriately Scaled for Children (D3)	20.00%	32.38%	17.14%	30.48%	0.00%	O

Table 4-7 Demand Attributes of Huayuan Village

(Source: Drawn by Author)

From the table, it can be seen that among the 13 demand indicators, those classified as

Expected Needs (O) are “Increase the Number of Play Areas(A1)”, “Suitable for Children of Multiple Ages (C2)”, and “Facilities More Appropriately Scaled for Children (D3)”, totaling 3 items. The Excitement Needs (A) include “Improve the Openness of the Site (A2)” and “Enhance the Fun of Play Facilitiess (C1)”, totaling 2 items. Basic Needs (M) include “Reduce the Passage of Motor Vehicles (B1)”, “Improve the Safety of Facilities (B2)”, and “Improve the Diversity of Site Forms (D1)”, totaling 3 items. Indifferent Needs (I) include “Reducing Road Obstacles (A3)”, “Increase Guardianship Areas (B3)”, “Suitable for Hosting Group Activities (C3)”, and “Integrate Play with Educational and Cultural elements (C4)”, totaling 4 items. Additionally, “Increase Plant Coverage (D2)” is classified as a Reverse Needs.

Due to the traditional Kano model's inability to perform secondary ranking of demands within the same category, the Better-Worse coefficient method proposed by Berger and others was selected for quantifying the Better coefficient (Si) and Worse coefficient (Di) of each demand element[69], thus quantitatively reflecting the impact of different demands on satisfaction. This method avoids the shortcomings of the singular demand hierarchy, which fails to effectively distinguish importance. The calculation formulas for the Better and Worse coefficients are as follows:

$$Better(Si)=\frac{(Ai+Oi)}{(Ai+Oi+Mi+Ii)} \quad (4\text{-}1)$$

$$Worse(DSi)=-\frac{(Oi+Mi)}{Ai+Oi+Mi+Ii} \quad (4\text{-}2)$$

Using the X-axis as the Better coefficient and the Y-axis as the Worse coefficient, the average values of the Better and Worse coefficients form the boundary that divides the scatter plot into four quadrants. Each demand is plotted according to its specific Better and Worse values, as shown in Figure 4-4.

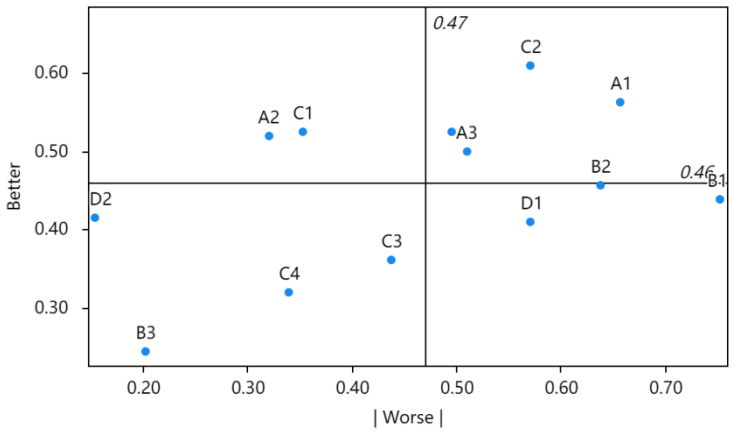


Figure 4-4 B-W Scatter Plot of Huayuan Village
(Source: Drawn by Author)

Furthermore, the sensitivity coefficient value W for each demand was calculated based on the Better and Worse coefficients. The closer the value of W is to 1, the more the user values that function. The calculation formula for W is:

$$W = \sqrt{|Better|^2 + |Worse|^2} \qquad (4\text{-}3)$$

Demand No.	Attribute	Better	Worse	W	Sensitivity Ranking	Final Ranking
A1	O	56.19%	-65.71%	0.8646	2	4
A2	A	52.38%	-35.24%	0.6313	8	9
A3	O	50.00%	-50.96%	0.7139	6	7
B1	M	43.81%	-75.24%	0.8707	1	1
B2	M	45.71%	-63.81%	0.7849	4	2
B3	I	24.47%	-20.21%	0.3174	13	12
C1	A	52.00%	-32.00%	0.6106	9	8
C2	O	60.95%	-57.14%	0.8355	3	5
C3	I	36.19%	-43.81%	0.5682	10	10
C4	I	32.00%	-34.00%	0.4669	11	11
D1	M	40.95%	-57.14%	0.7030	7	3
D2	R	41.54%	-15.38%	0.4430	12	13
D3	O	52.38%	-49.52%	0.7208	5	6

Table 4-8 Sensitivity Analysis of Demand in Huayuan Village
(Source: Drawn by Author)

Based on the calculated W values, the sensitivity ranking of various demands is shown in Table 4-8. The primary ranking follows the traditional Kano model priority order: Basic Needs > Expected Needs > Excitement Needs > Indifferent Needs. Within the same type of demand, a secondary ranking is made based on the sensitivity of the demand.

In summary, the ranking of children's activity space usage demands in Huayuan Village

Compounds is as follows:

Reduce the Passage of Motor Vehicles (B1)＞ Improve the Safety of Facilities (B2)＞ Improve the Diversity of Site Forms (D1)＞ Increase the Number of Play Areas (A1)＞ Suitable for Children of Multiple Ages (C2)＞ Facilities More Appropriately Scaled for Children (D3)＞ Reduce Road Obstacles (A3)＞ Enhance the Fun of Play Facilitiess (C1)＞ Improve the Openness of the Site (A2)＞ Suitable for Hosting Group Activities (C3)＞ Integrate Play with Educational and Cultural Elements (C4)＞ Increase Guardianship Areas (B3)＞ Increase Plant Coverage (D2).

4.3.2 Demand Results in Bubugao

(1) Reliability and Validity Testing of the Questionnaire

In Bubugao Compounds, a total of 80 questionnaires were collected, with 65 valid questionnaires, resulting in an effective response rate of 81%. The reliability and validity of the questionnaire meet the required standards, as shown in Table 4-9.

Type	Items	Sample Size	Cronbach's α	KMO Coefficient	Bartlett Test (p-value)
Positive	13	65	0.719	0.730	0.000
Negative	13	65	0.840	0.787	0.000

Table 4-9 Reliability and Validity Analysis of the Bubugao Questionnaire
(Source: Drawn by Author)

(2) Demand Attribute Classification and Ranking

Using SPSS software, frequency statistics were conducted on the demands from this set of questionnaires, and Kano attribute classification was performed. The results are shown in Table 4-10:

Function/Service	A	O	M	I	R	Attribute
Increase the Number of Play Areas (A1)	12.31%	43.08%	18.46%	26.15%	0.00%	O
Improve the Openness of the Site (A2)	21.54%	18.46%	10.77%	41.54%	7.69%	I
Reduce Road Obstacles (A3)	23.08%	32.31%	13.85%	30.77%	0.00%	O
Reduce the Passage of Motor Vehicles (B1)	6.15%	33.85%	41.54%	18.46%	0.00%	M
Improve the Safety of Facilities (B2)	13.85%	43.08%	16.92%	26.15%	3.08%	O

Increase Guardianship Areas (B3)	10.77%	23.08%	13.85%	46.15%	4.62%	I
Enhance the Fun of Play Facilitiess (C1)	40.00%	26.15%	16.92%	16.92%	0.00%	A
Suitable for Children of Multiple Ages (C2)	12.31%	38.46%	21.54%	24.62%	0.00%	O
Suitable for Hosting Group Activities (C3)	13.85%	24.62%	12.31%	46.15%	3.08%	I
Integrate Play with Educational and Cultural elements (C4)	10.77%	26.15%	15.38%	41.54%	6.15%	I
Improve the Diversity of Site Forms (D1)	12.31%	27.69%	33.85%	26.15%	0.00%	M
Increase Plant Coverage (D2)	9.23%	21.54%	10.77%	38.46%	20.00%	I
Facilities More Appropriately Scaled for Children (D3)	15.38%	38.46%	16.92%	29.23%	0.00%	O

Table 4-10 Demand Attributes of Bubugao
(Source: Drawn by Author)

Calculate the Better-Worse coefficient for each demand and determine its sensitivity W, then plot a scatter plot, as shown in Figure 4-5:

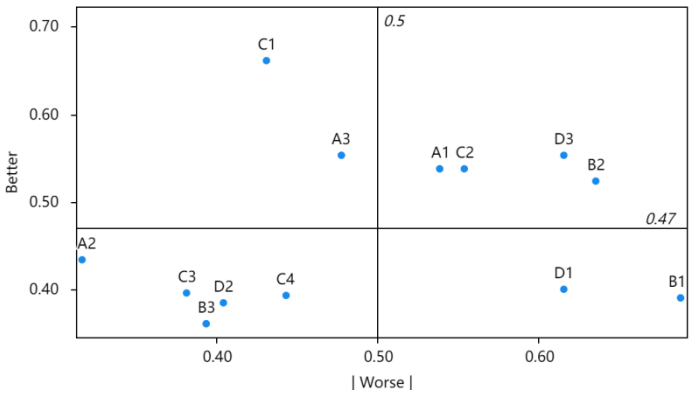


Figure 4-5 B-W Scatter Plot of Bubugao
(Source: Drawn by Author)

In summary, the ranking of children's activity space usage demands in Bubugao Compounds is as follows:

Reduce the Passage of Motor Vehicles (B1))＞ Improve the Diversity of Site Forms (D1) ＞Increase the Number of Play Areas (A1)＞Improve the Safety of Facilities (B2)＞ Suitable for Children of Multiple Ages (C2)＞ Facilities More Appropriately Scaled for Children (D3) ＞ Reduce Road Obstacles (A3)＞ Enhance the Fun of Play Facilitiess (C1)＞ Integrate Play with Educational and Cultural Elements (C4)＞ Increase Plant Coverage (D2)＞ Suitable for

Hosting Group Activities (C3) > Improve the Openness of the Site (A2) > Increase Guardianship Areas (B3).

4.3.3 Demand Results in Chuangye Village

(1) Reliability and Validity Testing of the Questionnaire

A total of 82 questionnaires were collected in Chuangye Village, with 59 valid questionnaires, resulting in an effective response rate of 72%. The reliability and validity of the questionnaire meet the required standards, as shown in Table 4-11:

Type	Items	Sample Size	Cronbach's α	KMO Coefficient	Bartlett Test (p-value)
Positive	13	59	0.842	0.793	0.000
Negative	13	59	0.823	0.814	0.000

Table 4-11 Reliability and Validity Analysis of the Chuangye Village Questionnaire
(Source: Drawn by Author)

(2) Demand Attribute Classification and Ranking

Using SPSS software, frequency statistics were conducted on the demands from this set of questionnaires, and Kano attribute classification was performed. The results are shown in Table 4-12:

Function/Service	A	O	M	I	R	Attribute
Increase the Number of Play Areas (A1)	20.34%	35.59%	15.25%	28.81%	0.00%	O
Improve the Openness of the Site (A2)	37.29%	32.20%	15.25%	15.25%	0.00%	A
Reduce Road Obstacles (A3)	20.34%	33.90%	15.25%	30.51%	0.00%	O
Reduce the Passage of Motor Vehicles (B1)	11.86%	32.20%	37.29%	18.64%	0.00%	M
Improve the Safety of Facilities (B2)	16.95%	42.37%	25.42%	15.25%	0.00%	O
Increase Guardianship Areas (B3)	18.64%	25.42%	11.86%	40.68%	3.39%	I
Enhance the Fun of Play Facilitiess (C1)	30.51%	20.34%	18.64%	27.12%	3.39%	A
Suitable for Children of Multiple Ages (C2)	22.03%	42.37%	15.25%	20.34%	0.00%	O
Suitable for Hosting Group Activities (C3)	27.12%	25.42%	13.56%	33.90%	0.00%	I

Integrate Play with Educational and Cultural elements (C4)	23.73%	25.42%	10.17%	38.98%	1.69%	I
Improve the Diversity of Site Forms (D1)	22.03%	32.20%	20.34%	25.42%	0.00%	O
Increase Plant Coverage (D2)	20.34%	22.03%	8.47%	32.20%	13.56%	I
Facilities More Appropriately Scaled for Children (D3)	28.81%	30.51%	11.86%	28.81%	0.00%	O

Table 4-12 Demand Attributes of Chuangye Village
(Source: Drawn by Author)

Calculate the Better-Worse coefficient for each demand and determine its sensitivity W, then plot a scatter plot, as shown in Figure 4-6:

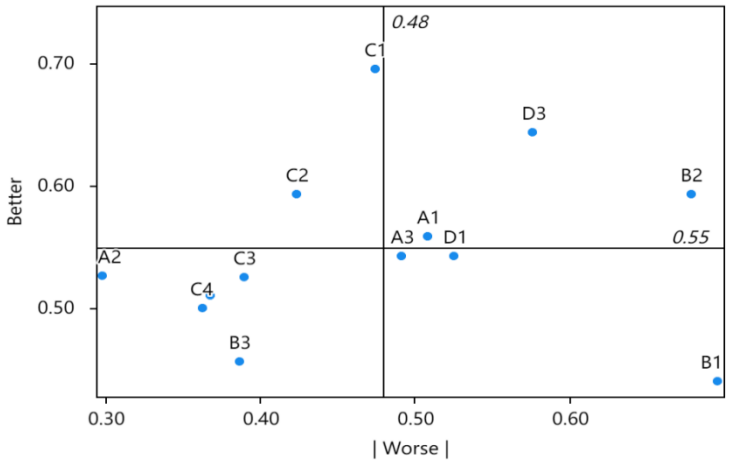


Figure 4-6 B-W Scatter Plot of Chuangye Village
(Source: Drawn by Author)

In summary, the ranking of children's activity space usage demands in Chuangye Village is as follows:

Improve the Safety of Facilities (B2)＞ Reduce the Passage of Motor Vehicles (B1)＞ Improve the Diversity of Site Forms (D1)＞ Suitable for Children of Multiple Ages (C2)＞ Increase the Number of Play Areas (A1)＞ Reduce Road Obstacles (A3)＞ Facilities More Appropriately Scaled for Children (D3)＞ Improve the Openness of the Site (A2)＞ Enhance the Fun of Play Facilitiess (C1)＞ Suitable for Hosting Group Activities (C3)＞ Increase Plant Coverage (D2)＞ Integrate Play with Educational and Cultural Elements (C4)＞ Increase Guardianship Areas (B3).

4.4 Analysis of children's Activity Space Demands

4.4.1 Overall Demand Analysis

A comparative analysis of the demand ranking results for each community is conducted. Overall, the B-category safety demands B1 and B2 are prioritized, reflecting children's concern for safety and the prevalent issue of insufficient safety in old residential compounds. Conversely, the overall demand for the C-category multifunctionality is ranked lower, with most needs falling into the indifferent or expected categories, indicating a lower demand for these features among children. According to the Kano model, priority should be given to satisfying Basic Needs (M) and Expected Needs (O), while continuously paying attention to Excitement Needs (A) and striking a balanced approach to Indifferent Needs (I).

Ranking	Huayuan Village	Bubugao	Chuangye Village
1	Reduce the Passage of Motor Vehicles (B1)	Reduce the Passage of Motor Vehicles (B1)	Improve the Safety of Facilities (B2)
2	Improve the Safety of Facilities (B2)	Improve the Diversity of Site Forms (D1)	Reduce the Passage of Motor Vehicles (B1)
3	Improve the Diversity of Site Forms (D1)	Increase the Number of Play Areas (A1)	Improve the Diversity of Site Forms (D1)
4	Increase the Number of Play Areas (A1)	Improve the Safety of Facilities (B2)	Suitable for Children of Multiple Ages (C2)
5	Suitable for Children of Multiple Ages (C2)	Suitable for Children of Multiple Ages (C2)	Increase the Number of Play Areas (A1)
6	Facilities More Appropriately Scaled for Children (D3)	Facilities More Appropriately Scaled for Children (D3)	Reduce Road Obstacles (A3)
7	Reduce Road Obstacles (A3)	Reduce Road Obstacles (A3)	Facilities More Appropriately Scaled for Children (D3)
8	Improve the Openness of the Site (A2)	Enhance the Fun of Play Facilitiess (C1)	Improve the Openness of the Site (A2)
9	Enhance the Fun of Play Facilitiess (C1)	Integrate Play with Educational and Cultural Elements (C4)	Enhance the Fun of Play Facilitiess (C1)
10	Suitable for Hosting Group Activities (C3)	Increase Plant Coverage (D2)	Suitable for Hosting Group Activities (C3)
11	Integrate Play with Educational and Cultural Elements (C4)	Suitable for Hosting Group Activities (C3)	Increase Plant Coverage (D2)

12	Increase Guardianship Areas (B3)	Improve the Openness of the Site (A2)	Integrate Play with Educational and Cultural Elements (C4)
13	Increase Plant Coverage (D2)	Increase Guardianship Areas (B3)	Increase Guardianship Areas (B3)

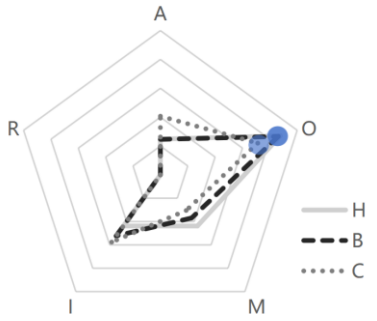
Table 4-13 Priority Ranking of Demands in Each compound
(Source: Drawn by Author)

4.4.2 Analysis of Specific Needs

The priority of the same demand item varies across different residential compounds due to differences in their current situations. Therefore, a horizontal comparative analysis of each demand is conducted, supplemented by field observations and interview results. In this subsection, for brevity, Huayuan Village is abbreviated as HY, Bubugao as BB, and Chuangye Village as CY; the same applies hereinafter.

(1) Accessibility Needs

① Increase the Number of Play Areas



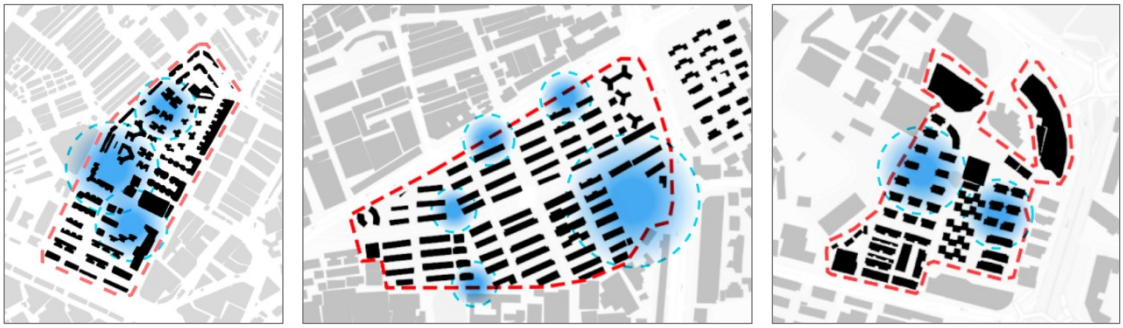
	A	O	M	I	R	P
HY	12.38%	43.81%	21.90%	21.90%	0.00%	4
BB	12.31%	43.08%	18.46%	26.15%	0.00%	3
CY	20.34%	35.59%	15.25%	28.81%	0.00%	5
Demand Characteristics						
Primarily expected needs, with no reverse needs.						

Table 4-14 Demand Analysis for the Number of Play Areas
(Source: Drawn by Author)

The demand for "increasing the number of play areas" is identified as an expected need in all three compounds, as shown in Table 4-14. This means that if this measure is not implemented, children's satisfaction will significantly decline; conversely, if it is implemented, children's satisfaction will significantly increase. It is evident that children generally feel the need to increase the number of play areas.

In Huayuan Village and Bubugao, the existing planar activity areas are located at the periphery (Figure 4-7a,b), which makes accessibility insufficient for children. Therefore, the child demographic generally hopes to have more play areas near their residences, allowing them

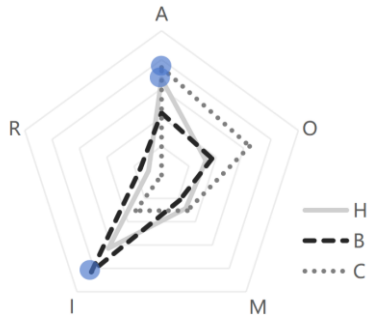
to enjoy outdoor activities more conveniently and fulfill their desire to "play close to home." In contrast, Chuangye Village has a wider radiation range for play areas (Figure 4-7c), leading to higher accessibility for children, and consequently, the willingness for this demand is not as strong, with nearly 30% of children indifferent to this measure. Nonetheless, overall, increasing the number of play areas remains a widely desired improvement among children.



a) Huayuan Village b) Bubugao c) Chuangye Village

Figure 4-7 Radiation Range of Activity Areas in Different Compounds
(Source: Drawn by Author)

② Openness of the Site



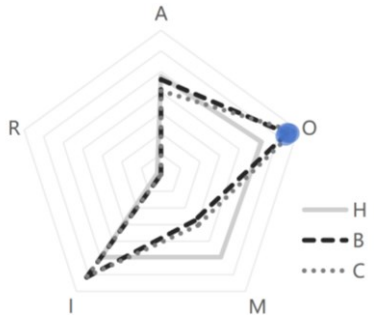
	A	O	M	I	R	P
HY	36.19%	16.19%	19.05%	28.57%	0.00%	8
BB	21.54%	18.46%	10.77%	41.54%	7.69%	12
CY	37.29%	32.20%	15.25%	15.25%	0.00%	8
Demand Characteristics						
There are significant differences among sites, primarily excitement needs.						

Table 4-15 Demand Analysis for the Openness of the Site
(Source: Drawn by Author)

According to Table 4-15, regarding the improvement of openness in play areas to enhance accessibility and thus increase the number of visiting children, opinions vary among children in different compounds. In both Chuangye Village and Huayuan Village, a relatively high proportion of children consider increasing the openness of play areas as an excitement need. This means that if this function is not provided, children's satisfaction will not significantly decline, but if it is provided, children's satisfaction will see a substantial increase, making it a desirable enhancement. This is due to the abundant centralized activity spaces in these two compounds, providing ample play areas for children. Especially in Chuangye Village, the activity areas have been renovated and are in good condition, leading children to look forward

to attracting more peers through increased openness, thereby expanding their social circles. However, in Bubugao, due to the lack of additional centralized activity areas, it is challenging to provide sufficient physical space for children's interactions, resulting in a lower demand for this need. Nevertheless, there is still some reverse demand, as both children and parents express concerns that excessive openness may lead to mixed crowds, potentially posing a safety threat to children.

③ Reduce Road Obstacles



	A	O	M	I	R	P
HY	23.81%	25.71%	24.76%	24.76%	0.95%	7
BB	23.08%	32.31%	13.85%	30.77%	0.00%	7
CY	20.34%	33.90%	15.25%	30.51%	0.00%	6
Demand Characteristics						
Primarily expected needs.						

Table 4-16 Demand Analysis for Reducing Road Obstacles
(Source: Drawn by Author)

The demand among children in all three compounds for reducing road obstacles primarily manifests as an expected need, with proportions of expected needs being 25.71%, 32.31%, and 33.90%, respectively, as shown in Table 4-16 This need belongs to the "second tier" of priorities that should be met. In the current old residential compounds, various obstacles often exist on the roads leading to play areas. For instance, in Bubugao and Chuangye Village (Figure 4-8), due to elevation differences, children usually need to navigate multiple flights of stairs to reach active zones, which undoubtedly increases their travel burden.

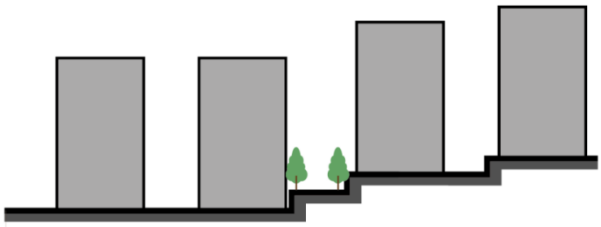


Figure 4-8 Road Profile of Chuangye Village
(Source: Drawn by Author)

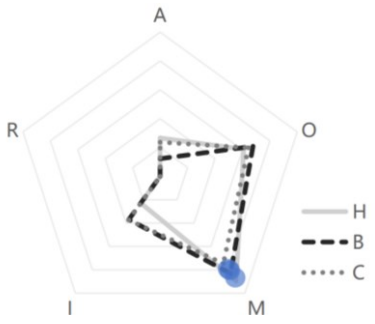
The roads within the compounds are relatively narrow, typically only 4-5m wide, and the issue of improper parking is particularly prominent, causing vehicle roads to become even

narrower, sometimes insufficiently wide at less than 3m. Some spontaneous behaviors from residents, such as setting up stalls or hanging clothes, encroach upon pedestrian spaces (Figure 4-9a). Additionally, some road pavements have not been replaced for many years and have multiple damages; the uneven surfaces threaten the safety of residents' passage and may lead to water accumulation during rainy days (Figure 4-9b), reducing passage comfort.

Figure 4-9 Road Obstructed by Debris and Non-motorized Vehicles
(Source: Photographed by Author)

(2) Safety Needs

① Motor Vehicle Passage



	A	O	M	I	R	P
HY	13.33%	30.48%	44.76%	11.43%	0.00%	1
BB	6.15%	33.85%	41.54%	18.46%	0.00%	1
CY	11.86%	32.20%	37.29%	18.64%	0.00%	2
Demand Characteristics						
The number of basic needs is comparable to expected needs.						

Table 4-17 Demand Analysis for Motor Vehicle Passage
(Source: Drawn by Author)

Based on the results of the Kano model, for the element "Reduce Motor Vehicle Passage," the data from the three surveyed compounds exhibit similar demand characteristics, namely that the ratio of basic needs to expected needs is comparable, as shown in Table 4-17. This indicates that this demand plays a fundamental role in enhancing children's overall satisfaction. If this issue is improved, it may not necessarily lead to a significant increase in satisfaction; however, neglecting this demand will significantly decrease children's satisfaction. Additionally, the proportion considered indifferent needs is relatively low, further highlighting its importance.

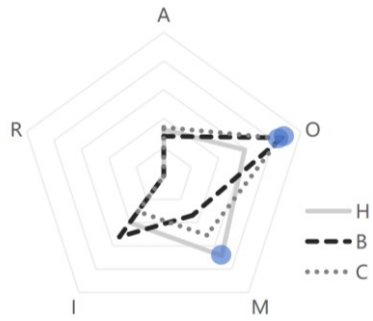
In-depth analysis of the reasons behind this demand reveals that the planning defects commonly found in old residential compounds are key factors. Most of these compounds fail

to achieve a separation of pedestrians and vehicles, leading to the intertwining of motor vehicle and children's activity spaces, thus creating potential safety hazards. In old residential compounds, most areas do not achieve the separation of pedestrians and vehicles, resulting in safety risks for children from motor vehicles. The demand from children in Chuangye Village for reducing motor vehicle passage is slightly lower than in the other two compounds, as this compound has implemented measures to restrict vehicles from entering courtyards, thereby reducing safety risks to some extent. Nevertheless, some children still report having witnessed incidents of vehicles colliding with children on the main road of the compound, indicating that motor vehicles still pose a significant threat to children. In the other two compounds, incidents of vehicle collisions are more severe, and vehicles can easily access the front yards or activity spaces of residential buildings (Figure 4-10), causing a sense of instability for children.

a) Vehicle entering the courtyard b) Vehicle entering the activity space

Figure 4-10 Vehicles can enter the courtyard or activity space
(Source: Photographed by Author)

② Facility Safety



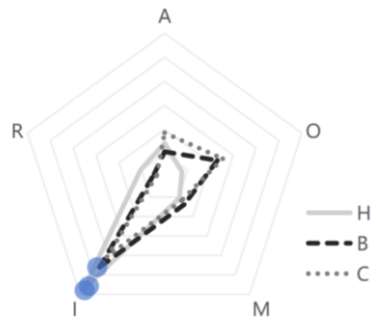
	A	O	M	I	R	P
HY	16.19%	29.52%	34.29%	20.00%	0.00%	2
BB	13.85%	43.08%	16.92%	26.15%	0.00%	4
CY	16.95%	42.37%	25.42%	15.25%	0.00%	1
Demand Characteristics						
There are differences among different venues, mainly consisting of expected needs.						

Table 4-18 Demand Analysis for Facility Safety
(Source: Drawn by Author)

Regarding the improvement of facility safety, more than 60% of children across the three compounds consider it a basic need or an expected need, as shown in Table 4-18. Among them,

children in Huayuan Village are more inclined to view it as a basic need, while the other two compounds regard it as an expected need. According to the Kano demand curve, the unmet basic needs lead to an exponential decline in satisfaction, with the extent of decline far exceeding that of expected needs. This data indicates that children in Huayuan Village have a more urgent demand for enhancing facility safety. It is known that several safety incidents have occurred in the activity areas of Huayuan Village, such as a seesaw suddenly breaking and toppling a child, and a basketball hoop collapsing, almost injuring passersby. Furthermore, some of these facilities have not received timely maintenance and repair.

③ Guardianship Space



	A	O	M	I	R	P
HY	14.29%	7.62%	10.48%	57.14%	10.48%	12
BB	10.77%	23.08%	13.85%	46.15%	4.62%	13
CY	18.64%	25.42%	11.86%	40.68%	3.39%	13
Demand Characteristics						
Primarily considered indifferent needs, with some reverse needs present.						

Table 4-19 Demand Analysis for Guardianship Space
(Source: Drawn by Author)

Regarding the allocation of guardianship space, more than half of the children and parents consider it an "indifferent need," and there is also a certain proportion of reverse needs, indicating low overall demand sensitivity, as shown in Table 4-19. The reasons behind this phenomenon can be analyzed from the psychological characteristics of children's development and the changes in parental supervision models.

First, school-age children have accumulated a certain amount of experience in independent activities; their dependence on supervision is gradually decreasing, and they may even develop resistance to overly noticeable adult supervision, seeing it as a constraint on their freedom to explore. Children at this stage are more inclined to play freely in environments without direct adult intervention (Figure 4-11a), to satisfy their growing autonomy and exploratory desires. Secondly, for parents of younger children, although there is theoretically a certain demand for guardianship space, in practice, they prefer to maintain close and flexible follow-ups while their children play (Figure 4-11b), rather than being confined to a specific guardianship area.

Additionally, some parents believe that allowing children to have some freedom to play and reducing supervision can help cultivate their independence and problem-solving abilities. Nevertheless, the survey results still show the presence of excitement needs, expected needs, and basic needs. In the design of renovations, the reasonable planning and layout of guardianship space cannot be completely ignored; a proper balance must be found between respecting children's autonomy and ensuring safety.

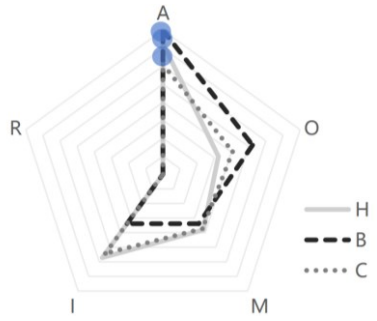

a) School-age children largely unsupervised by parents b) Parents closely following young children

Figure 4-11 Parental Supervision of Children of Different Ages

(Source: Photographed by Author)

(3) Multifunctional Needs

① Enhance the Fun of Play Facilitiess



	A	O	M	I	R	P
HY	36.19%	16.19%	19.05%	28.57%	0.00%	9
BB	40.00%	26.15%	16.92%	16.92%	0.00%	8
CY	30.51%	20.34%	18.64%	27.12%	0.00%	9
Demand Characteristics						
Primarily classified as excitement needs.						

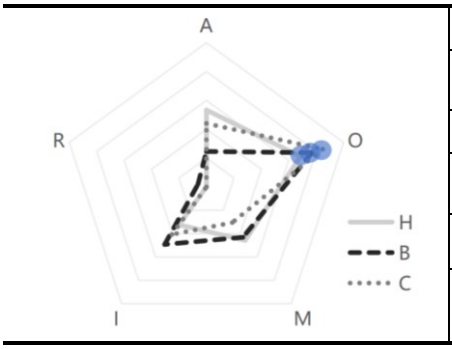
Table 4-20 Demand Analysis for Enhance the Fun of Play Facilitiess

(Source: Drawn by Author)

“Enhancing the fun of play facilities” has been identified as an excitement need, with expressions of 36.19%, 40.00%, and 30.51% in the three venues, as shown in Table 4-20. This indicates that not adopting this measure will not impact satisfaction, but meeting this demand can significantly enhance children's activity experiences, bringing them great surprise. Some children feel "bored" with the current play facilities and hope to introduce more stimulating and interesting equipment through improvements. However, this demand is not prioritized highly. In the actual renovation process, continuous observation and assessment of the demand for

enhancing the fun of play facilities can be conducted. After prioritizing basic needs and expected needs, measures to meet children's needs for fun and stimulation can be explored in conjunction with cost control.

② Suitable for Children of Multiple Ages



	A	O	M	I	R	P
HY	26.67%	34.29%	22.86%	16.19%	0.00%	5
BB	12.31%	38.46%	21.54%	24.62%	3.08%	5
CY	22.03%	42.37%	15.25%	20.34%	0.00%	4
Demand Characteristics						
Mainly classified as expected needs.						

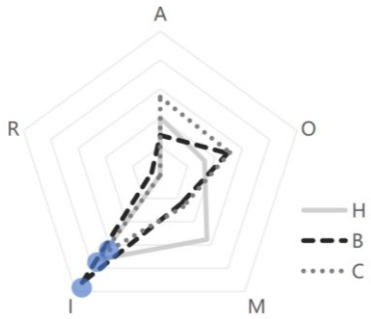
Table 4-21 Demand Analysis for Suitable for Children of Multiple Ages
(Source: Drawn by Author)

Regarding the suitability for children of all ages, as shown in Table 4-21, the proportion of expected needs among the children's feedback in the three compounds reached 34.29%, 38.46%, and 42.37%, respectively, occupying a dominant position. This reveals an imbalance in the configuration of children's activity spaces in old residential compounds. Currently, the activity areas mainly consist of traditional facilities such as seesaws and slides designed for children aged 3 to 6 (Figure 4-12). These facilities lack sufficient appeal for school-age children, leading them to feel overlooked. There are significant differences between the needs of school-age children and younger children; the former are more inclined to participate in activities that are more challenging and require higher skills. Meanwhile, for children aged 0 to 3 who are still in the crawling phase, parents believe that the existing play facilities are unsuitable for their use. Therefore, the activity spaces fail to meet the needs of children of all ages, becoming a common concern for both children and parents. In summary, children express a strong expectation for the multifunctionality of activity spaces, hoping that future renovations can consider the specific needs of different age groups and provide more diverse and suitable play facilities and environments.

a) Slide b) Seesaw c) Hopscotch

Figure 4-12 Uniform Age Range Suitability of children's Play Facilities
(Source: Photographed by Author)

③ Suitable for Hosting Group Activities



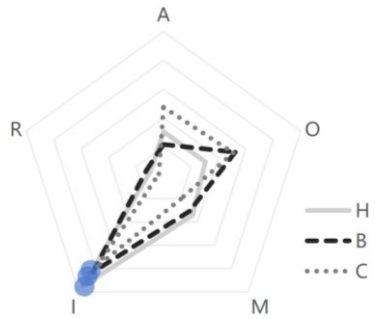
	A	O	M	I	R	P
HY	20.00%	16.19%	27.62%	36.19%	0.00%	10
BB	13.85%	24.62%	12.31%	46.15%	3.08%	11
CY	27.12%	25.42%	13.56%	33.90%	0.00%	10
Demand Characteristics						
Mainly Indifferent Needs						

Table 4-22 Demand Analysis for Suitable for Hosting Group Activities
(Source: Drawn by Author)

Regarding the need to increase hosting group activities, the proportion of indifferent needs in the three compounds is 36.19%, 46.15%, and 33.90%, respectively, as shown in Table 4-22, indicating that this demand item is viewed as neither essential nor particularly attractive, with an overall low sensitivity. Notably, the Bubugao compound shows a higher proportion leaning towards indifferent needs. According to children's feedback, their interest in community-hosted group activities is not strong, and participation rates are low. This reflects a possible disconnect in the design and implementation of current community activities from children's actual preferences, failing to effectively meet their diverse entertainment and social needs.

④ Integrate Play with Educational and Cultural elements

According to the data in Table 4-23, the demand from children for the combination of play facilities with cultural and educational elements generally presents indifferent characteristics, with a certain proportion of reverse needs, and the overall sensitivity of the demand is low. Children are naturally inclined to pursue play and entertainment, often viewing their leisure time as moments for relaxation and enjoyment.



	A	O	M	I	R	P
HY	15.24%	15.24%	17.14%	47.62%	4.76%	11
BB	10.77%	26.15%	15.38%	41.54%	6.15%	9
CY	23.73%	25.42%	10.17%	38.98%	1.69%	12
Demand Characteristics						
Mainly Indifferent Needs, with some Reverse Needs						

Table 4-23 Demand Analysis for Integrate Play with Educational and Cultural elements
(Source: Drawn by Author)

Some children explicitly stated that they "do not want to face learning tasks again after returning home" and expressed indifference towards educational facilities such as community bulletin boards (Figure 4-13), saying they "have never paid attention to them." This feedback highlights children's psychological tendency to seek clear boundaries between leisure and education, explaining why the proposal to integrate play with cultural and educational elements, although it did not elicit strong aversion, also failed to stimulate high interest or perceived necessity. In summary, the method of integrating play with cultural and educational elements should be carefully considered to balance children's entertainment needs with potential educational value, avoiding a simplistic overlay that could diminish the children's user experience.

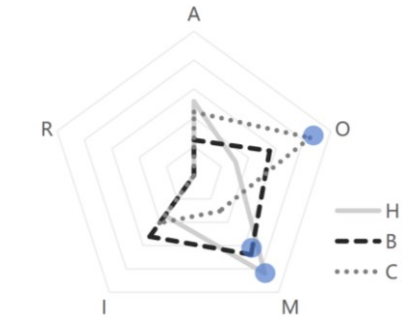
Figure 4-13 Bulletin Board in the compound
(Source: Photographed by Author)

(4) Comfort Needs

① Improve the Diversity of Site Forms

Regarding the enhancement of the richness of site forms, about 60% of children in the three compounds view it as a basic need or expected need, with high priority, as shown in Table 4-24. Among them, children in Chuangye Village are more inclined to classify it as an expected

need, hoping to obtain a richer play experience through diverse site forms.

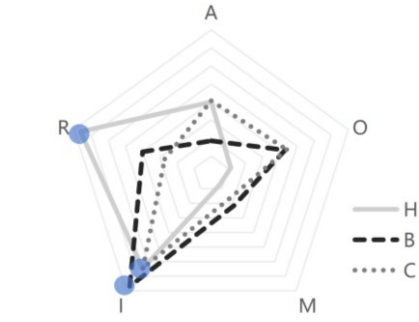


	A	O	M	I	R	P
HY	25.71%	15.24%	41.90%	17.14%	0.00%	3
BB	12.31%	27.69%	33.85%	26.15%	0.00%	2
CY	22.03%	42.37%	15.25%	20.34%	0.00%	3
Demand Characteristics						
Variations Across Different Sites, Mainly Basic Needs						

Table 4-24 Demand Analysis for Improve the Diversity of Site Forms
(Source: Drawn by Author)

The other two compounds view it as a basic need, considering the richness of site forms to be an essential element of children's activity spaces. Children are highly sensitive to their external environment and tend to pursue novelty and stimulation in sensory experiences. Therefore, a play area with diverse and changing appearances can greatly stimulate children's curiosity and desire to explore, leading to a strong willingness to play there.

② Increase Plant Coverage



	A	O	M	I	R	P
HY	20.00%	5.71%	3.81%	32.38%	38.10%	13
BB	9.23%	21.54%	10.77%	38.46%	20.00%	10
CY	20.34%	22.03%	8.47%	32.20%	13.56%	11
Demand Characteristics						
Variations Across Different Sites, Mainly Indifferent Needs						

Table 4-25 Demand Analysis for Increase Plant Coverage
(Source: Drawn by Author)

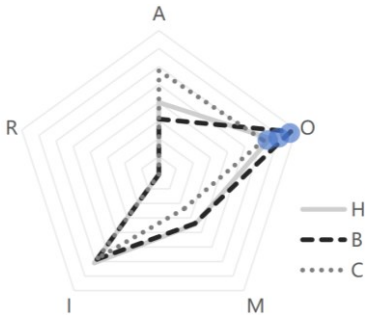
According to Table 4-25, the demand from children in the three compounds for increasing plant coverage shows differentiated indifferent or reverse attitudes. Among the children in Huayuan Village, 38.10% expressed reverse needs, while 32.38% showed indifferent needs. A large number of poorly managed plants not only fail to serve as positive elements in children's activity spaces but also cause inconvenience by occupying active areas (Figure 4-14).

a) Huayuan Village b) Bubugao c) Chuangye Village

Figure 4-14 Plant Conditions in Each Compound
(Source: Photographed by Author)

Compared to Huayuan Village, the children in Bubugao and Chuangye Village exhibit a more indifferent attitude towards plant coverage, although there remains a certain proportion of reverse needs. Particularly in Chuangye Village, where the vegetation is relatively well-maintained, the proportion of children holding opposing views is comparatively low, yet not entirely eliminated. This phenomenon indicates that in children's demands for activity spaces, the quantity and coverage of vegetation are not the primary considerations, and their importance is relatively low.

③ Facilities More Appropriately Scaled for Children



	A	O	M	I	R	P
HY	12.38%	43.81%	21.90%	21.90%	0.00%	6
BB	12.31%	43.08%	18.46%	26.15%	0.00%	6
CY	20.34%	35.59%	15.25%	28.81%	0.00%	7
Demand Characteristics						
Mainly Expected Needs, No Reverse Needs						

Table 4-26 Demand Analysis for Facilities More Appropriately Scaled for Children
(Source: Drawn by Author)

For the demand regarding “facilities appropriately scaled for children,” about 40% of the children across the three compounds consider this measure to be an expected need, and no reverse needs were observed (Table 4-26). Among them, the demand categories in Chuangye Village are relatively balanced, as the facilities in their children’s activity spaces are more aligned with children’s scales, such as various seating options designed for children’s comfort. Nevertheless, children generally recognize this as an expected need, indicating that the scale of facilities directly impacts children’s user experience and comfort, with significant room for

improvement in the current facility scales.

4.5 Summary of This Chapter

This chapter conducted a comprehensive evaluation of children’s needs for various friendly factors in activity spaces through the use of Kano questionnaires, combined with interviews and on-site research. Firstly, through vertical analysis, the type and classification of each demand in the respective residential compounds were identified, and the priority of each demand was ranked accordingly. Secondly, a horizontal comparative analysis was carried out for the three residential compounds to reveal both the differences and commonalities in the needs. For the items with similar results, the common needs of children for activity spaces were summarized based on the attribute of each indicator and their priority. For the items with divergent results, the internal connection between differences in environmental supply and the varying intensity of children’s needs was further explored.

Chapter 5 Optimization Strategies for Children's Activity Spaces in Old Residential Compounds

This chapter combines the objective material environment supply from Chapter 3 with the children's demand analysis from Chapter 4, proposing optimization strategies for children's activity spaces in old residential compounds in Dongguan based on children's psychological and behavioral characteristics. The chapter is divided into two parts: the first part focuses on renovation strategies to create activity spaces that meet children's needs and have broad applicability; the second part discusses implementation methods for these renovations to ensure effective execution and promotion of the strategies.

5.1 Renovation Strategies for Children's Activity Spaces

The renovation strategies begin with the 4 dimensions and 13 demand factors previously mentioned. Strategies and specific measures are proposed based on the intensity of children's demands. The objectives include improving accessibility to ensure children can easily reach activity spaces; enhancing safety to guarantee children's security during activities; emphasizing multifunctionality to meet children's diverse activity needs; and increasing comfort to create pleasant activity environments.

5.1.1 Enhancing Accessibility of Activity Spaces

Among the accessibility demands, increasing the number of play areas and reducing road obstacles are relatively high-priority needs. Thus, more resources and efforts should be invested to ensure these two demands of children are met. Improving the openness of the site is considered either an excitement need or an indifferent need, and moderate improvements should be made to balance community privacy and openness.

Level	Demand	Category	Strategy	Specific Points
Accessibility	Increase the Number of Play Areas	O	Explore Potential, Enhance Reachability	Reshape planar spaces
				Identify fragmented spaces
				Place-making in Road Spaces
	Improve Openness	A\I	Improve Openness and	Enhance recognition

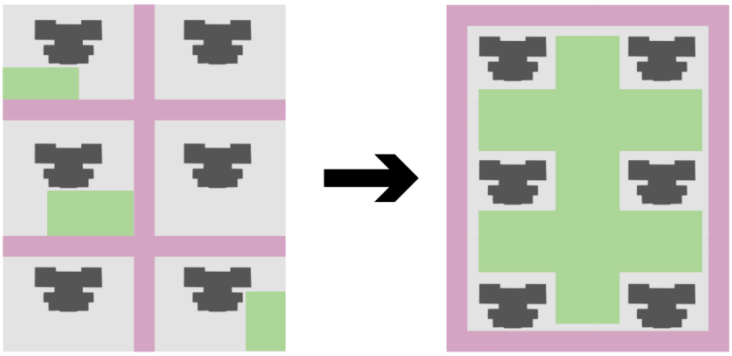
			Strengthen Community Connections	Flexible boundaries
	Reduce Road Obstacles	O	Eliminate barriers, Enhance Spatial Connectivity	Create continuous walking experiences
				Surface improvements to reduce obstacles

Table 5-1 Strategies to Enhance Accessibility
(Source: Drawn by Author)

5.1.1.1 Explore Potential, Enhance Reachability

The issue of insufficient children's activity spaces is prevalent in old residential compounds for two reasons: first, there is a lack of centralized open space, and second, there is improper utilization of scattered spaces. To address this issue, it is essential to explore potential spaces and redefine their functions, introducing elements that can attract children to activate idle spaces.

(1) Reshape Planar Spaces

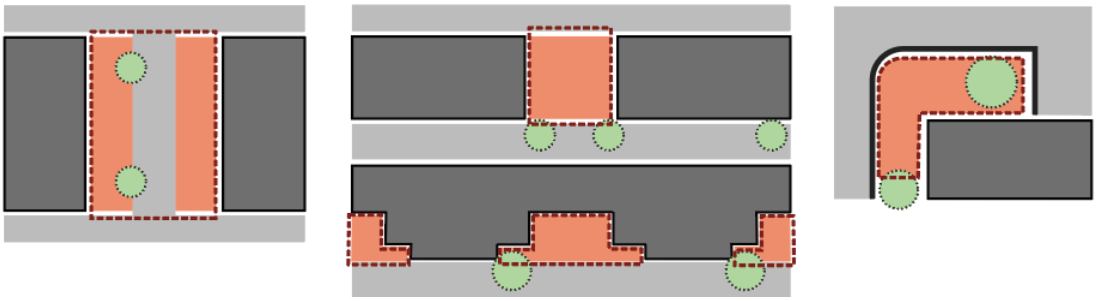


a) Before - Fragmented Activity Areas b) After - Integrated into Planar Areas
Figure 5-1 Reshaping Planar Spaces
(Source: Drawn by Author)

The fragmentation and irregularity of building plots have severely compressed the spaces between buildings. The layout of vehicular roads further exacerbates this situation, leading to many potential activity spaces being idle, while existing activity spaces fail to effectively create a sense of place suitable for children's activities. For this type of space, integrating plots and replanning the road system can transform the current fishbone-shaped roads into a loop road layout, thus converting scattered point spaces into continuous planar spaces, thereby improving spatial utilization efficiency (Figure 5-1).

（2）Identify Fragmented Spaces

In current old residential compounds, many front areas of residential buildings are occupied by vehicular roads, lacking courtyard spaces or being occupied by vehicles and clutter. By enclosing courtyards, additional activity areas can be provided for children. Furthermore, identifying and utilizing fragmented spaces such as street corners and gaps between buildings (Figure 5-2) can also increase point activity areas. Although these spaces are very limited, they still hold potential for conversion into activity spaces.



a) Between Buildings Courtyard　b) Vacant Land Next to Buildings　c) Corner Space

Figure 5-2 Classification of Fragmented Spaces

(Source: Drawn by Author)

For instance, the “Unusual Soccer Field” developed by AP Thailand in the Khlong Toei community of Bangkok (Figure 5-3) utilized abandoned spaces between buildings to design irregular soccer fields due to the lack of redundant open land.

a) Before Renovation　b) After Renovation

Figure 5-3 Khlong Toei Unusual Soccer Field

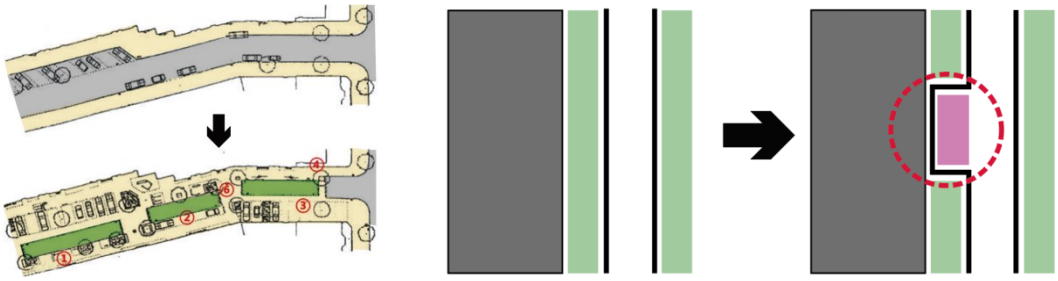
(Source: nationthailand.com/)

Any informal space can achieve maximum benefits by transforming irregular spaces into areas for organizing various activities, bringing the greatest flexibility and seamlessness to old residential compounds. By shaping landscapes and arranging appropriate movable urban furniture, these spaces are revitalized, providing children with convenient access to play right

outside their homes. This not only increases the activity space available to children but also enhances the accessibility and utilization efficiency of the space, thereby promoting children's participation in outdoor activities.

(3) Place-making in Road Spaces

For the roads in old residential compounds, transforming them from a single linear space into a composite activity space that integrates "point, line, and surface" elements can effectively increase the number of activity areas. For wider vehicular roads, resting and activity facilities can be added on both sides or in the central area, or strip green islands can be created. For example, in the Netherlands, "Woonerf" reassigns road rights, alters surface pavements, and adds landscape ponds to integrate children's activity areas into road designs (Figure 5-4a).



a) Renovation of Dutch Woonerf b) Narrow Pathway Renovation

Figure 5-4 Place-making in Roads
(Source: Drawn by Author)

For narrow pedestrian pathways, large-scale renovations are not necessary; instead, mini point activity spaces can be embedded along the road edges, maximizing utility with minimal changes (Figure 5-4b). Even simple colored graffiti areas can provide a space for children's activities, increasing the likelihood of social interactions among children.

5.1.1.2 Improve Openness and Strengthen Community Connections

(1) Enhance Recognition

Given the common lack of property management in existing old residential compounds in Dongguan, their operational models tend to lean towards open communities. For the transformation of children's activity spaces, Chuangye Village has taken the lead in practice by making pocket parks in front of buildings open to the public and providing entrance signage to guide children to use the space. Based on this experience, measures such as improving

recognition, setting up guiding signs, and providing children's maps (Figure 5-5) can enhance openness and improve accessibility to children's activity spaces in old residential compounds. More children from the surrounding area will recognize and visit these spaces, providing opportunities for children to make friends, and fostering participation from young adults through children's activities, thereby promoting interaction within the community.

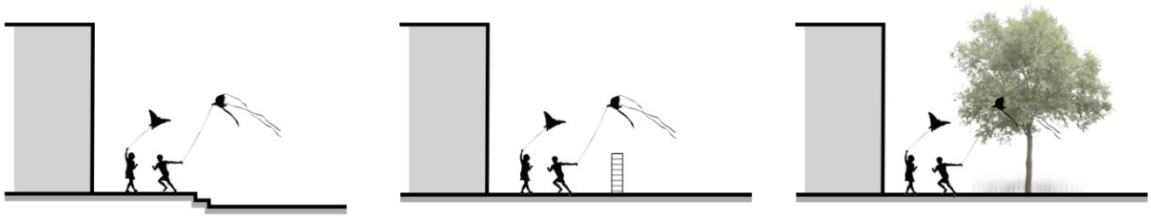
Figure 5-5 Entrance Signage
(Source: mp.weixin.qq.com/)

However, while enhancing openness, it is essential to consider safety issues and protect residents' privacy. Therefore, selecting appropriate ways and locations for openness is crucial. It is advisable to choose centralized activity spaces with strong public characteristics for opening, integrating more vibrant and publicly oriented functions to ensure that community space interaction is enhanced while also considering residents' safety and privacy needs.

(2) Establish Flexible Boundaries

By creating flexible and permeable boundaries at the edges of activity spaces, visual coherence between different areas can be enhanced, thereby improving overall connectivity and effectively guiding children safely and smoothly to various activity zones. There are various forms of flexible boundaries (Figure 5-6): firstly, natural boundaries can be created by planting low shrubs or systematically spaced trees. Secondly, defining boundaries using low walls and barriers can separate spaces while not obstructing sightlines; these low walls can be designed as seating to increase their functionality, while barriers can be made from brightly colored and varied materials to add interest to the space. Additionally, height differences can be used to define boundaries, but accessible facilities such as ramps and handrails should be

included to improve connectivity. Meanwhile, boundary spaces can also serve certain functions, such as integrating with rest areas to create new spaces that possess both flexible permeability and promote social interaction.



a) Divide by Elevation Difference b) Divide by Barricade c) Divide by Landscape

Figure 5-6 Different Ways to Distinguish Roads and Yards
(Source: Drawn by Author)

5.1.1.3 Eliminate barriers, Enhance Spatial Connectivity

（1）Create Continuous Walking Experiences

In old residential compounds, poor spatial connectivity and some hidden open spaces lead to low utilization rates. Constructing slow pedestrian paths can connect internal activity spaces within the compound, creating a fun and safe continuous experience for children (Figure 5-7). By designing easily recognizable paths for children, using brightly colored pavements and materials, centralized activity areas such as basketball courts can be linked with other point spaces, forming a play network. When these activity spaces are interconnected, originally hidden spaces can also be effectively organized. This enhances the accessibility of spaces, allowing children to conveniently reach various activity points, significantly revitalizing certain areas. Furthermore, gathering crowds helps to create a “watchful eye” effect on the street, thereby improving the safety of the space. Through this enhancement of spatial connectivity, children's activity spaces in old residential compounds can be comprehensively upgraded in terms of function and experience.

However, it is also necessary to balance the increase in child flow with the protection of residents' privacy. When selecting pathways for construction, it is important to avoid routes that directly pass under residential windows or in front of doors, ensuring that residents' private spaces remain undisturbed. Alternatively, buffer areas such as green belts or rest zones can be established between walking paths and buildings to physically isolate and reduce direct impacts on residents' lives.

a) Scattered activity spaces before remodeling b) Pathways to build play networks

Figure 5-7 Slow Walking Paths Connecting Activity Spaces
(Source: Drawn by Author)

(2) Surface Improvements to Reduce Obstacles

Old residential compounds, built many years ago and constrained by the planning designs of that era, often have pedestrian paths occupied by electric bikes, clutter, and other obstructions, in addition to issues such as road deterioration, uneven or damaged surfaces, water accumulation, and insufficient accessibility facilities, which are not friendly for children's travel. Addressing the paths in old residential compounds can begin with optimizing the road structure and uniformly planning parking spaces and clutter zones. Surfaces that are aging, damaged, or uneven should be repaired and filled to correct height differences (Figure 5-8), while necessary accessibility facilities should be installed to facilitate daily travel for the elderly and children.

Figure 5-8 Before and After Renovation of Guangzhou Ding'anli Community
(Source: mp.weixin.qq.com/)

5.1.2 Ensure the Safety of Activity Spaces

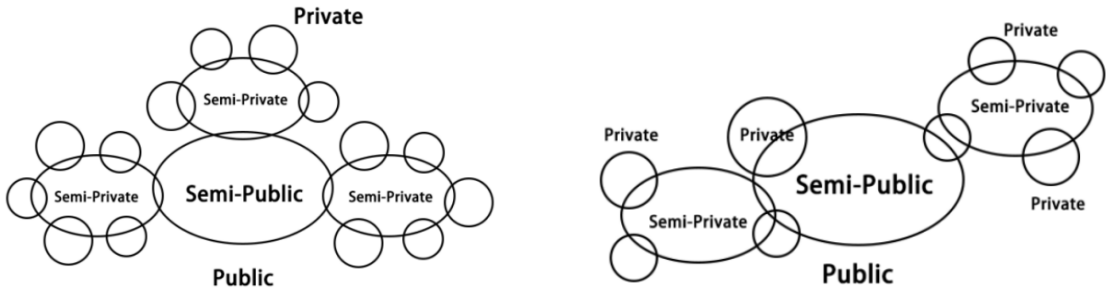
Reducing motor vehicles and improving the safety of facilities belong to basic and expected needs, with a very high sensitivity and priority. Therefore, this section focuses on analyzing these two needs and exploring their strategies. Although the priority of increasing guardianship areas is very low, it can significantly enhance children's safety. Thus, this research

aims to establish certain guardianship areas while avoiding causing aversion among children.

Level	Demand	Category	Strategy	Specific Points
Accessibility	Reduce the Passage of Motor Vehicles	M	Optimize Open Levels	Integrate fragmented plots
			Organize Road Structure and Standardize Parking	Organize road space
				Set Traffic Signs
				standardize parking
	Improve the Safety of Facilities	M\O	Enhance Facility Safety	Select safe facilities
				Regularly Maintain Facilities
	Increase Guardianship Areas	I	Create Defensible Spaces	Parental supervision should be appropriate
				Create Eyes on the Street

Table 5-2 Strategies for Improving Accessibility
(Source: Drawn by Author)

5.1.2.1 Integrate Fragmented Plots and Optimize Open Levels



a) Reasonable Hierarchy of Public Spaces b) Chaotic Public Hierarchy in Old Residential Compounds

Figure 5-9 Comparison of Open Levels
(Source: Drawn by Author)

The plots between the buildings in old residential compounds are fragmented and irregular (Figure 5-9b), leading to differing and chaotic open levels in the same unit building. Motor vehicles can easily approach the residential buildings. The open levels of the compound should be reorganized based on functional zoning and spatial forms.

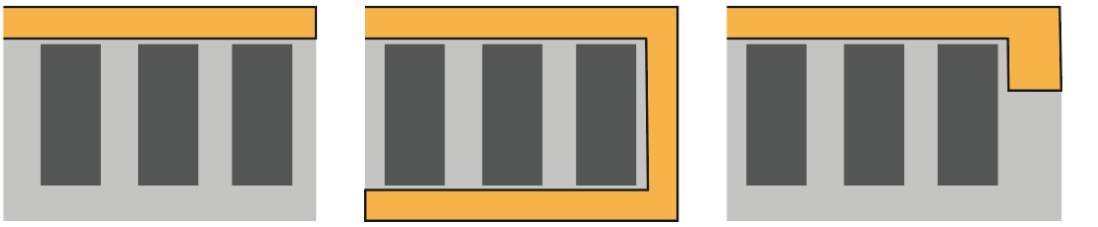
For street-side businesses, due to their vibrant activity, the level of openness should be the highest to better integrate into the surrounding environment, attract foot traffic, and enhance community vitality. The main roads and concentrated activity areas of the compound should have a slightly lower level of openness. The roads should ensure that they meet residents' daily

travel needs while providing a safe activity space for children; the audience for the concentrated activity areas is not only the children of the compound but also those living nearby.

The spaces between the buildings should have a lower level of openness, primarily serving the internal residents of the compound. The courtyard spaces should be organized based on their arrangement and spatial elements. The distinction between roads and courtyard spaces should be enhanced to improve the sense of territory within the courtyards while preventing motor vehicles from entering to ensure the safety of children's activities.

5.1.2.2 Organize Road Structure and Standardize Parking

（1）Optimize Road Space



a) Cuted Roads　　b) Renovated into a Loop　　c) Expanded Reversing Space

Figure 5-10 Renovation Methods for Cuted Roads

(Source: Drawn by Author)

Currently, the roads in old residential compounds are generally narrow, but due to prior planning and insufficient parking spaces, the spaces on both sides of the roads must be utilized, allowing only partial renovations. For main entrances and exits, widening and iconic designs should be implemented to ensure smooth traffic flow, separating different traffic streams and reducing potential risks for children in these areas. For secondary entrances and exits, restrictions such as narrowing the entrance width should be adopted to reduce vehicle passage frequency. Furthermore, there are often cuted roads, such as the west side road of Chuangye Village, where traffic flow should be organized to form a complete traffic loop or expand the dead-end reversing space to alleviate traffic pressure (Figure 5-10).

（2）Set Traffic Signs

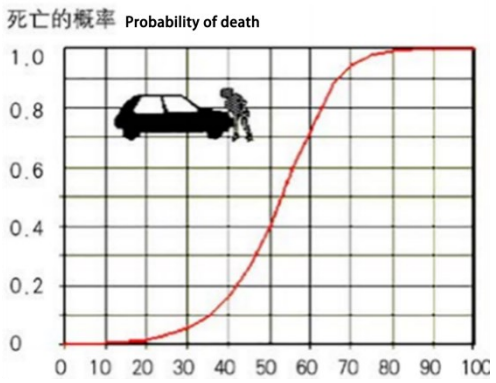


Figure 5-11 Relationship Between Vehicle Speed and Pedestrian Mortality Rate
(Source: Reference[70])

Figure 5-12 Traffic Signs
(Source: mp.weixin.qq.com/)

Due to phased construction and urban development, old residential compounds in Dongguan typically face problems with heavy vehicle traffic. According to the relationship graph between vehicle speed and pedestrian mortality (Figure 5-11), when vehicle speed drops below 30 km/h, the mortality rate decreases significantly. To ensure the safety of children within the compound, speed limit measures should be implemented on key roads where vehicles are likely to speed, along with additional traffic reminder signs (Figure 5-12), and reflective mirrors should be installed at turns and areas with poor visibility. Additionally, fun zebra crossings (Figure 5-13) should be set up on the roads to guide children safely and remind passing vehicles that there may be many children active in the area, thus increasing driver awareness and ensuring the safety of children's activities.

Figure 5-13 Fun Zebra Crossing
(Source: mp.weixin.qq.com/)

(3) Standardize Parking Areas

The early construction of residential compounds did not fully consider parking needs, resulting in ground parking occupying a significant amount of space, posing safety hazards for children's activities. However, the limited land in old residential compounds makes spatial

expansion difficult.

For existing concentrated parking areas, standardized management should be implemented, and parking spaces should be re-planned to ensure orderly vehicle parking. The introduction of a mechanical parking system could vertically increase parking capacity. Additionally, considering residents' needs for visual lines, lighting, and territoriality, lower-profile stacked parking (Figure 5-14) should be set up. Suitable locations include beside building gables or within larger open spaces, as well as next to residential buildings with storage functions on the ground floor.

Figure 5-14 Stacked Parking
(Source: brave.com/)

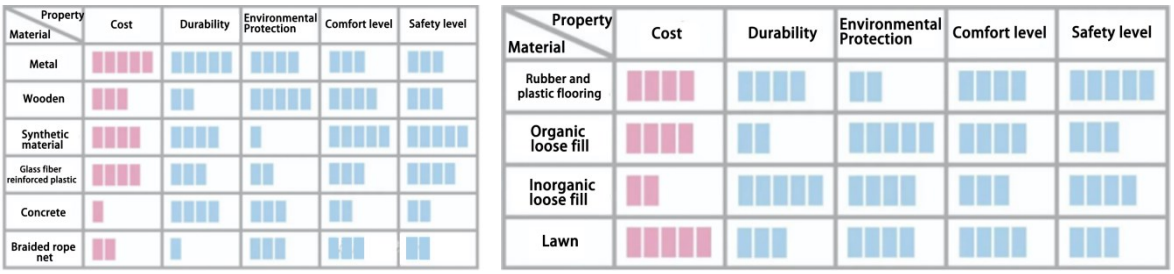
For parking along the roads, clear parking guidance signs should be established to reduce random parking issues and ensure smooth traffic flow. Furthermore, physical barriers should be created between the parking area and courtyards to prevent vehicles from entering courtyards, ensuring the safety of children's activities. The problem of random parking of non-motorized vehicles is also severe in old residential compounds, and dedicated non-motorized vehicle parking spaces and charging stations should be set up next to apartment buildings. In terms of management, the vehicle entrance checkpoint should enforce supervision duties to reduce the parking of long-unused "zombie vehicles" and social vehicles, ensuring that parking resources prioritize meeting the needs of the residents of the compound.

5.1.2.3 Improve Facility Safety

(1) Select Safe Facilities

The safety of children's play and fitness facilities is also a key consideration. When selecting play equipment, potential safety hazards and maintenance requirements must be

comprehensively evaluated. For example, while sandpits may seem suitable for young children, they can easily accumulate cigarette butts and hard debris during use, leading to higher maintenance costs if set up in old residential compounds. Moreover, children are prone to collide with nearby facilities while playing, so the design should avoid sharp edges by adopting rounded designs or enclosing sharp corners with soft materials to prevent injury.



a) Characteristics of Facility Materials b) Cushioning Material Facilities

Figure 5-15 Comparison of Different Material Characteristics

(Source: mp.weixin.qq.com/)

When considering materials, comfortable, durable, and safe materials should be chosen (Figure 5-15). If wooden materials are used, attention must be paid to splinters resulting from aging and wear, requiring timely replacement and sanding of the original materials to avoid injuring children. It is also important to consider the thermal conductivity of different materials, especially metal facilities. In Dongguan, where summers are extremely hot, high temperatures of facilities can cause burns to children.

(2) Regularly Maintain Facilities

To ensure children's safety during play, a regular and effective maintenance system must be established. Regular inspections should be conducted to identify safety hazards; cleanliness should be maintained to enhance the hygiene environment. Facilities that show signs of wear or damage should be promptly repaired to prevent small issues from becoming major failures; facilities that cannot be repaired or no longer meet safety standards should be replaced.

5.1.2.4 Create Defensible Spaces and Moderate Parental Supervision

The conceptual model of "Parental Care Interventions - children's Behavior" proposed by Hugh Matthews reveals the significant impact of parental control on children's daily behavioral characteristics(Figure 5-16). Combined with the research of Stanford University education

professor Jelena Obradović, it can be concluded that excessive parental involvement can hinder children's behavioral development when they are focused on an activity[71].

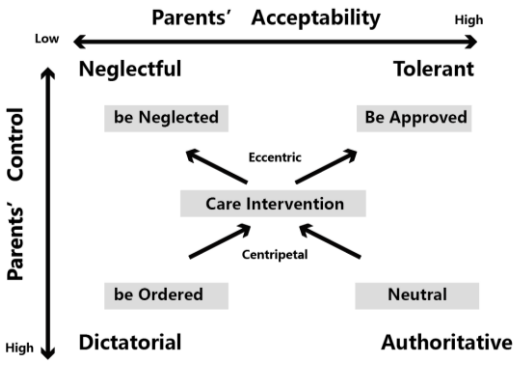


Figure 5-16 Parental Intervention - children's Behavior Model
(Source: Reference[72], Redrawn by Author)

Based on previous Kano data analysis, the need for guardianship space among children is categorized as indifferent needs, with some reverse needs. School-aged children already possess strong self-awareness and a sense of ownership; they inherently dislike the presence of parental supervision in activity spaces and do not wish for excessive parental intervention in their behaviors. However, the lack of guardianship space makes it difficult to ensure the safety of children's activities. Therefore, the moderation of supervision becomes a key consideration.

（1）Create Defensible Spaces

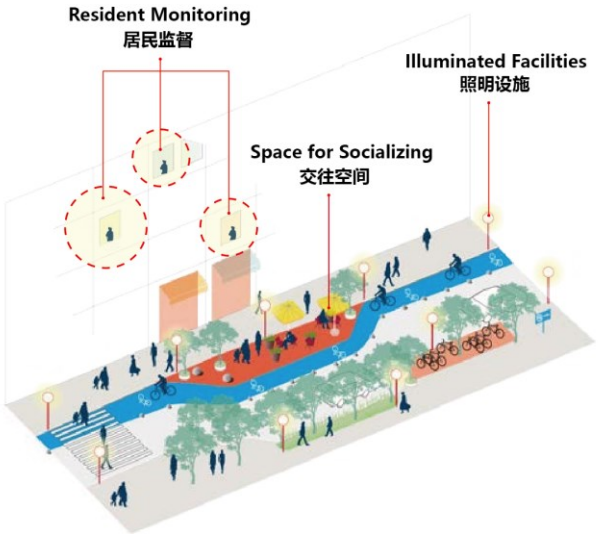


Figure 5-17 Shaping Eyes on the Street
(Source: Reference[73], Redrawn by Author)

Jane Jacobs introduced the concept of "eyes on the street" in her book *The Death and Life of Great American Cities*, emphasizing the enhancement of visibility and complexity in streets

to improve resident interaction and vitality[74]. This concept applies to the planar activity spaces of old residential compounds. By increasing the playability and accessibility of the space, more children and parents can be attracted to use it, thus fostering neighborhood cohesion and promoting the formation of "eyes on the street" (Figure 5-17).

Building upon this, Newman proposed the concept of Defensible Space, advocating for the segmentation of spaces into "defense units.[75]" By enhancing community safety and unity, natural surveillance can be achieved. In the lower-level open courtyards of old residential compounds, improving plant maintenance and increasing the number of streetlights can enhance visibility, allowing residents on higher floors or passersby to observe children's activities, thereby increasing their sense of social participation and promoting community self-management.

(2) Moderation of Parental Supervision Behavior

The design of guardianship spaces should differ according to children's age groups to balance parental monitoring needs with children's independent exploration requirements. In areas where younger children are active, appropriate guardianship facilities, such as seating, can be added so parents can rest while watching their children. For school-aged children, the guardianship area can be reduced in their activity zones, granting them more space for autonomous exploration.

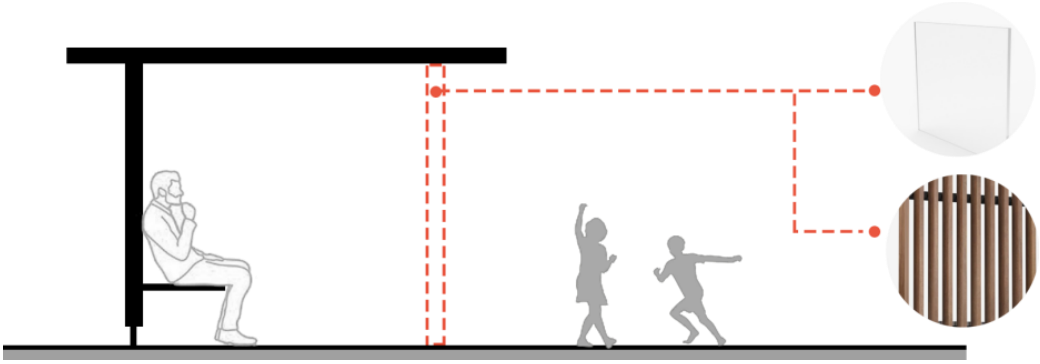


Figure 5-18 Partition Setup for Guardianship Spaces
(Source: Drawn by Author)

When designing guardianship areas, semi-open pavilions or rest zones can be utilized to ensure parents can observe children's activities while preventing children from feeling overly monitored. Using transparent or semi-transparent partition materials (Figure 5-19) can allow for unobstructed sightlines for parents while reducing psychological pressure on children, thus

creating a safe and free environment for children's activities.

5.1.3 Creating Shared Multifunctional Activity Space

Among the four sub-needs of multifunctionality, most belong to indifferent needs or charm needs. These needs are like highlights added to a product or service, constituting functional requirements that enhance its appeal. The need for spaces suitable for children of multiple ages is categorized as expected needs. Through in-depth analysis and research, strategies for age-inclusive spatial sharing are proposed, along with detailed analyses of specific design methods. On the other hand, hosting group activities and integrating educational and cultural elements fall under indifferent needs, thus emphasizing flexibility and adaptability in seamlessly integrating into the existing environment.

Level	Demand	Category	Strategy	Specific Points
Multifunctionality	Enhance the Fun of Play Facilities	A	Enhance the Fun of Play Facilities	Fixed play facilities
				Flexible "Toy Box"
	Suitable for Children of Multiple Ages	O	Age-Inclusive Temporal Sharing	Sharing among children of all ages
				Intergenerational sharing
				Time-sharing
	Hosting Group Activities	I	Fun Flash mob	Flexible and adaptable space layout
				Theme catering to children's preferences
	Integrating Play with Educational and Cultural Elements	I	Soft Integration of Cultural Education	"Learning Garden"

Table 5-3 Strategies for Enhancing Multifunctionality
(Source: Drawn by Author)

5.1.3.1 Enhancing the Fun of Play Areas

Play facilities in children's activity areas can be divided into fixed and movable play equipment (Figure 5-19). Improving the fun factor of both types of facilities can significantly enhance children's play experiences.

a) Original site b) Insertion of fixed facilities c) Insertion of movable facilities

Figure 5-19 Play Equipment in the Site
(Source: Drawn by Author)

(1) Fixed Play Facilities

In spacious planar areas, a suitable number of fixed play facilities can be installed to promote children's holistic development in a safe and enjoyable environment. For example, interactive installations can stimulate children's curiosity and exploratory desire, enabling them to learn and grow through play (Figure 5-20). However, when installing fixed play facilities, considerations of cost-effectiveness and ease of maintenance should be prioritized, opting for low-cost, easy-to-maintain devices. This approach can reduce the financial burden on the community while ensuring the long-term usability and maintenance of play facilities, thereby providing children with a stable and continuous activity environment.

Figure 5-20 Funny Fixed Facilities
(Source: m.dianping.com/)

(2) Flexible "Toy Box"

Movable play equipment, with its flexibility and variety, serves as an effective supplement in old residential compounds. This type of facility requires less space and is suitable for small planar areas like courtyards and vacant lots, providing children with opportunities to play anytime and anywhere. Given that children have limited private play equipment, introducing the concept of a "Toy Box" can effectively enhance their play experiences in public spaces. This design idea offers diverse and engaging equipment while saving space occupied by fixed

installations.

Drawing on the Duimdrop project in Rotterdam, Netherlands (Figure 5-21), old residential compounds can set up community "Toy Boxes" in public squares or parks, containing tricycles, roller skates, and other play equipment. Children can rent toys using a free membership card, enjoying playtime in public spaces. To cultivate a sense of responsibility, children can earn stamps by completing small tasks, such as cleaning the area or repairing toys, in exchange for the right to rent special toys.

Additionally, the management of the Toy Box can involve community participation, with parent volunteers sharing responsibilities, not only alleviating the burden on community management but also enhancing parents' sense of involvement and belonging in public spaces.

Figure 5-21 Duimdrop Project in Rotterdam
(Source: joostglissenaar.nl)

5.1.3.2 Age-Inclusive Temporal Sharing

（1） Sharing Among Children of All Ages

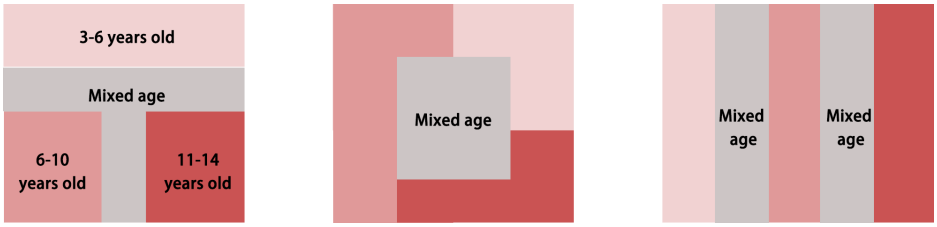


Figure 5-22 Age-Specific Zones in children's Activity Areas
(Source: Drawn by Author)

Currently, play facilities for children in old residential compounds exhibit a singular characteristic, primarily designed for younger children. However, children of different age groups have varying preferences and inclinations regarding activities, necessitating the creation of activity spaces suitable for different age groups and proportionately inserting them based on

site characteristics (Figure 5-22). For toddlers aged 0-2, spaces suitable for crawling and exploration should be provided; for preschool children, diverse play facilities like seesaws and slides should be equipped. Older children, who are capable of concrete operations and possess reasoning abilities, should be provided with intellectually stimulating facilities and various fun sports equipment.

(2) Intergenerational Sharing

Figure 5-23 Children Connecting the Community
(Source: Drawn by Author)

Furthermore, activity spaces should not only serve children but also accommodate youth and the elderly. Many elderly individuals currently bear the responsibility of caring for their grandchildren, so spaces should include areas for elderly individuals to rest and socialize. Additionally, intergenerational interactions can foster communication between children and youth, which is beneficial for children's development. Especially for teenagers, who often desire to connect with adults, activity spaces can serve as platforms for interaction, providing opportunities for them to engage with slightly older youths. This space can effectively meet their social needs. Moreover, intergenerational sharing can connect children as a bridge to the community, promoting the establishment of community in old residential compounds (Figure 5-23).

(3) Time-Sharing

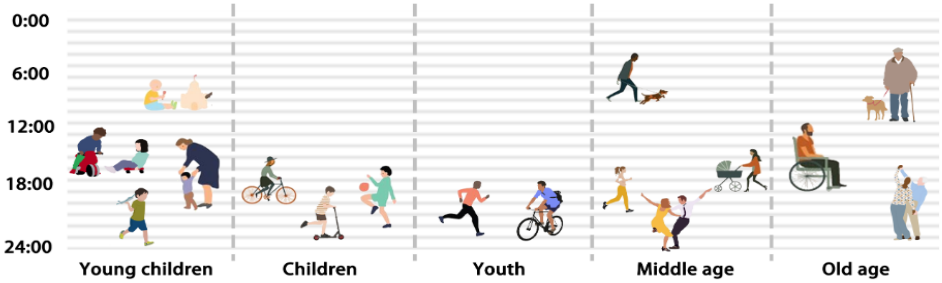


Figure 5-24 Activity for Time-Sharing
(Source: Drawn by Author)

Given the scarcity of spatial resources in old residential compounds, a time allocation

sharing mechanism needs to be established in existing spaces where expansion is not feasible, thereby increasing children's play areas without disrupting the daily lives of existing residents. For activity spaces, different age groups' preferences and activity needs should be considered. During the day, these spaces can primarily cater to the leisure needs of elderly individuals and residents drying clothes; from evening to nighttime, they can transform into play areas for children to accommodate their post-school activity needs (Figure 5-24). Regarding transportation spaces, traffic congestion occurs during school peak hours, while demand for parking is lower at other times. Therefore, temporary parking spaces can be established for brief use during peak hours, while the remaining time can be allocated as children's activity areas (Figure 5-25).

Figure 5-25 Limited-Time Parking Spaces Next to Schools
(Source: mp.weixin.qq.com/)

5.1.3.3 Fun Flash Mob

（1）Flexible and Adaptable Space Layout

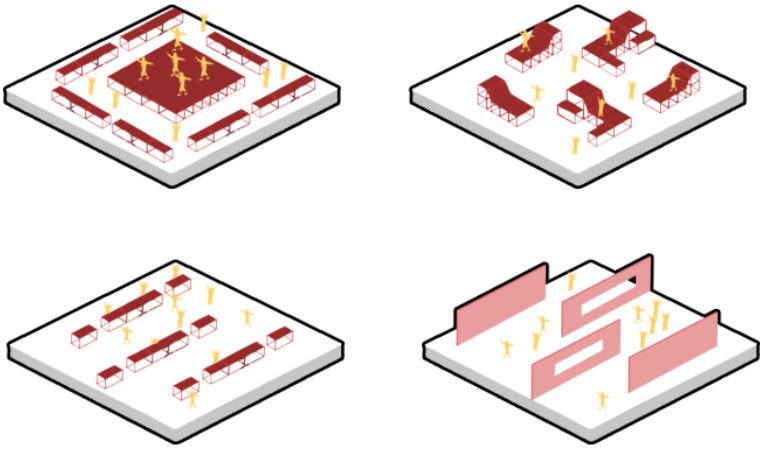


Figure 5-26 Flexible and Adaptable Space Layout
(Source: Drawn by Author)

The event space requires some redundant space to accommodate flexibility. The layout

should be adaptable and able to change according to the type of activities (Figure 5-26). Facilities should be mobile, such as foldable or stackable tables and chairs, allowing for quick space transformations. The flooring material must be durable and easy to clean to meet the demands of various events. Additionally, consideration should be given to providing power and internet access points to support the use of electronic devices.

(2) Themes that Appeal to Children

Through earlier analysis, it was found that the lack of interest and participation in group activities by children is primarily due to a disconnect between the activities and children's interests, as well as limited outreach. Therefore, activity planning should be based on children's preferences and scheduled during times when both children and parents are free, such as holidays or weekends. Additionally, children should be encouraged to participate in the planning process. To expand the reach of the activities, a combination of online and offline promotion methods should be used.

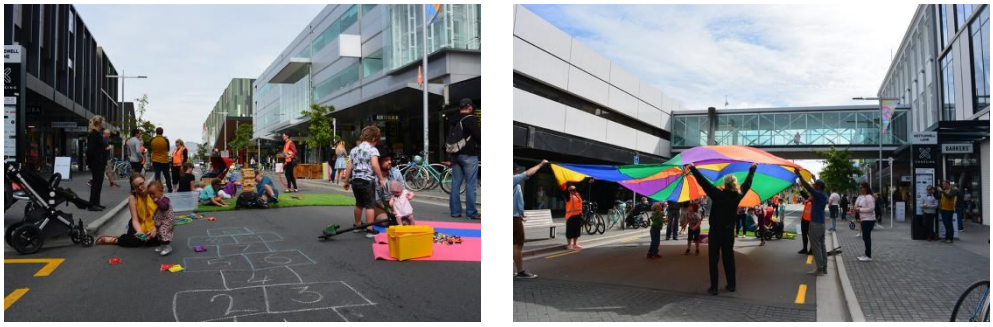


Figure 5-27 Colombo Play Street Event
(Source: nzta.govt.nz/)

An example can be taken from the Colombo Street in Christchurch, New Zealand. In March 2020, one section of the street was transformed into an "Open Play Street" for a day, during which vehicles were prohibited from entering. The "Play Street" provided space for children and residents to play, with children engaging in fun activities such as chalk drawing, picnics, and hide-and-seek with their friends and family (Figure 5-27). Meanwhile, community members could explore innovative uses of street space, fostering community interaction and strengthening social bonds.

5.1.3.4 Soft Integration of Cultural and Educational Elements

The rejection of combining educational culture with activity spaces by children actually reflects the ineffectiveness of traditional rigid promotional methods in capturing their interest. Simply relying on static educational tools such as bulletin boards and notice signs easily leads to boredom and disengagement, requiring us to explore softer and more engaging approaches.

Children tend to learn through hands-on experiences and interactive engagement, making them more receptive to subtle, immersive educational methods. By integrating scientific principles and cultural elements into play facilities, interactive installations, or participatory activities, knowledge can be seamlessly combined with fun, thus stimulating their intrinsic motivation for learning.

Figure 5-28 Yangpu Baicaoyuan Community Garden
(Source: Reference[76])

For example, introducing a playful “Learning Garden” by establishing planting areas within the residential compounds not only creates green spaces and enhances the aesthetic appeal but also cultivates children's hands-on skills, allowing them to learn through play and fostering intergenerational interaction. In Shanghai's Yangpu District, Baicao Garden is a community garden funded by the local government, designed by Tongji University's Department of Landscape Architecture, operated by a social welfare organization, and built collaboratively by the residents themselves under a model of community autonomy. This approach not only improves children's acceptance of educational culture but also nurtures their spirit of exploration and curiosity through their daily activities (Figure 5-28).

5.1.4 Improving the Comfort of Activity Spaces

In enhancing the comfort of activity spaces, both the diversity of site forms and the child-friendly scale design fall under either basic or expected needs. This means they are critical for creating an environment that attracts children. On the other hand, increasing plant coverage is considered an indifferent or even reverse need, suggesting a need to explore plant renovation strategies more suited to the characteristics of old residential compounds.

Level	Demand	Category	Strategy	Specific Points
Comfort	Richness of site forms	M\O	Improve form diversity, enhance sensory stimulation	Create micro-topography
				Create color interfaces
	Increase plant coverage	R\I	Optimize plant quality	Plant selection
				Reduce low-quality plants, Create activity spaces
				create interactive landscapes
	More child-friendly scale	O	Consider child size, improve embodied cognition	Optimizing spatial scale
				Optimize infrastructure sizes

Table 5-4 Comfort Improvement Strategies
(Source: Drawn by Author)

5.1.4.1 Enhancing Form Diversity and Sensory Stimulation

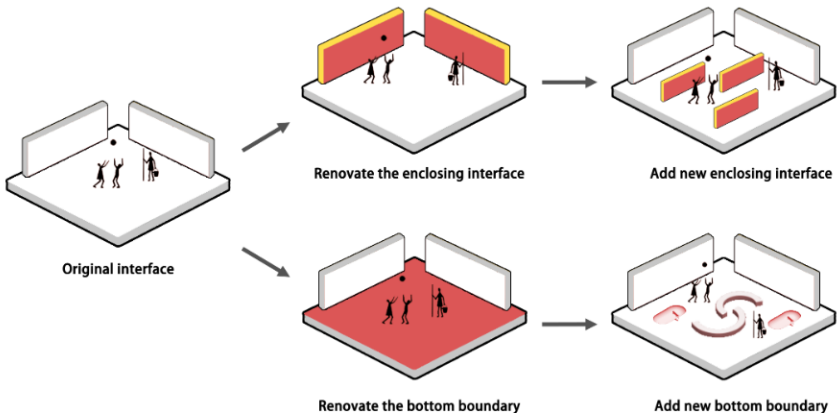


Figure 5-29 Methods of Space Interface Transformation
(Source: Drawn by Author)

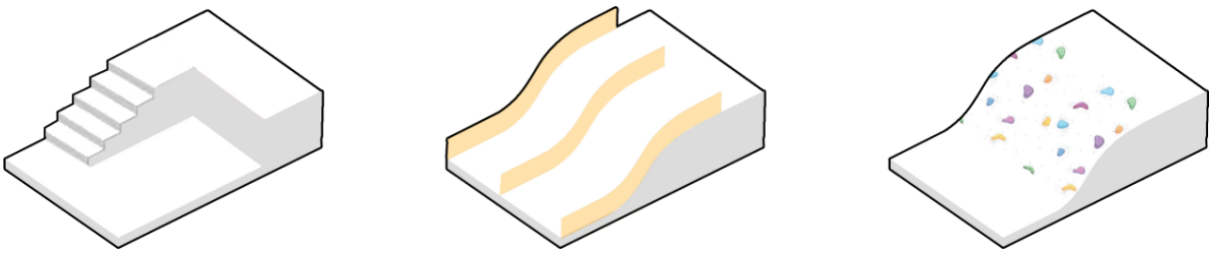
For outdoor public activity spaces, the usable interfaces include enclosed boundaries and the ground. To enhance the richness of site forms, intervention can be made through the addition

of new interfaces or the modification of existing ones (Figure 5-29). New interfaces can be freely shaped, with fewer site restrictions, creating highly interactive spaces. Modifying existing interfaces is another strategy, often implemented through techniques such as murals and landscaping. This approach, characterized by low cost and high adaptability, is very suitable for the practical needs of old residential compounds.

（1）Creating Micro-Topography

Figure 5-30 Shenzhen Meifeng Park
(Source: archiposition.com/)

While ensuring safety, children's activity spaces should not be limited to a single flat plane; vertical space richness can be explored[77]. For example, Shenzhen's Meifeng Community Park creatively uses fragmented concrete blocks to form a unique micro-topography, shaping a distinctive “Crack Garden.” Here, discarded concrete blocks and plants growing in the gaps complement each other (Figure 5-30), together forming a folded and undulating outdoor play space for children.



a) Original Site　　b) Fun Slide Design　　c) Fun Climbing Area Design

Figure 5-31 Utilizing Elevation Differences to Create Fun Spaces
(Source: Drawn by Author)

In old residential compounds, many places naturally have elevation differences, but current designs often only use simple stairways for traffic connections. By adapting to the original topography, micro-topographies, climbing frames, and landscape walls can be installed

to create multi-level, interesting spatial experiences within limited space (Figure 5-31).

(2) Creating Colorful Interfaces

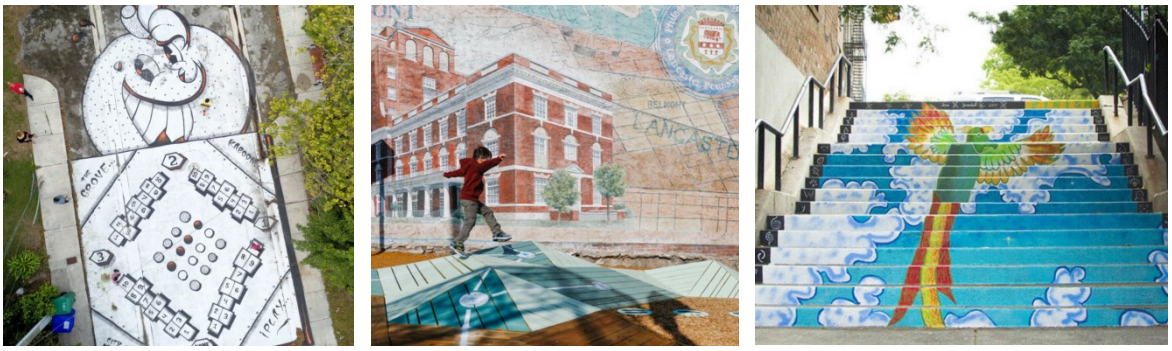


Figure 5-32 KABOOM!'s Play Everywhere Project
(Source: kaboom.org/)

The design of interface forms also needs to consider their paving and color. Appropriate color combinations can stimulate children's senses, attract their attention, and inspire play. For example, KABOOM!'s Bronx Steps 2 Health project (Figure 5-32) involved painting vibrant patterns on community steps, not only improving the pedestrian landscape but also providing children with an attractive environment for walking and exercising. In old residential compounds, patterns can be applied to the ground, gable walls, and any paintable objects such as water pipes and iron gates (Figure 5-33), offering sensory interactions for children.

Figure 5-33 Graffiti in Guangzhou Yile Community
(Source: mp.weixin.qq.com/)

5.1.4.2 Optimize plant quality

(1) Plant Selection

children's dissatisfaction with plants in activity spaces mainly revolves around two aspects: some plant species attract mosquitoes, affecting comfort, and a lack of proper maintenance leads

to poor growth conditions. According to related research, the density of adult mosquitoes is higher near mixed tree-shrub-grass plant clusters than in areas covered by trees or paved hard surfaces[78]. In response, high-canopy trees with high porosity, such as Albizia lebbeck, Delonix regia, and Terminalia mantaly, should be prioritized in planar activity spaces (Figure 5-34). These plants provide shade while reducing mosquito habitats. For mid-level landscapes like shrubs and small trees, species without thorns or toxins, requiring minimal maintenance and having high ornamental value, should be selected.

a) Albizia lebbeck b) Delonix regia c) Terminalia mantaly

Figure 5-34 High-Canopy Trees with High Porosity

(Source: mp.weixin.qq.com/)

（2）Reducing Low-Quality Plants and Creating Activity Spaces

According to surveys, children living in old residential compounds have low demand for plants, even considering them to occupy activity space. Therefore, the focus of plant landscape optimization should be on improving quality rather than quantity. Based on the compound's actual conditions, poorly maintained and low-quality plants should be cleared, reducing plant coverage and increasing hard surface areas to free up more space for children's activities. For instance, Dongguan’s Chuangye Village pocket park had overgrown weeds and broken stone pavements before renovation. After the renovation, the hard surface area increased, and EPDM flooring was added, expanding the play space for children.

（3）Creating Interactive Landscapes

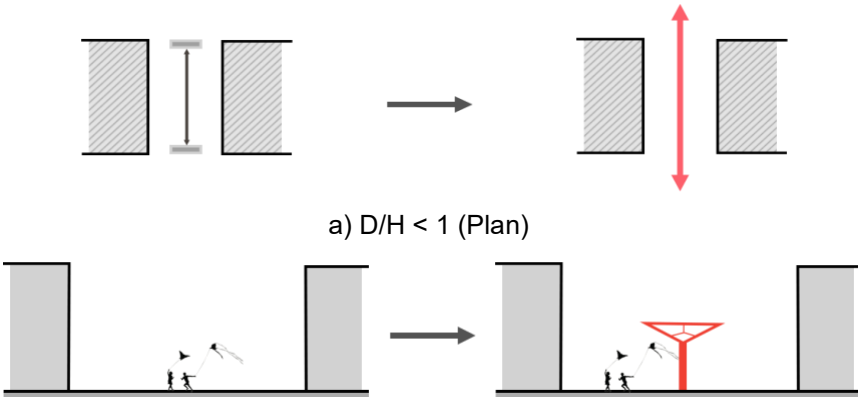
Enhancing the interactivity of plants by creating “Sensory Landscapes,” which include previously mentioned planting areas, can stimulate children's tactile, olfactory, visual, and taste senses through various activities, increasing their interest in landscapes and promoting community maintenance of the plants. For example, Shiru-ku Road Park in Japan (Figure 5-35)

features various sound-capturing devices that record the park's natural sounds in real-time, attracting many children and enriching their interaction with nature.

Figure 5-35 Shiru-ku Road Park in Japan
(Source: brotte.wordpress.com/)

5.1.4.3 Consider child size, improve embodied cognition

(1) Optimizing Spatial Scale



a) D/H < 1 (Plan)

b) D/H > 1 (Section)

Figure 5-36 Different D/H Values of Activity Spaces and Their Modification
(Source: Drawn by Author)

children's perception of space tends to be smaller. Here leads to the introduction of the D/H ratio, a concept describing spatial scale through the height-to-width ratio. When D/H>1, the space is wide horizontally, which may cause children to feel disoriented by the distance. Conversely, when D/H<1, the vertical height of the space is overwhelming, leading to uncertainty and fear. Neither of these conditions aligns with children's psychological characteristics. Therefore, the D/H value of children's activity spaces should approach 1, creating a relatively balanced environmental scale[79]. In larger activity spaces, structures can be introduced to reduce the perceived scale for children, functioning like a "stabilizing anchor"

to enhance the space's sense of security. In smaller activity spaces, increasing the openness at the entrance can reduce the sense of enclosure (Figure 5-36).

（2）Optimizing Facility Scale

In old residential compounds, facilities for residents often overlook children’s specific needs, limiting their range of activities and forcing them to adapt to environments scaled for adults. By optimizing the scale of facilities according to children’s physical characteristics—such as setting the spacing between vertical railing bars to less than 11 cm to prevent accidental head or neck entrapment, or adjusting the height of seating to around 35 cm so that children’s feet can touch the ground when seated—these child-centered scale designs not only serve as a symbolic declaration of children's “territory,” but also foster a sense of belonging. This allows children to feel the space is welcoming and suitable, enhancing their spatial awareness and environmental cognition.

5.2 Renovation Methods for Children’s Activity Spaces

5.2.1 Low-Cost Development as a Prerequisite for Renovation

In the process of transforming old residential compounds to be more child-friendly, low-cost development is a crucial prerequisite.

a) Before renovation　　b) After renovation

Figure 5-37 Renovation of the Hongyupo old residential compounds
(Source: mp.weixin.qq.com/)

First, attracting social capital is essential to achieve resource reuse and sustainable operation. For example, in the renovation of the Hongyupo old residential compounds in Chongqing (Figure 5-37), it reused idle resources from the district, community, and compounds

by integrating markets and supermarkets, and constructing parking buildings, enabling sustainable operation and profitability. Second, widespread compound involvement is encouraged, using forms of compound mobilization and volunteer services to jointly design and maintain children's play areas. This not only reduces labor costs but also strengthens cohesion and a sense of belonging. Additionally, in terms of play facilities and space design, the goal is to create rich and engaging environments while avoiding excessive extravagance. Reusing existing resources and materials within the compounds, such as discarded tires and stones, and repurposing them as part of children's play facilities saves costs and promotes an environmental ethos, ensuring the economic viability and maintainability of renovation projects.

Through the above implementation methods, child-friendly renovations in old residential compounds can beautify the environment, enhance functionality, and preserve cultural heritage, all under the premise of low-cost development, creating a healthier and happier environment for children to grow up in.

5.2.2 “One-Meter Perspective” of Children’s Participation

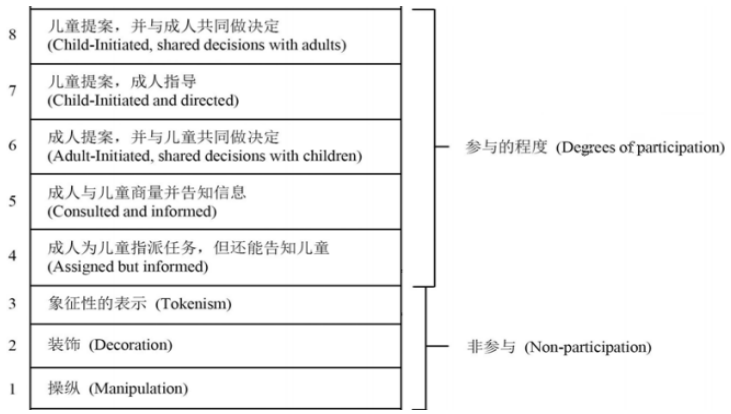


Figure 5-38 Hart's Ladder of children’s Participation
(Source: Reference[80])

A key right emphasized by Child-Friendly Cities (CFC) is children's participation. In the renovation strategy for children's activity spaces in old residential compounds, it is essential to respect and incorporate children's perspectives. According to Hart's Ladder of children’s Participation (Figure 5-38), in the first three rungs (manipulation, decoration, and tokenism), children do not genuinely participate, while the degree of participation gradually increases in the subsequent stages. In the renovation process of old residential compounds, efforts should

be made to enable children to propose ideas, with adult guidance, or to make decisions jointly with adults. This ensures that children participate in key stages such as street evaluations, proposal development, space optimization, and management and maintenance.

During the preliminary research phase, children can be organized to conduct on-site inspections, allowing them to identify problems from their own perspectives and propose targeted suggestions for improvement. In the community planning phase, techniques such as cognitive mapping and play can be used to enhance children's enthusiasm for participation, transforming their role from participants to co-designers. This ensures that the renovation project genuinely meets the actual needs of children. Through this process, children not only become information providers, understanding the significance of street spaces to their growth, but also become expressers of their needs, courageously articulating their expectations for the space.

a) children's drawing during a discussion b) Children painting manhole covers

Figure 5-39 Micro-renovation involving children in Yanjia Community

(Source: mp.weixin.qq.com/)

For example, in the renovation of the Yanjia Community in Ezhou, children provided feedback and suggestions on park facilities. Community staff adopted these recommendations, making targeted improvements to the park and involving children in the creation process (Figure 5-39).

In the process of renovating old residential compounds, cultivating children's sense of ownership not only motivates broader community participation but also positions children as bridges for their families' involvement in the compound's renewal. This fosters community cohesion. Through a bottom-up revitalization approach, children are empowered, and new vitality is infused into the sustainable development of old residential compounds.

5.2.3 Context-Specific Renovation Strategies

In the renovation of old residential compounds, context-specific strategies are of great importance. This approach not only respects the characteristics of the original site but also ensures the effectiveness and sustainability of the renovation.

First, a thorough consideration of the existing physical space and management mechanisms is necessary. For example, in row-based layouts common in old residential compounds, activity spaces are often homogeneous but not sufficiently spacious. In response, a point-based renovation strategy that capitalizes on every available space is more suitable. Secondly, renovations should fully integrate and reflect local cultural elements, ensuring that new facilities harmoniously coexist with the existing environment. For instance, Dongguan's Shipai children’s Park (Figure 5-40) draws design inspiration from the area's unique red stone culture, using red stone elements extensively as decorative features, making the park more visually attractive while promoting and preserving local culture.

Figure 5-40 Shipai children's Park
(Source: mp.weixin.qq.com/)

Additionally, context-specific renovations should account for children’s actual needs and habits, ensuring that the upgrades truly meet their requirements. By adopting context-specific renovation strategies, old residential compounds can not only gain new vitality but also preserve their unique regional culture and neighborhood connections.

5.2.4 Gradual Renovation Process

The gradual, step-by-step renovation approach not only improves the physical environment of residential compounds and enhances the living conditions of residents but also preserves and fosters the neighborhood structure and social networks. This method ensures that

physical space changes are integrated organically while maintaining social cohesion and continuity.

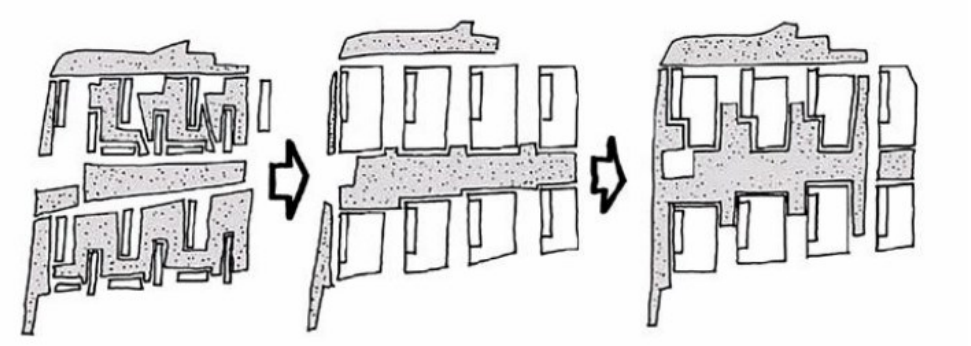


Figure 5-41 Gradual Renovation Process of Poptahof in Delft, Netherlands
(Source: Reference[81])

There are two main reasons for adopting this incremental renovation strategy. First, financial constraints play a significant role. Old residential compounds often face limited funding and scarce available space, making it highly challenging to establish dedicated children's activity areas. In cities like Dongguan, where many such compounds exist, each renovation must follow a "listing-application-approval" process, making large-scale renovations difficult to implement in a single phase. Second, children's needs vary in intensity and priority, meaning a "one-size-fits-all" approach would likely fail to meet the nuanced needs of different age groups and user preferences.

Therefore, when drafting specific renovation plans, thorough research on children's needs is essential. Based on this analysis, the importance of different activity needs can be ranked, guiding the renovation sequence. By prioritizing the most critical factors, the renovation can progressively address the most urgent issues while considering future development. This phased approach ensures that each stage of the renovation addresses current limitations and evolving needs, creating a sustainable process for continuous improvement.

5.3 Summary of this Chapter

This chapter proposes renovation strategies for children's activity spaces in old residential compounds from two aspects: optimization strategies and implementation approaches. In the optimization strategy section, specific measures are proposed from multiple perspectives based on the intensity of different needs. The focus is on analyzing solutions for basic needs and

expected needs, while maintaining attention to excitement needs and indifferent needs. Additionally, considering the actual conditions of old residential compounds, practical implementation methods are proposed to ensure the effective realization of the optimization strategies. Each design method includes specific renovation points to ensure that the renovation plan can effectively improve the environment of the compounds in practice.

Chapter 6 Practical Application of Renovation Design in Huayuan Village

In this chapter, one of the residential compounds studied earlier is selected for practical application of renovation design based on the spatial optimization strategies for old residential compounds discussed in Chapter 5, combined with children's psychological and behavioral characteristics and their actual needs. After a comprehensive comparative analysis, Huayuan Village is ultimately chosen as the case for renovation practice for the following specific reasons:

Special Status: Around the year 2000, Huayuan Village was the most prosperous residential area in the region. Its associated food street played a pivotal role in driving the economic development of surrounding areas. However, with the shift in the economic focus and the decline of brick-and-mortar businesses, this area gradually lost its former vitality.

Urgent Demand: Compared to the other two study compounds, Huayuan Village presents a more pronounced conflict between the current state of activity spaces and the growing needs of children. This highlights the greater urgency for renovation in this compound.

Complexity of Renovation: An in-depth analysis of Huayuan Village reveals its spatial diversity and complexity, as well as significant potential for renovation. By undertaking a renovation project in this compound, it can provide diverse samples for similar compounds elsewhere.

Therefore, this study selects Huayuan Village for a practical study on the renovation of children's activity spaces, focusing on creating a child-friendly environment.

6.1 Analysis of the Current Situation of Huayuan Village

6.1.1 Overview of Huayuan Village

Huayuan Village Compound was developed by the Dongguan Real Estate Development Company, with construction starting in 1985 and completion in 1993. It meets the definition of an old residential compound as per Dongguan city standards. The compound is part of the Huayuan Village community, located on Xinhebei Road in Guancheng Street, adjacent to the Qiantou and Zhang Village communities. The surrounding area is well-equipped with facilities,

and there are multiple bus stops nearby, making public transportation highly convenient for residents and enhancing ease of travel in their daily lives (Figure 6-1).

Figure 6-1 Roadways and Bus Stops Around Huayuan Village
(Source: Drawn by Author)

However, as the economic center of Dongguan shifted and the environmental conditions of the area deteriorated, the demographic composition of Huayuan Village has changed. Many local residents gradually moved out, opting for better living environments. Currently, the proportion of renters in the compound has significantly increased, and approximately 80% of the permanent population consists of migrant workers.

Since the residents moved into Huayuan Village, no formal property management company has been responsible for the compound. The daily management tasks are overseen by the community committee, which primarily handles the basic maintenance of the external environment. However, due to the absence of a professional property management company, the overall upkeep of the compound is substandard, particularly in terms of infrastructure updates and the optimization of community spaces. Additionally, the renovation of children's spaces is being led by the local Women's Federation. However, due to the limited scale of the renovation and funding constraints, the construction of child-friendly facilities has not yet been able to cover all areas of the compound, leaving much room for improvement.

6.1.2 Surroundings and Supporting Facilities

The area surrounding Huayuan Village Compound is filled with numerous self-built houses and industrial parks. These areas face issues such as narrow roads and a general lack of public activity spaces. To the north, there is a gated modern residential compound that external children are unable to access.

The area surrounding Huayuan Village is primarily composed of a large number of self-built houses and industrial parks (Figure 6-2). These areas generally have narrow roads and lack sufficient public activity spaces, particularly those suitable for children's activities. To the north of the compound, there is a modern residential compound under closed management, which prevents external children from entering and engaging in activities. At the same time, the surroundings of the compound are populated with numerous restaurants and retail stores, offering convenience for daily life. Additionally, a kindergarten is located in the north part of the compound, primarily serving the children residing within the compound and nearby.

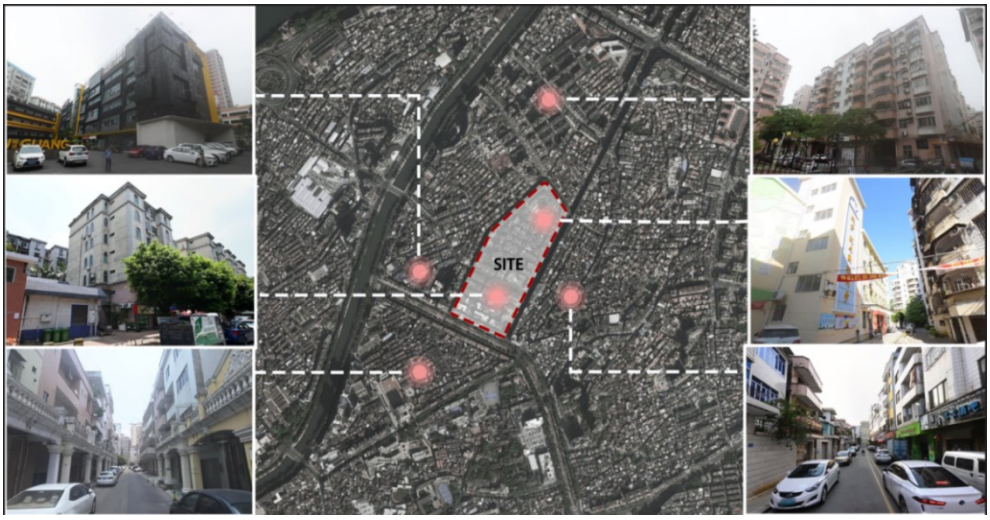


Figure 6-2 Surrounding Landscape of Huayuan Village
(Source: Drawn by Author)

Based on children's mobility, an 800-meter radius was used to define a 15-minute children's living circle (Figure 6-3). Within this range, there are four schools, yet only two green spaces. One of these is a small pocket park, but it lacks any play facilities specifically designed for children; the other is an unmanaged grove that lacks safety and usability. In contrast, the internal space of Huayuan Village offers a richer variety of activity spaces, providing children with diverse play options. The compound does not have gate control, allowing children to move

freely in and out and play with their peers. Thus, Huayuan Village compound, to some extent, supplements the surrounding area's deficiency in children's play spaces, fulfilling both recreational and social functions for local children.

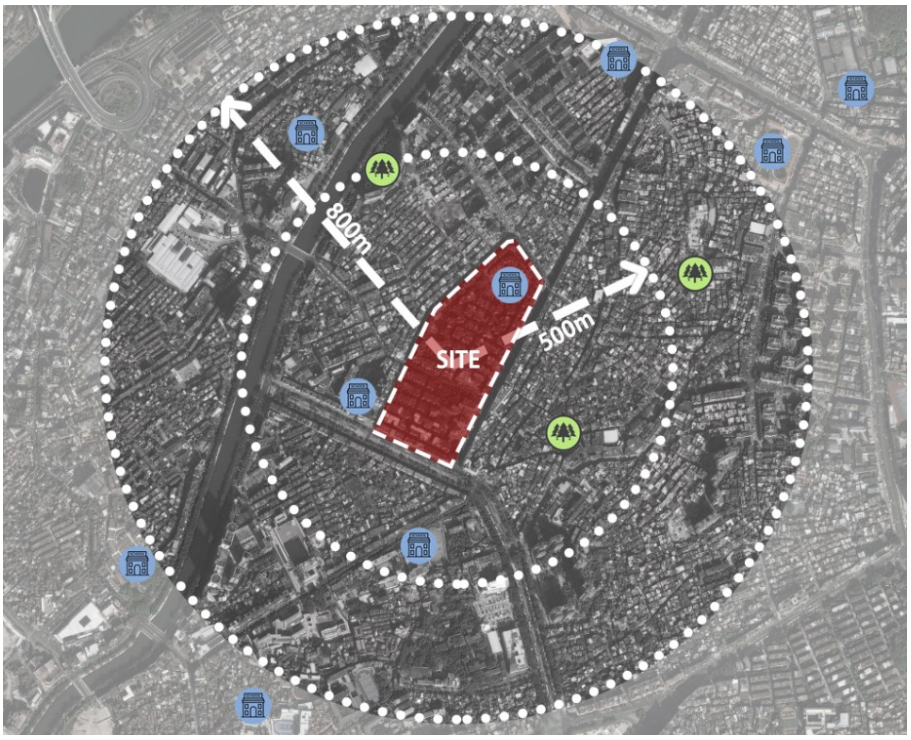


Figure 6-3 children's 15-Minute Living Circle in Huayuan Village
(Source: Drawn by Author)

6.1.3 Internal Circulation and Land Plot Division

a) Land Plot - Before Renovation b) Pedestrian and Vehicular Circulation - Before Renovation

Figure 6-4 Original Land Plot and Pedestrian-Vehicle Circulation
(Source: Drawn by Author)

Currently, the internal land plot layout of Huayuan Village is quite fragmented, especially

in the northern area where the divisions are even more pronounced (Figure 6-4a). The existing layout lacks proper planning and coordination, leading to fragmented children's activity spaces that are not effectively integrated. Additionally, pedestrian and vehicular circulation lines have not been adequately separated (Figure 6-4b), and the widespread phenomenon of vehicles moving freely through the compound has not only increased traffic safety hazards but also diminished the continuity and interaction within the internal spaces of the compound.

6.1.4 Current Situation of Activity Spaces

Figure 6-5 Current State of Activity Spaces in Huayuan Village
(Source: Drawn by Author)

The current state of activity spaces within the compound is illustrated in Figure 6-5. Most of the planar activity spaces are located near the periphery of the compound, and apart from the sports square, there are almost no facilities specifically designed for children in these areas. In these planar spaces, issues related to safety, accessibility, multifunctionality, and comfort are evident. Furthermore, the utilization of point activity spaces is extremely low, failing to serve their intended function and value. These spaces should ideally offer a variety of activity options for children, but due to current planning and facility arrangements, their potential remains underutilized.

6.1.5 Children's Outdoor Activity Needs in Huayuan Village

(1) children's Activity Characteristics

To better understand the characteristics of children's outdoor activities in Huayuan Village, a survey was conducted among children in the compound. The total number of valid respondents was 104, including 34 children aged 2 to 6 (and their parents), 42 children aged 7 to 10 (and their parents), and 29 children aged 11 to 14 (and their parents).

children's Residences: 75% of the children playing in Huayuan Village live within the compound, while 25% come from surrounding areas (Figure 6-6). This indicates the geographical convenience of Huayuan Village and the close connection between the compound and neighboring residential areas.

Modes of Transportation to Activity Spaces: Walking is the primary mode of transportation for children and their parents to reach Huayuan Village, with 88% arriving on foot (Figure 6-7). The next most common mode is riding small electric vehicles, primarily driven by parents. Only 5% use public transportation, and no one uses private cars.

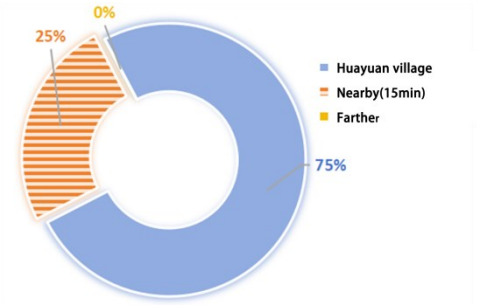


Figure 6-6 Children's Residences
(Source: Drawn by Author)

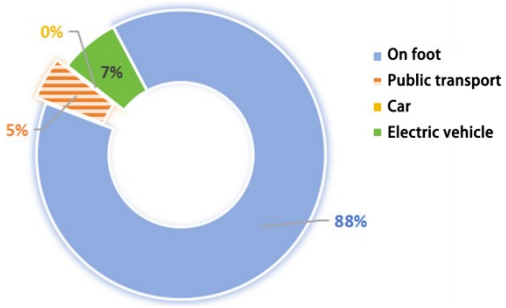


Figure 6-7 Modes of Transportation
(Source: Drawn by Author)

Activity Frequency: As shown in Figure 6-8, children aged 2 to 5 have a relatively balanced frequency of outdoor activities, with a notable percentage engaging in activities more than five times per week. For children aged 6 to 10, activity frequency is generally higher, with 79% participating more than three times per week. In contrast, only 65% of children aged 11 to 14 engage in activities more than three times per week within the compound.

Activity Time: children's primary activity times are during the daytime on weekends, followed by weekend evenings, with relatively fewer activities occurring on weekdays (Figure

6-9).

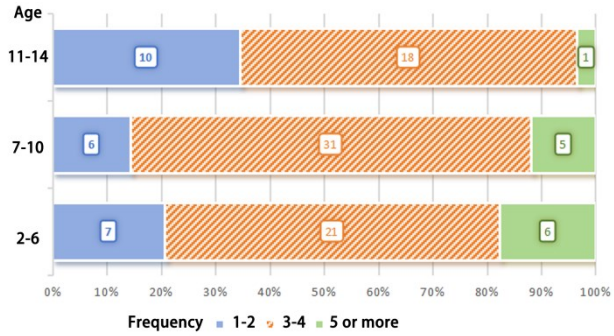


Figure 6-8 Frequency of children's Activities
(Source: Drawn by Author)

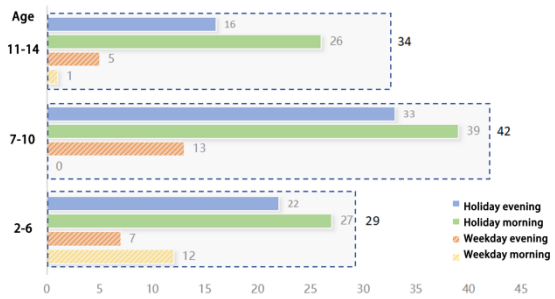


Figure 6-9 Time of children's Activities
(Source: Drawn by Author)

Activity Types: Children display clear preferences regarding the types of activities they engage in (Figure 6-10). Overall, they tend to favor social activities, while spontaneous activities are less popular. Older children are more inclined to participate in sports, while their interest in playground equipment gradually diminishes. Additionally, children show high enthusiasm for activities that do not require fixed facilities.

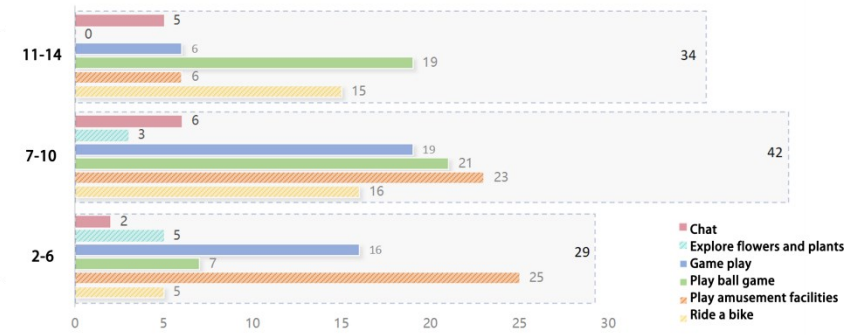


Figure 6-10 Types of children's Activities
(Source: Drawn by Author)

(2) Kano Classification of children's Activity Needs

Based on the previous analysis, the children's needs for activity spaces in Huayuan Village can be ranked as follows:

Basic Needs: 1- Reduce the passage of motor vehicles; 2- Improve the safety of facilities, 3- Improve the diversity of site forms;

Expected Needs: 4- Increase the number of play areas; 5- Make the site suitable for children of multiple ages; 6- Ensure facilities are more appropriately scaled for children; 7- Reduce road obstacles

Excitement Needs: 8- Enhance the fun of play areas; 9- Improve the openness of the site

Indifferent Needs: 10- Increase the hosting of group activities; 11- Integrate play with educational and cultural elements; 12- Increase guardianship areas

Reverse Needs: 13- Increase plant coverage

6.2 Design Concept

In the renovation of children's activity spaces in Huayuan Village, the goal is to create a shared playground for children within the whole community (Figure 6-11).

Demands of Children Living in the Community: The children living in the compound generally hope to make more friends to play with. Increasing the openness of the site can attract more children to participate in activities, providing them with a platform to meet new friends.

Needs of Nearby Children: Due to the lack of concentrated activity spaces in surrounding areas, children from other communities will be drawn to this compound. These children primarily prefer to use sports facilities and play equipment.

Lack of Community Cohesion: Old residential compounds often lack public activity spaces such as community parks. Additionally, many neighborhood residents live in self-built houses, resulting in relatively scarce public space and a lack of community cohesion and vitality.

Potential for Community Management: Since such old residential compounds are typically open to the public, this presents an opportunity to create a shared playground for the community. By leveraging this characteristic, children's activity spaces can be reasonably planned and designed to transform into shared resources within the community, serving not only children but also creating a place for interaction and communication among all residents.

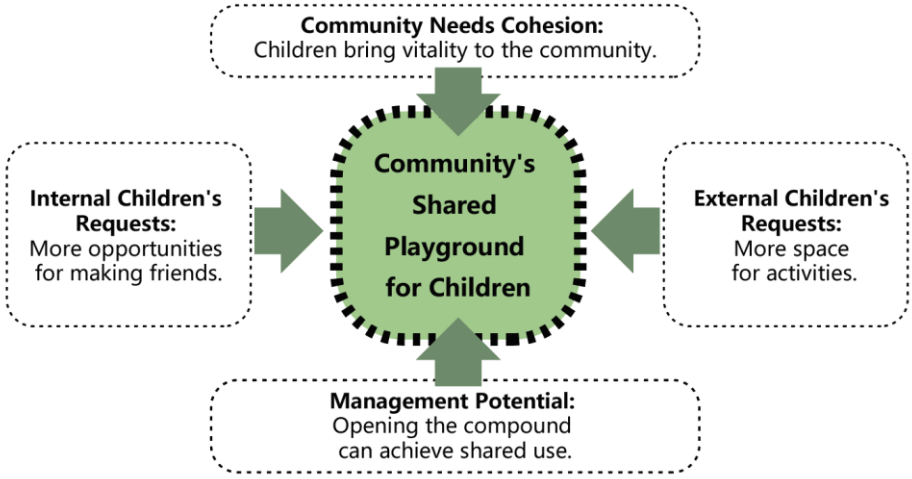


Figure 6-11 Design Objectives for Huayuan Village
(Source: Drawn by Author)

In summary, by comprehensively considering factors such as the needs of children, community residents, and management potential, the design goal is to build a shared playground for the community. This approach aims to prioritize the needs of children living in the compound while benefiting diverse groups and enhancing the overall environment and quality of life within the community.

Construction Content	Construction Requirements
Outdoor Activity Area	A large sports field with an area of no less than 3000 square meters within a 15-minute walking distance;
	A medium-sized sports field with an area of no less than 1300 square meters within a 10-minute walking distance;
	An outdoor play area suitable for children aged 12 and below within a 5-minute walk, with facilities such as sandpits, shallow pools, slides, and micro-terrain features.
Kindergarten	At least 6 classes, with a building area of no less than 2200 square meters and a land area of no less than 3500 square meters, providing inclusive preschool education services for children aged 3 to 6.
Children's Activity Center	A children's activity center with a usable area of no less than 200 square meters should be set up within the community cultural activity center, equipped with reading and activity spaces; It is recommended to set up a shared discussion space for children with a usable area of no less than 30 square meters, to meet the needs for meetings, training, and other activities.

Table 6-1 Compiled from 'China's Guidelines for Building Child-Friendly Communities' and 'Guidelines for Constructing Child-Friendly Urban Spaces.'
(Source: Drawn by Author)

According to relevant regulations, communities within the 5-10-15 minute walking radius

should have designated outdoor spaces for children's activities. In the case of Garden New Village, the existing activity areas are scattered, with concentrated sports fields exceeding 1200 square meters. For residents within the 5-minute walking radius, the area of activity space is sufficient, but there is a lack of spatial diversity. However, for the 10-minute community-level radius, the area of activity spaces needs to be expanded. The current area of the kindergarten in Garden New Village is approximately 2000 square meters, which is smaller than the required standard. The community service center includes a children's activity space, meeting the needs for meetings, training, and other activities.

Additionally, based on the activity preferences of children in Garden New Village and their spatial usage needs, it is necessary to reduce motor vehicle traffic in the transportation aspect. Regarding playgrounds, the quantity, variety, and age-appropriate suitability of activity spaces should be improved, providing sufficient space for ball games and cycling. Furthermore, it is important to increase the suitability and fun of facilities.

6.3 Overall Planning and Renovation Strategy

6.3.1 Diverse and Shared Play Network

To enhance the fun and coverage of children's activity spaces, Huayuan Village adopts the concept of diversity and sharing, creating a series of themed spaces suitable for children of all ages. In the overall planning, a primary pathway serves as a link, connecting three main activity cores and three secondary activity cores, radiating to surrounding clusters of point-like spaces, thereby creating a hierarchical and diversified play network for children (Figure 6-12)

Figure 6-12 Diverse and Shared Play Network in Huayuan Village
(Source: Drawn by Author)

Utilizing the limited spatial resources of Huayuan Village, different spaces are identified and classified based on point, line, and plane spatial characteristics. The design incorporates specific thematic interactive spaces according to their characteristics and the varied needs and interests of children. Examples include a sports plaza, encouraging children to engage in physical exercise and social interaction, and a happy farm, offering a nature-inspired learning experience (Figure 6-13).

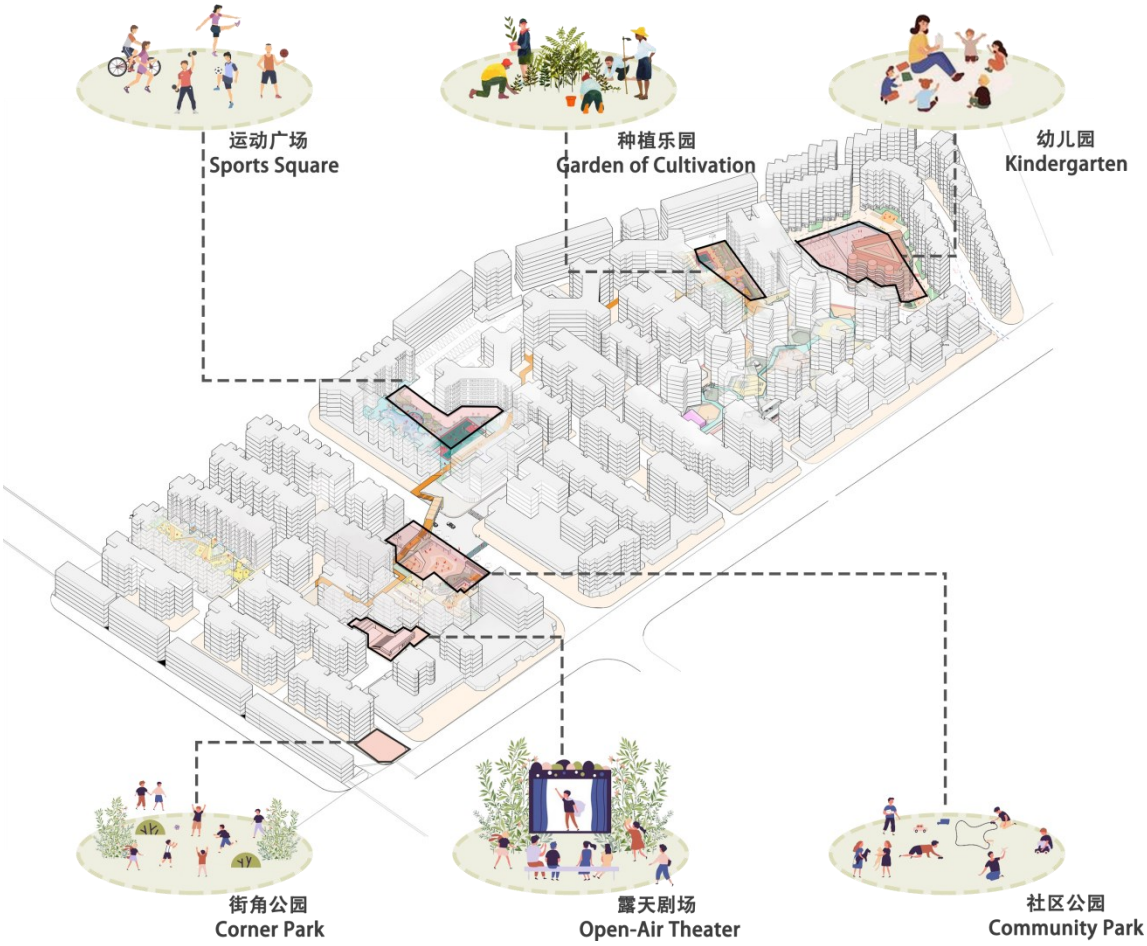


Figure 6-13 Thematic Spaces
(Source: Drawn by Author)

6.3.2 Iconic Visual Focal Points

Market Road, as an important urban artery, runs through Huayuan Village, dividing the compound into two areas: north and south. Due to the heavy foot traffic along this road, especially with many non-local residents coming to buy groceries or engage in other activities, Market Road serves not only as a key transportation route but also as a vital link connecting the internal and external community. On the one hand, it provides convenient passage for residents; on the other, it brings in external visitors, enhancing the vibrancy and interaction within the compound.

However, Market Road also causes a certain degree of spatial separation. The lack of adequate pedestrian crossings, such as zebra crossings, between the north and south sides exacerbates this divide. Additionally, the presence of a garbage station and parking area for waste collection trucks on the south side further contributes to the disconnection between the

two spaces. As a result, children's activities are mainly concentrated in the sports plaza on the north side, with relatively little interaction between the north and south areas.

Figure 6-14 View of the Pedestrian Bridge from the Side of Market Road
(Source: Drawn by Author)

To address this issue, a brightly colored pedestrian bridge has been constructed over Market Road, connecting the two plazas on either side (Figure 6-14). This bridge not only mends the physical divide between the north and south areas but also, through its vivid and playful design, captures the attention of children in the community, encouraging them to explore and play. Together, the bridge and the two plazas form a shared "community living room," providing a safe and dynamic space for children to engage in activities (Figure 6-15).

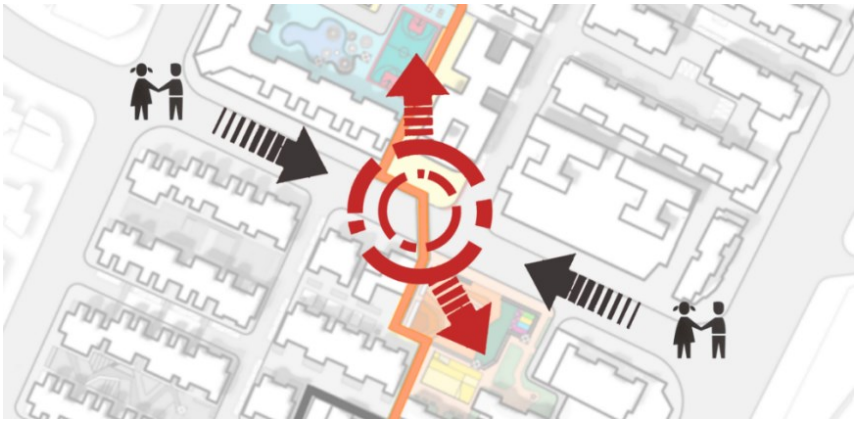


Figure 6-15 Pedestrian Bridge and Two Plazas Attracting Community Children

(Source: Drawn by Author)

6.3.3 Harmonious Coexistence of Children and Vehicles

(1) Regulating Vehicle Passage and Parking

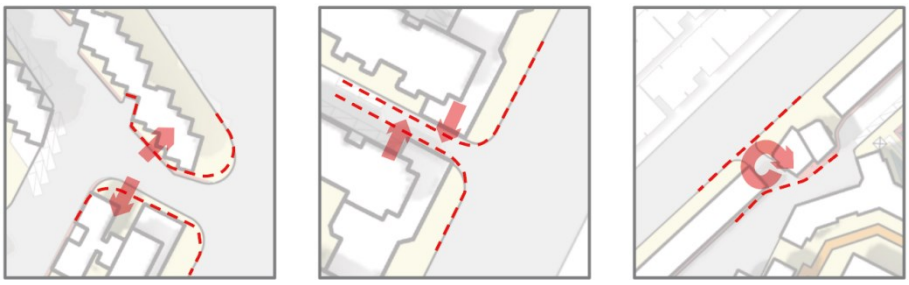
The existing land parcels are fragmented, allowing vehicles to easily enter the courtyards. Therefore, the relationship between the parcels is reorganized (Figure 6-16). By introducing enclosures, elevation differences, and plants, the possibility of vehicle access is reduced. Based on this, the pedestrian and vehicle flow lines are re-planned to achieve separation, creating a safe environment for children's activities. Additionally, reducing vehicle passage provides more opportunities for expanding children's activity spaces.

a) Parcel - After Renovation b) Vehicle-Pedestrian Flow - After Renovation

Figure 6-16 Parcels and Vehicle-Pedestrian Flow After Renovation

(Source: Drawn by Author)

(2) Organizing Community Entrances and Exits



a) Widening of Main Entrance b) Narrowing of Secondary Entrance

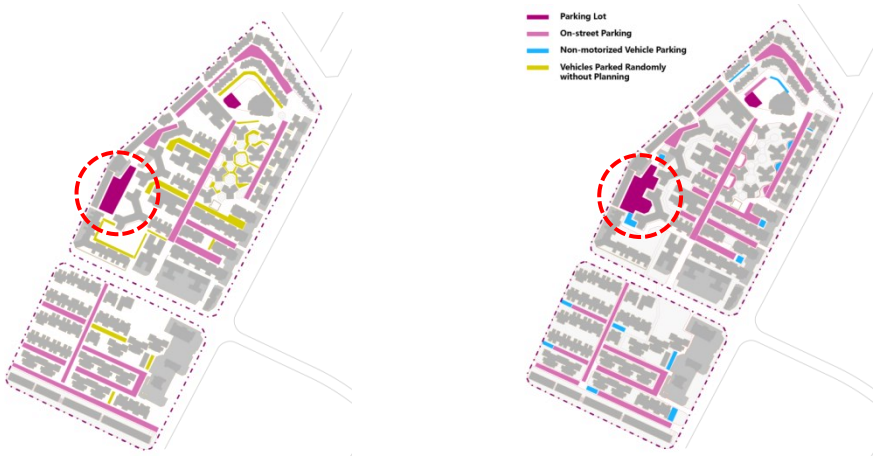
c) Cancellation of Redundant Secondary Entrance

Figure 6-17 Changes in Entrance Widths

(Source: Drawn by Author)

The main vehicle entrances and exits are appropriately widened to ensure unobstructed access, avoiding unnecessary congestion in both urban traffic and internal compound traffic. This guides vehicles to pass through these entrances and exits (Figure 6-17a). For several interfaces between the compound and the city, necessary secondary vehicle entrances and exits are retained and appropriately narrowed (Figure 6-17b) to reduce vehicle usage frequency at non-primary exits, thereby decreasing the number of vehicle entries and exits. Some redundant vehicle entrances and exits are canceled through parcel consolidation (Figure 6-17c). This ensures the safety of children's travel while achieving compound permeability, creating an environment where people and vehicles coexist harmoniously.

(3) Sorting out Parking Spaces



a) Original Parking Area b) Renovated Parking Area

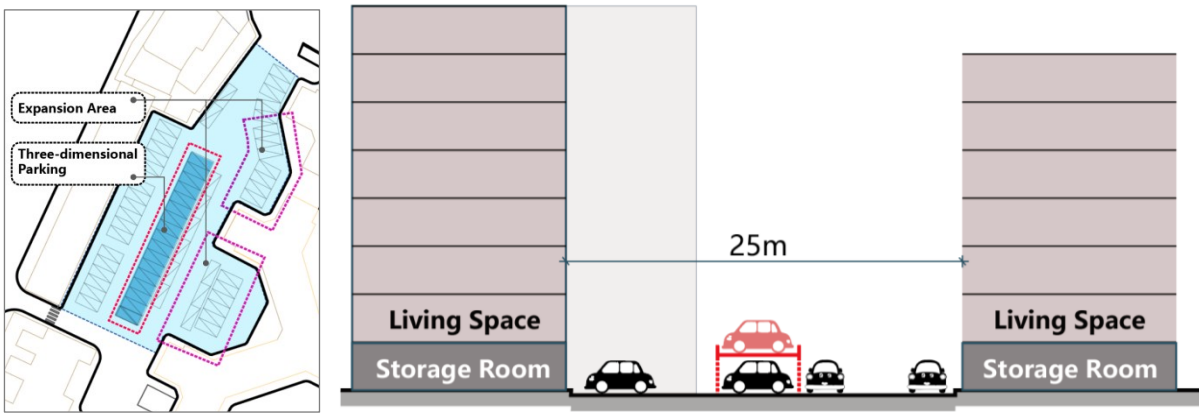
Figure 6-18 Comparison of Parking Areas Before and After Renovation
(Source: Drawn by Author)

To improve the order and safety of parking in the compound inappropriate on-street parking behaviors are rectified (Figure 6-18). Specific measures include prohibiting the obstruction of fire lanes and other emergency evacuation areas, and guiding residents to park in designated parking spaces with clear signage.

Additionally, considering the actual needs of residents in old residential compounds, a certain number of E-bike parking areas are added in various corners of the compound for residents to park conveniently based on their living locations.

Thirdly, the existing parking lot is expanded. The parking lot in Huayuan Village is located in the northern district, where there are two children's activity areas with fitness equipment and ping-pong tables at the edges. Due to their seclusion and frequent vehicle traffic, these areas

are rarely used by children. Integrating these two activity areas into the parking lot can not only increase parking capacity but also reduce safety hazards for children using the space. To address the overall shortage of parking spaces in the compound, a multi-story parking system is introduced. As shown in Figure 6-19 the new parking layout includes a central row designed for multi-story parking, effectively increasing the number of parking spaces while avoiding impacts on the light and privacy of adjacent residents.

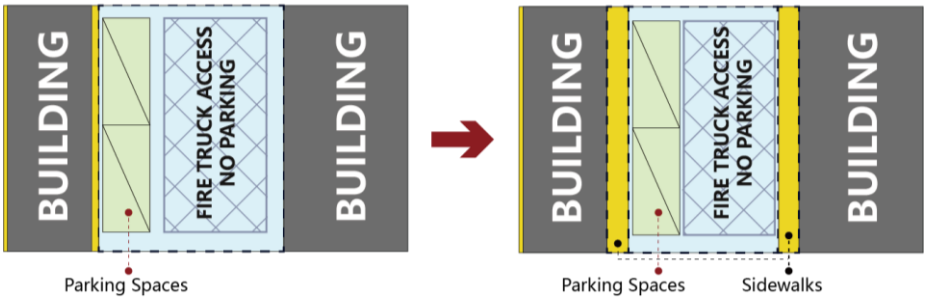


a) Parking Lot Plan b) Parking Lot Section

Figure 6-19 Introduction of Multi-Story Parking System in Northern District Parking Lot (Source: Drawn by Author)

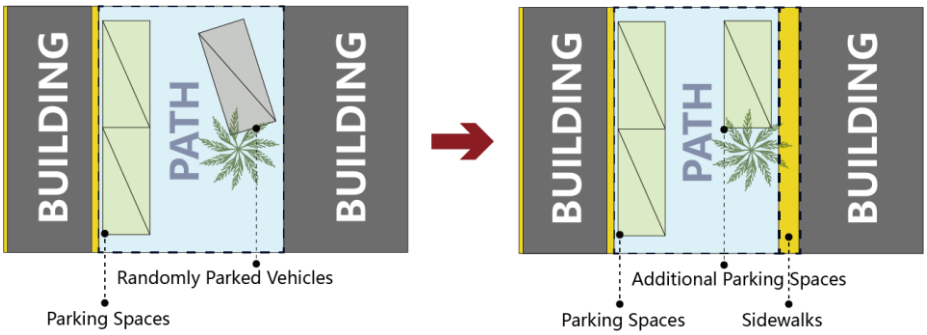
(4) Child-Friendly Walking System

To ensure the walking safety of children within the compound, the walking system of Huayuan Village is renovated. For roads that meet fire safety requirements and have sufficient width, double-sided parking is not permitted, allowing space for sidewalks. Thus, double-sided sidewalks are established (Figure 6-20). However, most roads in Huayuan Village are relatively narrow; for these roads, one side is allocated for sidewalks (Figure 6-21) to ensure children's walking safety.



a) Wider Road - Before Renovation b) Wider Road - After Renovation

Figure 6-20 Comparison of Double-Sided Sidewalks Before and After Renovation (Source: Drawn by Author)



a) Narrow Road - Before Renovation b) Narrow Road - After Renovation

Figure 6-21 Comparison of Single-Sided Sidewalks Before and After Renovation
(Source: Drawn by Author)

Furthermore, to further optimize the walking experience for children, a colorful path is designed to connect the main activity spaces within the community, achieving north-south connectivity. This path intertwines with the sidewalks, forming a coherent, child-friendly walking network (Figure 6-22) that not only enhances activity safety but also improves community connectivity and children's exploratory enjoyment.

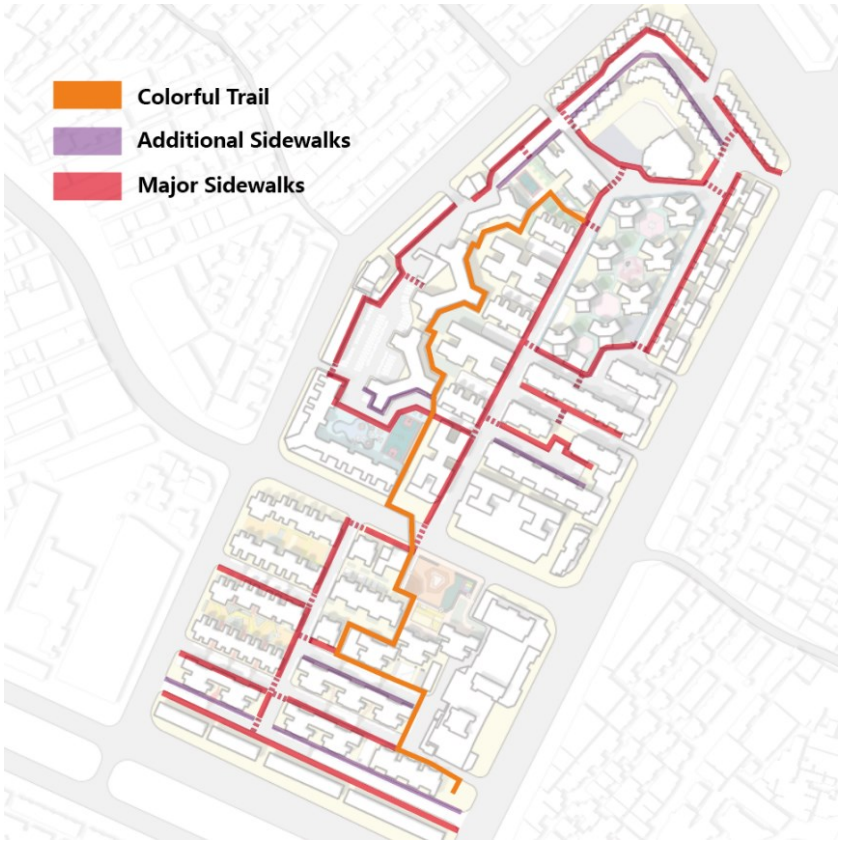


Figure 6-22 Walking Network in Huayuan Village
(Source: Drawn by Author)

6.4 Detailed Design

6.4.1 Detailed Design of Linear Spaces

(1) Colorful Pathway

The design of the colorful pathway enhances the walking experience for children and serves as a guide to different core activity spaces. More importantly, the colorful pathway itself is a play area, surpassing its basic function as a transit route.

Schultz noted in *The Spirit of Place*: "...a route is a direction sought to reach a goal, but if an event occurs along the way, then the character of the route itself is revealed, and it gains significance as a place..."

The form of the colorful pathway is flexible and varied (Figure 6-23) to accommodate the diversity and complexity of Huayuan Village. It can be winding or straight, feature resting benches or trellises covered in greenery, pass through the ground floor of buildings, or be elevated to the second floor. Through this combination of diverse forms, the colorful pathway evolves from a singular linear space into a meaningful place that integrates points, lines, and planes into a composite space.

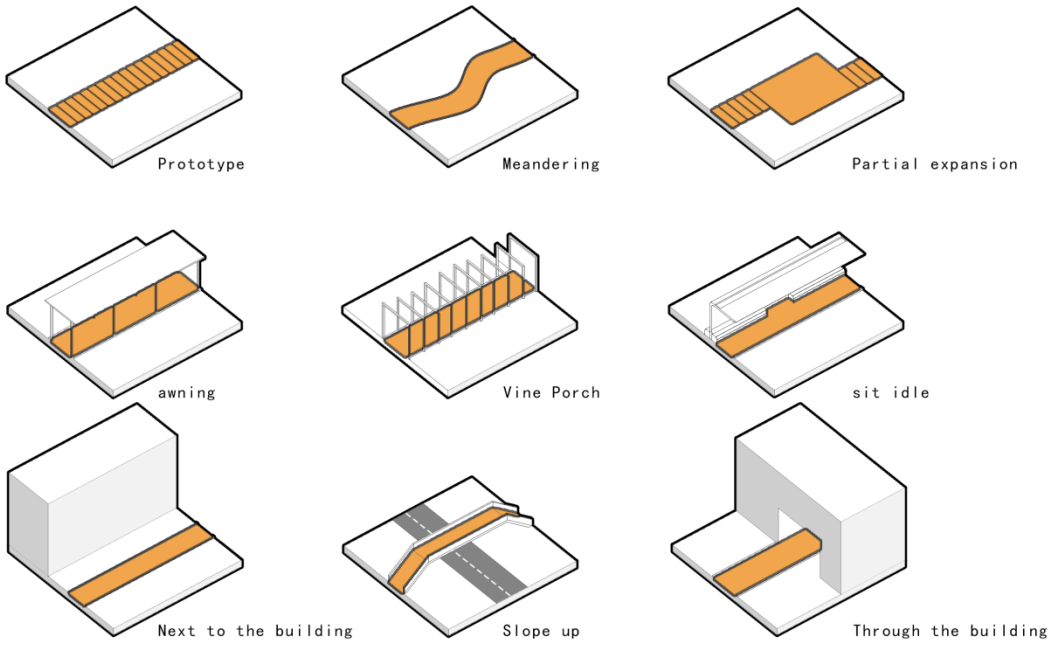


Figure 6-23 Colorful Pathway - Various Forms
(Source: Drawn by Author)

(2) Time-Shared "Play Street"

The main thoroughfare in the northern district of Huayuan Village, known as the northern main road, connects multiple courtyard clusters in the area, becoming an essential route for children's daily travel (Figure 6-24). The main road is approximately 10 meters wide, with parking spaces on both sides but lacks designated sidewalks and shade-providing street trees. The middle of the road serves as a fire lane, where parking is explicitly prohibited; however, many vehicles disregard this regulation, obstructing the passage for emergency situations.

The lighting and surveillance facilities on both sides of the road provide a degree of safety for children traveling at night. Occasionally, small stalls set up by residents can be seen along the roadside; the gable walls of the apartment buildings face the road, with colorful graffiti and bulletin boards brightening the otherwise monotonous streetscape. However, this segment primarily serves a traffic function, lacking safe walking paths and diverse play facilities for children.

Figure 6-24 Play Street - Current Condition
(Source: Drawn by Author)

After the overall traffic flow and parking space reorganization, the passage environment of this road has improved but still lacks place-oriented design for children's activities. Given that the primary function of the road is transportation, to avoid overly introducing recreational functions that may inconvenience other residents, the road is transformed into a "Play Street" in a "pop-up" format on specific days. This redefines and utilizes the main road of the compound

through a strategy of “environmental recognition - community consultation - obtaining permission - closing the road - post-event cleanup” (Figure 6-25), turning it into a temporary playground for children, enhancing compound vibrancy and achieving multifunctional use of space.

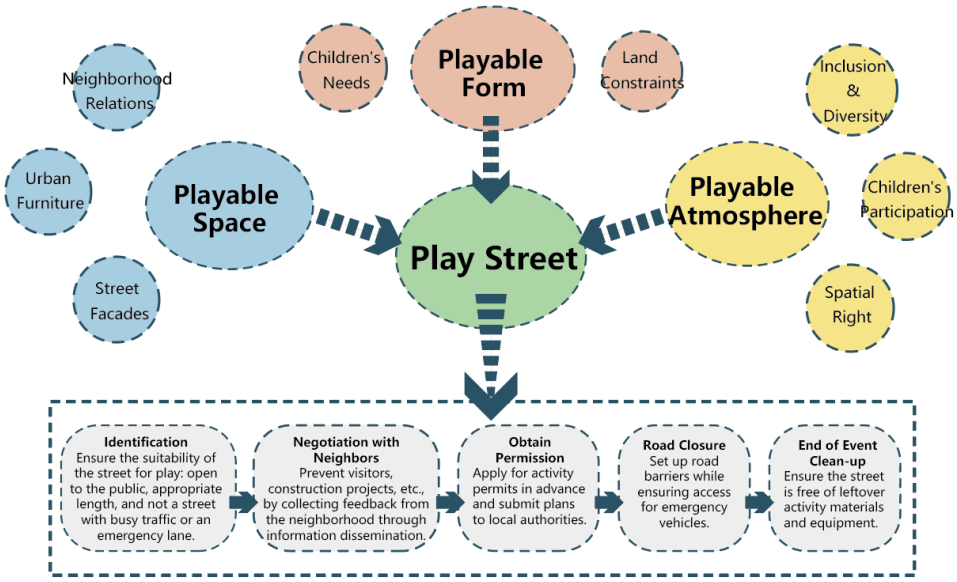
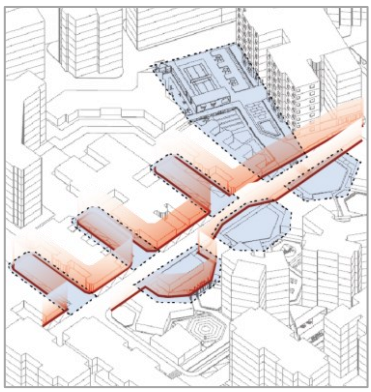
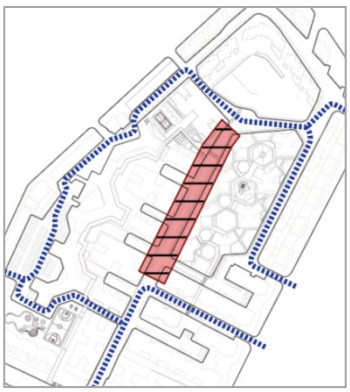


Figure 6-25 Play Street - Implementation Strategy
(Source: Drawn by Author)

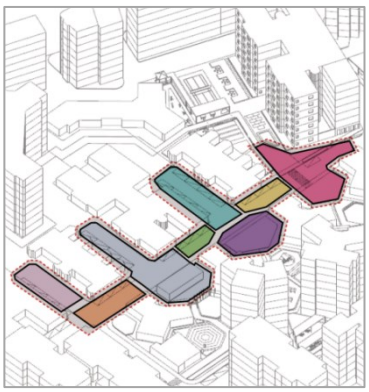
The design of Play Street is chosen for the latter half of the main road, based on two considerations: the undulating street interface provides a rich spatial experience with good potential for renovation, and there is lateral space on both sides of the street, offering ample room for specific activities (Figure 6-26a). To ensure the smooth implementation of Play Street, traffic rerouting is necessary in advance to guide vehicles to alternate routes. During the activity period, clear traffic signage and temporary barriers will be set up to ensure the selected section of the road is fully closed, safeguarding the safety of children and residents (Figure 6-26b).



a)Material Environment Conditions



b) Vehicles Detouring



c) Incorporating Different Activities

Figure 6-26 Play Street - Implementation Process
(Source: Drawn by Author)

For the scheduling of activity times, special dates like children's Day or the Mid-Autumn Festival can be chosen. Relevant games and activities can be designed based on the holiday theme to enhance the festive atmosphere in the compound. In planning thematic activities, children's opinions can be solicited in advance, incorporating interactive exhibitions, street picnics, craft booths, and neighborhood parades—activities that are vibrant and popular among children (Figure 6-27). This not only attracts children's participation but also allows them to play an active role in the planning process.

Figure 6-27 Play Street - Conceptual Design
(Source: Drawn by Author)

However, in the design and implementation of activities, it is important to avoid constructing large structures such as temporary stages or inflatable castles on the road, in order to minimize potential impacts on residents' daily lives and nearby traffic.

6.4.2 Detailed Design of Planar Spaces

6.4.2.1 Sports Square Node

The sports square is located on the southern side of the northern district and consists of a basketball court, two pavilions, and several surrounding children's play facilities (Figure 6-28).

Figure 6-28 Sports Square - Current Condition
(Source: Drawn by Author)

This space is adjacent to a busy urban road (Shichang Road), and the basketball court is visible from the street, attracting many children from the surrounding communities. The area itself is spacious and bright, with good lighting and ventilation, providing a comfortable environment for various activities. However, the space is surrounded by traffic lanes; although vehicles do not move quickly, parking around the area creates visual blind spots. The walls lack graffiti and colorful decorations, resulting in a deficiency of vitality and interest.

The play facilities in the area are primarily aimed at preschoolers, while the basketball court is predominantly occupied by teenagers; thus, the needs of children aged 6-10 are insufficiently addressed. Additionally, some of the play equipment in the area is damaged and has not been promptly repaired, reducing overall safety. Although the number of plants is adequate, they are poorly maintained, with reports of palm leaves falling.

Considering its open characteristics and advantageous geographical location, this activity space is positioned as a "Sports Exploration Area" (Figure 6-29), aimed at providing a vibrant

and challenging environment for children throughout the community. To achieve this goal, systematic road organization and functional zoning have been implemented, preserving the original pavilions and basketball court while designating play areas according to age groups and reorganizing the recreational and sports facilities.

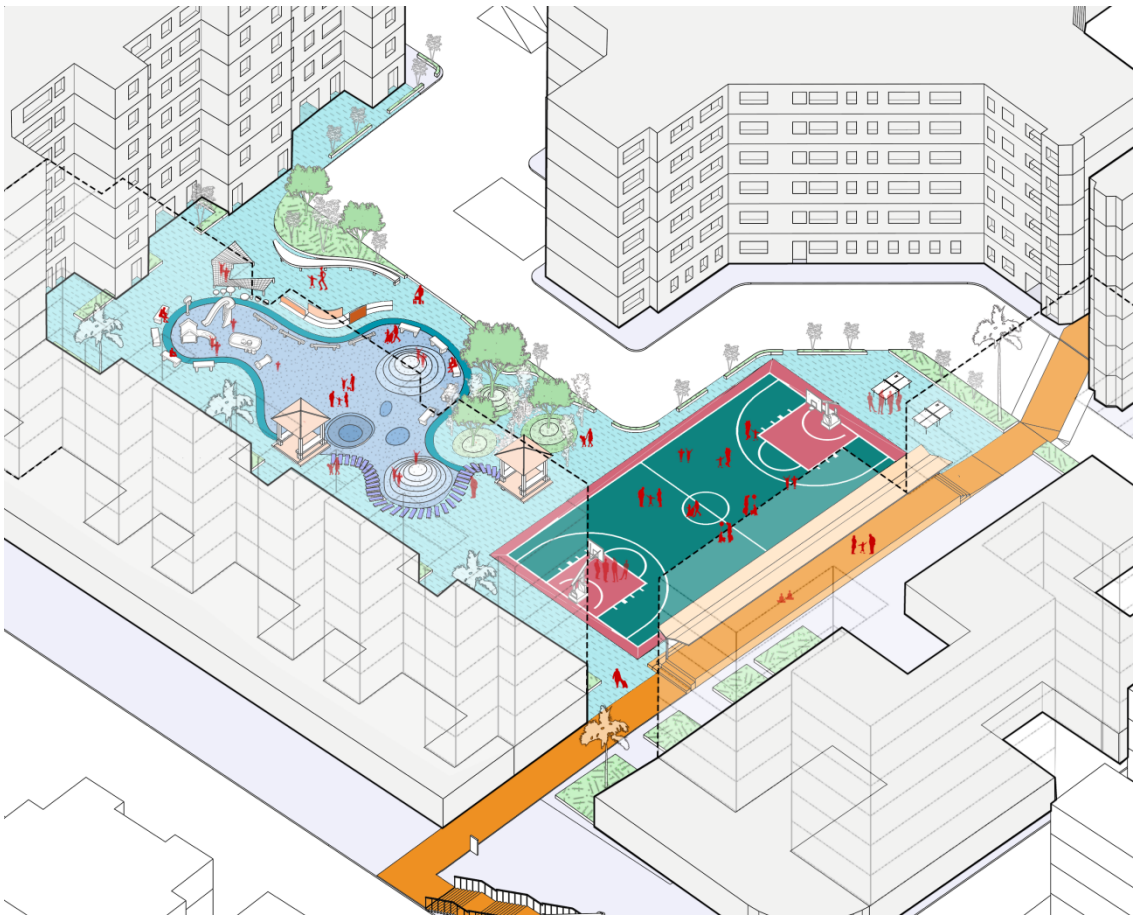
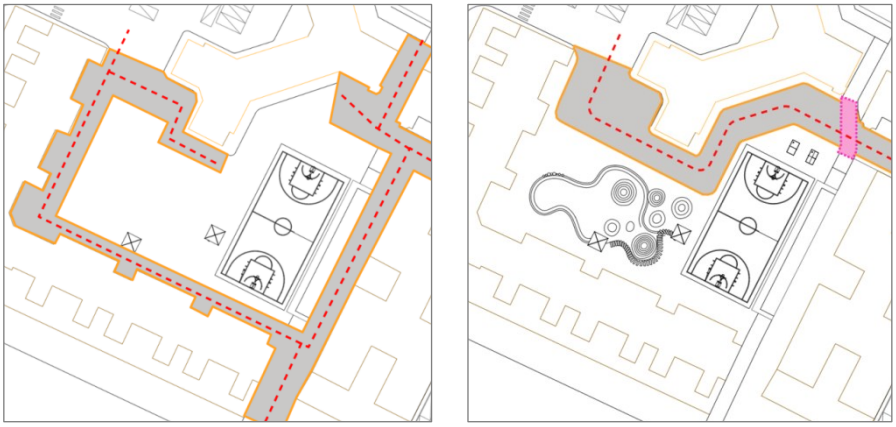


Figure 6-29 Sports Square - Axonometric View
(Source: Drawn by Author)

In light of road safety concerns and to prevent a high volume of traffic from endangering children, the surrounding roads of the sports square have been reorganized. The original enclosed configuration has been adjusted (Figure 6-30) to reduce vehicular detours, thereby minimizing the interface between the road and the sports square. Furthermore, the parking spaces adjacent to the area have been removed, retaining only the access road to reduce the interference of parked vehicles with children's visibility and accessibility. In one section, the motor vehicle lane inevitably intersects with the children's colorful pathway; therefore, speed bumps have been installed on this road surface, along with reflective mirrors and signage at the corners to alert drivers to slow down, ensuring the safety of the children.



a) Road Before Renovation b) Road After Renovation

Figure 6-30 Sports Square - Comparison of Road Conditions
(Source: Drawn by Author)

To meet the needs of children of all ages, the sports square has been divided into different zones (Figure 6-31). The central area is specifically designed for children aged 0-5, enclosed by a circle of playful paths. Numerous benches line both sides of the paths, close to the facilities, meeting the supervision needs of preschoolers' parents. In addition to conventional equipment such as slides and seesaws, micro-landscapes have been created for crawling infants, enriching the spatial form and enhancing their embodied cognition.

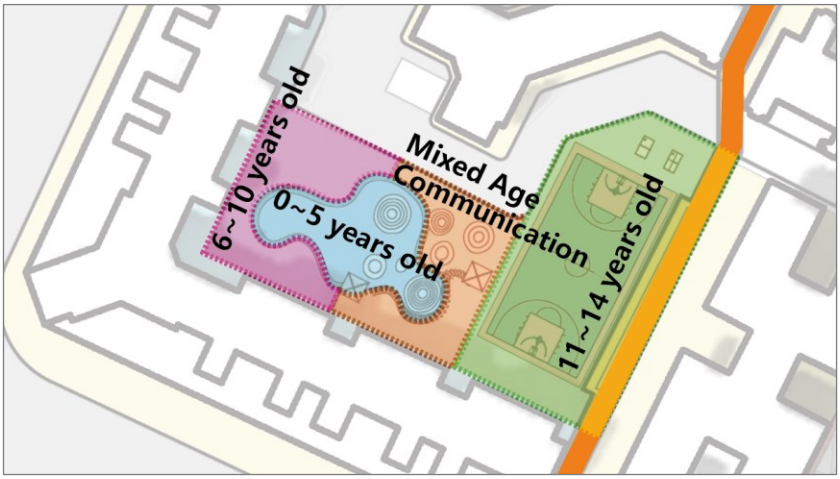


Figure 6-31 Sports Square - Zoning by Age
(Source: Drawn by Author)

The exploration area for children aged 6-10 is located outside the playful paths, ensuring they are not too far from the supervision area while having their own exploration zone equipped with adventurous sports facilities such as balance beams and climbing walls. On the side, sports facilities like basketball courts and table tennis tables suitable for older children aged 11-14

have been provided. The center of the space also includes some equipment suitable for multiple age groups, fostering interaction among children of different ages.

Figure 6-32 Sports Square - Perspective
(Source: Drawn by Author)

Positioned alongside Shichang Road and with strong functionality, the sports square serves as an entry point for many community children to access the space. A viewing platform has been established where the colorful pathway connects, which not only serves for watching games but also provides a visual vantage point for children entering the area for the first time, enhancing the site's navigability (Figure 6-32).

6.4.2.2 Community Park Node

The site is located in the southern area of Huayuan Village, adjacent to the south side of Market Road. The current site configuration includes rubber flooring, fitness equipment, and a pavilion, providing some recreational space (Figure 6-33). However, the number of children who come to play is relatively low. The main reasons for this are as follows: First, the site is enclosed by fences and display boards, obstructing visibility and giving the area a closed, inward-looking stance, which lacks openness. Second, the fitness facilities on site do not meet the entertainment needs of children. Lastly, the southern area is relatively small, with fewer children residing in the area. Combined with poor connectivity between the northern and

southern areas, children from the northern section seldom come to play here.

Figure 6-33 Community Park - Current Condition
(Source: Drawn by Author)

To address these issues, the site is redefined as a "cross-generational interactive" community park (Figure 6-34). First, the connection between the southern and northern areas has been somewhat improved by the introduction of crosswalks and a pedestrian bridge. Next, the openness of the site is enhanced by removing the thick display boards outside the fences, improving visibility from the street side. At the same time, eye-catching signage is installed at the entrance to guide children into the park.

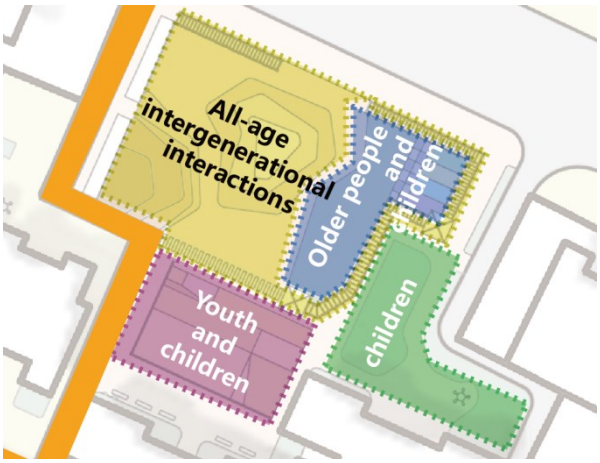


Figure 6-34 Community Park - Cross-Generational Functional Zones
(Source: Drawn by Author)

The park will be divided into functional areas based on different age groups, including the "Youth and children's Zone," "Elderly and children's Zone," "children's Exclusive Zone," and the "All-Ages Cross-Generational Interaction Zone" (Figure 6-35).

At the entrance, there will be an open space for interaction across all age groups. The

existing green spaces will be tidied up, and colorful pavement will be added to attract children's interest. This open plaza can host various community activities, and a sunken area will be included for hosting small lectures or classes. In the elderly and children's interaction zone, existing fitness equipment will be retained, and additional play elements like hopscotch will be introduced to encourage use by both the elderly and children. Young people, as a key source of vitality, are also crucial. Facilities favored by younger generations, such as a skateboard path, will be introduced to attract their participation, enhancing the vibrancy of the entire site.

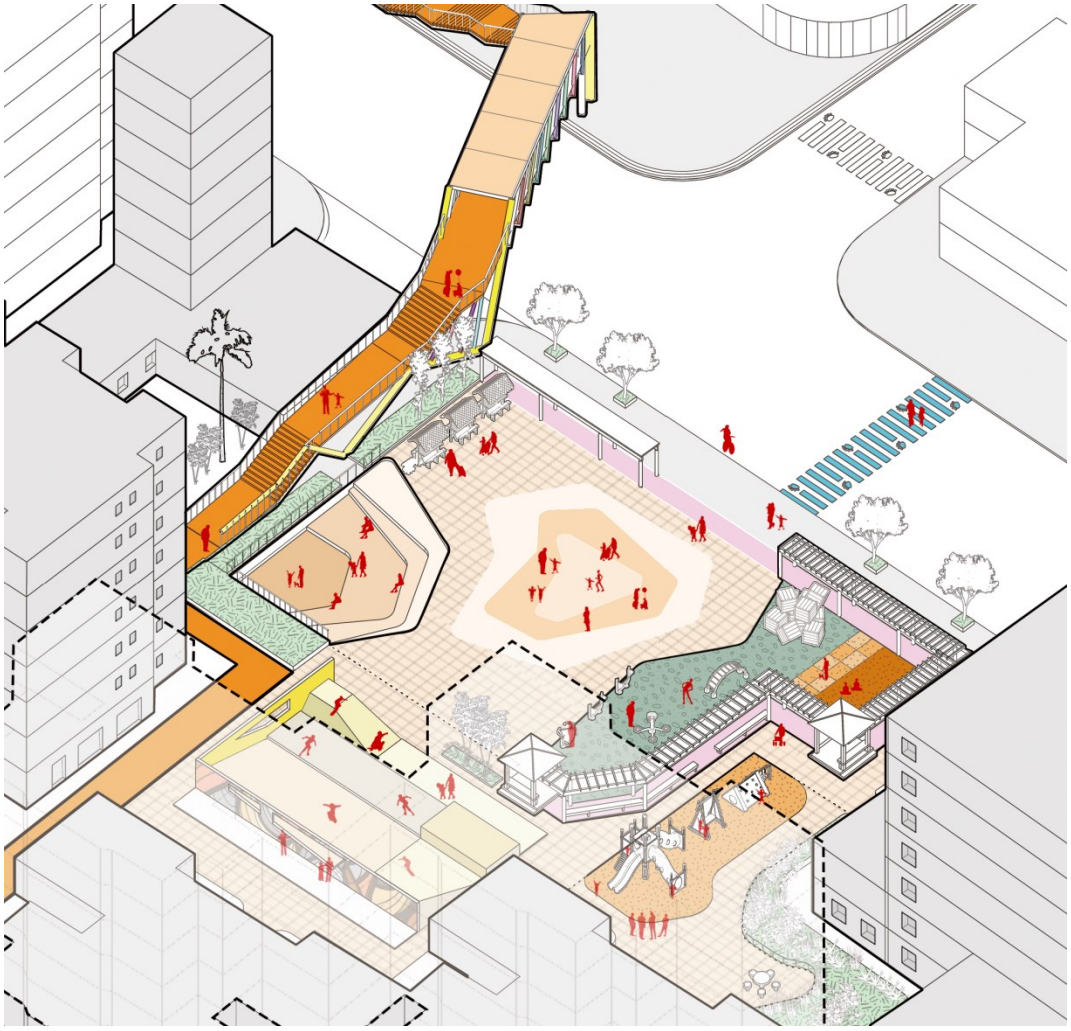


Figure 6-35 Community Park - Axonometric View
(Source: Drawn by Author)

6.4.2.3 Happy Farm Node

This site is located in the north-central part of the northern district and occupies a moderate area. Existing facilities within the farm include a pavilion corridor and a standard badminton court, as well as an untrimmed thicket of plants (Figure 6-36).

Figure 6-36 Happy Farm - Current Condition
(Source: Drawn by Author)

Site Location: The site is adjacent to the main road, making it neither edge nor concealed. From the northwest, the badminton court is very prominent and conveniently accessible as it is close to the roadside. However, from the main road to the southeast, some activity areas are obscured by dense shrubbery, making them harder to spot and resulting in lower visibility. Activity Area: The flagstone path is hidden among the grass, and the reduced visibility decreases safety. The net of the badminton court can be dismantled when not in use, turning it into a play area. Besides the badminton court, there is almost no other hard surface for children to play on. The form of the activity area is rather monotonous, lacking colorful graffiti or appealing facilities. Activity Facilities: Overall, the facilities and equipment in the area are relatively safe, primarily consisting of non-motorized fitness equipment. These facilities are more suited for older children in both function and scale, with little consideration for the needs of younger children. Landscape Plants: There are many plants in the area, which can attract mosquitoes. Tall trees obstruct the view of upstairs residents, leading to poor lighting and failing to create autonomous surveillance "eyes on the street." Residents sometimes plant vegetables in the area.

Given that this site is situated within a courtyard, although the area is relatively large, placing overly active children's facilities could still impact residents' daily lives. Therefore, considering the characteristics of the site, the needs of children, residents' daily life, and the concept of edutainment, the site is positioned as a "Happy Farm" (Figure 6-37).

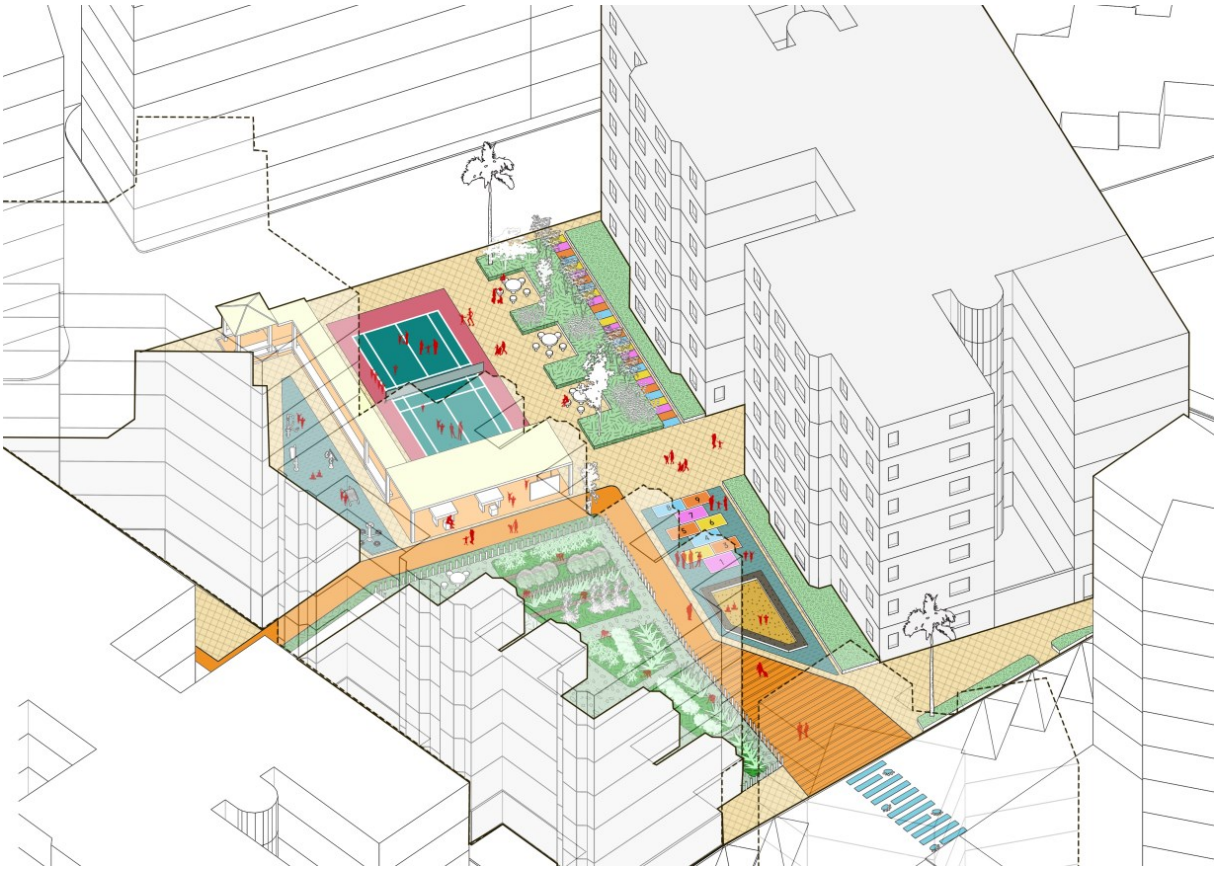
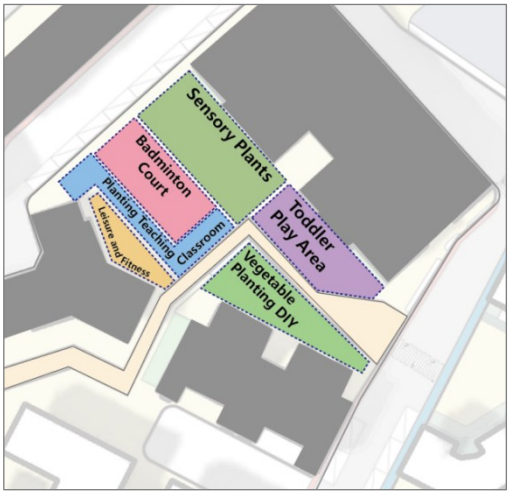
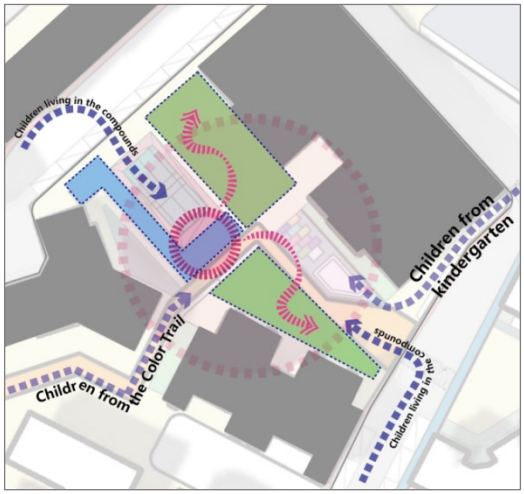


Figure 6-37 Happy Farm - Axonometric View
(Source: Drawn by Author)

The original pavilion and badminton court are retained, and the site has been replanned (Figure 6-38) to include a sensory plant viewing area, a vegetable planting area, a play area for younger children, a badminton court, a planting teaching area, and a recreational fitness area. The main user groups consist of children coming from the colorful pathway (including those from both within and outside the compound), preschool-aged children after school, children of all ages participating in planting activities, and residents.





a) Functional Zoning b) Foot Traffic

Figure 6-38 Happy Farm - Functions and Foot Traffic

(Source: Drawn by Author)

The activity process for children going to plant involves: learning in the teaching area → experiencing plants in the viewing area → planting in the planting area. The planting teaching area is centrally located and expanded from the original pavilion, serving as an outdoor teaching space. The community regularly conducts planting lessons here, organizing children for learning. The sensory plant viewing area is situated in the northeast, combining neatly arranged plants with a resting area, featuring "sensory plants" to ensure that children can fully engage with the plants while resting. The selected plants include Artemisia and marigolds (Figure 6-39), which are suitable for the climate of southern China and help repel mosquitoes, while minimizing plants that can accumulate water to prevent mosquito breeding[82]. A combination of trees, vines, and herbaceous plants is chosen, adorned with colorful decorations to provide children with a rich sensory experience. The vegetable planting area is located in the southwest of the site, where the original area has been managed to delineate plantable zones surrounded by a fence. Children living in the compound can each be allocated a small area to plant their favorite plants.

Figure 6-39 Happy Farm - Selection of "Sensory Plants"

(Source: Drawn by Author)

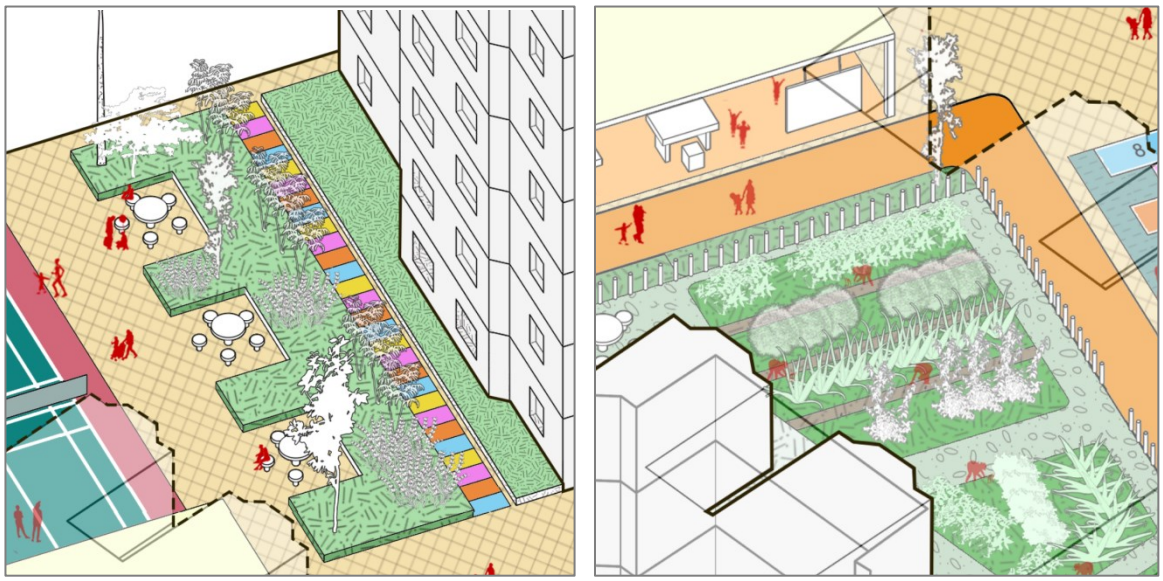


Figure 6-40 Happy Farm - Viewing Area and Planting Area
(Source: Drawn by Author)

The area close to the kindergarten on the east side is designated as a children's play area, equipped with suitable play facilities for children after school. The recreational fitness area is set on the west side for residents. With the restructuring, the play experience in this area has become more diverse, and the plants have been maintained, improving visibility and safety.

6.4.2.4 Kindergarten Node

The kindergarten is located at the northernmost side of the northern area, with parents and children typically entering through the north gate. This arrangement prevents any interference with the main circulation routes of the residents. Inside the north gate, there is a roundabout that features rest benches and large shade trees, but since it is still a considerable distance from the kindergarten entrance, few parents wait here. Outside the kindergarten, the only waiting area for parents is a narrow sidewalk approximately 2 meters wide, offering very limited space. On the west side of the kindergarten, there is a covered parking lot mainly used by residents, but with no designated parking spots nearby. Many vehicles are parked haphazardly, posing a potential safety risk to the children (Figure 6-41). After picking up their children, many parents walk with them to the sports plaza on the south side to play for a while before heading home.

Figure 6-41 Kindergarten - Current Condition
(Source: Drawn by Author)

In response to the current situation surrounding the kindergarten, improvements will focus on expanding waiting areas, utilizing activity spaces, and preventing improper parking (Figure 6-42).

First, the site needs to be restructured and optimized. The current space layout is relatively disorganized, particularly in the waiting areas where parents pick up their children, which feels cramped and lacks proper organization. Therefore, the first step is to pave more durable and easy-to-maintain hard surfaces, designating a specific waiting area. This will ensure that parents have sufficient space to wait during peak pick-up and drop-off times. Not only will this enhance the efficiency of space use, but it will also prevent congestion on the sidewalk, ensuring a smooth flow of pedestrians. At the same time, this waiting area will be equipped with basic amenities, such as benches and sunshades, to provide parents with a more comfortable waiting experience.

Secondly, given the limited land resources around the kindergarten, there is not enough space to expand new play areas for children. Therefore, existing resources must be fully utilized to meet the children's activity needs after school. To prevent children from lingering in front of the kindergarten or engaging in unstructured activities in the surrounding area, a “child-friendly” crosswalk will be installed, linking the kindergarten to the nearby “Happy Farm” playground.

Additionally, to address the issue of improper parking around the kindergarten, especially during peak hours when traffic congestion is severe, “Panda Parking Spots” will be designated around the kindergarten. These spots will allow parents’ private vehicles and electric scooters to temporarily stop during designated pick-up and drop-off periods. During non-peak times, these parking spots will be cleared and converted into an open area for children's activities, thereby increasing the available space around the kindergarten.

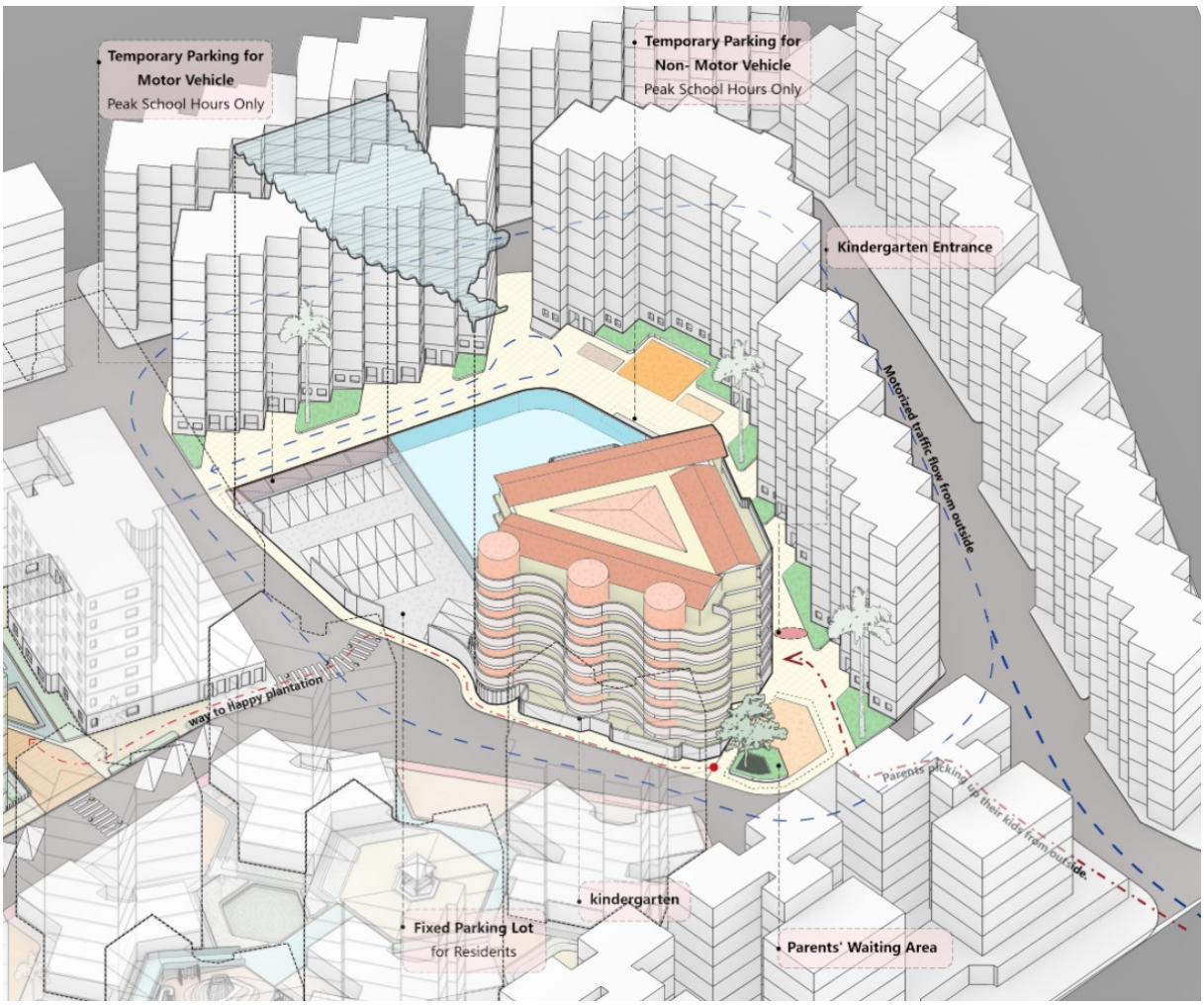


Figure 6-42 Kindergarten - Axonometric View
(Source: Drawn by Author)

6.4.3 Detailed Design of Point Spaces

6.4.3.1 Row Courtyard

Current Condition of the Site: Row courtyards are ubiquitous in Huayuan Village, with some allowing vehicle access while others do not. The courtyards are overgrown with shrubs,

and some are equipped with pavilions and other resting facilities; however, there are almost no play facilities, resulting in a lack of effective activity spaces for children (Figure 6-43).

Figure 6-43 Row Courtyard - Current Condition
(Source: Drawn by Author)

Figure 6-44 Row Courtyard - Axonometric View
(Source: Drawn by Author)

The functional requirements for row courtyards need to be clearly defined. Due to their low level of openness and consideration for residents' privacy, the front courtyards do not pursue functional diversity. Instead, they serve as a supplement to enhance children's access to activity spaces. In terms of activity experience, this area primarily provides universal fitness

and play facilities, benefiting the children and residents within the group.

The renovation concept for the row courtyard is: independent units with moderate interconnectivity (Figure 6-44).

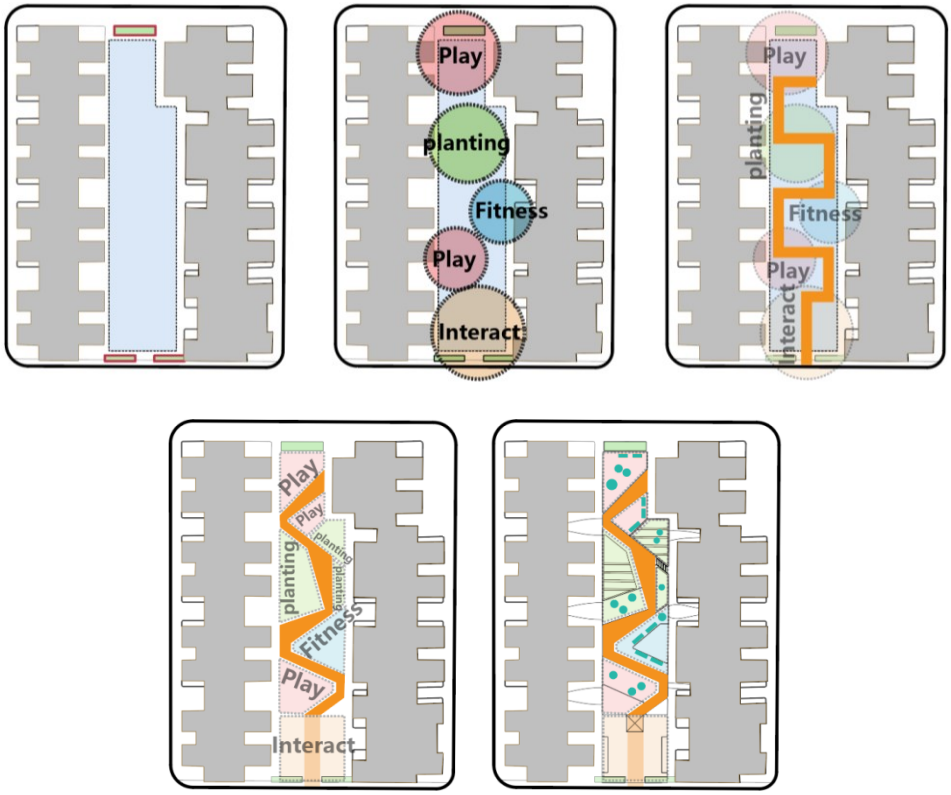


Figure 6-45 Row Courtyard - Renovation Process
(Source: Drawn by Author)

Specific Renovation Steps (Figure 6-45):

Step 1: Enclose the courtyard to prevent vehicle access, ensuring the safety of children's activities.

Step 2: Divide the area into functional zones, including fitness, play, interaction, and planting areas.

Step 3: Create pathways that run through each functional zone to facilitate movement for residents and children.

Step 4: Design winding and tortuous pathways based on children's psychological characteristics to stimulate their exploratory interests.

Step 5: Incorporate flexible and movable play facilities to enrich the activity experience.

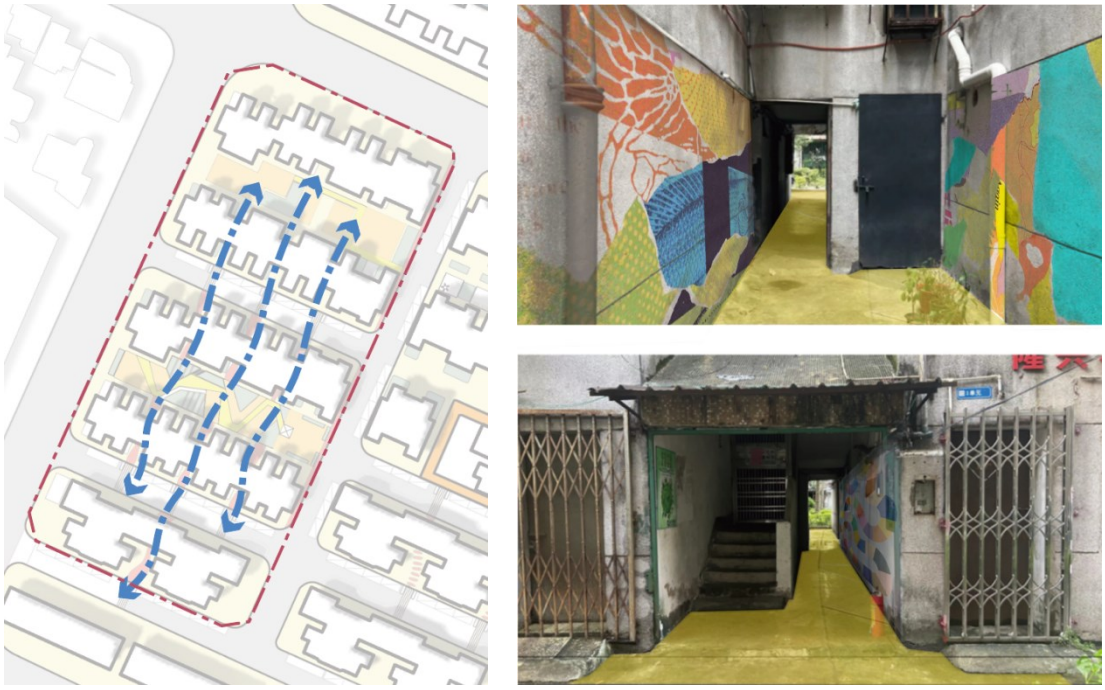


Figure 6-46 Row Courtyard - Ground Floor Corridor
(Source: Drawn by Author)

To achieve an organic connection between the courtyards and expand children's activity space, existing ground floor corridors will be utilized. By improving the corridor interface (Figure 6-46) and incorporating colorful graffiti, children will be guided to use and navigate through the corridors.

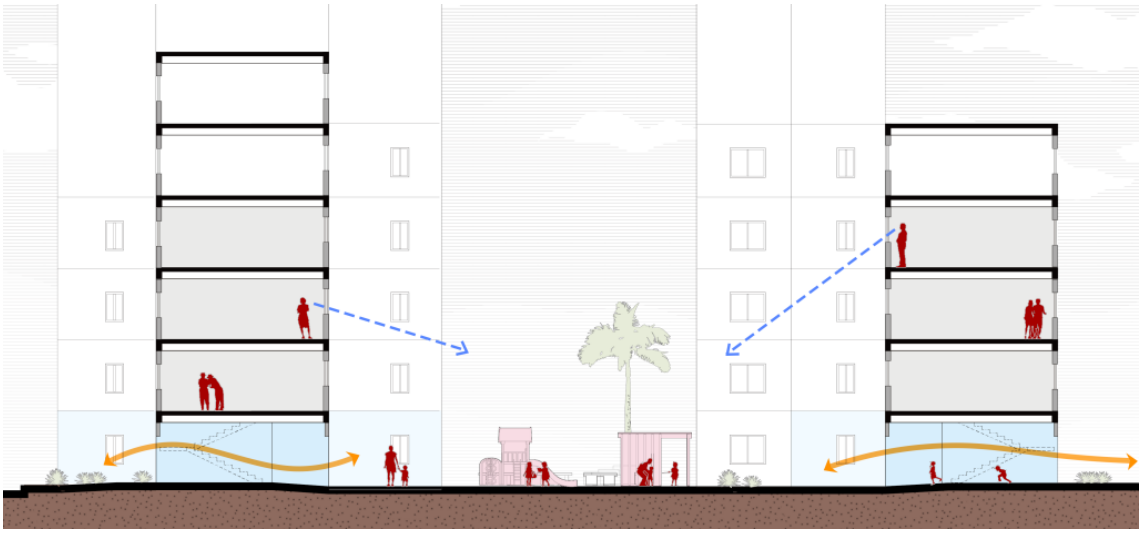


Figure 6-47 Row Courtyard - Section View
(Source: Drawn by Author)

To stimulate “eyes on the street” (Figure 6-47) and ensure children's safety during play, it is essential to manage the relatively unruly plants in the courtyards to provide good visibility.

This creates the necessary physical conditions for residents to autonomously supervise the area. Additionally, providing a certain degree of enclosure along the site's edges enhances the sense of territory, encouraging residents to engage in supervision and promoting interaction and autonomy among the compound's residents.

6.4.3.2 Point Courtyard

Point courtyards are widely distributed throughout Huayuan Village. This section uses a group of point courtyards located in the central part of the northern area as a case study. The courtyard typically consists of flower beds and a pavilion, with some fitness equipment, but no facilities designed specifically for children's play (Figure 6-48). The boundary between the courtyard and the main road is poorly defined, with no physical barriers, allowing motor vehicles to easily enter the space. This not only occupies the area designated for children's activities but also poses a potential safety hazard. The vegetation in the courtyard is largely unkempt, consisting mainly of shrubs, low trees, and palm trees. On the south side of the courtyard, there is a small building used by the maintenance team, which also serves as a storage room.

Figure 6-48 Point Courtyard - Current Condition
(Source: Drawn by Author)

To optimize the functionality and safety of this space, a comprehensive restructuring and integration of the site will be undertaken (Figure 6-49).

First, the fragmented plots will be systematically reorganized and integrated to optimize

the openness hierarchy of the courtyard. Physical barriers such as flower beds and fences will be installed at the boundaries to prevent vehicles from entering the area and ensure the safety of children's activities. Within the existing point courtyard, the pavilion will be preserved, and children's play equipment will be added. Pathways will be created to connect the scattered activity spaces organically. At the same time, visual corridors will be designed to ensure that children can “see” the space before physically arriving, enhancing the visibility and attractiveness of the site (Figure 6-50).

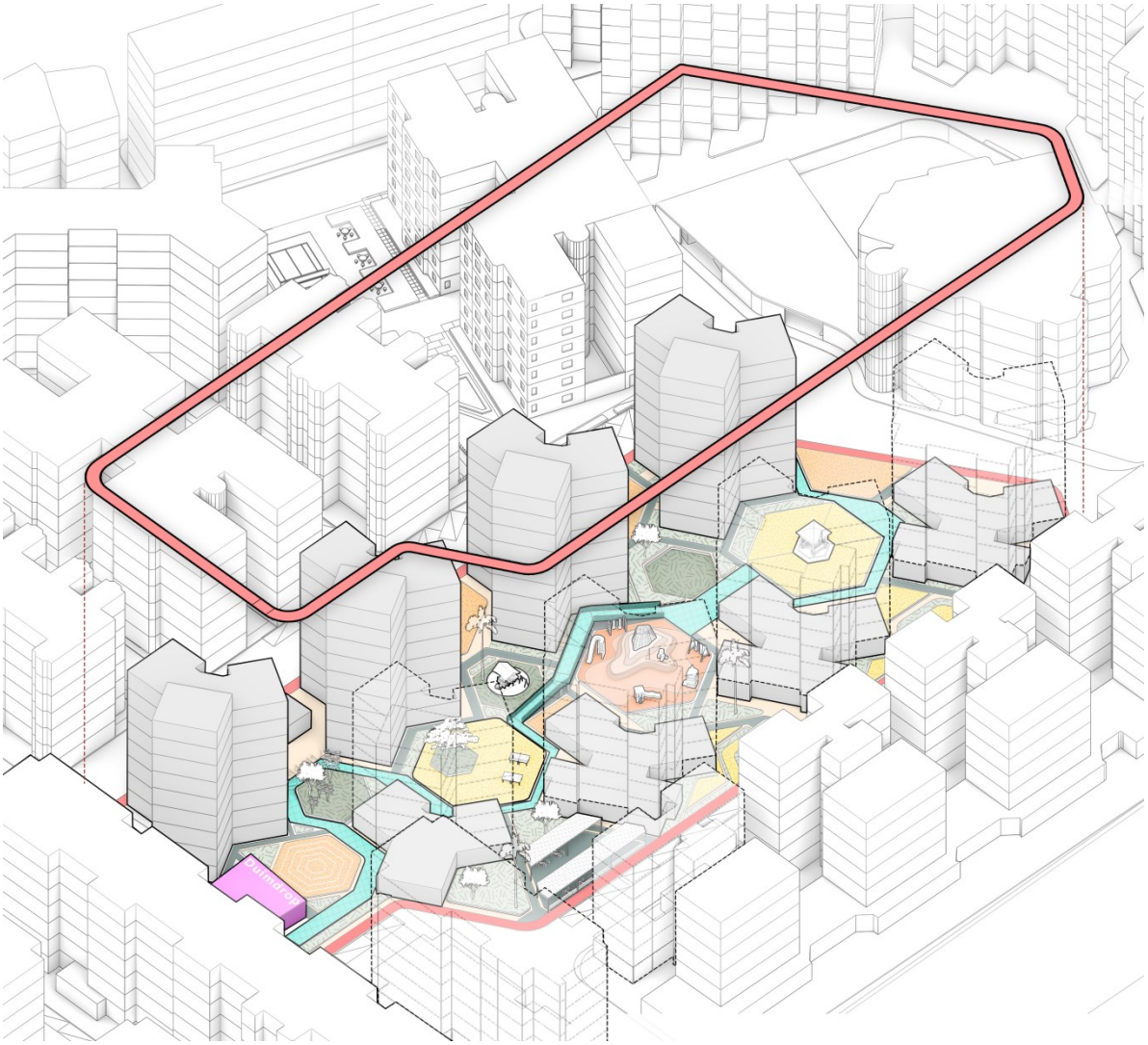


Figure 6-49 Point Courtyard - Axonometric View
(Source: Drawn by Author)

The low-quality and monotonous shrubbery within the courtyard will be reduced, and the proportion of hardscape paving will be increased to improve the overall quality of the space. Since children in Huayuan Village generally enjoy cycling, a bicycle loop will be planned around the perimeter of the courtyard to cater to their riding needs, enhancing the variety and

enjoyment of activities.

Additionally, the small building on the south side, currently used by the maintenance team, will be repurposed. Part of the space will be transformed into a shared “toy box” for the compound’s children, where they can borrow toys for free and use them within the courtyard. This initiative not only optimizes the functionality of the space but also provides more recreational resources for children. Community volunteers, organized by the residents’ committee, will be parents from the compound, contributing to the unity and cohesion of the community.

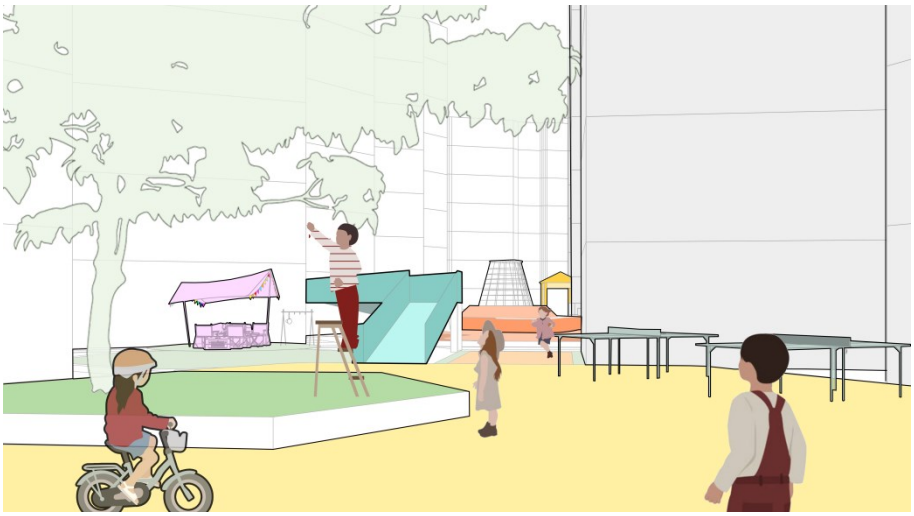


Figure 6-50 Point Courtyard - Perspective
(Source: Drawn by Author)

6.5 Summary of this Chapter

This chapter, based on the optimization strategies proposed in Chapter 5 and the actual conditions of Huayuan Village, focuses on the renovation of children’s activity spaces within the residential compound from four dimensions: accessibility, safety, multifunctionality, and comfort. The design revolves around the core concept of creating a “shared playground for the community’s children” and is divided into two main parts:

The first part addresses the optimization of the overall structure of Huayuan Village. By utilizing colored pathways, different activity spaces are organically connected, forming a multi-level and diversified play network. This enhances spatial connectivity and provides a variety of activity options. The second part delves into detailed node designs for various types of spaces. For planar spaces, specific themes are assigned, and their functions and uses are explored in

depth. For linear and point spaces, representative sections are selected as typical case studies to explore how local modifications can improve the overall quality and user experience of the space.

In conclusion, this chapter aims to create activity spaces in Huayuan Village that meet children's needs while considering local conditions. The design not only improves the daily quality of life for children but also fosters community cohesion through the creation of shared spaces, enhancing interaction and engagement among residents.

Conclusion and Prospect

Conclusion

This study focuses on children's activity spaces in old residential compounds in Dongguan and delves into renovation strategies. Using behavioral theories related to children and demand theory as a theoretical foundation, the research explores the supply and demand relationship of children's activity spaces in old residential compounds in Dongguan through field surveys, interviews, and questionnaires, proposing renovation design strategies. The main conclusions of the study are as follows:

(1) Analysis of children's Activity Space Types and children's Behavior in Old Residential Compounds: This study categorizes children's activity spaces in old residential compounds into three types: point, linear, and planar spaces. Based on Jan Gehl's classification of outdoor activities, it divides children's outdoor activities in old residential compounds into necessary activities, spontaneous activities, and social activities, investigating the relationship between spatial types and children's activities.

(2) Clarification of the Demand for children's Activity Spaces in Old Residential Compounds: Based on the study of theory, the research identifies the child-friendly elements of activity spaces in old residential compounds, namely accessibility, safety, multifunctionality, and comfort. Combining field observations and interviews, a demand index system with four criterion layers and thirteen proposal layers is constructed, and the Kano model is employed to categorize and prioritize these demands. Through horizontal and vertical analysis of three residential compounds, the study identifies commonalities and differences in children's needs, as well as the supply-demand relationship of existing activity spaces.

(3) Proposed Renovation Strategies for children's Activity Spaces in Old Residential Compounds: In proposing strategies, the study analyzes demand indicators in detail based on different results of children's activity space requirements at four levels. Coupled with the actual situation in Dongguan's old residential compounds, it suggests optimization strategies that can meet the diverse needs of children, thereby enhancing the quality of children's activity spaces in these compounds.

Innovations

(1) Through in-depth research and detailed descriptions of Dongguan's old residential compounds, this study provides a solid theoretical basis for future practical renovations, ensuring a close integration of theory and practice.

(2) This study addresses the diverse needs of children and explores countermeasures for the renovation of children's activity spaces in Dongguan's old residential compounds, effectively avoiding the problem of design homogenization. It aims to enhance the child-friendliness of activity spaces more precisely and effectively.

(3) Currently, research on old residential compounds primarily uses methods such as questionnaires and observational interviews to analyze children's needs. This study adopts quantitative data analysis methods, including the Kano model and Better-Worse analysis, providing clear directions and focal points for optimizing the design of activity spaces in old residential compounds.

Limitations and Outlook

(1) In terms of research dimensions, this study primarily focuses on the micro-scale within the residential compounds and does not deeply analyze the intrinsic links between compounds and the community. Additionally, the study mainly approaches the issue from the perspective of spatial design, with insufficient consideration of macro factors such as policies and funding. Future research needs to explore how the renovation of children's activity spaces in old residential compounds can be integrated with community development and urban policies, seeking strategies at a more macro level.

(2) Methodologically, this study conducts quantitative analysis of children's needs based on the Kano model and attempts to use straightforward language to minimize understanding deviations. However, due to differences in children's cognitive abilities, the accuracy of the questionnaire results may still be affected. Moreover, the number of distributed and collected questionnaires is limited, which may lead to discrepancies between the experimental results and actual conditions. In the next phase of research, it will be necessary to optimize the research methods by expanding the sample size to cover old residential compounds in different regions and conditions of Dongguan for a more comprehensive study.

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Appendix

Appendix 1 Importance Questionnaire

(Original version is in Chinese)

Dear children and parents,

I am a graduate student from the School of Architecture at South China University of Technology. In order to gain a deeper understanding of children's specific needs for activity spaces, I am conducting this questionnaire. I hope to receive your active support and participation. The table below contains some demand indicators for activity spaces. Please mark a "√" under the corresponding score based on how important you think each indicator is.

Elements	Very Important 5	Relatively Important 4	Neutral 3	Relatively Unimportant 2	Completely Unimportant 1
No passage of motor vehicles					
Safe play facilities					
Diverse site forms					
Rich and interesting play facilities					
Facilities appropriately scaled for children					
No road obstacles					
Suitable for people of all age groups					
Sufficient guardianship areas					
More plants providing shade					
Integration with cultural and educational elements					
Short walking time					
Suitable for hosting community activities					
Located near community service centers					
No need to cross major urban roads					
Appropriate space size, neither too crowded nor too sparse					
Site boundaries combined with greenery					

Paving materials with a mix of soft and hard textures					
Transitional areas between activity and resting spaces					
Prominent and convenient site entrances					
Good lighting and ventilation conditions					
High approval from surrounding neighbors					
Commercial facilities available around the site					

Appendix 2 Kano Research Questionnaire 1

(Original version is in Chinese)

Dear children and parents,

I am a graduate student from the School of Architecture at South China University of Technology. To better understand the needs of children and create a compound public space conducive to children's healthy growth, this survey is conducted.

Below are some of the measures to renovate the activity space, please select the answer according to your preference. Your support and participation would be greatly appreciated.

Child ☐ Parent ☐ Age:_____

	Demand		Like	Must be	Neutral	Acceptable	Dislike
Accessibility	Increase the number of play areas	increase					
		maintain					
	Improve the openness of the site	increase					
		maintain					
	Reduce road obstacles	increase					
		maintain					
Safety	Reduce the passage of motor vehicles	increase					
		maintain					
	Improve the safety of facilities	increase					
		maintain					
	Increase guardianship areas	increase					
		maintain					
Multifunctionality	Enhance the fun of play Facilities	increase					
		maintain					
	Suitable for children of multiple ages	increase					
		maintain					
	Suitable for hosting group activities	increase					
		maintain					
	Integrate play with educational and cultural elements	increase					
		maintain					
Comfort	Improve the diversity of site forms	increase					
		maintain					
	Increase plant coverage	increase					
		maintain					
	Facilities more appropriately scaled for children	increase					
		maintain					

Appendix 3 Kano Research Questionnaire 2

(Original version is in Chinese)

Dear children and parents,

I am a graduate student from the School of Architecture at South China University of Technology. To better understand the needs of children and create a compound public space conducive to children's healthy growth, this survey is conducted.

Child ☐ Parent ☐ Age:_____

1. children's outdoor activity duration:

A. Less than 0.5 hour B. 0.5–1 hour C. 1–2 hours D. More than 2 hours

2. Your residence:

A. In this compound B. Within 15 minutes walking distance C. Farther away

3. Frequency of activities per week:

A. 1–2 times B. 3–4 times C. More than 4 times

4. Main activity time:

A. Weekday daytime B. Weekday evenings

C. Weekend daytime D. Weekend evenings

5. Common play activities:

A. Chatting B. Exploring plants and flowers

C. Playing games D. Using playground equipment

E. Playing ball games F. Riding a bicycle

Below are some of the measures to renovate the activity space, please select the answer according to your preference. Your support and participation would be greatly appreciated. (Please put " √ " on the selected option)

	Demand		Like	Must be	Neutral	Acceptable	Dislike
Accessibility	Increase the number of play areas	increase					
		maintain					
	Improve the openness of the site	increase					
		maintain					
	Reduce road obstacles	increase					
		maintain					

Safety	Reduce the passage of motor vehicles	increase					
		maintain					
	Improve the safety of facilities	increase					
		maintain					
	Increase guardianship areas	increase					
		maintain					
Multifunctionality	Enhance the fun of play Facilities	increase					
		maintain					
	Suitable for children of multiple ages	increase					
		maintain					
	Suitable for hosting group activities	increase					
		maintain					
	Integrate play with educational and cultural elements	increase					
		maintain					
Comfort	Improve the diversity of site forms	increase					
		maintain					
	Increase plant coverage	increase					
		maintain					
	Facilities more appropriately scaled for children	increase					
		maintain					

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Time flies, and in the blink of an eye, it has been eight years since I first encountered architecture. As I reach the completion of my thesis, I carry a heart full of gratitude and extend my deepest thanks and warmest wishes to all those who have guided, accompanied, and silently supported me along this journey.

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As I write these words, lying on the grass by Building 1 in SCUT, the sun is clear, and the breeze is gentle. Over the past six months, I have been running tirelessly, and I am grateful that I never gave up. But now, I wish to slow my pace, no longer questioning which direction the wind blows, but instead embracing the final autumn of my student years.

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He Yining

November 2024, Guangzhou