Research on Informal Space Pattern Language and Its Application in Nanhuaxi Historic District from the Perspective of Organic Renewal

A Dissertation Submitted for the Degree of Master

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Abstract

As vital repositories of urban history and culture, historical districts encapsulate both tangible memories and the fabric of social life. Preservation practices worldwide have evolved from protecting individual buildings to holistic conservation, shifting from static preservation to dynamic revitalization. However, current renewal practices in China predominantly emphasize the physical spatial form, often neglecting the value of daily life. This oversight leads to issues such as commercial homogenization, cultural loss, and the erosion of local identity, potentially triggering spatial symbolization and gentrification conflicts. To reshape the organic order of these districts, it is crucial to recognize self-organizational principles and focus on the grassroots power of public participation.

This study examines the Nanhuaxi historical district in Guangzhou, focusing on the informal spaces spontaneously created through residents' self-initiated modifications. These spaces represent residents' spontaneous responses to their daily needs, embodying everyday logic and driving incremental urban growth. Their micro-diversity injects vitality into the district. However, informal spaces also present shortcomings such as safety deficiencies and disorder. This research advocates for absorbing rather than eliminating informal elements, transforming them into valuable resources that can activate a sense of identity and participation within the district.

The Nanhuaxi district currently faces a dual disconnect between its physical space and social relationships. New constructions disrupt the traditional fabric and human-scaled dimensions, creating spatial segregation. "One-size-fits-all" urban management suppresses local characteristics, yet informal activities continue to emerge. Surveys reveal that residents engage in informal businesses, spatial occupation, and spatial modifications by circumventing regulations, reflecting a conflict between planning design and the demands of daily life. While these phenomena pose potential risks, they also reveal the rationality of bottom-up approaches to filling planning gaps, necessitating systematic guidance to achieve their positive transformation.

The central research question of this study is: How can the organic order of informal spaces within historic districts be transformed into sustainable renewal strategies? In other words, how can bottom-up informal practices by residents support top-down planning decisions, achieving synergy and integration between the two approaches?

This study introduces Christopher Alexander's pattern language theory. As a research approach centered on everyday life, the theory distills recurring environmental problems and

their solutions into "patterns," organizing them into a coherent language system. Its defining feature lies in constructing a "space-event" association framework, visually linking material forms with usage behaviors. This provides an effective tool for analyzing complex social spaces, such as spontaneously constructed everyday life spaces (informal spaces). Current domestic renewal research based on pattern language theory is relatively comprehensive at the analytical level, but lacks exploration in practical application. Nevertheless, the application of pattern language theory in the field of traditional residential areas has opened up some theoretical understanding and strategic application discussions. This paper attempts to apply this theory to the study of informal spaces in historical districts, extracting pattern samples through field research, analyzing the interaction between space and behavior, and uncovering local pattern characteristics that contain collective memories. By combining multi-level analysis to construct a pattern language network and screening pattern types suitable for renewal goals, the study ultimately formulates renewal strategies for the Nanhuaxi district, promoting public participation in the informal construction of the district and realizing the profound meaning of organic renewal.

This research aims to explore the transformation paths of informal spaces, coordinating historical preservation and contemporary needs through a pattern language application framework. The goal is to reshape everyday life spaces that carry collective memories, rebuild harmonious relationships between people and between people and nature, and provide new ideas for the sustainable development of historical districts.

Key word: Pattern Language Theory, Informal Space, Organic Renewal, Historical District

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Chapter 1 Introduction

1.1 Research Origin and Background

(1) From the traditional top-down urban spatial production to a refined management model.

In our rapidly evolving societal landscape, traditional planning methods, while meeting the demands of efficient construction, have also engendered a multitude of issues concerning urban morphology, the human environment, and ecological preservation. Contemporary cities have evolved over centuries, with each historical period leaving its mark on the fabric of the urban structure. A failure to recognize the existing urban structure during planning decisions can lead to disharmonious interactions between the various layers of this fabric. As urban renewal in China shifts from an incremental to an inventory approach, the complex status quo of historical blocks, the patchwork of physical spaces, and the conflicting interests of multiple parties necessitate the construction of a more resilient and inclusive refined governance model within the context of organic renewal. This model should not only target the improvement of the material space of historical blocks and the enhancement of public space quality but also focus on the autonomous creation and spontaneous renewal of everyday life spaces, allowing the blocks to exude vitality in their spatial essence.

(2) In the context of historical street regeneration, the involvement of diverse stakeholders necessitates the incorporation of public participation mechanisms, particularly when considering the self-organizing properties of urban environments.

The stakeholders involved in the renewal of old urban districts are inherently diverse and complex, exhibiting disparities in their benefit demands, participation motivations, and capability levels. Given that urban renewal fundamentally entails the redistribution of benefits, implicating both public interests and the individual interests of multiple stakeholders, it is imperative to establish renewal mechanisms that ensure equitable and just outcomes. Furthermore, the prevailing "General Plan—Regulatory Plan—Detailed Plan" system, along with urban renewal unit planning, retains the momentum of rapid construction characteristic of incremental planning periods. This system lacks an intermediate tier that facilitates the transition from the district level to the foundational building level, resulting in a lack of clarity among responsible parties and beneficiary groups regarding the concept of preservation, a deficient understanding of their own rights and responsibilities, and an inability to effectively monitor activities. Current urban renewal policies and systems have expanded from a top-down to a bottom-up approach, with specific research focusing on two primary areas: first, how to

incorporate public interests into formal urban renewal planning; and second, the exploration by an increasing number of scholars of multi-party participation models involving government, developers, and community forces. The "Urban and Rural Planning Law of the People's Republic of China," promulgated in 2008, explicitly stipulates the introduction of a public participation system in urban planning as a matter of public policy, legally emphasizing the necessity and importance of public involvement. Against this backdrop, an increasing number of private sector entities and social groups are participating in urban renewal, providing a broader perspective and more sustainable impetus for the material renewal previously dominated by government and market forces, thereby forming an urban renewal mechanism involving the joint participation of governmental, market, and social forces[1]. Therefore, from the perspective of both top-down coordinated problem-solving and bottom-up participatory aspirations, the introduction of a public participation mechanism in the renewal of old urban districts is essential. It can effectively mediate the benefit demands of multiple parties and comprehensively address complex urban issues.

(3) The widespread phenomenon of informal renovations in old urban neighborhoods highlights the conflict between residents' needs and urban regulations.

In contemporary urban environments, informal practices mirror the daily routines of inhabitants, with these lived experiences continuously shaping streetscapes and the overall urban appearance, particularly in contrast to formally planned and officially designated spaces. The functions along the streets of older urban districts are primarily residential areas constructed in the 1980s and 1990s, funded by governmental bodies or work units. Due to the limitations of planning and construction ideologies at the time, the resulting residential spaces and supporting facilities are inadequate to meet the daily needs of residents. Consequently, with the passage of time, these older urban streets have seen numerous small-scale, bottom-up renewal and renovation activities led by residents. For example, ground-floor residents, recognizing business opportunities, have broken through walls to open shops, addressing market supply shortages. Astute merchants have expanded their operations beyond their storefronts, displaying goods or seating outside, or creating eye-catching shop signs to attract foot traffic. Mobile vendors weave through the streets and alleys, selling fruits, vegetables, and daily necessities, while community residents cultivate vegetables in idle spaces within residential areas. Although these unauthorized changes to the land-use nature of residences and the construction of unauthorized structures in public spaces do not comply with regulations, leading to issues such as the degradation of the urban environmental appearance, disruption of urban traffic, and increased urban management challenges, they not only compensate for the

inadequacies of top-down urban supply but also establish and strengthen social relationships in the process. This fosters a sense of place and local identity, increases employment opportunities, promotes economic development, and brings vitality to the streets.

(4) The indiscriminate imposition of "one-size-fits-all" bans and rectifications, while intended to improve environmental conditions, has concurrently engendered a multitude of adverse consequences.

The non-standard dimensions and facilities often found in informal spaces lead to environmental pollution and challenges in street management, triggering frequent social conflicts between residents, business operators, and stakeholders. Simultaneously, urban renewal in China has entered a transformative phase that emphasizes people-oriented approaches and high-quality development, with a focus on comprehensive urban governance and refined development strategies. Compared to the large-scale demolition and reconstruction of the past, street renewal and quality enhancement have a more profound value connotation, and many cities are widely carrying out street renewal work. However, in the pursuit of high efficiency and low cost, most city managers often adopt a "one-size-fits-all" approach to eliminate and rectify informal street phenomena, and a superficial approach to protect and restore the cultural value of historical blocks. This type of renewal, which remains at the material level of planning, eliminates safety hazards and improves the street environment, but also destroys the original diversity and vitality of the street, as well as its unique civic cultural value and urban self-organization mechanism. For example, streets are becoming more and more tidy, but the human touch and atmosphere of daily life are becoming weaker and weaker; micro-updates are increasing, but the public's recognition is decreasing; and the construction of public activity spaces is increasing, but people's lives are still not convenient, and public participation is very low. At the same time, the rectification campaign inevitably leads to "gentrification," which inhibits socio-economic development, destroys social networks, and damages the rich landscape of self-organized formation that the city has long enjoyed. Therefore, it is of great significance to find a comprehensive renewal method that can solve the spatial problems caused by such streets while retaining their cultural and social values.

1.2 Research Aims and Significance

1.2.1 Research Aims

(1) Exploring the Value and Mechanisms of Informal Spaces in the Renewal of Historical Blocks.

This research aims to move beyond the conventional "material space first" perspective in historical district preservation, focusing instead on the informal spaces created by residents from the bottom up, and analyzing their dynamic relationship with daily life needs. By observing the spontaneously constructed spatial forms and behavioral patterns of residents in the Nanhuaxi neighborhood, it reveals the implicit logic of informal spaces in maintaining social relations, carrying collective memories, and adapting to life changes, thereby answering the core question of "how to transform the organic order of informal spaces into sustainable renewal strategies."

(2) Developing a Framework for the Application of Pattern Language Theory in the Context of Organic Renewal.

Addressing the limitations of current pattern language research, which often emphasizes "heavy analysis and light practice," this study endeavors to integrate Alexander's pattern language theory with localized Chinese contexts to establish an applicable system for historic districts. Through the extraction of the informal spatial pattern language inherent to the Nanhuaxi neighborhood, the regular characteristics of spatial elements and behavioral interactions are elucidated. This involves constructing a translational pathway from "pattern recognition" to "strategy generation," intending to resolve the disconnect between material space renewal and the reconstruction of social relations.

(3) Proposing an urban renewal approach that carefully considers both historical integrity and contemporary needs.

Based on the practical context of the Nanhuaxi historical block in Guangzhou, an exploration of the synergistic mechanism between informal spaces and pattern language is conducted. The research is dedicated to filtering a network of pattern languages with local adaptability, with renewal strategies being proposed that consider spatial security, cultural continuity, and resident participation. This approach ultimately aims to achieve the “dynamic restoration” of historical blocks. This approach not only protects the traditional fabric and collective memory but also activates community vitality and local identity, providing methodological support for resolving the issues of "symbolic preservation" and the "gentrification crisis."

1.2.2 Research Significance

(1) Spearheading a paradigm shift in the conservation of historic districts.

Through a discussion of complexity thinking and the concept of self-organization, this study regards informal spaces as the "gene pool" for the organic renewal of historical blocks, moving beyond the traditional binary opposition of "frozen protection" and "standardized renovation." Through the localization and reconstruction of pattern language theory, it supplements domestic research on practical tools in this field, infusing the dynamic protection theory of historical blocks with a "bottom-up" observation dimension, and promoting the upgrading of the protection paradigm from "spatial form restoration" to "socio-spatial collaborative regeneration."

(2) Offering actionable technological tools for urban renewal.

The applied framework of pattern language, developed through the technical chain of "spatial behavior observation - pattern sample extraction - language network construction," transforms residents' daily practices into reusable design language. This method not only provides designers with a systematic tool for understanding local knowledge but also lowers the barrier to public participation through a visual "pattern library," promoting dialogue between professional design and folk wisdom, and injecting the possibility of "flexible intervention" into the renewal of historical blocks. Simultaneously, the method facilitates a feedback loop mechanism among the public, designers, and the government, aiding in the continuous iteration of urban renewal strategies, especially as many bottom-up, small-scale community renovations require new technological assistance for large-scale implementation.

(3) Facilitating sustainable community development with a human-centered approach.

Based on the empirical study of the Nanhuaxi neighborhood, this research explores how the excavation of informal spaces reshapes residents' sense of belonging and neighborhood relations, providing concrete strategies for resolving practical dilemmas such as "spatial isolation" and "cultural homogenization." The findings can directly inform the formulation of urban renewal policies in Guangzhou, promote the transformation from "one-size-fits-all" management to "inclusive governance," and offer a bidirectional mapping reference of "local experience-universal logic" for the revitalization of similar historical blocks nationwide, thereby helping to achieve a balance between "preserving nostalgia" and "activating new life."

1.3 Research Subjects and Content

1.3.1 Research Subjects

The present investigation centers on the Nanhuaxi historic district in Guangzhou, employing the Fu' an community within Nanhuaxi district as an experimental design site. The research specifically examines informal spatial formations within this urban context. In this study, the term “informal spaces” refers to the flexible places that residents spontaneously occupy and transform, which are not recognized by statutory planning but accommodate daily life. These phenomena primarily encompass three typological manifestations: Firstly, commercial conversions of street-facing residential structures within historic quarters, where leased properties are repurposed to provide tertiary sector services (including culinary establishments, personal care services, repair facilities, convenience retail, and market spaces). This process frequently involves commercial operators’ spatial encroachment into public thoroughfares through practices such as extending their business operations onto the streets (such as occupying public street space for stalls or seating); Secondly, bottom-up spatial transformations and spontaneous constructions in areas not covered by government-led renovation efforts, such as residents' self-initiated facade additions and the spontaneous formation of recreational areas (outdoor seating, flower stands, and storage spaces); Thirdly, changes to the streets resulting from daily life practices, such as mobile vending and street performance[2]. The selection of informal spaces as the research focus is predicated on several key considerations:

(1) Hallmarks of the Era

Informal spaces, serving as critical vehicles for urban renewal in older districts, essentially embody the materialized accumulation of diachronic behavioral patterns of local residents and businesses. This spontaneously formed spatial morphology, through continuous functional adjustments and morphological evolution, reflects the creative strategies employed by social groups in utilizing spatial resources during the urbanization process. Deconstructing the characteristics of informal spaces within neighborhoods and restoring people's daily living spaces is of significant importance for the preservation of historical districts.

(2) Feasibility

The widespread distribution of informal spaces within old urban blocks presents a dual advantage for research. Firstly, the diversity of spatial types, coupled with the universality of their distribution, ensures the typicality and representativeness of the research sample. Secondly, the explicit characteristics of these spaces, such as the physical forms of self-built structures,

and the implicit characteristics, such as the temporal patterns of place usage, are highly identifiable. This facilitates systematic fieldwork and data collection, laying a foundation for the establishment of a spatial pattern database.

(3) Adaptability

Christopher Alexander's "A Pattern Language" focuses on the spaces of everyday life. While the theoretical framework does not explicitly define the concept of "informal space," its deconstruction of daily life spaces implies a profound understanding of the characteristics of informal space. For example, Alexander emphasizes the value of permeable spatial boundaries: "An ideal street should allow commercial activities to cross the boundaries of the walkway, integrating the interior of the store with the public space through roof coverings, extended displays, and other means[3]." This spatial concept is similar to the spontaneous behaviors in informal spaces, such as shopkeepers displaying goods outside and expanding business boundaries.

This is because informal spaces can be seen as spontaneously constructed everyday living spaces[4]. Whether it is a spontaneously created, functional structure or a gathering place, it meets the daily life needs of the builders on a material or spiritual level. Therefore, focusing on informal space can also find corresponding references in the book. The research can not only draw on specific patterns to identify spatial characteristics, but also reveal the interaction mechanism between informal space and the urban system through pattern relationships.

1.3.2 Research Content

This paper introduces Alexander's pattern language theory, extracting the construction characteristics of informal spaces in neighborhoods from a phenomenological perspective, and ultimately forming a comprehensive application framework to realize the self-organized governance of neighborhoods from the perspective of organic renewal. The entire paper is structured around the research path of "theoretical analysis - current situation diagnosis - model construction - practical verification," and is divided into six chapters:

Chapter 1 elucidates the research background, delineates the research subject, articulates the objectives and significance of the study, defines relevant concepts, reviews pertinent literature, and outlines the research methodology and framework.

Chapter 2 deeply interprets the "space-event" logic and hierarchical network characteristics of Alexander's "A Pattern Language," combines community renewal and pattern language theory application cases in areas such as Turin, Italy, and Manazuru, Japan, and refines the technical chain of "spatial gene identification - pattern language network generation -

scenario translation application," summarizing and proposing a localized adaptation application strategy for pattern language theory.

Chapter 3, through SWOT analysis, reveals the contradictory situation of the Nanhuaxi historical block: "historical texture preservation - social network fragmentation." It extracts the self-organization laws of historical blocks from residential life and production and business informal phenomena, and demonstrates the renewal potential of informal space as a "vitality gene pool."

Chapter 4, based on the classification framework of "composite space pattern language - unit space pattern language - structural pattern language - spatial component pattern language," extracts local patterns according to the "pattern recognition - pattern extraction - pattern deconstruction" method, constructs a pattern language association network through an open source software based on the graph theory (Gephi), and forms an operable tool library of "pattern recognition - language integration - scenario generation," providing a refined design grammar for organic renewal.

Chapter 5 promotes empirical evidence in three phases: "remediation phase – advancement phase – refinement phase." The remediation phase activates historical genes through "water street revival," the advancement phase improves the utilization rate and diversity of public spaces, and the refinement phase carries out public function reshaping, promotes business integration, and improves people's spiritual attachment. The experimental process establishes a co-consultation mechanism of "government – community planners – residents," verifying the effectiveness of pattern language in solving "symbolic protection" and "gentrification crisis."

Chapter 6 provides a comprehensive summary and reflection on the research conducted.

1.4 Conceptual Analysis and Literature Review

This study leverages the latest international research advancements to address domestic research potential and gaps, integrating cutting-edge research trends to achieve practical application of theory. Consequently, the literature review is structured into four main sections:

First, to understand the developmental context of the organic renewal concept, interpreting it from the perspective of self-organization theory to clarify its connotation and methods.

Second, to review interdisciplinary literature on urban informality, comprehensively understanding the role of informality in urban development.

Third, to analyze and synthesize the primary classifications of informal space research both domestically and internationally, comparing different governance strategies in urban renewal to help position the development trends and application directions of informal space.

Fourth, to examine the development and application of pattern language theory in urban design processes across different countries, critically reflecting on the current advantages and limitations of its application, and articulating how it can be adapted to the Chinese context, thereby further establishing the research theme.

1.4.1 A Review of Organic Renewal and Its Related Theories

1.4.1.1 Concept of Organic Renewal

The organic renewal theory originated from Saarinen's "Organic Decentralization" concept, emphasizing the self-organizing nature and dynamic progression of cities as living organisms[6]. Its core essence lies in adopting small-scale, diversified renewal approaches to improve physical environments while preserving social relationships and urban fabric. Key characteristics include holistic nature, continuity, phased implementation, and people-oriented participatory governance[12]. Introduced in China by Prof. Wu Liangyong, this theory focuses on protecting historical contexts and implementing community-based micro-regeneration practices, aiming to balance urban metabolism with socio-economic vitality[21].

1.4.1.2 The Genesis And Evolution of International Organic Renewal Theories

The concept of "organic" originates from architectural circles in Europe and America, with its initial definition stemming from the relationship between nature and architecture, emphasizing that buildings should adhere to the laws of nature[5]. Subsequently, Eliel Saarinen, often regarded as the "father of American modern design," introduced the theory of "organic decentralization" to address the typical urban challenges of the rapid industrial transformation era. This theory posits that the internal operational mechanisms of a metropolis, akin to those

of an organic living entity, can be optimized by establishing semi-independent towns closely linked to the central city. This approach aims to alleviate pressure on the urban core and achieve coordinated regional development[6]. To ensure the concrete implementation of the theoretical framework, he advocated the adoption of a “Dynamic Design” strategy. This approach emphasizes preserving the spatial utility values established through daily life in urban areas, while systematically implementing “organic decentralization” of activity concentration points through deliberate interventions. The vacated spaces would then be repurposed for more appropriate urban functions. Although urban development follows predetermined objectives, the planning process maintains sufficient flexibility. The Organic Decentralization theory integrates the social ideals of the “Garden City” while transcending the extreme dispersal proposed by the “Broadacre City.” By extending urban renewal to examine the relational patterns between human activities and urban spatial organization, it establishes a planning system that harmonizes the amenity characteristics of daily life with the functional order and operational efficiency required by modern urban development.

Contemporaneously, around the end of the 19th century, and inspired by new developments in life science research, German biologist Ernst Haeckel founded ecology, emphasizing the dynamic equilibrium between organisms and their environment. Concurrently, British sociologist Herbert Spencer proposed the "social organism theory," analogizing society to a living organism and suggesting that its development follows evolutionary laws similar to those in the natural world. Both scholars have endeavored to elucidate social phenomena through a biological lens, thereby formulating a natural law process theory[7], The theoretical framework positing that cities evolve from simple, undifferentiated homogeneous systems to complex, differentiated heterogeneous systems, and that urban development should emulate the self-organizing properties of nature, continues to exert a profound influence on contemporary concepts of organic renewal.

The theory of "organic renewal" is an extension of Saarinen's theory of "organic decentralization," and its broader context lies in the social critiques prevalent in developed countries such as the United Kingdom and the United States during the slum clearance movements of the 1950s and 1960s[8]. The widespread disappearance of once-vibrant communities has prompted a re-evaluation of the social functions of cities. It is now argued that urban areas, as human settlements, should be regarded as organic entities, subject to biological processes of metabolism. Consequently, urban decay should be addressed through "revitalization" strategies aimed at improving impaired functions, rather than through crude demolition and reconstruction efforts.

To ensure the concept of the "organic city" transcends mere theoretical abstraction and effectively guides the analysis and resolution of urban challenges, scholars began, after the 1960s, to shift their focus beyond the study of cities' organic spatial forms. They started investigating the intrinsic mechanisms underlying complex, self-organizing urban systems. Christopher Alexander, in "A City Is Not A Tree" (1965), elucidated the disparities in spatial vitality and receptivity between "Natural Cities" and "Artificial Cities." Natural cities exhibit semi-lattice structural characteristics, whereas artificial cities are based on tree structures. The semi-lattice structure is capable of fostering a diversity of connections and structural complexity, thereby enhancing urban vitality and adaptability. Furthermore, drawing upon the generative logic of Pattern Language, He posited that material structures supported by Pattern Language could form a richly layered, continuous, and complete organic urban structure, analogous to the organic growth processes of living organisms[9].

Similarly inspired by the paradigms of life science research, Jacobs introduced the dimension of time into the discourse on urban systems. Although she did not directly employ the term "organic," she posited that "process" is the most essential connotation for a city. She pointed out that social vitality and cultural characteristics are the result of the accumulation of people's collective life in a long and complex temporal process. The repeated failures of modern urban planning stem fundamentally from the misconception that a city is a process, rather than a utopia to be drafted on blueprints[10].

Both the formal structure of the urban physical environment and the operational processes of the socio-economy have led scholars both domestically and internationally to concur that cities possess self-organizing organic characteristics, representing a normal developmental process of social self-renewal. The organic mechanisms of cities originate from the collective actions of human society. Consequently, organic renewal, as a means of constructing organic cities, focuses on people's daily lives while improving the urban physical living environment through a micro-level, diverse, dynamically progressive, and sustainable renewal pathway. It encompasses the participation of various social actors in construction, striving to protect and stimulate the city's social activity relationships and metabolic capacity to the greatest extent possible.

1.4.1.3 Research and Development of Organic Renewal Theory in China

In China, the concept of "organic renewal" was introduced by Mr. Wu Liangyong in the 1990s. It can be summarized as urban construction that should follow the inherent order and laws of the city, conform to the urban fabric, adopt appropriate models and reasonable scales,

properly handle the relationship between the present and the future according to the content and requirements of the renovation, continuously improve the quality of planning and design, explore the renewal and development of the city on the basis of sustainable development, and make the environment of the urban renovation area consistent with the overall urban environment[11]. Building upon this foundation, Dr. Fang conducted a further analysis, positing that "organic renewal should encompass at least three conceptual layers: an organic urban whole, organic cell and tissue relationships, and an organic renewal process." Furthermore, he stipulated seven principles that renewal must satisfy: holism, spontaneity, continuity, phasing, economic viability, human scale, and comprehensive benefits[12]. However, in the subsequent two decades, research on urban organic renewal, from planning to implementation, has become somewhat fragmented. Varying perceptions of the concept of urban "organicity" have, to some extent, led to differing interpretations of the mechanisms and strategies for organic renewal.

Discussions on organic renewal predominantly revolve around the protection and inheritance of the "urban historical context," emphasizing the holistic and phased characteristics inherent in organic renewal[13-14]. In the historical district preservation plan for Tongren Democratic Upper Street in Qinghai, Wu Lian et al. proposed adopting a "cellular organic metabolism, microcirculation-style" protection and renewal method through zoning, classification, or grouping[13]. From the perspective of urban philosophy, Qiang Naishe pointed out that the key to solving urban integration and metropolitan area problems lies in recognizing the organic dialectical relationship between intercity, interpersonal, and urban-human interactions[14].

Furthermore, some studies consider "people-oriented" approaches as the core essence of organic renewal, emphasizing that organic renewal should take the community as the basic unit and create a humane living environment from the bottom up, based on human behavior and feelings[15-16]. Yang Jianqiang and his team discuss urban renewal aimed at enhancing spatial quality, and emphasize the establishment of a "people-oriented" value system for renewal objectives and advocating for a gradual, "acupuncture-like activation" approach to urban regeneration and repair[17]. Concurrently, a significant body of research is focused on the sustainable development of ecological and social resources within urban environments, emphasizing the organic integration of humanity and nature in rural settlements[8].

Under the current context of the stock era, the concept of organic renewal - which views cities as self-organizing complex systems and emphasizes the coordinated improvement of both the physical environment and social life – has begun to attract significant attention. Wu Jiang systematically articulated the principles of urban organic renewal and refined governance,

emphasizing that urban vitality thrives only by respecting the evolutionary logic of urban development and meticulously responding to subtle changes in urban growth[18]. Huang Ling and her research team explored the application of community spatial-cultural structural concepts in neighborhood renewal planning through a case study of Qixinggang Street in Yuzhong District, Chongqing[19]. Mao Mingrui and his team investigated intelligent community governance models within the organic renewal framework[20]. These studies collectively provide pathways and methodologies for implementing refined urban governance in the context of organic renewal.

In summary, much of the work to date has remained at the level of considering "organic renewal" as a visionary objective, with significant challenges in translating this into clear and effective concrete actions. To better implement the practice of organic renewal, people need to return to the principles of urban organic mechanisms. Scholars such as Tong Ming have proposed two important considerations: (1) constructing micro-diverse organic spaces through tactical spatial operations; (2) promoting a gradual and sustainable organic process through strategic temporal tactics[21]. Organic renewal not only implies a greater focus on the minutiae of daily life when addressing urban spatial issues, but also emphasizes the establishment of a holistic institutional framework. This framework should ensure that the urban system is fully participatory, enabling every micro-individual living in the city to engage constructively in shaping the overall environment.

1.4.2 Relevant Research on Urban Informality

1.4.2.1 Concept of Urban Informality

Currently, there is no universally accepted definition of urban informality. In its narrowest sense, "informality" generally refers to "informal employment and informal human settlements[22]." In recent years, a broader definition of "informality" encompasses: From a legal standpoint, informality is regarded as the antithesis of state laws, regulations, and policies—the fundamental distinction from formality lies in its adherence, or lack thereof, to legal or regulatory frameworks[23]; From the perspective of the planning process, informality is regarded as the absence of formal planning controls, design, and construction[24].

In translating from English to Chinese, the term "informal" can be rendered as either "非正式" (fēi zhèngshì, non-official) or "非正规" (fēi zhèngguī, non-standard). This translation choice is not merely a straightforward semantic conversion, but rather corresponds to a paradigm shift in research methodology. While both convey characteristics such as bottom-up approaches, unofficial status, lack of planning, freedom, and absence of restrictions, some

research reveals both overlap and distinct differences. Chinese scholars like Long Yuan, Chen Yingfang, Xu Miao, and Huang Gengzhi have translated it as "非正规", focusing their research on settlements with large-scale, collective, established violations and traceable characteristics, such as peri-urban areas, urban villages, and the unauthorized use of public spaces like street vendors. In other scholarly research, the definition is reconceptualized through translation as "非正式" to encompass urban spaces that resist categorization while manifesting concealed, liminal, or ambiguous characteristics[25]. Informality ("非正式性") concentrates on the spontaneous, temporary, and non-institutionalized modes of spatial utilization by residents, distinguishing itself from informality ("非正规性"), which places greater emphasis on systemic institutional deficiencies, such as those found in informal settlements or economies.

The decision to translate it as "informal (非正式性)" stems from the rapid societal development, the enhancement of material living standards, and the strengthening of individual self-awareness. Contemporary informal phenomena are transitioning from large-scale, collective, and overtly non-compliant behaviors to smaller, less definable, and legally ambiguous actions, such as community spontaneous gardens, street art display corners, mobile seating installations, and resident-constructed pavilions[41]. This paper aims to expand the scope of research beyond the examination of legal and regulatory frameworks governing behavior and space, to include those everyday activities and spaces that elude precise definition. It seeks to thoroughly explore the spontaneity inherent in community building, extracting the material and social spatial characteristics of neighborhoods. The "informality" studied in this paper can be defined as dynamic practices characterized by concealment, liminality, and ambiguity, which emerge as individuals or groups navigate and transcend established institutional frameworks through self-organization within the urbanization process. Its core characteristics include:

(1) Legal Dimension: Navigating the gray area between explicit legal prohibitions and tacit tolerance; (2) Spatial Dimension: The spontaneous production of space that transcends planning controls, such as street usage methods not defined by regulatory texts; (3) Behavioral Dimension: Shifting from overt collective violations to micro-level everyday practices, such as the temporary occupation of spaces where legal boundaries are ambiguous; (4) Social Dimension: Supporting citizen-initiated networks of community relationships.

While both "非正规" and "非正式" are strategically employed in the literature review to align with prevailing translation conventions, the designation "非正式" is systematically

adopted throughout subsequent analyses. Below is a synthesis of value judgments on urban informality from the perspectives of architecture, urban and rural planning, urban design, and sociology.

1.4.2.2 The Value Assessment of Urban Informality

In the architectural domain, user self-organized behavior is of critical value in constructing the functional integrity of architectural spaces. In "Architecture Without Architects," Rudofsky elucidates that enduring architectural forms are not conceived by a select cadre of elites or specialists. Instead, they emerge from the collective, spontaneous, and sustained creative endeavors of communities sharing common cultural traditions, shaped by their shared experiential knowledge[26]. Pritzker Prize winner Aravena's award-winning work, "Incomplete Buildings," articulates the concept that architects should not aim for absolute completion in their designs. Instead, they should intentionally leave room for residents to actively participate in the gradual refinement of their spatial environments.

In the realms of urban and rural planning and urban design, bottom-up urban regeneration can compensate for the limitations inherent in top-down urban planning approaches. Camillo Sitte, in "City Planning According to Artistic Principles," opposed the technocratic urban order of Vienna, lauding the "folk art" order that emerged from the bottom-up development of medieval squares. Similarly, Christopher Alexander, in "A New Theory of Urban Design," critiqued top-down, blueprint-style planning, advocating for a gradual, small-scale approach integrated with bottom-up methodologies in urban planning. Furthermore, Pereira asserts, "The spaces created by the vulnerable within the margins and fissures of formal society cannot entirely supplant hegemonic spatial narratives, but their existence serves to localize and contextualize these narratives." Acts of rebellion are not isolated occurrences; rather, they are frequently intertwined with formal systems, rendering spatial separation virtually impossible[27]. Scholars of everyday urbanism also emphasize the use value of space in daily life, advocating for the encouragement of flexible modification and utilization practices of the urban built environment by individuals[28-29].

From a sociological standpoint, informal urban spaces possess numerous latent values across social, psychological, and economic dimensions. Regarding psychological utilization, individuals exhibit distinct psychological preferences for informal spaces, including a sense of security and place attachment. In "The Death and Life of Great American Cities," Jane Jacobs critiques the presumptuous planning ideologies of government and elite circles. She champions the self-organized spaces created by citizens, which foster social connections, enhance street

vitality, and resolve many latent urban issues[10]. An empirical assessment of Copenhagen's Superkilen Urban Park, conducted by the University of Melbourne, reveals that non-programmatic zones paradoxically empower users to appropriate the space and foster interaction. The study indicates that genuine intercultural exchange is effectively promoted through quotidian sharing and communality[30]. To a certain extent, the non-definitive nature of spatial functions holds positive communicative significance. Having conducted extensive research across more than twenty countries spanning five continents, Doug Saunders observed that while urban informality may initially present challenges such as disorder and inadequate sanitation, it paradoxically offers vital opportunities for rural migrants to establish themselves in cities. Embracing and coexisting with this phenomenon holds the potential to cultivate a new middle class, alleviate rural poverty and underdevelopment, and ultimately eradicate social inequalities[31]. Lefebvre's descriptions of "product" and "work" characterize formality versus informality, where formal space, akin to a "product," is the result of standardized, mechanically controlled processes. Informal space, resembling a "work," is created through the intricate coordination of "hand, eye, and brain" by actors during the process, imbued with artistic and creative forms. Informal space production, though characterized by its gradual, differentiated, and decentralized nature, effectively caters to the needs of its users, transforming otherwise impersonal physical environments into vibrant and emotionally resonant social spaces[32].

Through synthesizing interdisciplinary research findings on informality, the study argues that urban informality extends beyond mere regulatory noncompliance. The analysis reveals its multifaceted impacts, including contributions to architectural spatial integrity, critiques of urban planning limitations, influences on crowd psychology, and enhancements to social cohesion. The research advocates for a dualistic framework to understand urban informality, recognizing both its constructive and disruptive dimensions within urban systems. The evolution from "adversarial informality (fēi zhèngguī, non-standard)" to "negotiated informality (fēi zhèngshì, non-official)" within the context of China. At the same time, these characteristics also reflect that it is not only a product of urban complexity, but also tactically promotes urban organic renewal — constructing micro-diverse organic spaces. Urban organic space is not only determined by upper-level planners or planners, but also requires public participation. On the one hand, informal behavior is a direct means for the public to participate in urban transformation. Residents' bottom-up informal practices mobilize the self-organizing ability of the urban system and fill institutional gaps. Second, informality breaks the dogma of zoning in space, promotes spatial innovation, helps incubate new urban forms, and enhances urban

diversity.

However, some scholars argue that the "informal" socio-economic activities spontaneously and unorganizedly carried out by different residents and collectives, and their reflection in the urban built environment, not only demonstrate the diverse and vibrant aspects of the city, but also reveal the chaotic and unregulated aspects of urban development[33]. Therefore, correct guidance and assistance at the social level is essential.

1.4.3 Research Concerning the Governance of Informal Urban Spaces

1.4.3.1 Concept of Informal Urban Spaces

Urban informal spaces are dynamic spatial types spontaneously formed and utilized by residents, encompassing informal housing settlements, mobile vendor clusters, unofficial street utilization, and community gardening areas[25]. Their core characteristics manifest as flexibility, temporality, and social embeddedness, typically exhibiting legally tolerated gray-area uses and bottom-up spatial innovations[60]. Significant divergences exist in governance approaches internationally: Western nations emphasize standardized guidance through institutional frameworks[37-38], while China explores innovative practices such as designated vending zones and community co-governance mechanisms, aiming to strike a balance between regulatory order and social inclusion[41, 49].

1.4.3.2 Informal Urban Spaces and Governance

A search of the China National Knowledge Infrastructure (CNKI) using the subject term "informal space" reveals only 211 core journal articles and doctoral dissertations published since 2002, with 136 of these pertaining to architectural science and engineering. A search for "informal governance" yields 790 articles. In contrast, a Web of Science search for English literature using the subject term "informal space" identifies 5,308 articles since 1996, while "informal governance" returns 4,848 articles. This stark contrast between domestic and international research indicates that, although the significance of urban informality is acknowledged in Chinese cities, research on informal space and its related applications still lags behind.

Furthermore, scholarly investigations into informal spaces, both domestically and internationally, have predominantly concentrated on specific regions or typologies. Regionally, the focus has been on informal settlements in developing nations, such as slums and shantytowns in Latin America and South Asia. Current domestic research tends to emphasize urban villages and demolition communities. There is a relative paucity of typological analyses and renewal studies pertaining to informal spaces within historical districts or older

communities. A search using the terms "informal (or non-formal) historical districts" and "informal (or non-formal) old districts" reveals a mere 41 core journal articles and doctoral dissertations published since 2012. The examination of CNKI indicates that informal spaces in historical districts exhibit distinct characteristics, representing an accumulation of traditional culture and the living habits of local residents. These spaces possess research value and are of significant importance for the preservation and development of historical districts.

Table 1-1 Research on the value of informal spaces in Historic Districts

	Title / Date	Author / Source	Central Thesis	Research Focus	Field of Study
1	"Research on Spatial Optimization of Guangzhou Old City Neighbourhood Commercial Streets Space the Perspective of Daily Life " / 2021	Zhang Zhen / South China University of Technology doctoral dissertation	The primary aim is to optimize market spaces in Guangzhou's old city, balancing traditional lifestyles with modern needs. By examining the interaction between these spaces and residents' daily activities, the goal is to enhance their cultural significance and functionality, leading to the organic renewal of the old city.	Urban market spaces are highlighted as essential to residents' daily lives, using both quantitative and qualitative methods to explore their historical development, spatial features, and connection to resident behaviors. The article recognizes the cultural significance of informal spaces, with traditional lifestyles and spontaneous activities being crucial to maintaining market vibrancy.	Urban Planning
2	"From Management to Governance —— The Role of Government in Historical Block Conservation" / 2014	He Yi, Deng Wei / Urban Planning Forum	The transition of governmental functions from traditional "management" to modern "governance" is examined, focusing on role adjustments in preserving and renewing urban historic districts. Emphasis is on promoting a shift from large-scale, one-time renewal to a sustainable development model characterized by small-scale, incremental, and multi-stakeholder collaboration, within the framework of limited, collaborative, and service-oriented functions.	The article, while focusing on transformations in governmental functions, case studies, and governance model theories, argues that preserving the "continuity of life" requires respecting residents' spontaneous evolution. It highlights the importance of informal spaces in maintaining the vitality of historic neighborhoods.	Urban Planning
3	"The Study of Community Tourism Empowerment —— Analysis Based on Three Historic Districts in Shandong Province" / 2012	Zhang Yan / Shandong University doctoral dissertation	Exploring strategies to enhance sustainable tourism development in historic districts by empowering community residents, addressing the dichotomy between preservation and development of urban historical areas, and ultimately achieving a synergistic advancement of heritage conservation, tourism development, and community interests.	The paper examines case studies from three historical districts in Shandong Province, emphasizing formal institutional frameworks and policy design. It highlights the resolution of insufficient community engagement through a systematic empowerment model, while implicitly acknowledging community autonomy within informal spaces.	Specialized History

Source: literature[34-36]

The research focuses particularly on typical informal phenomena, such as informal streets, mobile vendors, and urban gardening. Researchers have categorized the modes of intervention in informal spaces through typological analysis, identifying seven primary types: new construction, expansion, reconstruction, parasitism, integration, transgression, and appropriation[25]. Subsequently, in conjunction with the research content of this paper, several types of informal spaces will be selected to comparatively analyze different governance strategies both domestically and internationally, and explore the development trends and application directions of informal spaces.

(1) Informal streets

Informal streets encompass a variety of unregulated activities within the street space, such as storefronts with unauthorized signage and encroachment, itinerant vendors, and street performers exhibiting without permits. Governance models for informal street spaces are quite diverse in international contexts. The Tokyo Metropolitan Urban Planning Council has

established comprehensive design guidelines for storefront signage, encompassing specifications for typography, color palettes, forms, and dimensions. These guidelines ensure the formal aesthetics of the overall environment while affording shop owners a degree of creative latitude[35]. In Melbourne's urban management, detailed regulations have been established for the operation of mobile food trucks, encompassing aspects from the design and safety of the vehicles and the scope of food sales to the operational area and hours, to effectively coordinate the interests of all stakeholders and strive to maximize public benefits[38]. In Lyon, France, authorities have delineated specific zones and timeframes wherein cross-store operations are permissible, allowing merchants to independently determine the necessity of external displays based on market-driven pricing.

Within China, numerous practical explorations have been undertaken to govern informal street spaces. In response to the frequent disturbances caused by plaza dancing in residential streets, governance principles that emphasize reasonable zoning, public decision-making, and ease of management are proposed[39]. Gao Huizhi suggests that governance of informal spaces should be based on mechanisms tailored to the distinct attributes of each street. For streets with strong public characteristics, the increase in development rights should be minimized during regulation or formalization by measures such as reducing land rent, subsidizing management fees, and awarding additional floor area ratio. In contrast to streets with strong marketability, governance methods should be implemented to recover the added value of development rights through means such as collecting land rent and imposing public service responsibilities[41].

(2) Mobile vendors

Informal vendors are a quintessential representation of irregular spaces, and while various nations have amassed considerable governance experience, the approaches to managing them differ due to variations in systems and objectives. In developing nations, the informal economy, largely composed of itinerant vendors, constitutes a significant component of daily income. Governance strategies primarily involve protection and de-congestion, such as providing or designating fixed locations or time slots for business operations. Additionally, the establishment of vendor unions allows for the articulation of policy demands to the government and the safeguarding of individual rights[42]. Singapore's approach to managing itinerant vendors is notably distinct. On one hand, it leverages the unique characteristics of these vendors to create marketplaces and competitions, transforming them into urban icons that attract both domestic and international tourists. On the other hand, it continuously raises the standards for vendors by issuing operating licenses, ensuring that only those who pass the qualification review are

permitted to operate, while imposing severe penalties on those who violate the regulations[43]. Given the significant disparities in urban development across China, the approaches to managing mobile vendors vary considerably. Scholars such as Huang Gengzhi and Xue Desheng have dedicated extensive research to mobile vendors in Guangzhou. By investigating the spatial distribution and behavioral patterns of these vendors, they have proposed the establishment of designated zones in areas with frequent vendor activity, such as near medical, health, or educational facilities[44].

(3) Informal Planting Zone

Informal cultivation zones refer to urban gardening activities, such as vegetable and flower cultivation, undertaken by residents utilizing vacant, underutilized, or residual urban green spaces. Scholarly research indicates that urban horticulture, influenced by individual aesthetics and preferences, results in highly fragmented spatial usage and significant variations in landscape character[45]. Some scholars advocate for the refinement of the planning system at the planning level, the provision of dedicated horticultural spaces, and the establishment of garden self-governance organizations. These organizations would be led by representatives responsible for bidirectional communication, with experts appointed to provide horticultural guidance to prevent environmental damage from improper use. Additionally, they suggest increasing penalties to deter repeat violations[46]. By transforming neglected roadside green spaces into innovative urban farms, the Clover House project has successfully engaged diverse stakeholders, including local residents, in cultivating collaboratively managed community gardens, thereby addressing and mitigating the disorderly phenomenon of unauthorized private cultivation within the community[40].

These governance methods reveal that incorporating multi-stakeholder consultations and integrating diverse needs into spatial design and management rules can serve as a solution to mitigate the adverse effects of informal activities. Contemporary informal phenomena exhibiting characteristics such as spontaneity, improvisation, openness, fluidity, temporality, flexibility, and creativity. The actors involved have shifted from those at the lower rungs of society, urban migrants, and vulnerable groups to a broader spectrum of urban residents, shopkeepers, artists, and creative entities[47]. The former typically seek opportunities for survival in the city based on fundamental needs, while the latter actively explore the city, driven by the desire for a better quality of life[48]. Consequently, some scholars argue for a direct acknowledgment of the roles informal spaces play in both social relations and the physical environment. Furthermore, they advocate for a shift in governance perspective from ex-post

management, which addresses outcomes, to a source-oriented governance that focuses on antecedents[25]. This involves guiding the public's widespread informal behaviors and activities, enabling their participation in informal ways, and fostering the organic development of the city[25]. In response to such perspectives, the case of Wuyue Village in Pantang, Guangzhou, illustrates how community planners, acting as informal governance agents, foster collaborative initiatives rooted in place-making[49]. This involves a dual dynamic: first, a top-down process of community empowerment, and second, a bottom-up process of community collaboration. However, the study also suggests that the current community management mechanisms and governance systems need improvement, particularly in promoting community participation to shift from superficial involvement, such as voting schemes and expressing opinions, towards deeper engagement involving shared funding and autonomous renovation[49]. This necessitates the incorporation of novel technologies and methodologies.

1.4.4 Domestic and International Research on the Application of Pattern Language Theory

1.4.4.1 Concept of Pattern Language

The Pattern Language Theory, proposed by Christopher Alexander, establishes a universal vocabulary for urban design through 253 patterns that emphasize the correlation between spatial structures and behavioral events[3]. Its core lies in hierarchical and interlocking pattern combinations, generating complex but organic urban forms through self-organizing logic[51]. The theory aims to provide human-centered and replicable design solutions for towns, buildings, and constructions. Domestic research primarily focuses on theoretical interpretation and adaptation, while the systematic construction of urban regeneration methodologies still requires further investigation and empirical case studies[56].

1.4.4.2 Developmental Context

In the aftermath of World War II, Western cities faced an urgent need for reconstruction. Modernist urban planning, driven by functionalism and technical rationality, rapidly transformed urban landscapes. However, this approach's abstract rationality often overlooked human experiences and social contexts, tending to erase local distinctions. By the 1960s and 1970s, critiques of modernism's homogenizing effects intensified, with scholars and practitioners advocating for a return to human-scale design and a sense of place. Jane Jacobs, in The Death and Life of Great American Cities (1961), emphasized the importance of street vitality and incremental growth, while Kevin Lynch's The Image of the City (1960) explored cognitive imagery and urban vitality. These perspectives directly influenced Christopher

Alexander's pattern language theory[89]. Alexander consistently distinguished between "designing" buildings or urban spaces and "fabricating" them through alternative means. Starting with "A City is Not a Tree," Alexander identified the challenge facing urban designers and planners: how to "make" rather than "design" buildings or urban places, and attempted to address the feasibility of "making" the complexity of the city[50], Subsequently, "A Pattern Language: Towns, Buildings, Construction" was published in 1977. This monumental work, which explores the language of everyday living spaces, reveals the structure and rules of the built environment by observing and documenting the universal patterns of interaction between human bodies and space that recur in daily life, seeking to create a living structure for the environment. The 253 pattern languages detailed in the book serve both as snapshots of everyday life and as the foundational elements for creating and interpreting environments[3]. "The Timeless Way of Building," on the other hand, offers the theory and guidance for the use of language, addressing the issue of how to generate linked, overlapping urban structures[51]. In the 1960s and 1970s, movements advocating for democratic participation, community rights, and environmental awareness gained momentum, emphasizing the importance of ordinary individuals' perception and involvement in shaping their environments. Christopher Alexander believed that "ordinary people should design their own environments," rather than leaving such decisions solely to experts. In summation, pattern language serves as an efficacious instrument, interlinking the utilization of space with the physical morphology of urban environments, thereby establishing a collection of vitality genes and holistic principles that closely approximate the environment. Concurrently, it transmutes research findings into the lexicon of designers, employing a "problem-solution" approach to pinpoint key areas during the design phase. This constitutes an effective means of fostering communication among designers and inviting laypersons to partake in the design process.

Table 1-2 The evolution and development of Alexandrian scholarly thought

Period	Principal publications	Research Focus
Formative Stage （1954 - 1966）	"A City is Not a Tree" / 1965	Addressing architectural design challenges through the application of systems-theoretic knowledge.
Maturity Stage （1966 - 1977）	"The Oregon Experiment" / 1975 "A Pattern Language" / 1977 "The Timeless Way of Building" / 1979	Employing the "pattern language" design methodology to critically examine the design processes and methods of modern architecture, as well as the disconnect between design and everyday life.
Development Stage （1977 - present）	"The Nature of Order" (Books 1-4)	The collation and application of preliminary theoretical achievements, providing a foundation for his theoretical framework.

Source: compiled and illustrated from relevant literature[3, 9, 51, 52]

1.4.4.3 A Comparative Analysis of Scholarly Research Across Different Nations

In subsequent new construction projects, such as those at the University of Oregon and Higashi Tokyo Denen Chofu High School, Alexander attempted to apply pattern language theory. Although his aspirations were not fully realized, this initiated academic discussions on the application of the theory and raised the question of the extent to which complex design is feasible. The following study of how scholars from different countries use pattern languages will help us understand the strategies and methods of designing for urban complexity.

Beyond Alexander's foundational discourse on the origins of pattern language theory, subsequent scholarly investigations into its application have concentrated on vernacular architecture, all objects within the built environment, and public engagement. These studies underscore the paramount importance of pattern language's overlapping, interlocking, clustered, and hierarchical nature. Nikos A. Salingaros, who collaborated with Alexander on "The Nature of Order," focuses on social housing and community involvement, advocating for sustainable urban development through bottom-up design methodologies. Inspired by Christopher Alexander, Salingaros posits that pattern languages necessitate the formation of systems through internal and external connectivity, rather than existing as isolated rules. This perspective addresses the concerns of some architects who perceive pattern description as an incomplete method, insofar as they fail to apply patterns in concert. While patterns are components of a design system, their integration must adhere to supplementary principles[53]. Professor Stephen Marshall at UCL in the United Kingdom organizes his students to apply pattern language theory in the design process. They adopted pattern language theory as a central

method for understanding the components and relationships of urban morphology, and they attempted to use pattern language as a generator of urban form to overcome the cognitive constraints of designers[54]. The students' design processes similarly demonstrated the overlapping and interlocking characteristics of pattern languages. Integrating pattern language theory, Professor Marshall also proposed the "Streets and Patterns" theory, which transcends the traditional dichotomy of urban streets. Simultaneously, it emphasizes the realization of synergy between function and form through design specifications, such as street cross-section design and road network density adjustment[55].

European scholars have similarly contributed to this discourse, focusing their application of pattern language theory on human behavior and the processes inherent in urban design. They translate research findings into a design language specifically purposed for urban design applications. For instance, scholars in the Netherlands and Italy have researched and developed design languages grounded in local conditions and design challenges[56-57]. They engage the public to extract individual patterns, contemplate solutions, leverage interdisciplinary knowledge to realize single pattern clusters, and further test how existing patterns generate new ones and how new patterns evolve[56-57]. These studies offer insights into circumventing the limitations of pattern language theory and realizing Alexander's vision of overlapping, interlocking patterns and urban self-organization.

Pattern language theory not only describes spatial characteristics by linking physical space with patterns of behavior—clarifying long-neglected “tacit knowledge” and elevating folk wisdom and intuitive experience into a communicable design language—but it also provides an overlapping application framework. This framework offers tactical and strategic support for organic urban renewal through a participatory approach that allows everyone to be involved. In The Oregon Experiment, Alexander proposes that cities should grow organically through “small-scale, incremental, and sustainable” projects rather than large developments, an idea that aligns with many contemporary concepts of organic urban renewal. However, Alexander’s pattern language has also encountered numerous questions and critiques from scholars.

At the theoretical and methodological level, the first issue is its singular worldview. Alexander firmly believes in the existence of a universal objective aesthetic standard (the "Quality without a Name" mentioned in The Timeless Way of Building) as a criterion for judging some environments superior to others[89]. Critics point out that human values vary with culture and individual experience, and Alexander' s assumption that everyone responds identically to a given space overlooks the pluralistic and subjective nature of these values[89].

Secondly, the pattern language is criticized as being overly romantic. Alexander depicts an idealized lifestyle characterized by comfort, leisure, a strong sense of community, and freedom from external constraints as the setting for his patterns[89]. This vision is overly idyllic, scarcely considering the many social, political, and economic constraints present in the real world[89]. Critics argue that such a romanticized perspective leads Alexander to dismiss realities that do not meet his ideal. This dogmatic stance makes his theory less inclusive and even reflects a degree of bourgeois complacency[58]. Another critique targets a Western-centric bias. Although Alexander claims the pattern language is universal, almost all the "good environment" examples in his books are drawn from Western traditions—such as small medieval European towns or his own design projects in Europe and America[89]. Researchers note that because his aesthetic ideal pays little attention to non-Western contexts, the pattern language harbors an implicit Western-centric bias and fails to fully consider the diverse aesthetics and spatial practices of different cultures[89]. On this point, Alexander' s own statements are somewhat contradictory. In the preface to A Pattern Language, he writes that the book is only "one possible pattern language," encouraging readers to improve or create new patterns, yet he also asserts that "every vibrant society has its own unique pattern language"[89]. This suggests plural possibilities but at the same time implies that each healthy society should have a single unified pattern language. If patterns are divorced from their specific context, they may not be applicable anywhere in the world[56]. Such ambiguity further calls into question the claimed universality of his theory.

Beyond theoretical debates, pattern language faces practical challenges. Alexander' s ideal design process relies on pattern language and community participation to reconcile and integrate diverse interests, thereby creating spaces imbued with "overall life force" (holistic vitality). Critics point out, however, that his approach deliberately sidesteps real-world institutional and economic constraints, attempting to "bypass" entrenched power structures and reconstruct the design process in an idealized context[91]. Some scholars have attempted to develop a "local pattern language" to improve designs in China' s urban villages, but the results have been modest, indicating that further context-specific adaptation and additional case studies are needed[62]. This suggests that while pattern language provides a valuable conceptual framework for participatory design, it cannot be transplanted wholesale without regard to specific context; otherwise, its practicality and effectiveness are greatly diminished[62]. Ultimately, Alexander' s contribution may lie not in a fixed catalog of patterns that can directly remake cities, but in offering a broad theoretical foundation for creating more humanistic and vibrant urban environments[91]. For example, Cai Jiaxiu contends that the pattern language approach' s chief contribution is the methodology itself: it shows how to bridge research and

design, and how to facilitate communication between professionals and laypeople. Alexander's patterns provide a starting point for non-experts or designers to develop their own context-based patterns[56]. She also emphasizes that patterns should not be used merely as a static list; equal attention must be given to the connections between patterns. Linking patterns as a set offers insight into the methodology and allows individual patterns to be added or replaced at any time[56]. Furthermore, other scholars note that with advances in decision-making theory and methods, pattern language can be applied to contemporary urban planning issues, since patterns enable intra-disciplinary discussion, encompass the two key dimensions of planning—decision and design—and provide a direct paradigm for designers and builders[57].

1.4.4.4 Applicability in China and Principles of Amendment

In Asia, Japanese scholars have successfully applied pattern language theory to urban regeneration projects following the 2011 earthquake and tsunami, providing guidance for practical implementation[56]. However, the systematic application of pattern language theory at the urban level in China remains relatively limited. Since the translation and introduction of Christopher Alexander's book, there has been little further reflection or research on its application. A search of CNKI using the subject term "pattern language" reveals that most studies are in the fields of linguistics, literature, and computer science. Among architectural core journals and doctoral dissertations, a total of 207 articles primarily focus on the analysis and evaluation of the theory, as well as using the theory as a lens to translate regional genes such as spatial patterns and human behavior, expanding the local architectural pattern vocabulary. The theory was selectively adopted, with the process of community empowerment largely overlooked. Only a few articles discuss the comprehensive application of the theory and conduct case studies. Further research is urgently needed to supplement this gap. As documented in the literature: [59-62].

Table 1-3 Current status of comprehensive application of Pattern Language Theory in China

	Title / Date	Author	Central Thesis	Research Focus	Reflection	Type
1	"Pattern Language of Accessible Communitiesand Application to Community Planning" / 2024	Cai Jiaxiu, Liu Kun, Sun Jichen, Fu Yicheng	The paper focuses on developing a methodological framework for creating barrier-free community model languages in the context of human-centered new urbanization, with the goal of enhancing inclusivity in aging societies and elevating urban civilization.	The research centers on utilizing "pattern language" to improve participatory planning practices, thereby enhancing public engagement and addressing community-level accessibility issues. It underscores the importance of validating the technical adaptability and social efficacy of pattern language.	By integrating additional accessible community renovation projects, we aim to continuously refine and evaluate the language of accessible community models, with the objective of developing a more robust and universally applicable toolkit for accessible design.	Aging residential area
2	"A Preliminary Exploration of the pattern language Constructed by"Supplementary Space"_Take the Tea Village in Xihu District, Hangzhou as an example" / 2022	Jin Ying	Interpreting Alexander's pattern language theory, the exploration of spatial classification methods within "A Pattern Language" is analyzed. Selected pattern languages serve as a foundation to systematically study and organize the experiential "supplementary spaces" autonomously constructed by villagers in tea villages. This effort aims to develop spatial design pattern languages applicable to villagers during "supplementary" construction, addressing issues in urban villages.	Extract the "supplementary narrative space" pattern language of urban villages and guide its micro-level application.	By refining the self-construction mechanisms of villagers, a controlled spontaneous evolution can be achieved, resulting in an organic village layout. However, this approach is not applicable to more intricate urban environmental scenarios.	Urban village
3	"Research of Planning and Design of Country Park Based on PatternLanguage--A Case Study of Hangzhou Sanjianghui Country Park" / 2021	Yu Xixuan	The paper utilizes landscape pattern language to explore the conflict between ecological conservation and vernacular landscape preservation in suburban parks during urbanization. It suggests creating a "vernacular landscape schematic language system" to achieve ecological restoration, express regional character, and integrate recreational functions.	The research aims to create a schematic language system based on vernacular landscape features like topography, vegetation, and settlements. It formulates a technical framework of "element analysis-schematic induction-spatial translation" to convert regional cultural symbols into a reusable design language, bridging the gap between ecological conservation and cultural expression in traditional planning.	Researchers primarily depend on subjective judgment when choosing their sample space and summarizing core characteristics, often lacking precise quantitative analysis.	Rural landscape
4	"The public space of participatory design pattern" / 2011	Qian Ying, Su Qingdong	The paper examines participatory development theory in anthropology alongside Alexander's "Pattern Language" as its foundational framework. It explores how these theories can challenge conventional top-down design paradigms in public space design by emphasizing the involvement of user groups in decision-making and implementation processes. This approach aims to balance "empowerment" and "demand-driven" strategies. The primary focus is on validating the adaptability and effectiveness of participatory design in complex socio-cultural contexts through localized experiments, thereby advancing spatial design from "expert-led" to "public co-creation."	The methodology centers on standardizing participatory design processes through "behavioral research-spatial annotation-collaborative design." This approach combines quantitative and qualitative analyses, including surveys and behavior trajectory recordings, to systematically incorporate user needs into spatial planning. Simultaneously, universal design principles for community public spaces are extracted using "pattern language" and transformed into actionable guidelines that balance professional guidance with public comprehensibility.	The focus is on documenting public engagement models and small-scale design experiments, with no mention of strategies applicable to larger scales.	Urban village

Source: compiled and illustrated from relevant literature[59-62]

Although the application of this theory in Chinese urban design is still in its nascent stages, scholars have indicated its suitability for China. Firstly, the organic renewal of Chinese cities requires a method that can withstand flexibility while also fostering the emergence of new elements; pattern language offers a feedback loop mechanism. Secondly, individual patterns can aid in constructing and understanding the complexities of Chinese cities. Finally, the efficient communication capabilities of the pattern language approach can effectively mediate the intricate web of stakeholders in China[56]. However, it is crucial to note the importance of coordinating institutions and mechanisms during the theoretical application, particularly for projects involving old neighborhoods and shantytowns. Western self-organization models emphasize clear property rights and public participation. Chinese historical districts often face issues such as ambiguous property rights and multi-party interest games. Direct application of Western theories can easily lead to maladaptation. The differences in property rights systems between Chinese and Western communities are shown in Table 1-4.

Table 1-4 Community ownership systems in China and abroad

	A Comparative Analysis of Property Rights Systems
Chinese Community	In historical districts, the prevalence of "public housing privately leased" or "multiple households per residence" arrangements results in intricate property rights and diverse community structures. Spatial quality is also a critical issue that warrants attention when studying informal residential spaces in China[63].
Western Community	In countries across Latin America and South Asia, where slums are concentrated, land is predominantly privately owned. Consequently, a crucial pathway to formalizing informal settlements lies in legalizing and privatizing the land on which these slums are situated[64].

Source: compiled and illustrated from relevant literature[63-64]

In this regard, relevant studies can provide us with certain localized principles for reference. First, it is essential to account for the dynamic nature of property rights. For instance, "micro-property rights agreements" could be implemented to harmonize interests among multiple stakeholders while enabling flexible circulation of usage rights through institutional innovation[25]. Secondly, there is a transition towards a "collaborative" community-based informal governance action model. The aforementioned urban renewal of Guangzhou's Pantang Wuyue Community, facilitated by a "community planner-resident" collaborative mechanism, has cultivated two distinct models under the aegis of the community planner: "inward-linking collaboration" and "outward-acquiring empowerment." This provides a fertile ground for the localization of pattern language theory[49]. Thirdly, the existence of flexible boundaries must be permitted. Spatial functions can be dynamically adjusted according to demand, avoiding rigid functional zoning. For instance, the establishment of informal space guidelines could restrict the temporal parameters of outdoor vending zones, thereby achieving equilibrium between regulatory order and urban vitality[44].

In conclusion, the use of pattern language circumvents the long, arduous, non-linear, and incremental process traditionally required to create a "traditional" urban structure, offering a means to craft a new, potentially traditionally styled urban "fabric" that is far more nuanced than a mere "cut-and-paste" replication of historical elements or their mechanical reproduction on a sewing machine. This approach serves as a constant reminder to respect the organic evolution of urban form and to avoid imposing uniform, standardized redevelopment. Furthermore, pattern language is well-suited to the needs of organic urban renewal in China, and its rich understanding of complex cities can be applied to the study of informal spaces. However, the appropriate perspective on pattern language theory is to regard it as a design tool and a mode of thinking rather than a panacea for all urban economic or legal issues; instead, it should be seen as an ideal frame of reference that provides inspiration for what constitutes a

"good city" or "good community." On this basis, a localized pattern language in China can be distilled. At the same time, emphasis should be placed on cultivating community capacity and institutionalizing resident participation, efforts reliant on holistic spatial design patterns, in order to reinvigorate pattern language theory within the Chinese context. Although Alexander's pattern language theory is adopted here as a solution to urban problems, the focus of this work is not limited to using the theory to catalog and analyze informal block-level spaces to form a reusable spatial design language; it also strives to develop a comprehensive design approach characterized by overlapping and interlocking conceptual and spatial elements, thereby facilitating effective communication among stakeholders in the process of organic urban renewal.

1.4.5 Other Relevant Theory

The pattern language approach may be too abstract to implement designs in a tangible manner, leading to difficulties during the design phase. To address this, morphological analysis can aid in regional analysis during the early stages of design and generate improved spatial hierarchies in the design outcomes. Therefore, morphological studies are conducted to theoretically underpin the successful application of pattern language theory, facilitating the organic regeneration of cities[56]. The "management unit" is a methodological concept derived from Conzenian urban morphology, proposed for the organic renewal of historical towns in China.

1.4.5.1 Urban Management Unit

Originating in Germany and flourishing in the United Kingdom, the urban morphology theory of the Conzenian school (M.R.G. Conzen) primarily employs historical maps and planning diagrams to analyze urban structures, their formative elements, and underlying mechanisms. Based on this theory, the "town-plan analysis" method is instrumental in comprehensively understanding the historical development of urban morphology, thereby providing support for the renovation of urban landscapes and the management and zoning of cities[65]. However, the regionalization theory of urban morphology proposed by Conzen has encountered challenges in practical application within China, indicating a lack of contextual fit. The schematic representation of urban spatial relationships in ancient Chinese cartography, in contrast to the proportional maps of the West that were meticulously drafted using surveying principles, has presented a considerable impediment to the methodological analysis of urban layouts[66]. Through applied research on the utilization of Conzenian urban morphology in

historical district preservation planning, the Urban Morphology Research Unit at South China University of Technology has proposed the concept of the "Urban Management Unit[67]." This approach, grounded in the consolidation of urban morphology, draws upon the "urban planar pattern analysis" method to delineate and overlay morphological and property rights zones within areas slated for renewal[67]. Subsequently, it categorizes units based on varying renewal approaches. The introduction of this concept represents a significant breakthrough in the domestic research of Conzenian urban morphology, providing a foundational basis for the "small-scale, incremental" realization of urban organic renewal in China. It effectively addresses the dual complexities of urban form and property rights inherent in old city renewal. On one hand, any given unit can maintain consistency in its future renewal treatment; on the other hand, the clear delineation of rights and responsibilities facilitates future operations.

1.5 Research Methodology

(1) Literature Review and Synthesis Method

This study systematically reviews the evolution of organic renewal theory, urban informality research, and pattern language theory. By integrating interdisciplinary perspectives, it aims to construct an application framework for the organic renewal of historic districts.

(2) Research Tool Selection and Adaptation Method

By conducting a comparative analysis of applications of Alexander's pattern language and urban renewal projects in China's aging residential areas, this study identifies transferable localized tools to establish a methodological foundation for empirical research. The research operationalizes the concept of organic renewal through a three-step process: spatial analysis, dynamic design, and localized construction, thereby facilitating the practical implementation of small-scale, incremental development strategies.

Table 1-5 Classification and description of research tool

Hierarchy	Tool type	Research tool
Urban planning	Systematic analysis tools	Analytic Network Process (ANP), Pattern correlation matrix (Gephi)
Urban design	Dynamic design tools	Spatial network mapping, Temporal narrative pattern language
Architecture	Participatory construction tools	Pattern guidelines, Scenarios description

Source: literature[54, 57, 70] review by the author

(3) Multidimensional empirical research method

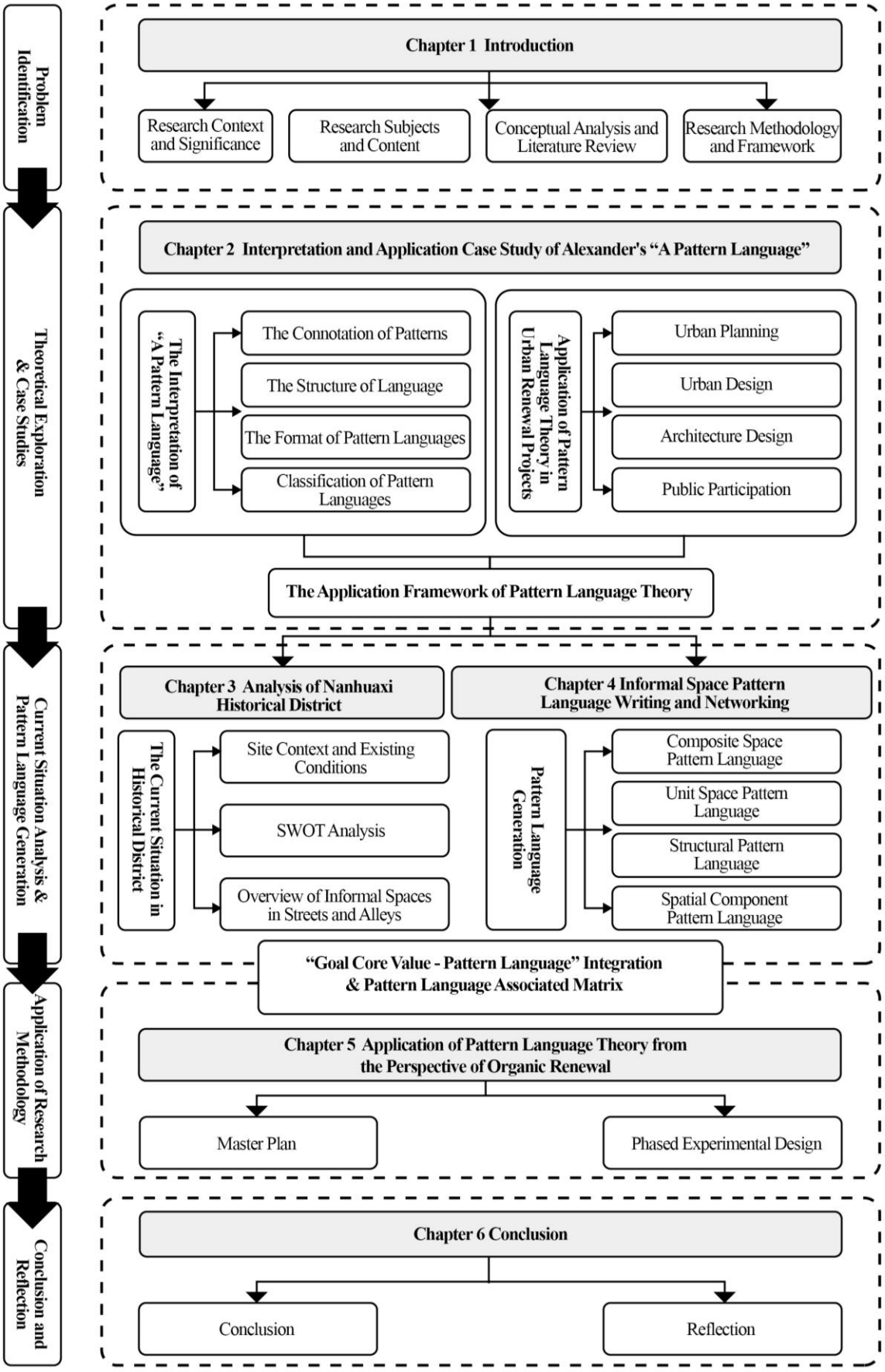
A six-month multidimensional field study was conducted, incorporating participatory

observation, structured questionnaires, and spatial mapping techniques. This comprehensive approach facilitated the collection of data on both the physical environment and resident behaviors within the district. Subsequently, behavior maps were generated, and a database of informal space samples was established to support further analysis and application.

(4) Diagrammatic Analysis and Pattern Language Construction Method

Utilizing pattern language tools, this study analyzes the coupling relationships between spatial configurations and human behaviors, extracting locally distinctive spatial patterns from field research data. Employing semantic network analysis software, such as Gephi, a pattern association matrix is constructed to identify the strength of inter-pattern relationships. This process distinguishes core patterns from derivative ones, forming a hierarchical and scalable pattern language network. Through this methodology, the study facilitates the translation of theoretical concepts into practical design guidelines, enhancing the applicability of pattern language theory in complex urban environments.

1.6 Research Approach and Framework



Chapter 2 Interpretation and Application Case Study of Alexander's "A Pattern Language"

This chapter begins with a comprehensive interpretation of Alexander's pattern language theory to grasp its profound connotations and expressive methods. Subsequently, it introduces the application of pattern language through a series of representative examples. Finally, an application framework suitable for the research and design experiments of the informal spaces of Nanhuaxi district is summarized.

2.1 The Interpretation of "A Pattern Language"

To achieve the "Timeless Way" in both architecture and urban design, Alexander posited that we must establish a dynamic pattern language as a gateway[51]. In Alexander's view, natural constructions or cities require a "genetic code," or pattern language. But what exactly is "pattern language"?

2.1.1 The Connotation of Patterns

According to Christopher Alexander, the fundamental qualities of architecture or urban environments are shaped by recurring patterns of events that occur within them (Figure 2-1-a). He posits that the spatial structure of buildings and cities is constituted by spatial patterns—analogous to atoms and molecules in physical matter (Figure 2-1-b). While the elements comprising these spatial patterns may vary with each instance, such as differences in building materials, the relationships among these elements remain consistent. The interplay between spatial patterns and patterns of events forms the "genes" of architecture or urban environments, which Alexander terms "patterns"[51]. He distills recurring environmental problems and their corresponding solutions into these patterns, organizing them into a cohesive system expressed in the form of a language.

Both "spatial patterns" and "patterns of events" are fundamentally relational constructs. A "pattern of events" is itself a relational configuration, and within a "spatial pattern," it represents a specific mode of interaction. Conversely, the "spatial pattern" serves as the physical substrate that supports and facilitates the "pattern of events." This dynamic interplay suggests that "patterns of events" influence the formation and evolution of "spatial patterns," and vice versa. Consequently, the built environment is not merely a collection of static physical elements but is composed of an intricate web of interwoven, non-material relationships.

a) Events Pattern b) Space Pattern

Figure 2-1 Nanhuaxi "Patterns of Events" and "Patterns of Space" (Source: author)

2.1.2 The Structure of Language

Following the explication of the pattern's intrinsic characteristics, it is imperative to establish methodologies for their amalgamation, thereby constructing a cohesive architectural language (Figure 2-2). The structural integrity of this language emerges from the interrelationships among individual patterns. The overall coherence of the language is contingent upon the degree to which these patterns integrate into a unified whole. "A Pattern Language" elucidates the comprehension of individual patterns and their interdependencies. These patterns are arranged sequentially, commencing with the broadest scales, such as regions and towns, followed by neighborhoods, building clusters, dwellings, rooms, and culminating in construction details. Each pattern is intrinsically linked to several "larger" preceding patterns and several "smaller" subsequent patterns (Figure 2-3). Furthermore, each pattern contributes to the refinement of the preceding larger patterns while simultaneously being informed by the subsequent smaller patterns (Figure 2-4).

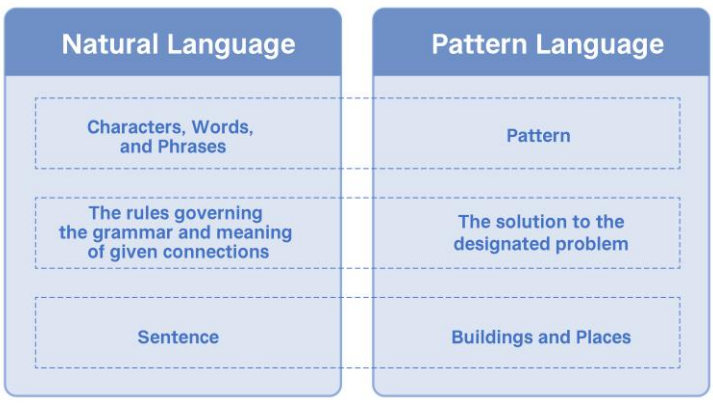


Figure 2-2 Comparison of natural language and pattern language

(Source: redraw based on literature[51, 71])

Pattern A necessitates Pattern B as an integral component to achieve its complete realization, while conversely, Pattern B requires Pattern A as a constituent element for its own fulfillment. Each pattern is situated within a network of interconnected patterns.

Figure 2-3 The interrelationships among patterns (Source: literature[51])

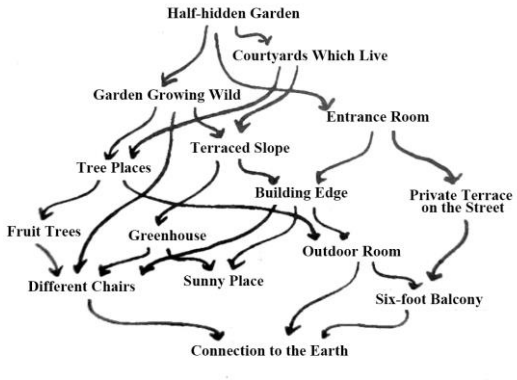
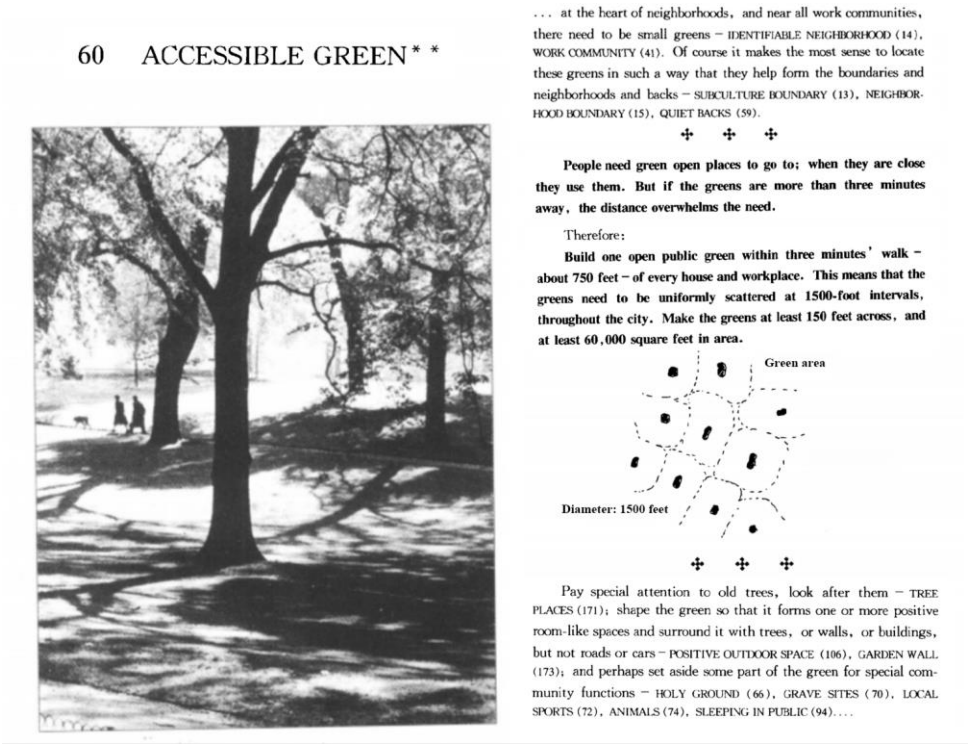


Figure 2-4 Pattern network for "HALF-HIDDEN GARDEN" (Source: literature[51])

For instance, Pattern 60, "Accessible Green," is interconnected with larger patterns such as Pattern 13, "Subculture Boundary"; Pattern 14, "Identifiable Neighborhood"; Pattern 41, "Work Community"; and Pattern 59, "Quiet Backs." It also relates to smaller patterns like Pattern 106, "Positive Outdoor Space"; Pattern 171, "Tree Places"; and Pattern 173, "Garden Wall." This implies that "Identifiable Neighborhood", "Subculture Boundary", "Work Community", and "Quiet Backs" are incomplete unless they incorporate "Green Street". Conversely, "Accessible Green" are deficient without "Positive Outdoor Space", "Tree Places", and "Garden Wall". Furthermore, when employing actual pattern language, if one intends to design a green space according to this pattern, one must not only follow the various directives that describe the pattern but also strive to embed the green space within an "Identifiable Neighborhood" or a "Subculture Boundary" to facilitate the formation of a "Quiet Backs". Additionally, one should continuously cultivate this green space according to patterns such as "Positive Outdoor Space", "Tree Places", and "Garden Wall" to gradually perfect it[3].

2.1.3 The Format of Pattern Languages

To ensure cohesive and interconnected writing, a comprehensive understanding of pattern language writing formats is essential. Alexander's "A Pattern Language" provides a detailed exposition of the general form of patterns. Each pattern comprises three key elements (Figure 2-5). Subsequently, Alexander demonstrated the application of pattern writing through examples within "A Pattern Language" (Table 2-1). Consider pattern 60 "ACCESSIBLE GREEN" as an example.



60 ACCESSIBLE GREEN * *

... at the heart of neighborhoods, and near all work communities, there need to be small greens – IDENTIFIABLE NEIGHBORHOOD (14), WORK COMMUNITY (41). Of course it makes the most sense to locate these greens in such a way that they help form the boundaries and neighborhoods and backs – SUBCULTURE BOUNDARY (13), NEIGHBORHOOD BOUNDARY (15), QUIET BACKS (59).

People need green open places to go to; when they are close they use them. But if the greens are more than three minutes away, the distance overwhelms the need.

Therefore:

Build one open public green within three minutes' walk – about 750 feet – of every house and workplace. This means that the greens need to be uniformly scattered at 1500-foot intervals, throughout the city. Make the greens at least 150 feet across, and at least 60,000 square feet in area.

Green area

Diameter: 1500 feet

Pay special attention to old trees, look after them – TREE PLACES (171); shape the green so that it forms one or more positive room-like spaces and surround it with trees, or walls, or buildings, but not roads or cars – POSITIVE OUTDOOR SPACE (106), GARDEN WALL (173); and perhaps set aside some part of the green for special community functions – HOLY GROUND (66), GRAVE SITES (70), LOCAL SPORTS (72), ANIMALS (74), SLEEPING IN PUBLIC (94)....

Figure 2-5 The pattern within "A Pattern Language" (Source: literature[3])

Table 2-1 The format and elaboration of pattern writing

Class heading	Elaboration
Photographs	Illustrate prototypical instances of the pattern.
Introduction	Contextualizes the pattern, explaining its relationship to preceding and subsequent patterns, and how it contributes to the larger whole.
Problem	States the essence of the problem in concise terms.
Context	Describes the experiential background of the pattern, providing examples of its viability and illustrating various ways the pattern might manifest in architecture.
Solution	The core of the pattern. It outlines the spatial and social relationships required to address the problem presented above. Users gain a clear understanding of the actions necessary to implement the pattern.
Diagram	A diagrammatic representation of the solution, with key elements labeled.
Related Patterns	Identifies other, smaller patterns that connect with and refine, elaborate, and enrich this pattern.

Source: literature[3, 68] review by the author

The section on writing pattern languages for the informal spaces of the surveyed site will follow the structural format of Alexander's "A Pattern Language." Given that both positive and negative site conditions are being documented, the writing process will incorporate fundamental assessments of the advantages and disadvantages of the observed pattern phenomena, with an attempt to offer suggestions for improvement.

2.2 Classification of Pattern Languages

Prior to extracting "pattern languages" from the complex research site, a structured and cohesive approach to the writing of pattern languages will be established. This will involve a review of the classifications of pattern languages presented in "A Pattern Language" by Alexander and other researchers (Table 2-2). Furthermore, considering the manifestations and interventions of informal spaces within the community, a category framework suitable for this study will be developed. This framework will guide the extraction, synthesis, and organization of patterns at various levels.

Table 2-2 Varied classification methodologies for Pattern Languages from diverse scholars

Tittle/Author	Classification of Pattern Languages
"A Pattern Language: Towns, Buildings, Construction" / Christopher Alexander	The 253 pattern languages within the text are presented in a sequential manner, progressing from macro-scale patterns to micro-scale patterns, encompassing the domains of "towns—buildings—construction[3]." However, the narrative content resists a strict hierarchical organization due to Alexander's shifting perspectives. The author employs diverse methodologies, including empirical investigations, complex mathematical modeling, evocative descriptions of lifestyles, and observational analyses[69].
"A Preliminary Exploration of the Pattern Language Constructed by 'Supplementary Space' - Take the Tea Village in Xihu District, Hangzhou as An Example" /Jin Ying	The pattern language can be broadly categorized into four hierarchical classifications: comprehensive patterns, generative patterns, structural patterns, and component patterns. It is crucial to recognize that each pattern within these categories is not isolated but rather interconnected, exhibiting a network-like characteristic.

Source: literature[3, 60, 68-70] review by the author

Table 2-2 Varied classification methodologies for Pattern Languages from diverse scholars (Continued)

Tittle/Author	Classification of Pattern Languages
Translating "the Everyday": A Pattern Language as A Design Tool for Hanzheng Street Area Transformation / Cai Jiaxiu, Henco Bekkering, Machiel van Dorst	Based on a 13-year observational study conducted by the Urban Environment Research Center of Huazhong University of Science and Technology, coupled with field investigations, personal experiences, and literature reviews, this research elucidates the relationship between daily life patterns and social structures within the Hanzheng Street area, culminating in the identification of 20 representative individual models. Employing an "abstract-concrete" axis and multi-scale integration, these models are categorized into structural models (e.g., "Recognition system"), umbrella models (e.g., "Public & Private"), and connective models (e.g., "Stairs"), thereby establishing a hierarchical linguistic network, as detailed in the Table 2-3. Furthermore, interdisciplinary workshops were organized, inviting designers and sociologists to independently construct model languages. The clarity and universality of these models were then assessed through a comparative analysis of the clustering and linking methodologies employed by different participants. Professor Bekkering provided further interpretation and evaluation of the abstract and concrete attributes of the models, as presented in the Figure 2-4.
A Preliminary Analysis on Alexander's Space Research in "A Pattern Language" / Chen Jie	The author categorizes patterns based on spatial characteristics, differentiating between patterns concerning spatial scales, spatial relationships, and spatial boundaries. Within the study of spatial scales, the findings can be further classified into three categories: "precise scale," "relative scale," and "fuzzy scale." Research on spatial relationships yields three spatial archetypes: "niche space," "tangent space," and "differential space." Furthermore, based on spatial boundaries, patterns are categorized into "unambiguous boundaries" and "ambiguous boundaries." These classifications reflect Alexander's methodological approach and preferences in spatial research.
Manazuru Town Planning Ordinance "Standards of Beauty"	The framework comprises eight principles and sixty-nine patterns. The eight principles draw inspiration from "A Vision of Britain: A Personal View of Architecture" by HRH Prince Charles, The Prince of Wales, with detailed specifications provided in the Table 2-6 below.

Source: literature[3, 60, 68-70] review by the author

Table 2-3 Classification method for Hanzhengjie patterns

Category	Meaning	Results
Umbrella pattern	All other individual patterns can be regarded as variations of these two, serving as the focal point of the research.	2 Space appropriation, 16 Public and private
Structure pattern	The concept can be regarded as an anchor within the pattern language, representing the initial tier.	11 Recognition system, 8 Flowing, 9 Mixed use, 3 Eating in the street, 17 Continuously varied borders
Connection pattern	The second tier can be conceptualized as a representative pattern of a cluster, linking to smaller-scale patterns on the left and larger-scale patterns on the right (with the X-axis representing scale), while connecting to more abstract patterns upwards (with the Y-axis representing the "concrete-abstract" continuum).	18 Inside out, 13 From spectator to actor, 5 Chinese drying, 6 Up sleep + down business & Back home + front shop, 12 Parasitism
Conditional pattern	The concept may be either tangible or intangible, serving as a foundational condition for all other patterns, and can be conceptualized as the Z-axis.	15 Street and alley networks, 1 Street in street

Source: literature[68] review by the author

Table 2-4 Excerpts from Professor Bekkering's classification method

Category	Meaning	Results
Abstract pattern	Numerous models converge upon it, indicating its position at a higher level of abstraction.	9 Mixed use, 3 Eating in the street, 18 Inside out, 16 Public and private, 8 Flowing, 15 Street and alley networks
Specific pattern	Fewer patterns pertain to it, indicating that it is a relatively specific, small-scale pattern.	5 Chinese drying, 19 Stairs

Source: literature[68] review by the author

Table 2-5 Classification method of "Standards of Beaut

Standards	Key Terms	Meaning
Place	Respecting the Site	Architecture must harmonize with the landscape rather than dominate it.
Hierarchy	Cultural Vernacular	Architecture should reinterpret local memory and articulate urban identity.
Proportional Scale	Human-Centered Scaling	Architectural proportions must prioritize anthropomorphic compatibility before contextual alignment.
Harmony	Symphonic Integration	Architecture must achieve chromatic and formal consonance with marine blues, verdant ecologies, and urban ensembles.
Material Selection	Tectonic Authenticity	Construction should employ locally-sourced materials with embedded socio-technical memory.
Ornamentation	Articulated Detailing	Architectural ornamentation demands artistic synthesis beyond mere appliqué.
Community Stewardship	Participatory Stewardship	Architectural production necessitates inclusive co-creation, empowering communal rights and responsibilities.
Visionary Perspectives	Picturesque Framing	Architecture should choreograph scenographic dialogues between built form and natural vistas.

Source: literature[70] review by the author

Furthermore, Landscape Pattern Language, which has garnered sustained scholarly attention in recent years, integrates pattern language with landscape architecture theories. By extracting spatial schemas through diagrammatic analysis - termed "characters", "words", and "phrases" in landscape spatial syntax - it constructs an interconnected landscape schema language system through nesting, thereby addressing the limitations of pattern language in spatial scaling and generative mechanisms[71]. This study adopts the taxonomy of this theoretical framework, analyzing patterns through four dimensions: Composite Spatial Class, Unit Spatial Class, Structural Class, and Component Class. Each hierarchical level corresponds to "character", "word", and "phrase" respectively (Table 2-6), with subsequent spatial elements being progressively woven through "character → word → phrase" sequences.

The "character" level refers to informal spatial structures and component elements, such as columns, benches, and vegetation. "Words" denote informal spatial units encompassing functional programming, dimensional parameters, and locational attributes, exemplified by frontage gardens. "Phrases" emerge from combinations of spatial elements/units with homogeneous or heterogeneous functional properties, exhibiting greater diversity and functional complexity than individual units. They articulate culturally-specific spatial configurations, as seen in "A Pattern Language" like the "MARKET OF MANY SHOPS" (Pattern 5).

Given our focus on street-level built environments in historic districts, this research adapts Kevin Lynch's five elements of urban form while incorporating scholarly frameworks for community-generated spaces Figure 2-6). Consequently, the extraction of informal spatial unit patterns prioritizes four categories: community-level road-based unit, community-level boundary-defined unit, community-level node-centric unit, and neighborhood-level outward-oriented unit[72].

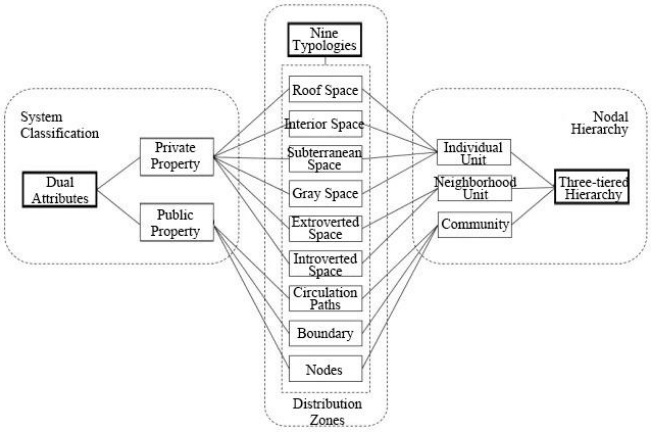


Figure 2-6 The categorization of spontaneously constructed public spaces within the community

（Source：literature[72]）

Table 2-6 Classification criteria of pattern languages in this study and the corresponding detailed explanations (Source: author)

Natural Language	Pattern Category	Characteristics	Sub-category
Phrase	Composite space pattern language	At the macro-scale level, this describes the overall form and layout characteristics of the spatial environment. It is formed through the combination of spatial elements and units with homogeneous or heterogeneous functional attributes, demonstrating the contextual expression of local characteristics.	
Word	Unit space pattern language	At the meso-scale level, this delineates the generative principles of spatial configuration, encompassing both the functional purposes of spaces and their contextual relationships with adjacent environments.	Community-level Road-based Unit Space Pattern
			Community-level Boundary-defined Unit Space Pattern
			Community-level Node-centric Unit Space Pattern
			Neighborhood-level Outward-oriented Unit Space Pattern
Character	Structural pattern language	At the micro-scale level, this specifies the concrete structural articulation of spaces, encompassing dimensional parameters and the constituent properties of spatial elements.	
	Spatial component pattern language	At the micro-scale level, this addresses the constituent components of spatial systems, which cannot independently achieve spatial construction but require systemic integration with other patterns.	

The "pattern language" methodology seeks to deconstruct and reconstruct existing building experiences. While the fundamental methods of "deconstruction" have been established, further investigation is required to understand "reuse" and "reconstruction." Subsequently, a framework for the application of pattern language theory will be developed, based on existing case studies, to guide design experiments.

2.3 Case Study of Pattern Language Theory in Renewal Projects

This section initiates with an analysis and synthesis of recognized, effective informal governance collaborative action models within the context of old community renewal, using case studies to establish the direction of the research. Subsequently, it contrasts the application of Alexander's Pattern Language theory across various scales of planning, urban design, and architecture with case studies of accessible community renewal planning in China. The aim is

to identify transferable practical tools, thereby constructing an application framework for empirical research and design experiments. The following cases all, to varying degrees, adhere to the principles of organic renewal.

2.3.1 Institutional Safeguards for Pattern Language Theory Application

2.3.1.1 Background

The Guangzhou Pantang Wuyue community, located in the Jiankang Street—Liwan Lake historical and cultural district of Liwan District, exemplifies an old urban community. Its architecture, predominantly constructed in the 1960s, possesses a rich historical and cultural heritage. With the advancement of urban renewal policies, the community faces the inherent conflict between tourism real estate development and the preservation of traditional character. The micro-transformation project initiated in 2016 aimed to achieve the preservation of the historical district and enhance community vitality through a "co-creation" model, although early planning efforts encountered conflicts due to a lack of resident participation. The disappearance of informal business spaces and the singular functionality of public spaces further exacerbated the alienation between residents and the government. In response, community planners intervened as intermediaries, leveraging local government financial support to explore a renewal path that integrates community self-organization with historical and cultural preservation, through participatory planning and the integration of local knowledge[49].

2.3.1.2 Mechanism Characteristics

The informal governance of Pantang Wuyue centers on community planners, establishing a "planner—resident" partnership. Community planners, acting as intermediaries, adopt a dual empowerment and collaborative model. On the one hand, institutional platforms such as the "Co-creation Committee" are established to incorporate resident demands into planning decisions. For example, expert review meetings were organized to restore historical artifacts like "pomegranate bricks," and residents and planners jointly created artifact models to deepen participation. Simultaneously, community planners organized over ten participatory activities (e.g., photography exhibitions, plan introduction meetings), gradually building trust and stimulating resident agency. On the other hand, planners proactively connect with external resources, apply for financial support, and introduce cultural, commercial, and tourism industries to promote community economic revitalization. This informal governance action model balances the rigidity of policy requirements with the actual needs of the community through the embedding of local knowledge and the setting of collaborative goals.

a) Mediator-Mediated Internal-External Collaborative Activities in Pantang

b) Photos of Pantang community before and after regeneration as well as the participatory activities

Figure 2-7 Models of informal governance actions in Pantang community (Source: literature[49])

Through case study analysis and the extraction of action pattern characteristics, the community planner system provides fertile ground for the practical application of pattern language theory. However, this also necessitates the integration of a comprehensive framework for applying pattern language theory, one that simultaneously addresses top-down planning requirements and bottom-up practical needs. Given the absence of a complete, integrated case study spanning from the planning level to architectural design during the actual case search, this author endeavors to draw upon empirical research experiences from various cases to construct a localized pattern language application framework.

2.3.2 Pattern Language as a Planning Decision-making Support Tool

2.3.2.1 Background

Borgo Rossini, situated northeast of Turin, Italy, adjacent to the historical center, represents a mixed-use community characterized by both residential and industrial functions. Its physical and social structure exhibits a high degree of heterogeneity, encompassing traditional residential areas alongside abandoned industrial buildings, with significant issues related to aging infrastructure and functional limitations. The impetus for community regeneration stems from two primary drivers: the strategic urban renewal plan for the adjacent Scalo Vanchiglia area and the anticipated influx of population and investment spurred by the introduction of a new metro line. Within the context of globalization, the central challenge for urban planning lies in reconciling the objectives of sustainable development with the preservation of local cultural heritage. This project innovatively integrates Spatial Multicriteria Analysis (SMA) with Pattern Language Theory as a comprehensive design methodology, thereby enhancing the objectivity of planning goals and enabling a more predictable transition from "problem" to "solution," thus

addressing conflicts among various stakeholders[57].

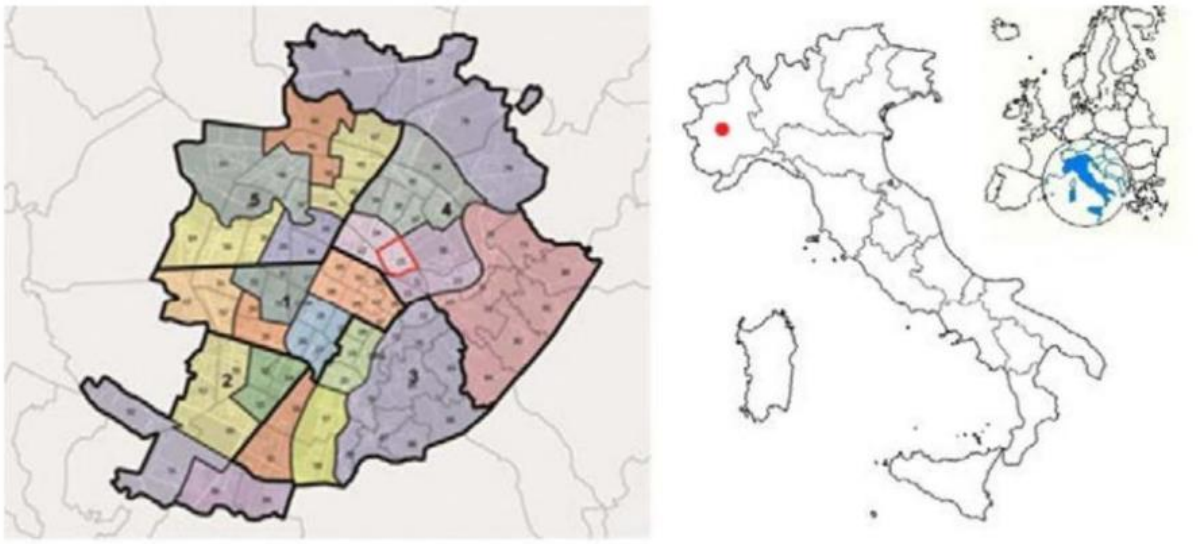


Figure 2-8 The case study of Borgo Rossini in context (Source: literature[57])

2.3.2.2 Application Steps

Initially, a framework for regional analysis and strategic assessment was established by defining a set of interwoven criteria (sub-objectives) aligned with the multidimensional concepts of sustainable development. These criteria were organized within the Super Decisions software, following the theoretical principles of the Analytic Network Process (ANP), to quantify stakeholder preferences across various scenarios. Simultaneously, these core values were integrated into the Gephi software and associated with each relevant pattern.

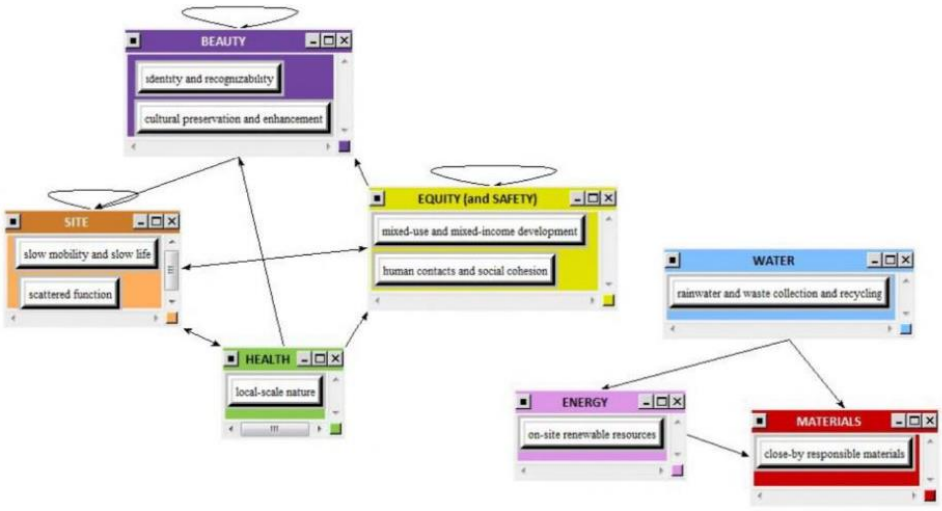


Figure 2-9 The decision-making network organized in clusters and elements, according to the Analytic Network Process and as displayed by the software Super Decisions (Source: literature[57])

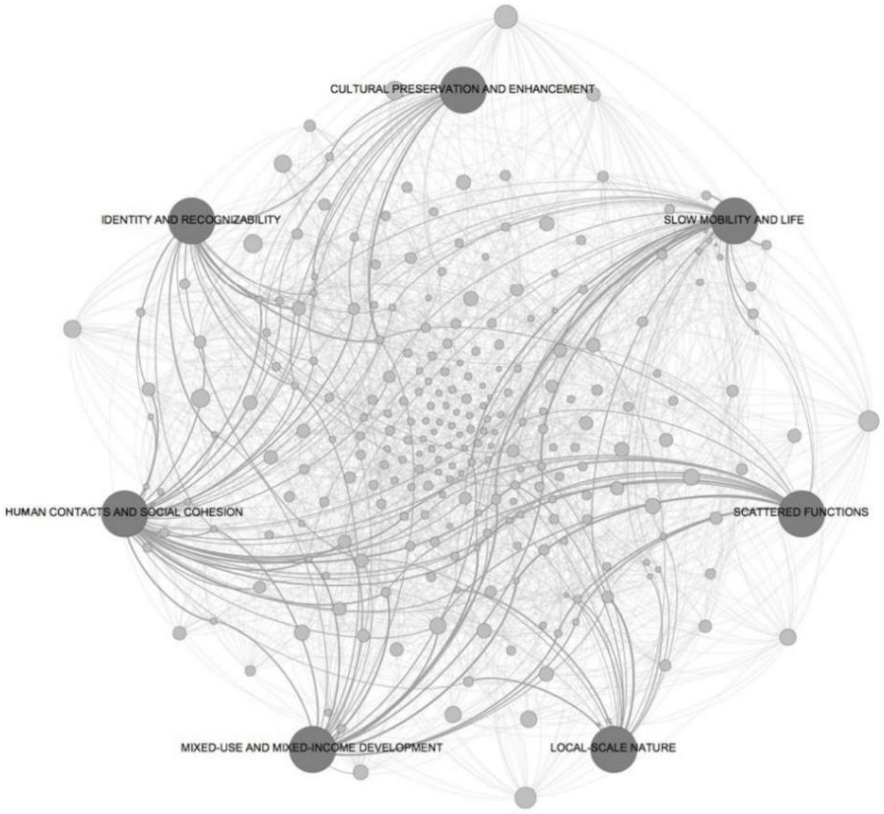


Figure 2-10 A visual representation elucidates the correlation between subordinate objectives' core values and their associated patterns in Gephi (Source: literature[57])

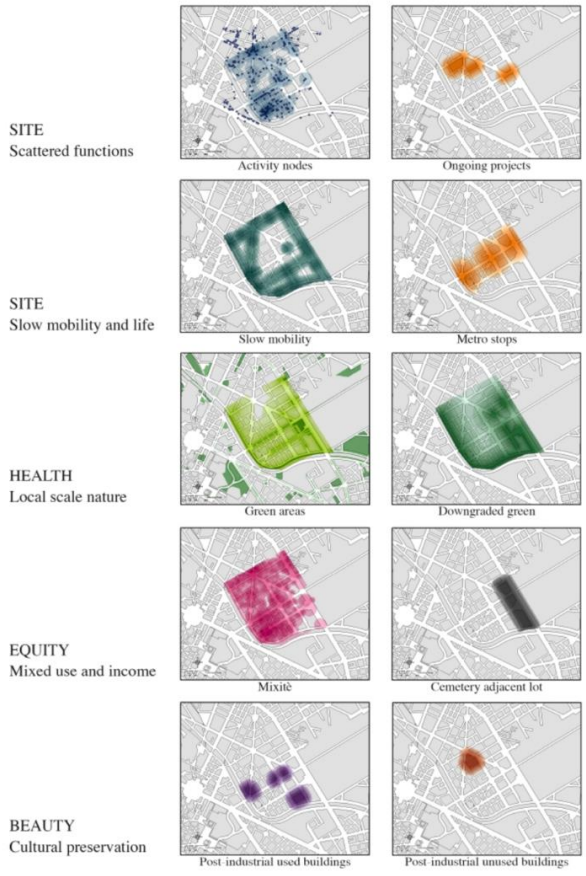
Subsequently, a spatial SWOT analysis was conducted to systematically understand the area's key characteristics. In alignment with the overarching objectives, the ANP method was employed to assess the relative importance of each criterion.

Clusters	***Elements***	***Sub-elements***			
		S	***W***	***O***	***T***
Site	*Slow mobility and slow life*	*Bus lines, bike paths, car/bike sharing*	*Traffic congested roads*	*Metro stops*	*
	Scattered functions	*Activity nodes*	*	*Ongoing projects*	*
Health	*Local-scale nature*	*Green Areas*	*Downgraded green*	*	*
Equity	*Mixed-use and mixed-income Development*	*	*	*Mixité*	*Cemetery adjacent lots*
	Human contacts and social cohesion				
Beauty	*Cultural Preservation and Enhancement*	*Post-industrial buildings, used*	*	*	*Post-industrial buildings, unused*
	Identity and recognisability				

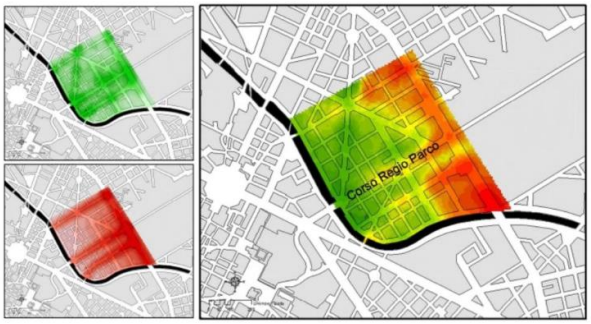
Figure 2-11 List of Clusters, Elements and Sub-elements adopted as the conceptual framework to carry out the SWOT analysis (Source: literature[57])

Finally, the weighted results are synchronized with the spatial SWOT analysis to quantitatively assess indicators such as traffic accessibility and green space distribution,

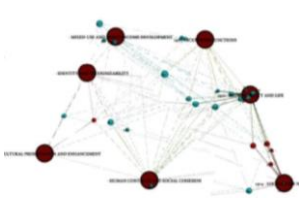
generating a "positive and negative element synthesis map" to identify priority renovation areas. Simultaneously, synchronization with the Gephi network layout utilizes the "Force Atlas" layout algorithm to screen key patterns. Combining the pattern language network, two scenario strategies are formed: "mixed-use" and "green regeneration." Taking Scenario 1 - "mixed-use" as an example, its key patterns are "#30 - Activity Nodes," "#33 - Shopping Streets," and "#32 - Waterfront Promenade," which should bring diversity to the urban fabric. These three patterns suggest that the project develop a street system with shops and activity clusters along its edges.



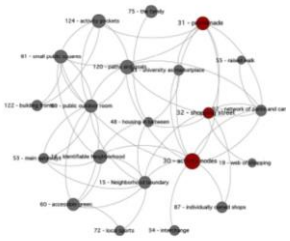
a) Raster standardized maps containing the spatial influence of sub-elements.



b) Map of "positivities" (top left), map of "negativities" (bottom left) and map of "synthesis" (right) for the "Regeneration based on mixitè" scenario of development.



c) Application of "Force Atlas" layout in Gephi. Picture: the weights in Scene 1.



d) Pattern Languages identified for Development through mixitè.

Figure 2-12 Transferring the weights of elements into maps and Gephi to define Pattern Languages (Source: literature[57])

2.3.2.3 Implementation outcomes

In the Borgo Rossini community regeneration project, the "Force Atlas" layout algorithm of Gephi was employed to organize the design pattern language with its most relevant objectives, enabling designers to gain a comprehensive overview of the language features based on the project's design goals, such as sustainability-related goals. This approach reduces communication costs across interdisciplinary teams and avoids the "goals-means" disconnect

often seen in traditional planning. Simultaneously, the coupling of MCDA with the Gephi model allows for continuous editing of design specifications and quantitative analysis. Ultimately, Scheme 1 identified the industrial land parcel on the northeast side as a potential area for functional mixing, proposing a "street system embedded with small-scale commerce and activities" strategy, based on the highest weights of patterns "30 Activity Nodes," "33 Shopping Street," and "32 Promenade" in Scenario 1 (mixed functions). Scheme 2, focusing on the southern historical district, emphasized the activation of slow-moving systems and public spaces, as Scenario 2 (green regeneration) prioritized the concepts of "accessible green spaces" and "shared by all" in the pattern prioritization.

2.3.2.4 Limitations and Reflections

While the combined application of the MCDA and Gephi models demonstrated the ability of pattern language theory to address the complexities of urban planning and development, there is room for improvement in this case:

① The integration of GIS, Gephi, and Super Decisions necessitates manual cross-platform operations. It is imperative to mitigate potential inaccuracies stemming from data conversion errors, which could compromise the validity of the analytical outcomes.

② The patterns relied solely on the 253 patterns from Alexander's original pattern library, without incorporating new patterns based on the local spatial genes of Turin, thereby weakening the adaptability to the local context.

③ Residents primarily served as data sources rather than co-designers, particularly lacking a transparent negotiation mechanism in the weight assignment stage, which may exacerbate the conflict between "technical rationality" and "community perception."

In summary, the Borgo Rossini case validates the feasibility of the collaborative use of pattern language and quantitative tools, but further breakthroughs are needed in tool integration, pattern localization, and participation mechanisms. Furthermore, in conjunction with the overview of pattern language theory in Chapter 2, the differences in property rights between Chinese and Western community renewal are evident. Therefore, the adaptability of the "data-goals-design" process warrants further consideration, providing a paradigm for the renewal of highly complex historical districts.

2.3.3 Application in Dynamic Urban Design

2.3.3.1 Background

This case, based on pattern language theory, emphasizes the intertwining and overlapping

of traditional urban structures, aiming to generate complex urban forms through modular patterns, thereby challenging the simplification and division of modernist planning. As a design exercise for the "Urban Morphology and Formation" course at the UCL Bartlett School of Architecture, students were required to explore how to construct organic urban spaces by combining patterns as basic units, while also testing cognitive limitations in design. The project site, the Camden area, itself has a multicultural background and urban renewal needs[54]. Its historical context contrasts with Alexander's advocacy for a "semi-lattice structure," providing an experimental field for the application of pattern language. The design project attempts to translate abstract patterns such as "publicness gradient" and "identifiable neighborhoods" into concrete spatial structures.

2.3.3.2 Application Steps

The design progressed in four stages. Initially, only the unfinished courtyard framework was presented, followed by the gradual overlay of patterns such as "shopping network" and "active outdoor space." Conceptual diagrams were drawn for each stage, with core patterns such as "identifiable neighborhoods" and "active outdoor spaces" annotated for each stage's scenario problems, and the relationships between patterns were indicated through arrows and nodes, ultimately forming a complete schematic diagram of the social space hierarchy.

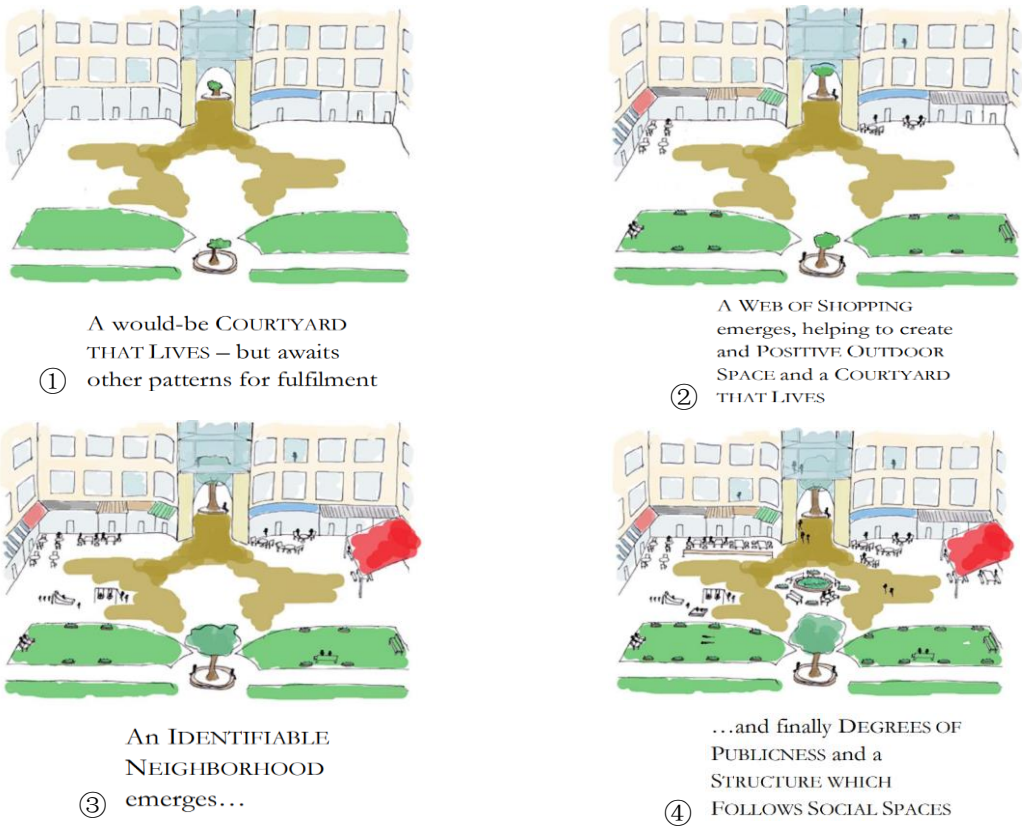


Figure 2-13 Sequential development of the courtyard over time (Source: literature[54])

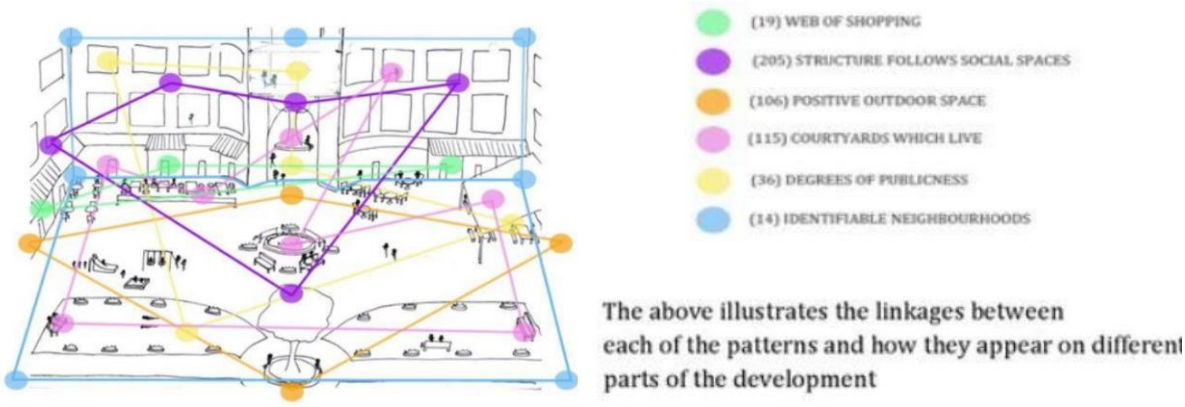


Figure 2-14 Abstract linkages between patterns overlain on sketch (Source: literature[54])

2.3.3.3 Implementation Results and Limitations

The final design incorporated phased pattern superposition, resulting in a "recognizable neighborhood" with social functions, such as differentiating the private and open areas of social space through a "publicness gradient." Some patterns were embedded in the space, successfully verifying the potential of pattern language in generating functional complexity. Simultaneously, students explained pattern evolution through narratives, demonstrating the transformation of courtyards from isolated spaces to social hubs through time series, emphasizing the dynamism of pattern superposition.

Although charting tools assisted some students in understanding pattern hierarchy, they failed to fully overcome modular thinking. For instance, in the process of cross-scale integration, students attempted to combine the macro pattern "density ring" with micro elements like building facades. However, they often first conceived the overall framework (such as road layout) and then retroactively annotated patterns, leading to a contradiction between modularity and holism. In addition, the results remained on paper, lacking verification of practical feasibility, and the direct translation of some patterns into spatial forms still requires further research.

2.3.4 Application of Pattern Language in Architectural Space Design

2.3.4.1 Background

Manazuru Town is located on a peninsula at the western end of Sagami Bay in Kanagawa Prefecture, Japan, known for its natural landscape of forests, mountains, and seas, as well as traditional fishing and stone industries. In the 1980s, the development of tourism real estate led to the emergence of high-rise apartments, threatening the traditional streetscape and residents' lifestyles. To address this crisis, the local government and residents quickly reached a consensus on protection, established a working group, and invited expert support. Based on Christopher

Alexander's pattern language theory, they aimed to preserve the local nature, history, and daily life, spending two years formulating "Standards of Beauty" (community building regulations)[70]. The regulations include 69 pattern languages based on local daily experiences, aiming to balance development and protection through common standards, avoiding the erosion of local culture by homogenized abstract spaces.

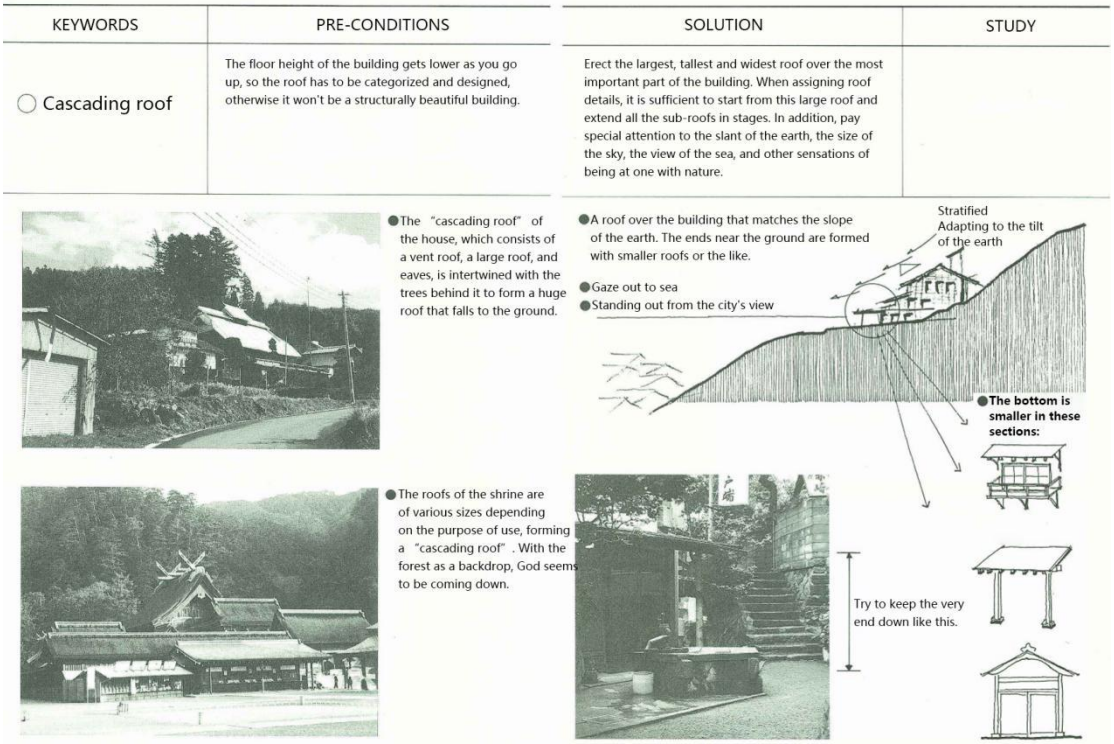


Figure 2-15 "Cascading roof" from the Masahiro-cho urban planning ordinance's "Standards of Beauty" (Source: literature[70])

2.3.4.2 Application Steps

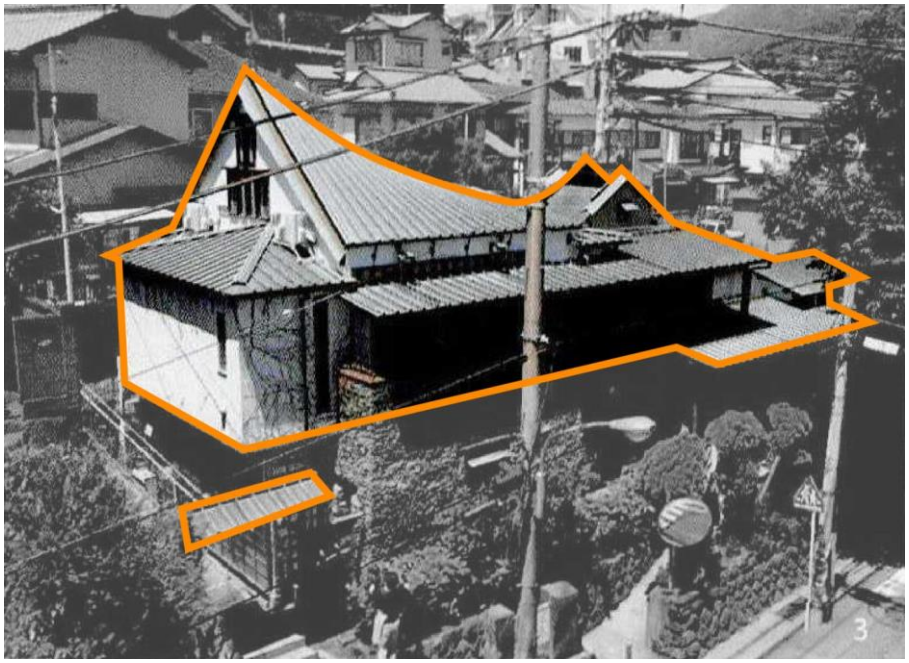
The "Community Manazuru" project, completed in Manazuru, serves as the inaugural demonstration project for "Standards of Beauty," effectively illustrating the practical application of pattern language theory in architectural projects.

This project establishes a crucial link between "patterns—scenario writing—spatialization" through the decomposition and synthesis of pattern languages. It demonstrates the potential for architectural planning and spatial design to originate from everyday language rather than personal conjecture, achieved through a dialogue and parallel process between traditional, drawing-based spatial design and the thick description of spatial scenarios. The implementation steps of the design are as follows:

①Initially, needs are gathered through questionnaires, interviews, and model-making. Subsequently, in alignment with "Standards of Beauty" and considering the site and project conditions, the regulations are deconstructed into 139 sub-patterns.

②The "Design Manual" clarifies the relationship between pattern language and spatial form, emphasizing the role of residents in spatial generation to foster mutual understanding and collaboration.

③ Extensive scenario writing is conducted using the 139 sub-patterns to synthesize spatial narratives. Taking the pattern language concerning the roof as an example, the combination and interplay of elements such as "main house," "shape along the slope," "protective roof," "gradually falling roof," "eaves exterior and interior," "the place of termination," "pedestrian goals," and "impressions of forest, sea, and earth" culminate in the scenario description of "the roof covering the large meeting room":



The main building of the community center serves as a pedestrian destination for those approaching it. Its expansive covering structure, reminiscent of the gentle curves of ships and fishing nets that symbolize maritime life, is topped with copper sheets resistant to sea breezes. The linear strength of the barrel tiles complements the smaller roofs beneath, creating a sense of gradual descent from the sky. The eaves are adorned with elliptical panels, whose rhythm is offset by the cadence of the interior decorative heavy timber, establishing a continuous connection with the earth. At the apex of the roof, metallic ornaments of cranes, symbolizing aerial respiration, evoke the essence of community development in accordance with regulations.

Figure 2-16 The "Community Manazuru" project (Source: literature[70])

2.3.4.3 Implementation Results and Limitations

"Aesthetic Standards" effectively preserved the traditional streetscape and lifestyle while simultaneously driving real estate appreciation and regional economic revitalization. Pattern language, through scenario narratives, transformed abstract regulations into concrete spaces, enhancing citizens' consensus on regional "beauty." "Community True Crane" also became a

shared space without access control, freely accessible, attracting diverse groups for spontaneous activities. However, some patterns struggle to encompass complex realities, necessitating continuous dynamic adjustments and community participation. The writing of scenario narratives demands high professional competence, and the threshold for ordinary citizens to directly participate in design still exists, requiring reasonable mechanisms for coordination and cooperation.

2.3.5 Application in Promoting Public Participation in Community Renewal

2.3.5.1 Background

Shenzhen Jiahua New Village, built in 2004, serves as a typical aging commercial housing community, facing issues such as mixed pedestrian and vehicular traffic, low utilization of public spaces, and insufficient barrier-free facilities. The elderly and disabled populations account for as much as 30%, highlighting a significant demand for barrier-free renovations within the community. This study, based on pattern language theory, combines cross-scale professional practice with local resident participation to construct systematic solutions through patterns, responding to the requirements of the "Law of the People's Republic of China on the Construction of Barrier-Free Environments" for refined governance[59].

2.3.5.2 Application Steps

Based on domestic and international barrier-free standards and field investigations, the research team extracted 42 individual patterns, covering dimensions such as facilities, systems, and landscapes, and formed eight major clusters, including conceptual consensus, institutional guarantees, and therapeutic landscapes, through clustering (Figure 2-17). Through participatory workshops, over 80 residents utilized "community pattern cards" to identify problems, select corresponding patterns, and formulate three-stage planning goals: "level and safe, smooth and continuous, rich and barrier-free." Subsequently, the planning was implemented in stages. The basic stage added barrier-free ramps and non-slip paving; the advanced stage constructed a pedestrian system and guidance network; and the in-depth stage integrated therapeutic landscapes and universal fitness facilities. During the process, the pattern language was dynamically revised, redundant patterns were merged, and localized needs were supplemented (Figure 2-18).

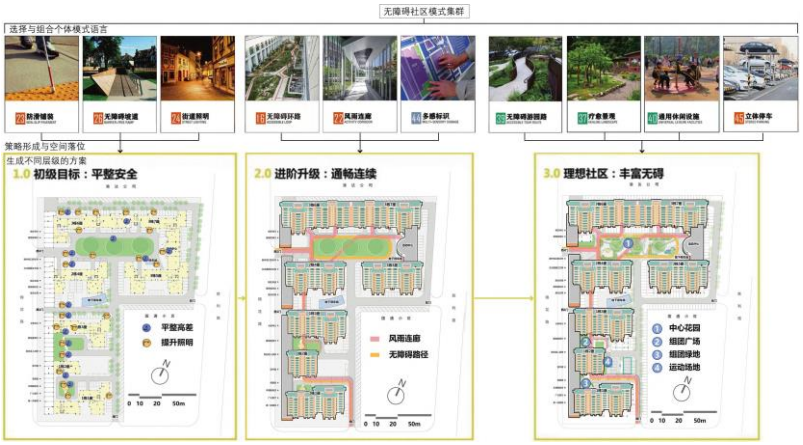


Figure 2-17 The Relationship Between Spatial Planning Strategies for Accessible Communities and Pattern Language (Source: literature[59])

Figure 2-18 Application of Pattern Language and Participatory Design in Accessible Community Design (Source: literature[59])

2.3.5.3 Implementation Results and Limitations

In this case study, the integrated application of pattern language initially facilitated spatial improvements in the Jiahuaxincun community. The addition of accessible circulation routes and ramps significantly enhanced safety, while a 60% increase in nighttime lighting coverage and the introduction of universal fitness facilities and therapeutic landscapes invigorated public spaces. Furthermore, residents utilized pattern cards to quickly grasp technical terminology, with over 80 individuals participating in workshops and offering suggestions, thereby significantly strengthening community cohesion. Finally, pattern language served as a "solution repository," lowering the threshold for public participation and providing a replicable planning framework for other aging communities. However, the implementation of the plan still relies on the promotion by the government and property management, and a resident-led maintenance mechanism remains undefined, raising questions about long-term efficacy. The singularity of the sample also limits the verification of the pattern's universality. Moreover, the integration of pattern language with current regulations necessitates policy coordination. Future research should incorporate more community case studies to continuously refine the theoretical and practical integration of pattern language.

2.3.6 Transferable Research Tools

In examining the application of pattern language theory across various scales and levels, a certain understanding of the framework's logic has been gained. However, the question remains regarding the most suitable practical tools for the renewal of China's old urban areas.

Table 2-7 Selection of transferable research tools

Hierarchy	Tool type	Research tool
Urban planning	Systematic analysis tools	Analytic Network Process, ANP analysis (Super Decision), Pattern correlation matrix (Gephi)
Urban design	Dynamic design tools	Spatial network mapping, Temporal narrative pattern language
Architecture	Participatory construction tools	Pattern guidelines, Scenarios description

Source: literature[54, 57, 70] review by the author

In summary, utilizing pattern language as a theoretical framework, collaborative governance is interwoven throughout, facilitating the organic renewal of urban environments through a three-step toolchain of "spatial analysis—dynamic design—on-site construction."

2.4 The Application Framework of Pattern Language Theory

Building upon the multidimensional spatial evaluation methods employed by Italian

scholars, this study integrates a localized "management unit" approach tailored to the Chinese context. This integration aims to address the complexities inherent in urban environments and to enhance the efficacy of pattern language theory in achieving the objectives of organic renewal characterized by small-scale, incremental development. By incorporating this localized methodology, the study seeks to refine and complement existing frameworks, thereby facilitating more effective and context-sensitive urban design strategies.

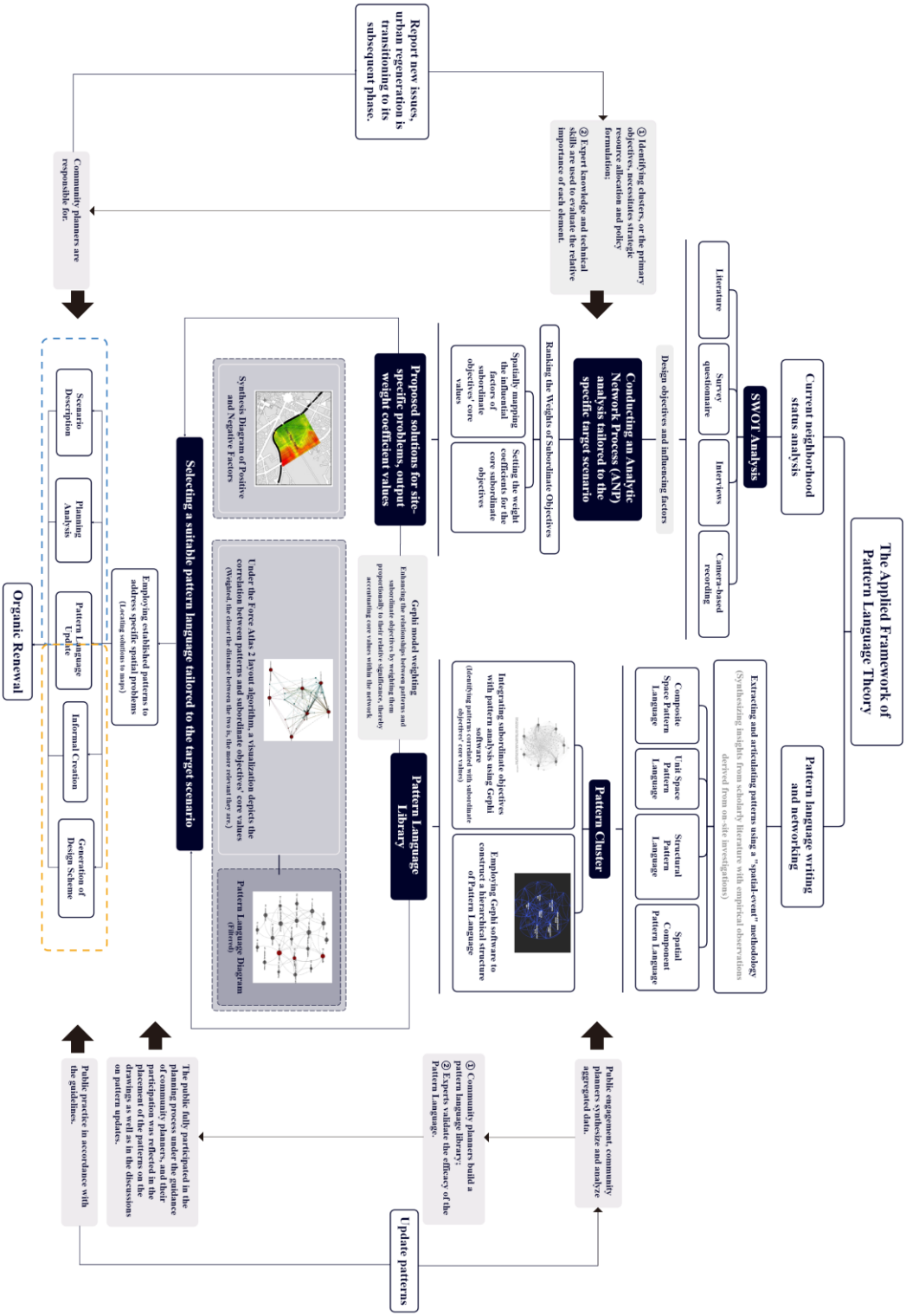


Figure 2-19 The application framework of Pattern Language Theory

2.5 Chapter Summary

This chapter systematically elucidates the interaction logic between "spatial patterns" and "event patterns," using the theoretical core of Alexander's "A Pattern Language" as its foundation. It reveals the profound value of pattern language as the self-organizing gene of a city. By comparing international cases such as Turin, Italy, and Manazuru, Japan, this study distills a technical chain of "spatial gene identification - pattern language network generation - scenario translation application," constructing a cross-scale pattern language application framework. Research indicates that pattern language theory holds significant advantages in planning decision support, dynamic space construction, and public participation mechanisms. However, it necessitates adaptive adjustments in conjunction with localized scenarios. For instance, the division of "management units" can resolve conflicts in complex scenarios, facilitating small-scale, incremental updates. Case practices demonstrate that the synergy of quantitative tools and pattern networks can reduce design complexity, but one must be vigilant against conflicts between technical rationality and community perception, emphasizing the transparency of resident participation. Ultimately, this chapter provides theoretical tools and methodological support for the organic renewal of the Nanhuaxi historical district, laying the groundwork for subsequent empirical research.

Chapter 3 Analysis of Nanhuaxi Historical District

A comprehensive understanding of the theory and its applications having been established, the site selection process will be systematically elaborated, followed by a detailed analysis of the site characteristics.

3.1 The Rationale for Selecting the Nanhuaxi District

To explain why Nanhuaxi district was selected, it is necessary to approach the analysis from three key aspects.Initially, Nanhuaxi district clearly demands urban renewal. As a reflection of Guangzhou's long history as a commercial center, Nanhuaxi district's layout and architecture possess considerable cultural value. However, it has been negatively impacted by urban development and traditional renewal models, necessitating the restoration and upkeep of the street environment.

The uneven development of the street has resulted in a fragmented spatial configuration, leading to spatial segregation. The area can be broadly categorized into two main types: spaces with rich textures and spaces lacking texture. The former is primarily concentrated west of the Shuzhu River, including low-rise residential buildings, arcade streets, river alleyways, and multi-story buildings no higher than nine stories, collectively creating enclosed external spaces. The latter is mainly found east of the Shuzhu River and along Binjiang Road, characterized by high-rise office buildings, high-rise residential buildings, and schools, where the buildings fail to enclose external spaces, thus fragmenting the organic relationship of the street's overall texture. Furthermore, the superficial repainting and refurbishment of building facades have confined the arcade streets and traditional residential buildings to a single-layer interface along the street, leading to a homogenization of the street's appearance and a gradual loss of architectural character.

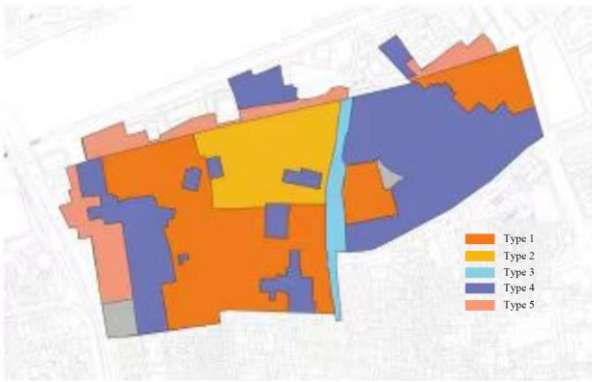


Figure 3-1 Mosaic block plan

(Source: literature[74])

Figure 3-2 Surface renovation work

(Source: author)

Secondly, the physical and economic conditions of Nanhuaxi district, which is located in a strategically important area, currently hinder the achievement of long-term urban development goals. Therefore, urban renewal is necessary to realize the area's economic potential. Regarding the overall district positioning, municipal authorities are utilizing the area's rich historical and cultural resources to distinguish it from other districts within Haizhu, thereby establishing it as a unique historical and cultural landmark for the district.

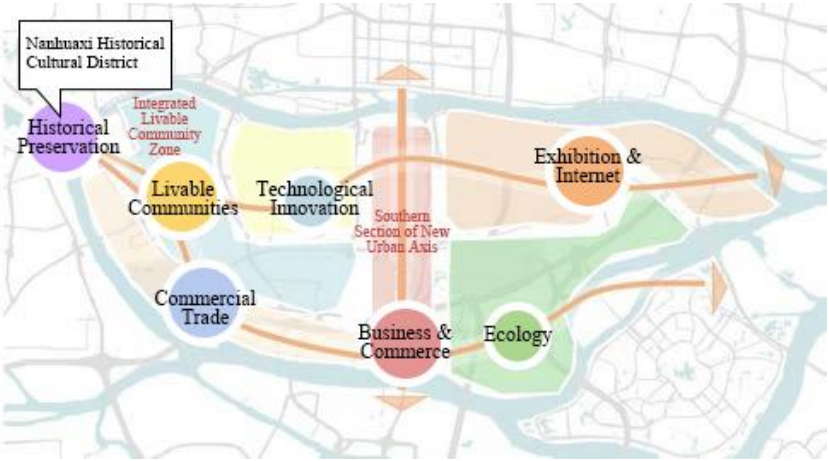


Figure 3-3 Positioning of Nanhuaxi Historic District in Haizhu District

(Source: Adapted from Strategic Development Outline of Haizhu District, Guangzhou City (2017-2035))

The economic activities within the historical district, while diverse, exhibit a lack of sophistication and low value. The traditional industries, deeply entrenched within the district, exert a significant inertia, thereby limiting the enhancement of both the district's and the wider area's urban functionality. Furthermore, a substantial number of storefronts have become vacant post-pandemic. Surveys indicate that 51 out of 138 shops on Nanhuaxi district are vacant (as illustrated in Figure 3-4). On Tongfu West Street, 13 out of 98 shops are vacant (as illustrated in Figure 3-5), with numerous "for rent" signs, indicating a severely depressed and declining economic condition within the district.

Figure 3-4 Distribution map of vacant shops in Nanhuaxi arcade street (Source: author)

Figure 3-5 Distribution map of vacant shops in Tongfuxi arcade street (Source: author)

Thirdly, Nanhuaxi district necessitates immediate enhancements to its physical environment, demanding infrastructure upgrades to elevate residents' quality of life, neighborhood vitality, and sense of belonging, thereby fostering social equity. The street's favorable scale and dimensions support diverse street activities. Its rich historical context has cultivated a historically-rich urban fabric and an open, shared social space, formerly attracting numerous small vendors and skilled artisans. However, the standardized approach to old-town renovation has disrupted Nanhuaxi district's original vitality. Following design guidelines and government-led street renovations, the built environment has undergone significant transformation. Longdaowei Market, situated on Nanhuaxi district, underwent infrastructure and facade renovations in 2022, resulting in features such as uniform ground paving, standardized billboard materials and colors, and uniformly positioned streetlights. Although these unified renovations have improved the street's cleanliness and spaciousness, the vibrant neighborhood atmosphere of the past has diminished. Nonetheless, during a revisit to Longdaowei on the eve of the 2025 New Year, it was observed that neighbors had re-established awnings along the road boundaries and were selling New Year goods, continuing to enact the unique street life of Longdaowei through informal activities and adaptations, despite their relatively limited spatial influence (Figure 3-6). Consequently, effective community governance is of utmost importance.

Evaluations and commentaries on the outcomes of the Longdaowei market renovation were collected from various stakeholders through in-depth interviews. These were then summarized and refined to facilitate an understanding of the disparities in assessments among different entities, as presented in the following tables

a) Pre-regulation Market in 2022 | b) Post-regulation Market in 2022 | c) Current Market Status

Figure 3-6 The spatial evolution of Longdaowei Market (Source: a from google; b & c by author)

Table 3-1 Summary of the evaluative attitudes of various stakeholders towards the renovated Longdaowei

Stakeholders	Spatial dimension	Economic dimension	Social dimension	Cultural dimension
Government	√	√	√	√
Residents	√	√	◯	—
Businesses	√	×	◯	—
Citizens	√	—	×	×

Notes: √: Positive Attitude; ×: Negative Attitude; ◯: Composite Attitude; —:Neutral Attitude.

Source: Compiled and drawn by the author based on questionnaire results (Source: appendix 1)

Table 3-2 Summary of comments from different stakeholders on the post-renewal Longdaowei Market

Stakeholders	Spatial dimension	Economic dimension	Social dimension	Cultural dimension
Government	Urban environment enhancement	Land value appreciation	Improved social stability	Highlighting of historical and cultural heritage
Residents	Residential environment improvement	Property value appreciation	Access to safeguarded rights and interests channels / Relocation of familiar stores	—
Businesses	Business environment improvement	Increased operational costs	Reduced social conflicts / Increased surveillance	—
Citizens	Urban environment enhancement	Increased consumption costs for certain items	Decline of familiar social spaces	Weakening localization of culinary culture

Source: Compiled and drawn by the author based on questionnaire results (Source: appendix 1)

The historical context of Nanhuaxi, originally shaped by the Shuzhu Creek, included the Pan Family Garden to the west and the Wu Family Garden to the east, creating a vibrant private garden environment. Currently, these structures have been replaced by high-density, bamboo-tube-style residential buildings. The available public spaces for residents' social activities are limited to the Tongde Courtyard in the Fuan community and a few corner activity areas.

The existing spatial configuration of Tongde Xiaoyuan is characterized by disorganization, functioning as zones for bicycle storage, package retrieval, and waste management, thereby demonstrating passive utilization. Moreover, while some activity spaces at street corners, such as small seating areas beneath banyan trees, are furnished with seating, these areas are predominantly utilized as transit routes by residents, leading to infrequent usage. The limited availability of public spaces necessitates that a significant portion of residents conduct their

daily social interactions primarily at their doorsteps and within alleyways.

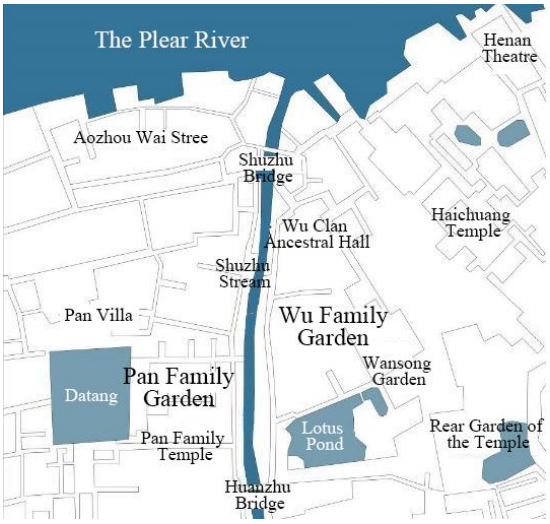


Figure 3-7 Gardens around Shuzhu Creek in the Qing Dynasty
(Source: literature[75])

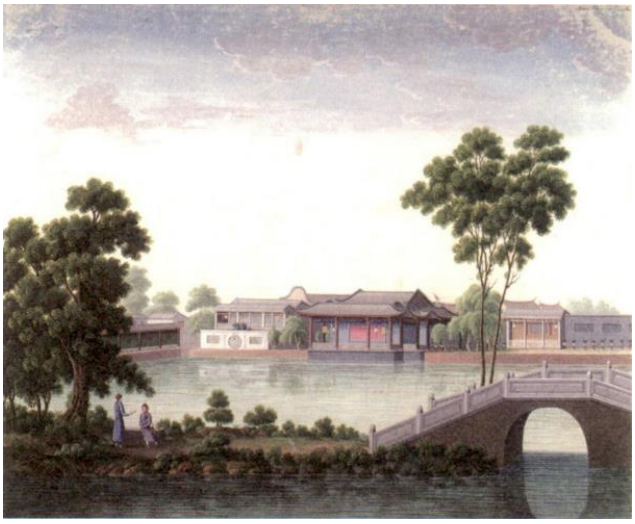


Figure 3-8 Pan Family Garden
(Source: Anonymous, The Garden of a Wealthy Chinese Merchant 'Puan Khequa', British Library Collection.)

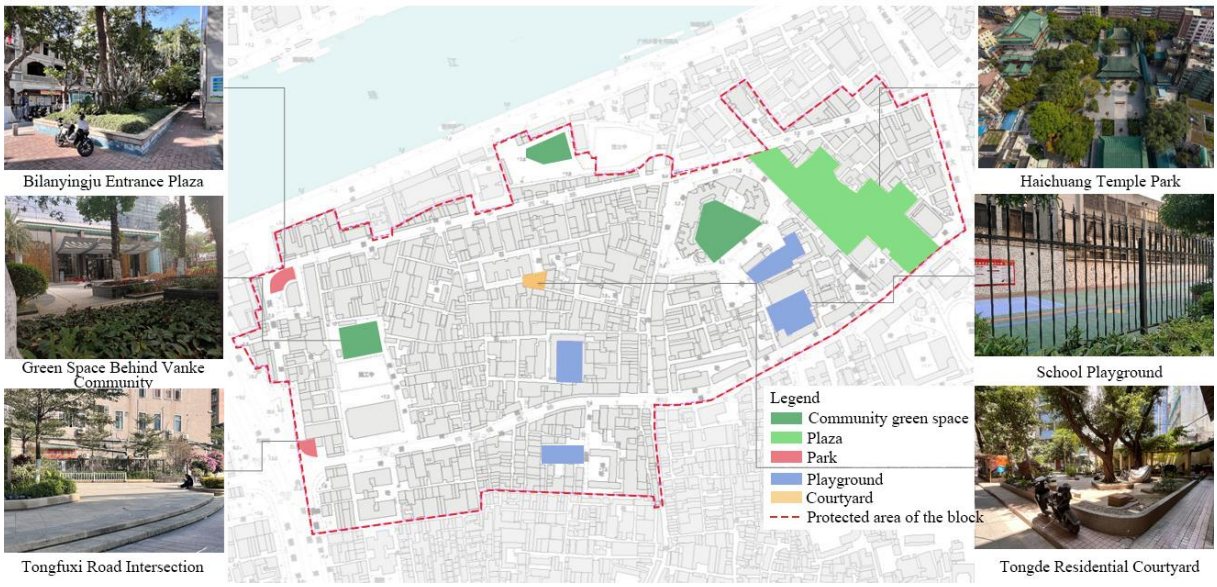


Figure 3-9 Distribution Map of Open Spaces in the Block (Source: redraw based on literature[76])

In summary, Nanhuaxi district is located in the old city area, characterized by diverse streetscape types, mixed property rights, and a large number of private property owners. This poses significant challenges for municipal authorities in addressing urban issues through top-down, static planning blueprints. Specifically, acquiring land and building usage rights for public projects is difficult, necessitating lengthy negotiations, which often impede the implementation of specific actions and strategies. On the other hand, many urban renewal proposals for Nanhua West Street put forward by experts and scholars were predominantly based on independent expert decision-making, resulting in lukewarm feedback from residents

during actual implementation.

3.2 Site Context

3.2.1 Spatial Dimension Analysis

Nanhuaxi district, situated in the southwestern part of Guangzhou's Haizhu District, within the historical urban core, is recognized as a historical and cultural preservation zone by the Guangzhou Municipal Government. It represents the most extensive and concentrated area of historical and cultural heritage in Haizhu District. The street's spatial structure is defined by low-rise, high-density development, typical of a traditional residential neighborhood.

The study area includes the region from Qixing South and East, Longqing North, through Longwu Li to Tongfu West Road in the south, to Nanhuaxi Road (including buildings along its northern edge) and Aozhou Inner Street in the north, to Hongde Road in the west, and to Baogang Avenue in the east, encompassing a total preservation area of 29.24 hectares. The core preservation area constitutes 22.3 hectares, with the construction control zone covering 6.94 hectares. The design scope primarily centers on the Fuan community, which has a land area of 6.29 hectares.

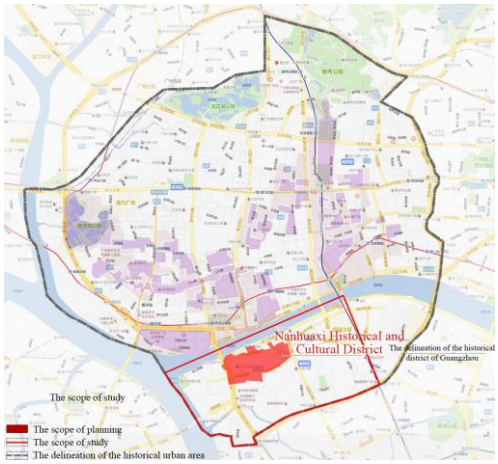


Figure 3-10 Location of Nanhuaxi historic district (Source: literature[77])

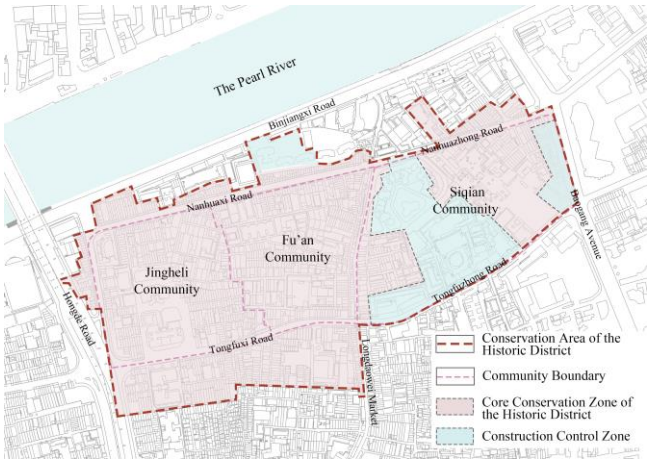


Figure 3-11 Conservation boundaries of Nanhuaxi historic district (Source: literature[77])

The historical and cultural district of Nanhuaxi, the origin of Haizhu District, has experienced a decline in commercial importance due to contemporary urban development. Nevertheless, its rich historical and cultural heritage persists as its most significant asset. Hongde Road within the district showcases its commercial and trade culture, while the Shuzhu River reflects the illustrious history of the Thirteen Hongs era. Moreover, Haichuang Temple represents the district's Buddhist cultural characteristics. These three key elements are fundamental to the district's cultural identity and serve as the foundation for its historical revitalization. Improving the quality of these elements and re-emphasizing their cultural

significance should facilitate the comprehensive revitalization of the district, thereby enhancing social recognition.

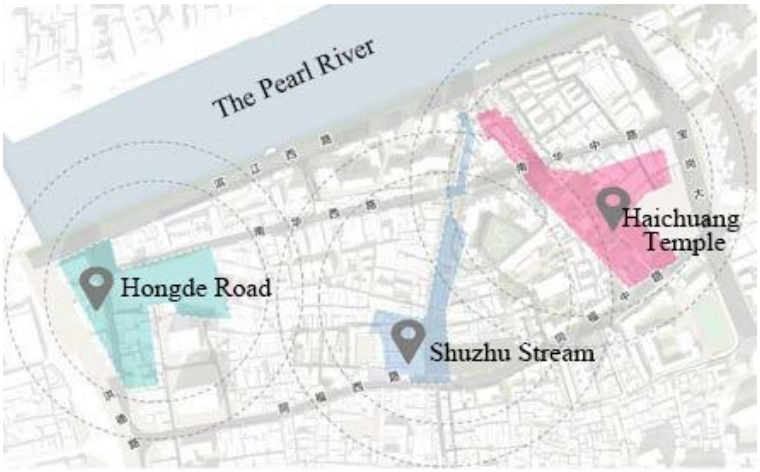


Figure 3-12 Three revitalization nodes in Nanhuaxi historic district (Source: literature[76])

3.2.2 Temporal Dimension Analysis

The sequence "first Nanhuaxi, then Haizhu District" signifies the historical primacy of Nanhuaxi district, the initial development within Haizhu District. Founded in 1776, its history encompasses 249 years. This area has significantly influenced historical development, presently offering a silent testament to its past.

(1) The Qing Dynasty

Prior to the Ming and Qing dynasties, "Henan" remained a remote, peripheral island. With the silting and land reclamation of the Pearl River Plain, migrants gradually crossed the river to establish villages. By the mid-Qing dynasty, the Qing government constructed the salt port and warehouses in Yuelongli on the south bank of the Pearl River. Yuelongli, encompassing the present-day Nanhua Road and Tongfu Road, became the genesis of urban development on the south bank of the Pearl River. As the Pearl River channel narrowed, facilitating increasingly convenient ship traffic, "Henan" gradually evolved into a commercial hub outside Guangzhou, attracting merchants. Wealthy merchants established ancestral halls, built residences, and constructed bridges and roads, forming a classic itinerary: from the Haichuang Temple on the Pearl River—to the Wu Family Garden—to Longwei Dao—to the floating market—to Longxi Shouyue, culminating at the Jin Hua Niang Niang Temple on the Pearl River (Figure 3-13). Shuzhu Yong served as the primary waterway for Nanhuaxi district. Its mouth, diagonally facing the Haizhu Stone in the Pearl River, presented a "sleeping dragon washing pearls" visual, hence its name. Shuzhu Yong predates the Thirteen Hongs; in the early Qing dynasty, it was known as the "Grain Transport River," with wooden boats transporting grains, fruits, and

vegetables produced in "Henan" to the city, exchanging them for daily necessities. Due to its convenient transportation, Shuzhu Yong's banks flourished with commerce, numerous famous gardens, and a multitude of restaurants, earning it the moniker "Guangzhou's Qinhuai."

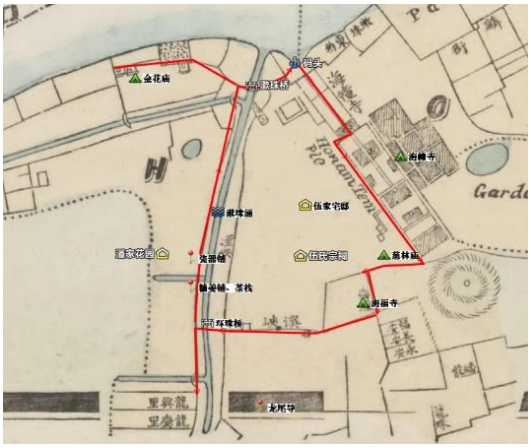


Figure 3-13 Classic itinerary route

(Source: literature[75])

Figure 3-14 "Floating Market" Scene

(Source: Private Nashville, TN collection.)

(2) Modernity

The southern bank of the Pearl River saw a gradual expansion of commercial, industrial, and residential developments along its waterfront during this period. By the early Republic of China era, areas such as Nanhua Road and Tongfu Road had reached full development. Simultaneously, the Guangzhou Municipal Public Office was founded, and the demolition of city walls to build roads greatly improved urban transportation. The formulation of arcade building policies and regulations standardized the transformation of street-front buildings, resulting in the construction of arcade commercial districts. The government established the Henan Industrial Zone from 1929 to 1936 and, in 1933, opened the first Haizhu Bridge, which crossed the Pearl River. The opening of the Haizhu Bridge promoted the inland development of the southern urban area, stimulating large-scale industrial production. To expedite construction and reduce costs, early 20th-century Guangzhou arcades generally featured simplified facade treatments; as a result, although Nanhuaxi district has numerous arcades, the proportion of high-quality examples is relatively small.

（3）Contemporaneity

Post-Liberation, the People's Government swiftly began transforming Guangzhou from a consumption-oriented city, primarily focused on commerce, into a production-oriented city, with industry as the core of the national economy. The industrial sector within the city center was largely concentrated in the Haizhu and Liwan districts. The direct discharge of both domestic and industrial wastewater into the Zhushuyong without prior treatment, combined with a lack of dredging and maintenance, caused this canal to degrade into a notorious open

sewer within the Henan region of Guangzhou. Starting in 1966, the government converted the Zhushuyong into a box-type culvert, with widths ranging from 1.2 to 2.8 meters. The original bridges spanning the canal were largely demolished, except for the eastern arch of the Zhushu Bridge and the historical site of the Huazhou Ancient Ferry. However, due to the southward relocation of industrial zones and subsequent economic development, the majority of historical structures and alleyways have been preserved, thus providing a material foundation for the city's spiritual and cultural advancement.

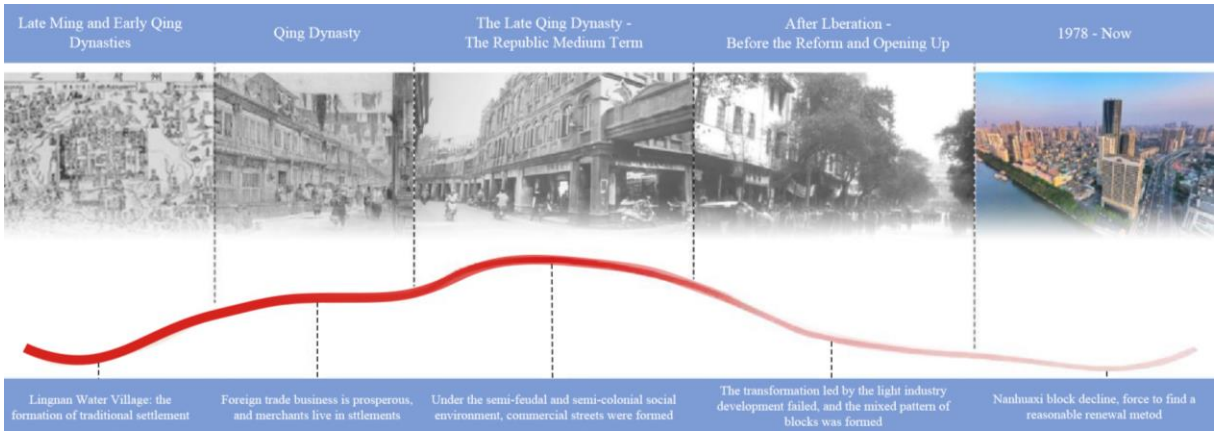


Figure 3-15 Historical evolution of in Nanhuaxi historic district (Source: literature[88])

a) Qing Dynasty b) Modern Era c) Contemporary Era

Figure 3-16 Evolution Process of Shuzhu Creek (Source: a from *Canton, China* (1880), b from *China: Back streets canal and housing, Canton (Guangzhou)* (1917), c by author)

3.2.3 Historical Value and Cultural Significance

The historical and cultural significance of Nanhuaxi district serves as a concentrated representation of the developmental shifts within the Henan region. As a residential area for merchants of the Thirteen Hongs during the Qing dynasty, it is a repository of rich architectural remnants. The historical value is primarily encapsulated in the following four points:

(1) Demonstrates the spatial development trajectory of the Henan region, "born from water, thriving because of water";

(2) Serves as a testament to the interactions between Guangzhou's Thirteen Hong

merchants and foreign traders;

(3) Represents authentic embodiments of diverse residential patterns in the Henan region during the late Qing Dynasty and the Republican period;

(4) Constitutes significant fragments of modern national and democratic revolutionary movements.

Consequently, the traditional spatial structure and historical features should be preserved. First, the historical water system, with a focus on Shuzhu Creek, is to be preserved. This includes safeguarding historical artifacts like the Shuzhu Bridge site. Second, the historical imprints of interactions between Guangzhou's Thirteen Hong merchants and foreign merchants are to be conserved. This involves protecting extant merchant residences, such as the Pan family courtyard, and significant locations of foreign exchange, including Haichuang Temple. Third, the spatial texture and traditional appearance of diverse residential neighborhoods from the Qing dynasty to the Republican era are to be preserved. This encompasses conserving the spatial texture and traditional appearance of characteristic traditional residential areas, such as the bamboo tube houses and large houses of the late Qing and early Republican periods, as well as the red brick Western-style houses of the Republican era.

Furthermore, Nanhuaxi boasts a rich tapestry of folk traditions and intangible cultural heritage.

Folklore Literature	Jinhua Ferry, Historical Accounts of Shuzhu Creek, Poetry of Nanhuaxi
Time-honored Brands	Gengtiangong Herbal Tea House, Chengzhu Restaurant
Traditional Performing Arts	Puppetry
Traditional Music	Guqin Art (Lingnan School), Guangzhou Xianshui Folk Songs
Intangible Cultural Heritage Craftsmanship	Colored Paper Sculpture (Guangzhou Lion Head Craft), Xiaofeng Cake (Chick-shaped Cookie) Making Technique, Nanhuaxi Lantern Craft, Herbal Tea Brewing
Notable Figures Merchant Families	Pan, Lu, Wu, and Ye Families (Representative merchants of the Thirteen Hongs), Master Artists and Revolutionary Pioneers

Figure 3-17 Outstanding Traditional Culture and Intangible Cultural Heritage of Nanhuaxi

(Source: literature[77])

3.3 Existing Site Conditions

Based on the protection and utilization plan for the historical and cultural block of Nanhuaxi district in Guangzhou, and in conjunction with literature review and on-site field research, a classification of morphological element types is conducted.

3.3.1 Business Value Analysis

Nanhuaxi district presents a varied array of service facilities, primarily situated between Tongfu West Road and Tongfu Middle Road. Nevertheless, several challenges remain. Initially, the area surrounding the former location of Shuzhu Creek, which functions as a comprehensive market for the community, is characterized by traditional small-scale retail, dining establishments, hardware stores, and craft workshops. Significant potential exists for enhancing the area's developmental prospects. Secondly, the quality of hotel services, encompassing both the environment and facility configurations, is generally substandard, thereby impeding the capacity to satisfy the requirements of urban economic and tourism advancement.

The regulatory detailed plan delineates the projected land use for the urban structure, thereby establishing the parameters for its development and integrating urban renewal strategies. This plan serves as a critical urban planning instrument, facilitating the regulation of the built environment and fostering a vision for the future urban form. In practice, the functions of buildings are multifaceted and subject to change, rather than being rigidly defined. The Protection and Utilization Plan (2017) advocated for functional compatibility within Nanhuaxi district.

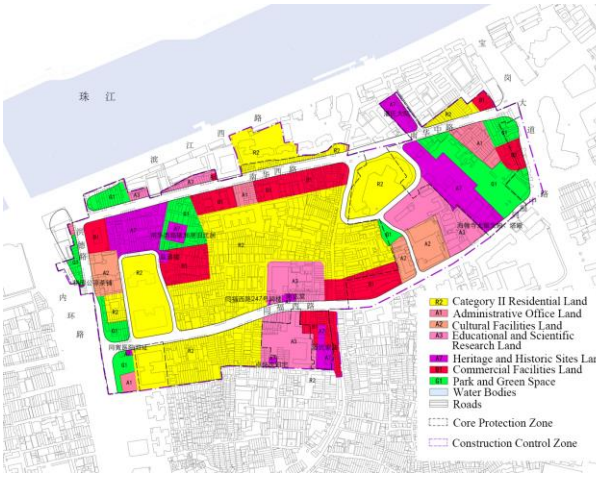


Figure 3-18 Current Land Use

(Source: literature[77])

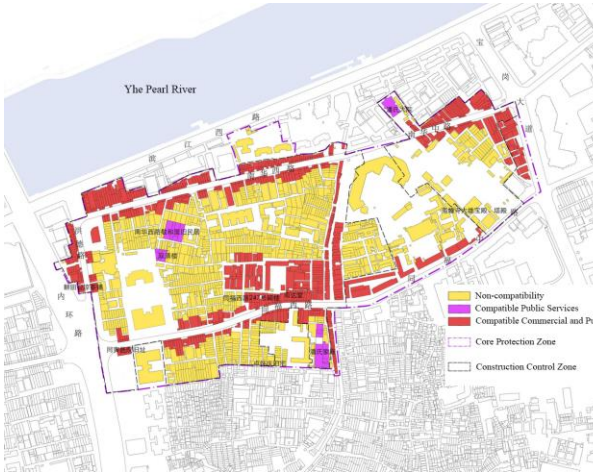


Figure 3-19 Building Functional Compatibility

(Source: literature[77])

3.3.2 Traffic Analysis

The existing Metro Line 8 currently serves the area, with the future addition of Line 19. Line 19 is designed to pass through the district, providing connections to multiple historical locations. Complementing the metro, several bus routes operate in proximity to Nanhuaxi district, offering alternative short-distance transportation choices for inhabitants. The metro station directly linked to Nanhuaxi district is Tongfu West Station. An assessment of the service radius reveals that the site is situated within a 5-minute walking distance of the metro station.

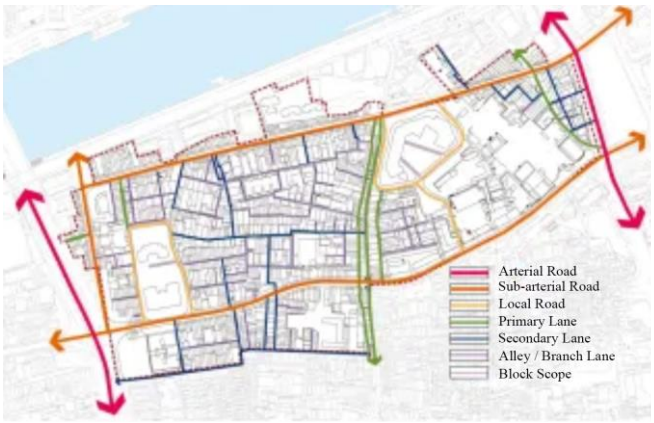


Figure 3-20 Street System Hierarchy

(Source: literature[74])

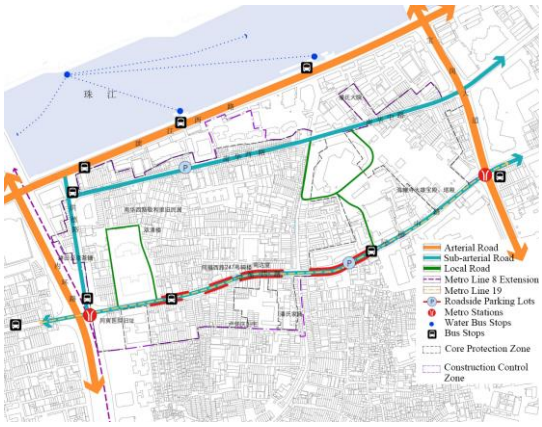


Figure 3-21 Transportation System Planning

(Source: literature[77])

3.3.3 Analysis of Architectural Typologies

The urban block's architectural typology exhibits considerable variety, including Qing dynasty merchant residences, bamboo tube houses, and "dayu" (large houses) from the late Qing and early Republican eras, as well as arcade buildings erected during the Republic of China's unified planning. Additionally, red-brick Western-style houses, constructed by returned overseas Chinese, collectively showcase a concentrated representation of Guangzhou's diverse residential patterns. The immovable cultural heritage comprises five cultural relic protection units, such as the Mahavira Hall and Pagoda Hall of Haichuang Temple, and the Pan Family Courtyard, along with five additional immovable cultural relics, including the former site of the Tung Yin Hospital and the Gengtian Gong Herbal Tea Shop. The "Protection and Utilization Plan for the Nanhuaxi district Historical and Cultural Block" specifies distinct protection requirements for buildings based on their condition.

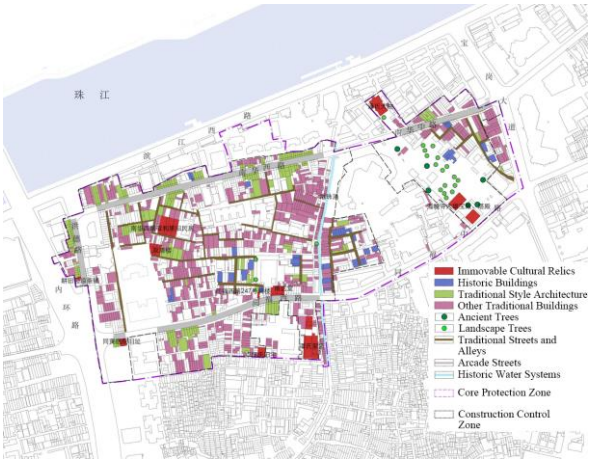


Figure 3-22 Distribution Map of Protected Objects

(Source: literature[77])

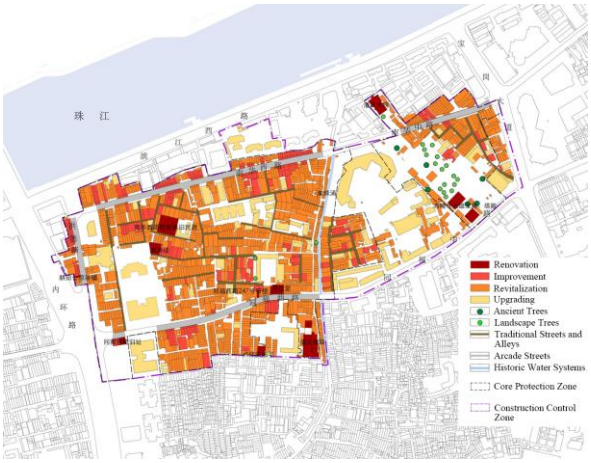


Figure 3-23 Classification-based Conservation and Renovation Plan (Source: literature[77])

3.3.4 Environmental Analysis

The urban environment of the area is characterized by significant density and congestion. The availability of public open spaces and green areas for public use within the district is inadequate, and their development lacks coordination and interaction with residents, leading to a problematic transition between public and private realms. An examination of survey findings concerning the challenges in the old district indicates that 34.5% of participants identify traffic congestion as the most pressing issue. Narrow streets impede the district's development, and the parking of motorcycles and bicycles further exacerbates traffic flow problems. Approximately 31.6% of respondents express concern over the scarcity of parks and plazas, which limits activity spaces for the elderly and children. Moreover, 31.5% of resident respondents perceive the building quality in the district to be substandard, while about 25.5% of respondents cite inadequate municipal drainage, resulting in street flooding and a lack of sanitation infrastructure[78].

Figure 3-24 Green spaces in the Nanhuaxi Historical District

(Source: literature[76])

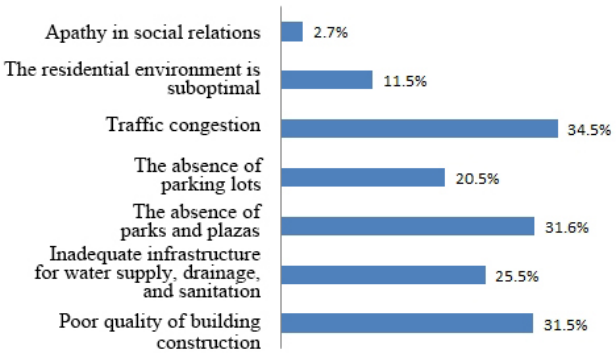


Figure 3-25 Problems with neighborhood life as perceived by the residents interviewed

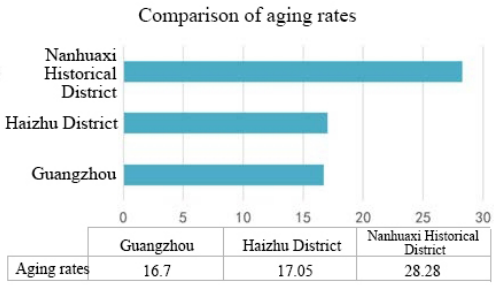
(Source: literature[78])

3.3.5 Social Space Analysis

3.3.5.1 Prominent Challenges in Aging Population and Employment

The historic cultural block of Nanhuaxi district demonstrates a population density of 3.8499 persons per square kilometer, a figure that considerably exceeds the average density of Guangzhou city (2.726 persons per square kilometer). As a traditional old district of Guangzhou, it is distinguished by a high concentration of residents. The absence of enhancements in the living environment of the old district, combined with the scarcity of essential public spaces such as green areas, has resulted in an outflow of local residents with the financial capacity to relocate. Consequently, the remaining population predominantly comprises elderly residents who, due to economic constraints and employment limitations, are unable to move and continue to reside in

the area.



	Guangzhou	Haizhu District	Nanhuaxi Historical District
Aging rates	16.7	17.05	28.28

Figure 3-26 Comparison of aging rates

(Source: literature[76])

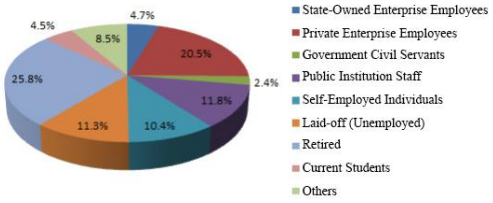


Figure 3-27 Residents' Employment Status

(Source: literature[78])

3.3.5.2 Strengthening Local Identity and Sense of Belonging

The displacement of original inhabitants and the arrival of new residents, despite a degree of neighborly coexistence, have precipitated a gradual decline in established social networks, consequently diminishing the collective sense of identity and community within the neighborhood. Research indicates that newcomers constitute roughly one-third of the population. This demographic encompasses both temporary renters and middle-class residents. Renters are primarily drawn to the area due to its proximity to employment centers and relatively affordable housing costs; they typically have limited expectations regarding living standards and often lack an appreciation for the significance of historical preservation within the neighborhood. Middle-class residents in the newer residential areas, due to their shorter tenure, possess limited knowledge of the neighborhood's historical evolution and traditional culture (see Table 3-3), thus lacking a personal emotional connection to the historical district. Moreover, inadequate mutual understanding between long-term residents and transient renters, as well as between residents of new and older districts, has contributed to the gradual fragmentation of social networks. Nevertheless, the presence of enduring establishments, such as the 25-year-old Zhajia Yi Fried Skewers Shop and the 39-year-old Ying Kee Eatery, within the historically significant Nanhuaxi neighborhood, provides opportunities for newcomers to develop a new emotional cognitive framework in an alternative manner.

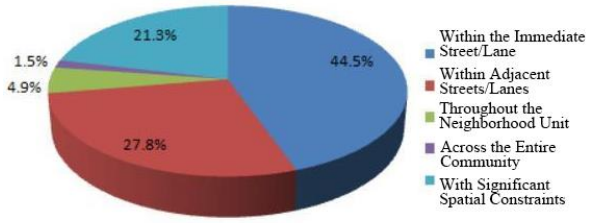


Figure 3-28 The primary distribution of familiar neighborhood residents

(Source: literature[78])

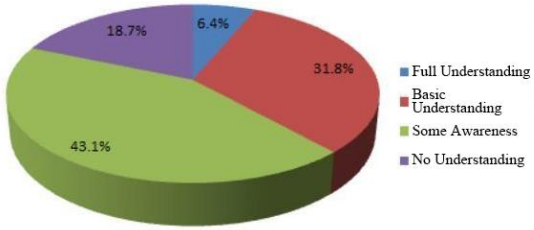


Figure 3-29 The extent of understanding of the neighborhood residents

(Source: literature[78])

Table 3-3 The understanding of historical districts among interviewees from migrant populations and residents of newly developed communities (Source: literature[78])

	Migrant population	Residents of newly developed residential communities
Block History	20%	20%
The Cultural Practices of the Thirteen Hongs	0	30%
Haizhuang Temple	90%	90%
Cobblestone Street	10%	10%
Shuzhu Stream	40%	0
Shuzhu Bridge	90%	70%
Huanzhu Bridge	60%	60%
Hennan Christian Church	70%	60%
Guangzhou Colored Porcelain	0	0
Lion Dance	20%	20%
Festoon Craft	0	0

Table 3-4 The understanding of local food stores among interviewees from migrant populations and residents of newly developed communities.

	Ying Kee Eatery	Bao De Bakery	Guoqiang Bakery	Chunxin Pastry House	Sisters' Cake Shop
Migrant population	90%	90%	50%	60%	90%
Residents of newly developed residential communities	90%	90%	60%	70%	70%

Source: self-designed based on interview findings (Appendix 1)

3.4 SWOT Analysis

Lynch's framework for evaluating a "good city" identifies seven key factors: vitality, sense, fit, access, control, efficiency, and equity. "Soft City" further delineates nine criteria for assessing the livability and sustainability of high-density built environments, including diversity in building form and outdoor spaces, flexibility, human scale, walkability, sense of control and identity, pleasant microclimate, a smaller carbon footprint, and higher biodiversity[79]. The present study, however, is not intended to formulate a comprehensive strategic plan for Nanhuaxi district; instead, it aims to assess the potential of an integrated urban design approach, thereby limiting the scope of analysis to methodological aspects. This approach has facilitated the generation of four standard clusters and their corresponding sub-element targets. A spatial SWOT analysis is employed to identify internal strengths and weaknesses, as well as external opportunities and threats, that influence the organic development goals of Nanhuaxi district. The detailed hierarchical list is presented in the subsequent table (Table 3-5). The elements (Sub-objective Core Value) associated with these standards are subsequently compared in pairs using the ANP method; these sub-elements also function as factors influencing the achievement of sub-goals, which are utilized to determine the relative importance of sub-goals within a specific context.

Clusters	Elements	Strengths	Weakness	Opportunities	Threaths
Social	**Cultural preservation and enhancement**	-Strategic position in the city -Valuable historical culture and buildings, eg. Arcade Street	-Informal settlements and illegal construction -Mosaic Block shape -Neglected historical culture -Only basic services available, poor cultural offer.	-Cultural diversity: potential to create new services and facilities	-The departure of low-income people due to gentrification
	Identity and recognizability	-Proximity to high density residential areas	-Regional population aging		-A high percentage of immigrants: weak sense of community
Site	**Easy mobility and slow life**	-Direct connection with subway station -Pedestrian street	-Narrow internal roads and high-density buildings -Lack of parking lots	-Take advantage to public transportation	-Increase of traffic and noise
	Multiple functions	-Activity nodes	-Poor quality architectures -Idle shops	-Renovation or reuse of vacant buildings and lots	
Health	**Nature and environment**	-Close to the Pearl River	-Lack of green open space -Weak connections	-Enhance the possibility of enjoying landscape views -Renewal of traditional river	-Informal use of public space
Equity	**Mixed-use and mixed-income**	-There are many small independent businesses in the base	-Low profits in retail industry -Low tax contribution -High cost of social management for itinerant vendor	-Renewal brings new functions and facilities, provides new jobs and attracts young people, investors and tourists.	-No remediation funds
	Human contacts and social cohesion	-Historical culture leads to stable social network -Carry out community activities to create a sense of human belonging	-Inflexibility of the proposed municipality plan -An increase of foreign population	-An innovative plan for Nanhhuaxi, with micro-mobility systems connecting the new developments	-Impossibility of using public spaces without public engagement

Table 3-5 SWOT analysis of Nanhuaxi district

(Source: self-plotted diagram based on

preliminary analysis results)

Table 3-6 Influencing factors associated with subgoals and their spatial representation (Source: author)

Clusters	Sub-objective Core Value	Influencing Elements	Description	Spatial Representation
Site	Easy mobility and slow life	Bus lines, Bike paths, Pedestrian street	Road accessibility	Street System Hierarchy Map
		Bus stops and Metro stops	Distance from bus stops and metro stops (in project)	Road Traffic System Planning
		Lack of parking lots	Concentration of parking lots	Parking Space Distribution Map
	Multiple functions	Activity nodes	Concentration of activity spaces (mini park, playground)	Block Open Space Distribution Map
		Idle shops	Concentration of idle shops	Vacant Shops Map
		Renovation projects	Influence of areas in transformation	Conservation and Renovation Plan
Health	Environment	Weak connections	Influence of areas with fences and roads	Spatial Accessibility
		Informal use of public space	Distribution of informal construction and activities	Informal Activities Distribution Map
	Nature	Natural Landscape	Distance from the river	Site Water System
		Lack of green open space	Number of green open space	Green Space Distribution Map
Social	Cultural preservation and enhancement	Historical value	Distribution of protected objects	Protected Objects Distribution Map
		Informal settlements and illegal construction	Concentration of informal construction	Informal Activities Distribution Map
		Mosaic Block shape	Building texture map	Building Texture Map
		Poor quality architectures	Building quality distribution map	Building Quality Analysis Map
		Cultural diversity	Building types distribution map	Building Typology Analysis Map
		Gentrification	New markets and new residential buildings	Pre- and Post-Renovation
	Identity and recognizability	Street system	Traditional street map	Traditional Street and Alley Conservation Map
		Mixture	Concentration of activity nodes and residential buildings	Activity Nodes and Residences
		people's everyday life and their bond with the environment	Distribution of informal construction and activities	Informal Activities Distribution Map
Equity	Mixed-use and mixed-income	Employment opportunities	Concentration of shops, hospitals, pharmacies, schools, markets	Compatible Spaces
		Convenient service		
		Low profits and low tax contribution	Concentration of individual economy	Individual Economy Distribution Map
		High cost of social management		
		Tourism	Concentration of scenic spots	Tourist Attractions Distribution

Table 3-6 Influencing factors associated with subgoals and their spatial representation (Continued)

Clusters	Sub-objective Core Value	Influencing Elements	Description	Spatial Representation
Equity	Human contacts and social cohesion	Stable social network	The proportion of the migrant population; Degree of understanding of one's neighbors; Distribution map of familiar neighbors	Proportion of Migrant Population; Residents' Familiarity with the Neighborhood; Distribution of Familiar Neighbors
		Educational and cultural activities	The frequency of conducting educational and cultural activities	Participation in Educational and Cultural Activities
		the proposed municipality plan	Transformation Policies and urban planing	Conservation and Utilization Plan
		Renovation with public engagement	Residents' satisfaction with street improvement and renovation efforts	Public Participation in Neighborhood Renewal Efforts

Source: author

(1) Current Challenges in Nanhuaxi district

The coordination between formal planning and informal practices in Nanhua West Street has become an urgent imperative.

① Streetscape: The district exhibits unbalanced development, with widespread spontaneous spatial modifications by residents and merchants. This has resulted in a disordered and discontinuous street interface, failing to harmonize historical character with contemporary aesthetics. Additionally, local resources are dispersed and relatively concealed, leading to a lack of distinctive features in the area's overall appearance.

② Green Environment: Public green spaces are scattered and non-contiguous, leading to inefficient service provision and the privatization of public spaces, thereby fostering physical segregation.

③ Site Utilization: Insufficient public spaces and infrastructure impede optimal space utilization.

④ Social Space: Continuous population mobility contributes to the erosion of social networks, fostering social isolation. The absence of public cultural activities leads to a decline in public spirit.

⑤ Commercial Value: Despite its strategic importance in cultural development and significant tourism potential, the area's industries are underdeveloped, with limited functionality in activity nodes, thereby lacking sustained commercial appeal.

(2) Proposed Solutions

① Enhance street usability by incorporating unique humanistic and ecological elements of Nanhuaxi, developing themed alleyways and cultural exploration routes to revitalize the historical and cultural value of the district and reinforce residents' sense of identity.

② Increase space utilization efficiency and mitigate spatial segregation by implementing time-sharing usage of private or institutional spaces.

③ Cater to the daily needs of local residents by establishing community micro-spaces, providing effective bottom-up construction methods to enhance the density and diversity of public service spaces, thereby improving the overall living standards and well-being of the community.

④ Transform landmark locations into multi-functional cultural activity zones to invigorate the site, integrating new and existing business formats to highlight industry characteristics and attract visitors.

3.5 Overview of Informal Spaces in Streets and Alleys

A typological analysis of the informal spatial samples within the entire block is undertaken in this section. Utilizing both place-centered and person-centered behavioral mapping methodologies, the study examines the "space - event" correlations within the context of production-oriented and residential informal spaces. Through the investigation of event activities occurring in diverse informal spaces, coupled with the findings from questionnaire surveys, the research aims to elucidate the behavioral habits and usage requirements of various demographic groups.

3.5.1 Site Selection for Investigation

The study's scope, focusing on "informal spaces," encompasses Guangzhou's Nanhuaxi historical district, specifically the Jingheli, Fu' an, and Siqian communities. Residential properties within each community have exhibited varying degrees of renovation, both internally and externally. These modifications, largely incremental, have been implemented within existing private property boundaries and courtyard dimensions. This suggests that resident-led, incremental renovation has been a consistent practice, representing a fundamental mode of spatial production inherent to the historical urban fabric, thereby reflecting the district's capacity for spontaneous spatial generation. Based on preliminary community surveys, a comparative analysis of the prevalence and quantity of informal spaces facilitated the selection of the "Huanzhu Bridge - Longdaowei Market" area as the primary focus for "production and business-related informal spaces." Furthermore, the Fu' an and Jingheli communities were

selected as the focal points for the study of "residential and lifestyle-related informal spaces."

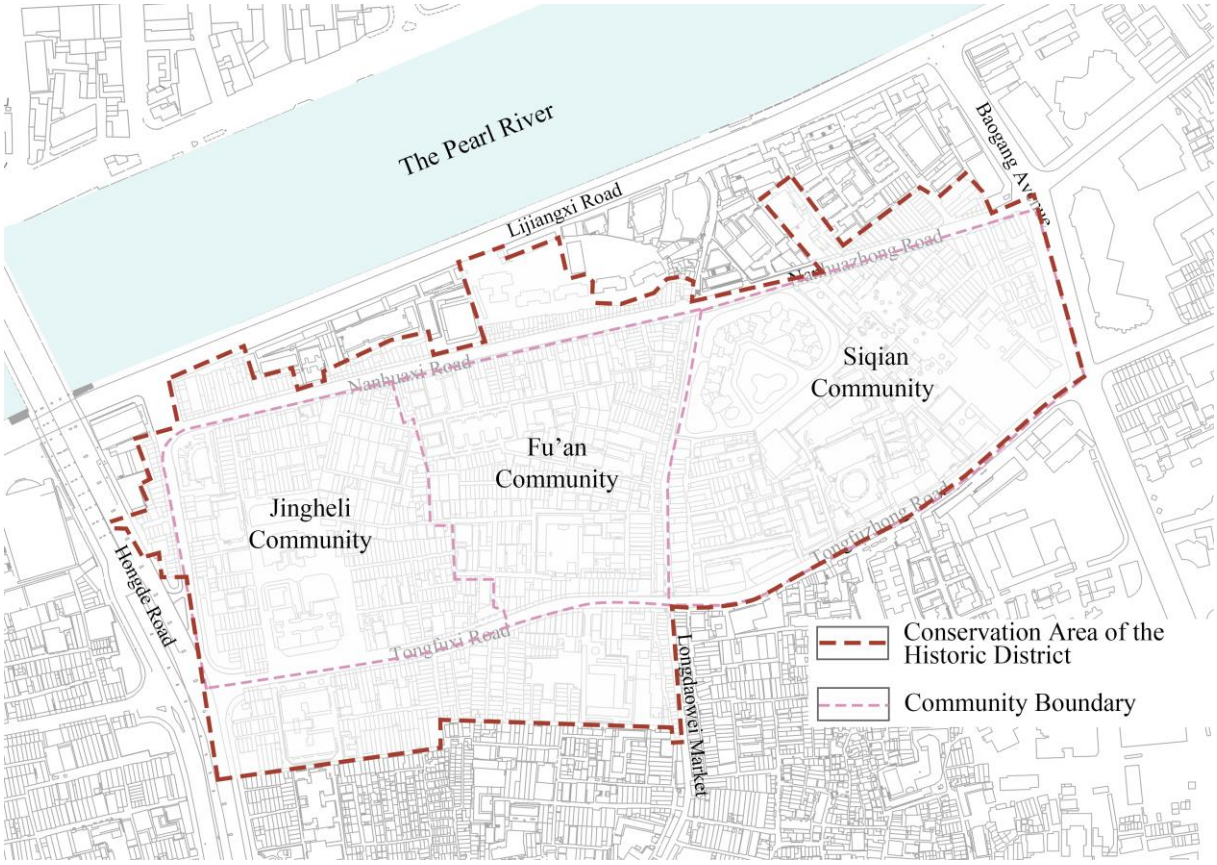


Figure 3-30 Surveyed Site Community Boundaries (Source: literature[77])

3.5.2 Analysis of Informal Spaces Classified by Functional Use

Amidst the transformations within historic districts, the convergence of residential and lifestyle needs with those of production and commerce has engendered a complex interplay. This has subsequently influenced spatial utilization and functional alterations, thereby giving rise to a series of informal spaces, which constitute a unique spatial typology. To facilitate the subsequent formulation of specific pattern language and the refinement of patterns in the application of pattern language theory in Chapter Six, this section commences with a synthesis of the field research findings. It then proceeds to analyze the relationship between the representative informal spaces associated with different business types and the primary architectural structures, focusing on the "space-behavior" dynamics to elucidate the spatial components and their specific applications.

3.5.2.1 Informal Spaces for Production and Commerce

Informal spaces for production and commerce can be categorized into two types: those associated with the retail sector and those associated with the service sector. The vertical dimension of these spaces is generally limited to approximately one story. Due to variations in

overall scale, their layouts tend to be somewhat disorganized.

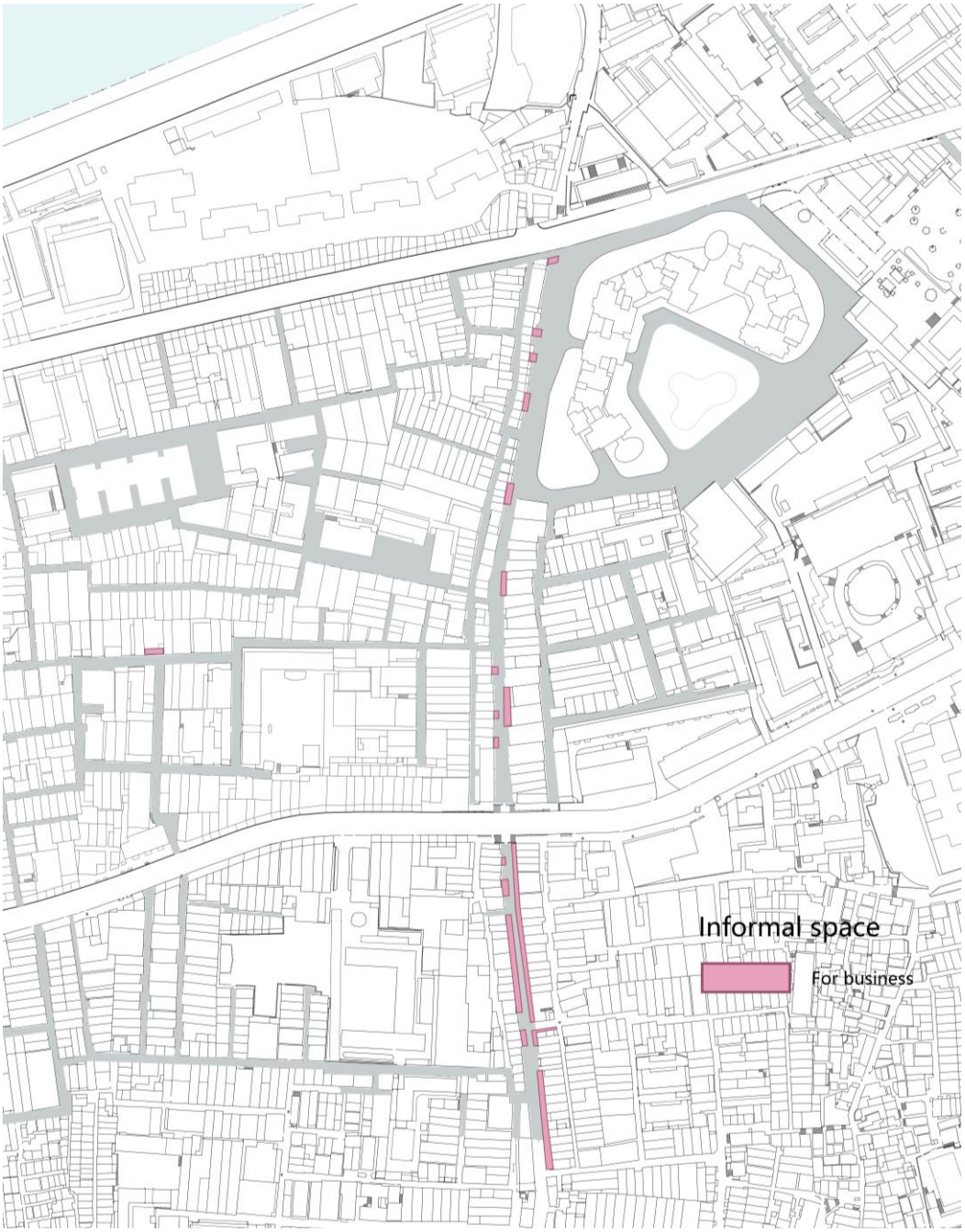


Figure 3-31 Mapping the spatial distribution of informal production and commercial spaces (Source: author)

Table 3-7 Overview of informal production and commercial spaces

a) Informal spaces associated with the retail sector (Source: author)

Table 3-7 Overview of Informal Production and Commercial Spaces (Continued)

b) Informal spaces associated with the service sector (Source: author)

The spatial configuration of informal spaces predominantly involves the temporary construction of shelters or the occupation of space directly along the roads flanking the main market thoroughfares. These structures, owing to their adjacency to the primary buildings, exhibit a degree of order. The interior of informal spaces dedicated to service industries typically features arrangements of tables and chairs, accommodating either four or six individuals. Retail-oriented informal spaces generally incorporate counters or display units for the exhibition and sale of merchandise. Some also function as hybrid production spaces, utilized for the preparation of fresh pastries, a practice particularly evident during the peak season for New Year goods, when additional space is required for dough proofing and oil draining. Subsequently, the analysis will focus on specific case studies of these two types of informal spaces, examining them through the lenses of "space" and "event."

The space depicted in Figure 3-32 represents an informal space associated with retail activities at No. 19 Longheli. The author has attempted to categorize the identities of individuals who are required to work within the space and those who may enter it, analyzing the flow lines generated by the events occurring within the space. As illustrated in Figure 3-32, the orange flow lines represent the merchants: ① The pastry chef, after preparing the dough in the back kitchen, immediately allows it to proof in a shaded area for a specific duration. Subsequently, they proceed with filling, wrapping, or rolling; ② The semi-finished products are then placed in a pan for frying, until golden brown, and then removed to drain the oil; ③ The finished pastries are packaged using a packaging machine; ④ The packaged pastries are directly displayed for sale in the display case. Merchants typically produce pastries such as Yau Gok (fried cantonese dumplings) and Daan San (crispy fried egg twists) at the shop level. Furthermore, during festive periods, other citizens or tourists also visit Nanhuaxi to purchase New Year goods, as the green flow lines shown in the Figure 3-32: ① Arriving near the

informal space; ② Queuing or interacting with others within the space; ③ Observing the pastry chefs' handmade pastry-making process; ④Leaving the space. Their duration of stay within the space is variable. Because tourists can directly observe the handmade production process upon entering the space, they are more likely to engage in purchasing behavior. Consequently, merchants are also inclined to provide open spaces for tourists and other individuals.

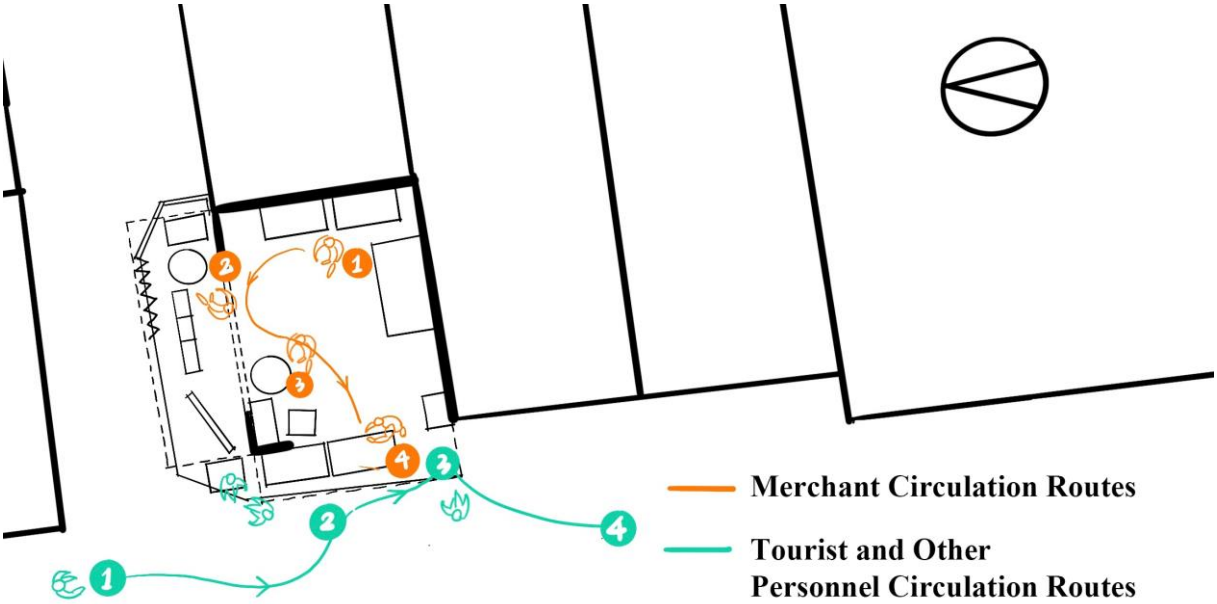


Figure 3-32 Spatial Circulation Analysis of User Activity at Longheli No. 19 (Source: author)

Within this informal setting, the design prioritizes both spatial utilization and visual interaction among individuals of diverse identities. The primary thoroughfare is characterized by complete openness, featuring transparent glass display cases to facilitate these interactions. Conversely, the secondary thoroughfare is defined by the need for security and enclosure, essential for the operational requirements of the commercial entities. These spaces are demarcated using materials such as stainless-steel shelving or plastic partitions, thereby ensuring a flexible and adaptable environment.

For the purpose of this analysis, the informal spaces associated with the service sector are exemplified by the case study of No. 43 Tongfu Middle Road, as illustrated in Figure 3-33. The commercial entities within this space undertake several key functions: ①conducting essential logistical operations; ②managing front-of-house service activities; ③performing preliminary food preparation and waste disposal during non-operational hours; and ④engaging in customer interaction within the informal space during operational hours, as required. The consumer flow is delineated as follows: ①consumers enter the informal commercial space from the main

street of Longdaowei; ②they are seated within the informal space for consumption; ③they proceed into the restaurant for additional related activities; and ④they exit the space from the opposite side. Given the encroachment of the informal space onto the public thoroughfare, visual interactions between visitors and the space are inevitable. The interactions of visitors and other citizens are characterized by: ①their approach to the vicinity of the informal space; ② their passage through the space, often drawn by the visual appeal of the food being consumed; and ③ their departure from the space.

In summation, the commercial service characteristics of production and operation-oriented informal spaces contribute to a complex spatial flow of individuals. Beyond the safety and hygiene requirements inherent in production functions, these spaces are relatively open, with spatial boundaries primarily defined by canopies.

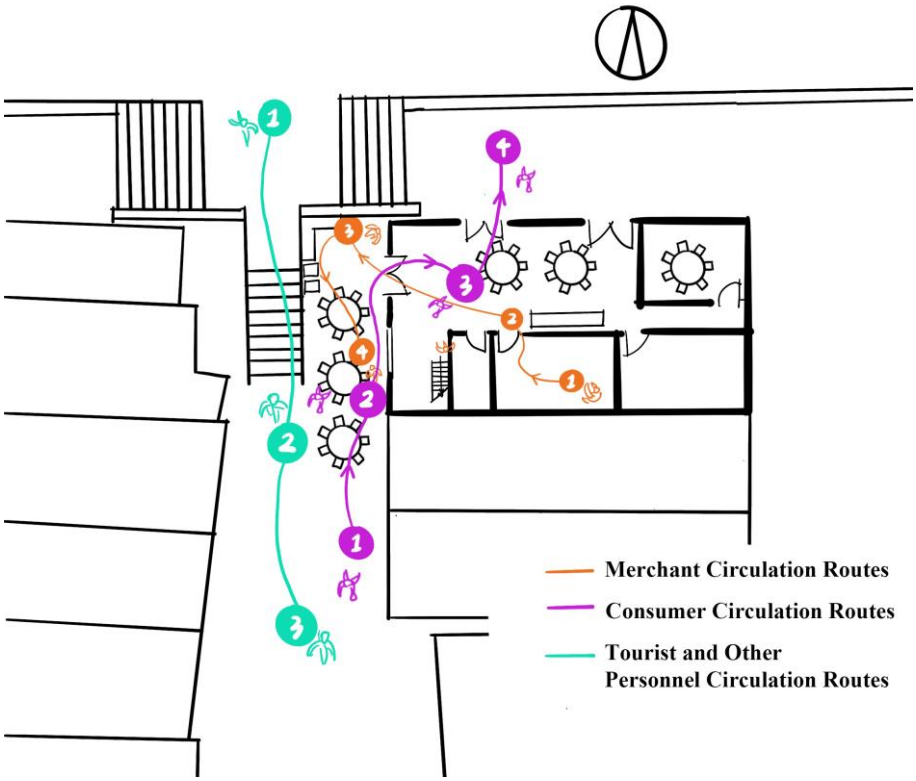


Figure 3-33 Spatial Circulation Analysis of User Activity at 43 Tongfu Middle Road (Source: author)

3.5.2.2 Informal Residential Living Spaces

The Jinghe and Fu'an communities represent a fusion of tourism and residential functions, with commercial activity primarily limited to a small number of guesthouses and youth apartments. A comprehensive renovation of the communities was undertaken in 2022. Modifications to front yards or building terraces were permitted, including the addition of awnings and the cultivation of flowers and plants for aesthetic purposes, subject to specific guidelines. Due to the limited interstitial space between buildings, informal spaces

predominantly utilize front yard areas or the balconies and rooftops of the primary structures, typically in an open or semi-enclosed configuration, often featuring frameworks without complete enclosure or with partial enclosures and overhead coverings. These informal spaces can be categorized based on their functional purpose: those primarily serving domestic needs, such as laundry drying, storage, food preparation, and sanitation; and those designed for gardening and recreational activities. The orientation of the primary structures varies, resulting in a diverse range of materials and dimensions within these informal spaces.

Figure 3-34 Mapping the spatial distribution of informal residential living spaces (Source: author)

Table 3-8 Overview of informal residential living spaces

a) Daily-Service Informal Spaces (Source: author)

Table 3-8 Overview of informal residential living spaces (Continued)

b) Horticultural-Recreational Informal Spaces (Source: author)

Similarly, a case study analysis of informal spaces for residential life is presented. Figure 3-35 illustrates the mixed-use informal space for living services and leisure activities at No. 80 Xixia Street. As shown in the Figure 3-35: ① Residents fulfill their daily living needs within the main functional buildings; ② Residents sit in informal spaces to sunbathe or engage in other leisure activities such as pet care; ③ Residents plant and maintain greenery and potted plants; ④ Residents hang out their laundry daily; ⑤ They leave the informal space. Because this area is close to Haichuang Temple, there are also tourists passing by. Tourists or others enter the alley, as the green flow lines shown in the Figure 3-35: ① They arrive near the informal space; ② They pass by the informal space, sometimes being attracted by the layout of the courtyard; ③ They leave the space. Tourists and others generally do not enter the informal space area, but their line of sight penetrates the space when passing by.

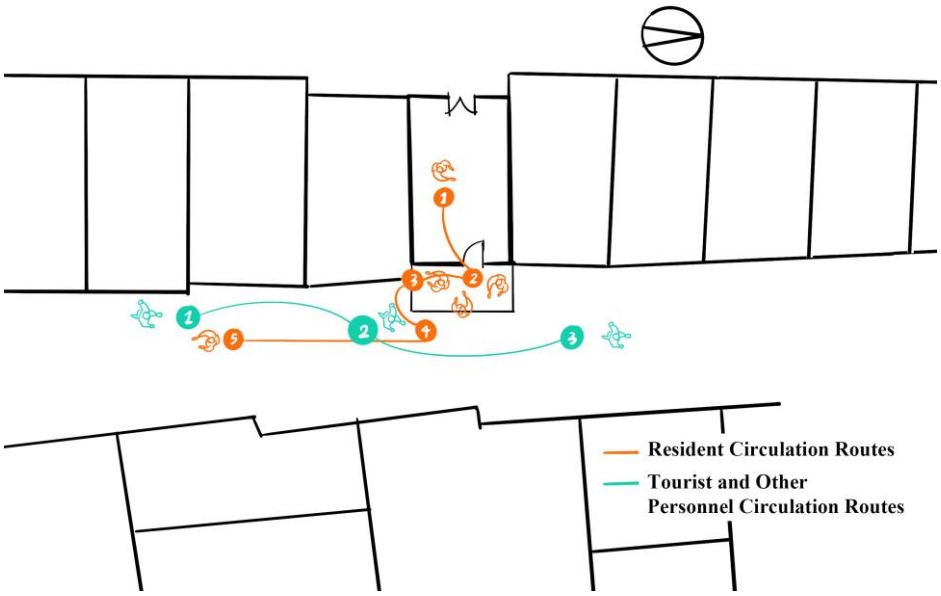


Figure 3-35 Spatial circulation analysis of user activity at No. 80 Xixia Street (Source: author)

Within this informal setting, residents commonly engage in activities such as resting, crafting, gardening, or airing garments. The space, excluding the side adjacent to the primary structure, lacks solid wall enclosures, instead employing low walls or elevated ground to delineate boundaries. Occasionally, steel frameworks are implemented for privacy or to support climbing plants. Furthermore, canvas canopies are sometimes deployed to provide essential protection from rain and sun.

Beyond the aforementioned analysis of specific building function typologies, the aggregation of individuals within the "Huanzhu Bridge-Longdaowei Market" area has engendered a diverse range of informal behavioral characteristics within the primary street spaces. A subsequent, human-centric behavioral mapping analysis will be undertaken to inform the development of spatial patterns and, in conjunction with survey findings, synthesize the identified needs of the populace.

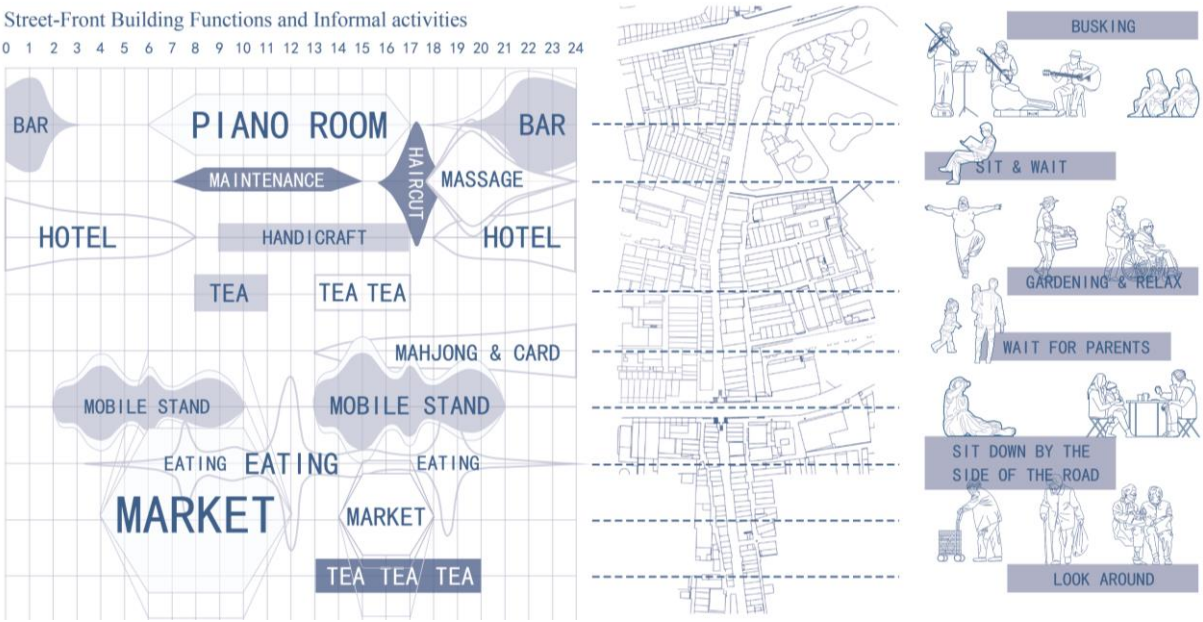


Figure 3-36 Correlative Diagram: Street-Front Building Functions and Informal activities (Source: author)

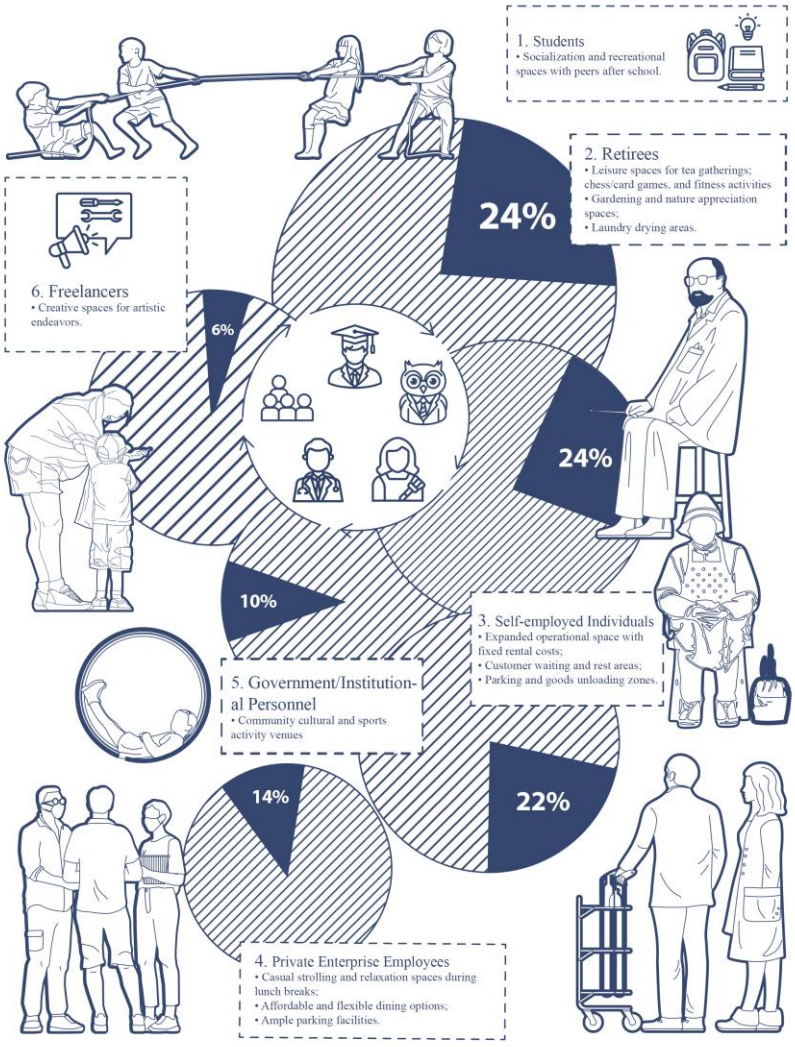


Figure 3-37 Spatial needs of various groups of people (Source: author)

3.6 Chapter Summary

This chapter examines the spatial and social contradictions within Guangzhou's Nanhuaxi historical district. Through a multi-dimensional site analysis, the study reveals the deep-seated dilemma of "historical fabric preservation versus social network fragmentation." Employing spatial, temporal, and social-spatial analyses, the research identifies issues such as the district's mosaic-like character, superficial renovation efforts, the persistent presence of informal spaces, and the fragmentation of public spaces. These issues stem from a disconnect between top-down planning and bottom-up practices. A SWOT analysis clarifies the district's potential and challenges in cultural heritage, accessibility, and commercial vitality, leading to the proposal of a phased renewal strategy. Furthermore, a typological classification of the street's informal spaces is conducted, extracting the generative logic of production-oriented and residential informal spaces, and arguing for their renewal value as a "vitality gene pool" for the district. This chapter provides empirical evidence for the extraction of pattern languages and network construction, thereby anchoring the direction for subsequent strategic design.

Chapter 4 Informal Space Pattern Language Writing and Networking

This chapter endeavors to extract and articulate the pattern language of informal spaces in Nanhuaxi District (Table 4-1). The informal spaces of Nanhuaxi district are the result of residents' prolonged adjustments based on environmental conditions and lived experiences, gradually taking shape through daily activities. The spatial structure and the interrelationship of its components are relatively loose, rendering them challenging to categorize. Therefore, prior to extracting the pattern of informal spatial units, it is imperative to gain a comprehensive understanding of the environment in which these spaces exist. Building on the analysis of Nanhuaxi's natural environmental factors and human geography from the previous chapter, the discussion begins with the spatial composition patterns being examined from the perspective of Composite Space Pattern Language. These patterns do not entirely belong to informal phenomena, yet the process of place-making often involves informal activities. The focus is on elucidating how the generation of informal spatial units is intrinsically linked to the residents' lives and the environment, emerging under the influence of certain orders and rules. Subsequently, the methods of generating spatial units are summarized, followed by a classification and organization of structures and components, ultimately forming a pattern language that, while theoretically grounded, reflects the regional characteristics of the surveyed site, serving as a reference for the practical creation of vibrant neighborhoods. The methods and forms of creating informal spaces on Nanhuaxi district are diverse and cannot be fully described by merely thirty or so patterns, yet they can preliminarily achieve an organic and orderly construction of the street's spatial environment. Table 4-1 below provides an overview of the informal spatial pattern language in Nanhuaxi Historic District, with each pattern reference derived from literature[3, 56, 70, 80].

Table 4-1 Overview of pattern language in Nanhuaxi historical district

	Name	Self-drawn Schematic	Reference Source	Reference Schematic
Composite Space	1 SACRED SITES		Alexander's Pattern 24 *"SACRED SITES"*	

Table 4-1 Overview of pattern language in Nanhuaxi historical district (Continued)

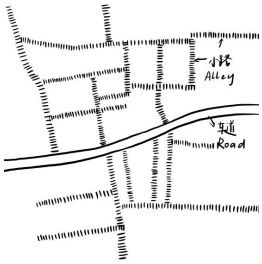
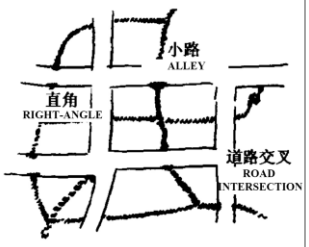
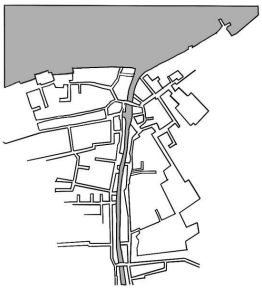
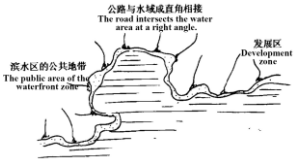
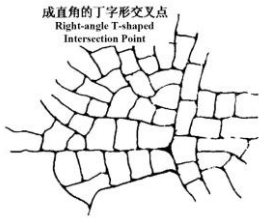
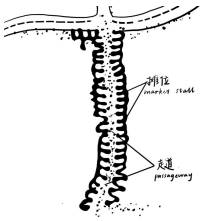
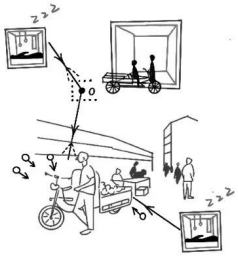
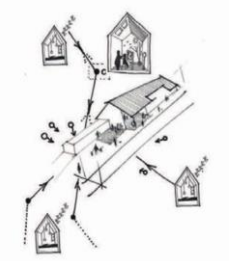
	Name	Self-drawn Schematic	Reference Source	Reference Schematic
Composite Space Pattern Language	2 STREET NETWORK		Alexander's Pattern 52 *"NETWORK OF PATHS AND CARS"*, and Pattern 73 *"HEIGHT/WIDTH RATIO"* from "The Pattern Book #1"	
	3 ADJACENT WATERS		Alexander's Pattern 25 *"ACCESS TO WATER"*	
	4 THREE-WAY INTERSECTION		Alexander's Pattern 50 *"T JUNCTIONS"*	
	5 MARKET OF MANY SHOPS		Alexander's Pattern 46 *"MARKET OF MANY SHOPS"*	
	6 MOBILE VENDORS		Pattern 4 *"HAIRDRESSER"* from the "Hanzheng Street Pattern Language"	

Table 4-1 Overview of pattern language in Nanhuaxi historical district (Continued)

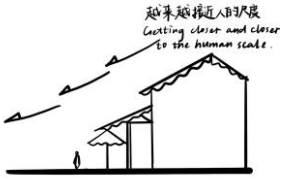
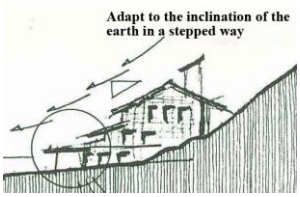
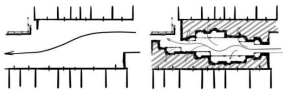
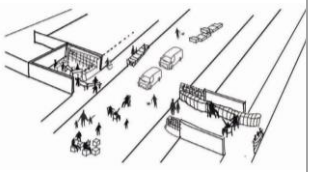
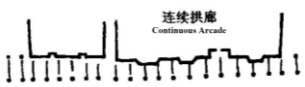
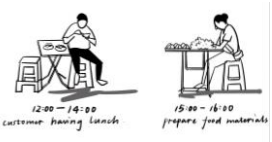
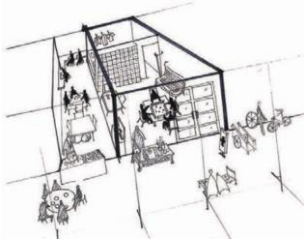
	Name	Self-drawn Schematic	Reference Source	Reference Schematic
Composite Space Pattern Language	7 CASCADE OF CANOPIES		Alexander's Pattern 116 *"CASCADE OF ROOFS"* and Pattern *"OVERLAPPING AND INTERSECTING CANOPIES"* from the Masahiro-cho urban planning ordinance's "Standards of Beauty"	
	8 DYNAMIC BOUNDARIES		Pattern 17 *"CONTINUOUSLY VARIED BORDERS"* from the "Hanzheng Street Pattern Language"	
	9 RICH BUILDING EDGE		Alexander's Pattern 160 *"BUILDING EDGE"* and Pattern *"OVERLAPPING DETAILS"* from the Masahiro-cho urban planning ordinance's "Standards of Beauty"	
	10 UNDER THE ARCADE		Alexander's Pattern 119 *"ARCADES"*, and Pattern 11 *"URBAN PORTICOES"* from "The Pattern Book #1"	
	11 MIXED USE		Pattern 9 *"MIXED USE"* from the "Hanzheng Street Pattern Language"	

Table 4-1 Overview of pattern language in Nanhuaxi historical district (Continued)

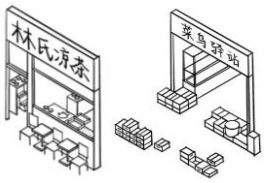
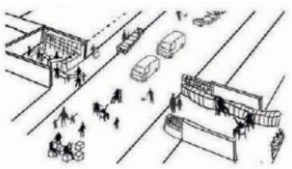
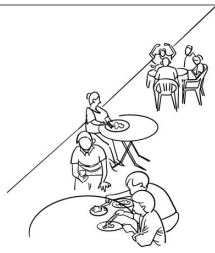
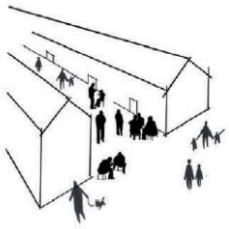
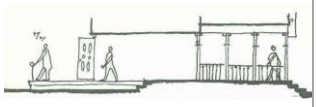
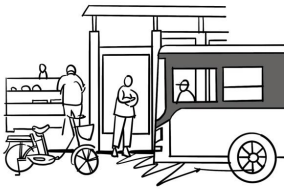
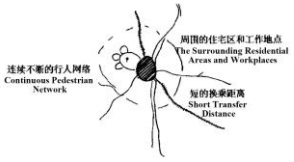
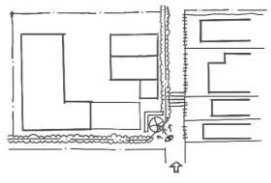
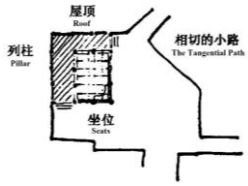
	Name	Self-drawn Schematic	Reference Source	Reference Schematic
Unit Space Pattern Language	12 SPACE APPROPRIATION		Pattern 2 *"SPACE APPROPRIATION"* from the "Hanzheng Street Pattern Language"	
	13 EATING IN THE STREET		Pattern 3 *"EATING IN THE STREET"* from the "Hanzheng Street Pattern Language"	
	14 TRANSITIONAL SPACE		Pattern *"TRANSITIONAL SPACE"* from the Masahiro-cho urban planning ordinance's "Standards of Beauty"	
	15 INTERCHANGE		Alexander's Pattern 34 *"INTERCHANGE"*	
	16 LANDSCAPE AT THE PATH CORNER		Pattern *"THE BUILDING INTERACTS WITH THE HUTONGS"* from the Masahiro-cho urban planning ordinance's "Standards of Beauty".	
	17 INFORMAL PAVILION		Alexander's Pattern 69 *"PUBLIC OUTDOOR ROOM"*	

Table 4-1 Overview of pattern language in Nanhuaxi historical district (Continued)

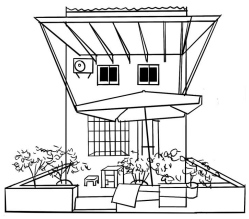
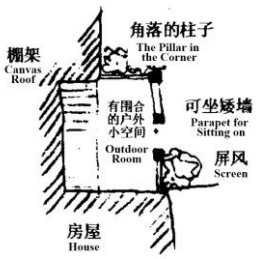
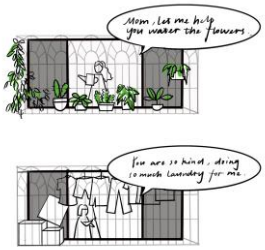
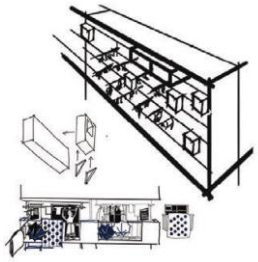
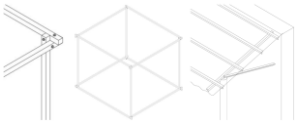
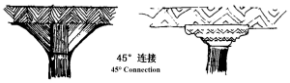
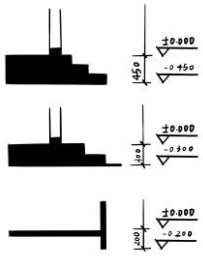
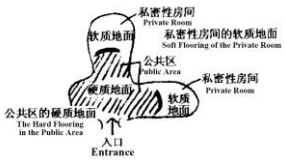
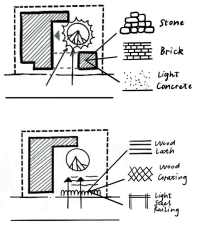
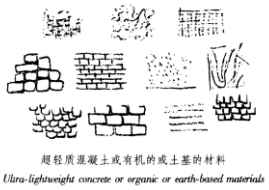
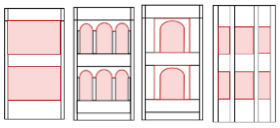
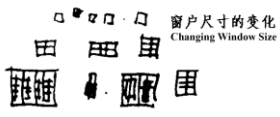
	Name	Self-drawn Schematic	Reference Source	Reference Schematic
Unit Space Pattern Language	18 OUTDOOR ROOM		Alexander's Pattern 163 *"OUTDOOR ROOM"*	
	19 STREET-FACING SECURITY GRILLES		Pattern 12 *"PARASITISM"* from the "Hanzheng Street Pattern Language"	
Structural Pattern Language	20 COLUMN CONNECTION		Alexander's Pattern 227 *"COLUMN CONNECTION"*	
	21 FLOOR SURFACE		Alexander's Pattern 233 *"FLOOR SURFACE"*	
	22 COURTYARD ENCLOSURE MATERIALS		Alexander's Pattern 207 *"GOOD MATERIALS"*	
	23 WINDOW OPENING		Alexander's Pattern 221 *"NATURAL DOORS AND WINDOWS"*	

Table 4-1 Overview of pattern language in Nanhuaxi historical district (Continued)

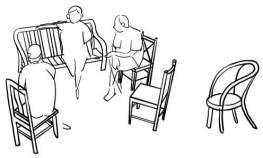
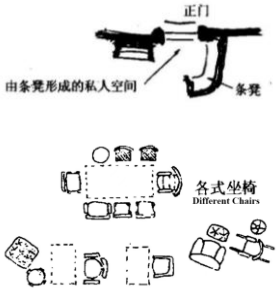
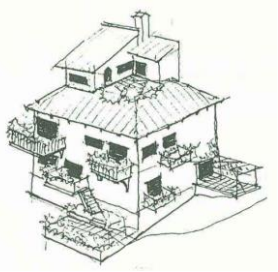
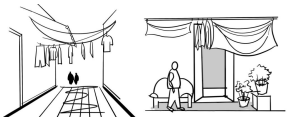
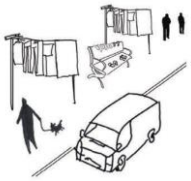
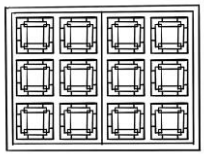
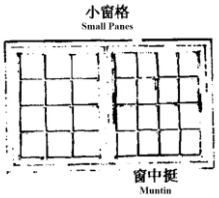
	Name	Self-drawn Schematic	Reference Source	Reference Schematic
Spatial Component Pattern Language	24 SITTING WALL/STOOP		Alexander's Pattern 243 *"SITTING WALL"* and Pattern *"BUILDING EDGE"* from the Masahiro-cho urban planning ordinance's	
	25 SEATINGS FOR SMALL GROUPS		Alexander's Pattern 242 *"FRONT DOOR BENCH"* and Pattern 251 *"DIFFERENT CHAIRS"*	
	26 POTTED GREENERY		Alexander's Pattern 246 *"CLIMBING PLANTS"* and Pattern *"COVERED WITH GREENERY"* from the Masahiro-cho urban planning ordinance's "Standards of Beauty"	
	27 RAISED FLOWERS		Alexander's Pattern 245 *"RAISED FLOWERS"*	
	28 CANVAS ROOFS		Alexander's Pattern 244 *"CANVAS ROOFS"*	
	29 CHINESE DRYING		Pattern 5 *"CHINESE DRYING"* from the "Hanzheng Street Pattern Language".	

Table 4-1 Overview of pattern language in Nanhuaxi historical district (Continued)

	Name	Self-drawn Schematic	Reference Source	Reference Schematic
Spatial Component Pattern	30 SMALL PANES		Alexander's Pattern 239 *"SMALL PANES"*	
	31 CANTONESE FOLDING TABLE		The distinctive pattern of Nanhuaxi	

Source: author

4.1 Composite Space Pattern Language

Beginning with a comprehensive context, the pattern language of informal spaces emerges from the accumulation of long-term, fragmented behavioral patterns. This can be regarded as a composition of spatial elements and units, representing the initial stratum of pattern language research. The writing spans from the relationship between the natural, cultural space of a neighborhood and its daily life space, to the layout of neighborhood roads, community boundaries, social spaces, and the temporal characteristics of space usage, extracting 11 patterns from the research samples for composition.

1 SACRED SITES

Refer to Alexander's Pattern 24 "SACRED SITES".

……Within each neighborhood, specific locales function as symbolic representations of the area's historical context. In experiments conducted by Alexander and colleagues within various communities, it was consistently observed that these locations were perceived as embodying the populace's connection to the land and its historical narrative[3]. These locales may be natural landscapes or historical remnants of bygone eras. Furthermore, they are imbued with vitality due to the enduring behavioral patterns of the inhabitants.

The severance of the material environment from its historical antecedents precipitates a corresponding disruption in the populace's spiritual connection to the past. The physical presence of elements such as moored sampans, pedestrian bridges, and venerable banyan trees adjacent to ancestral halls and docks constitutes a tangible link to bygone eras of maritime commerce, pedestrian transit, and communal gatherings. These elements should be regarded as integral to the preservation of local identity. Furthermore, the provision of spatial opportunities

that facilitate informal activities centered around historical remnants is crucial, as these spontaneous interactions contribute to the cultural landscape of the district, perpetuating the customs of previous generations and serving as testaments to the history of the Lingnan water towns.

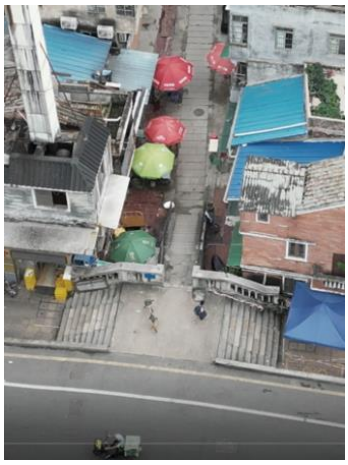
The Nanhuaxi district, situated on the southern bank of the Pearl River, exhibits a confluence of waterways and elevated terrains. The orientation of the river channels is predominantly east-west, while the streets on the elevated terrain are primarily north-south. The genesis of Nanhuaxi dates back to the forty-first year of the Qianlong reign during the Qing dynasty. At that time, the Pan family, led by Pan Zhencheng, along with a cohort of merchants, acquired land west of Wulonggang in present-day Haizhu District, establishing villages and residences. They also constructed the Shuzhu, Huanzhu, and Yuelong bridges to facilitate transportation. The Shuzhu Canal and Shuzhu Bridge became renowned tourist destinations during the Qing dynasty. The scenery surrounding Shuzhu Bridge was picturesque, with the Shuzhu Canal directly connecting to the Pearl River. Its proximity to the Guangzhou city center, coupled with the proliferation of taverns and the prevalence of pleasure boats, rendered it a favored locale for Qing-era dignitaries and merchants seeking leisure, as well as a source of inspiration for poets and scholars. Today, the former canals have been transformed into tranquil alleyways, with laborers engaged in commerce congregating on the bridges and local residents strolling through the lanes below, thus ensuring the continuation of the past in a modified form.

a) Shuzhu Sream and Shuzhu Bridge
(Source: *Canton, China*, 1880.)

b) The boatmen on the river and
the pedestrians on the shore.
(Source: *China, in a Series of Views, Displaying the Scenery, Architecture, and Social Habits, of that Ancient Empire*, Vol. III , London: Fisher, Son, & Co., 1843, p. 10.)

Figure 4-1 "SACRED SITES" conceptual diagrams

a) Cargo handlers on existing Shuzhu bridge (Source: author)



b) Shops along both sides of the current Shuzhu creek (Source: google)

c) Visitors Walking on the Covered Watercourse (Source: author)

Figure 4-2 Contextual overview of Shuzhu bridge area

Consequently, it is imperative for urban planners and stakeholders engaged in the Shuzhu Yong renovation and its environs to acknowledge that the provision of diverse open spaces (bridge surfaces, banks, and water surfaces) adjacent to the historical site, while concurrently safeguarding the ancient canal remnants and fostering opportunities for observation and interaction, can yield a positive impact by augmenting its public significance. Moreover, this strategy can mitigate the potential for a "theme park" aesthetic. In the context of a homogenous environment, the examination of past landscape history can serve as a guiding principle, re-establishing a sense of identity within the area through the adept reconstruction of lost significant connections and anchor points.

Figure 4-3 "SACRED SITES" schematic illustrations (Source: author)

Allocate open spaces, or a series of open spaces, to each valuable location, providing shaded areas and "SEATING FOR SMALL GROUPS" (25). These spaces can function as

transfer stations, facilitating rest, congregation, and recreation, thereby fostering an environment conducive to both observation and being observed.

2 STREET NETWORK

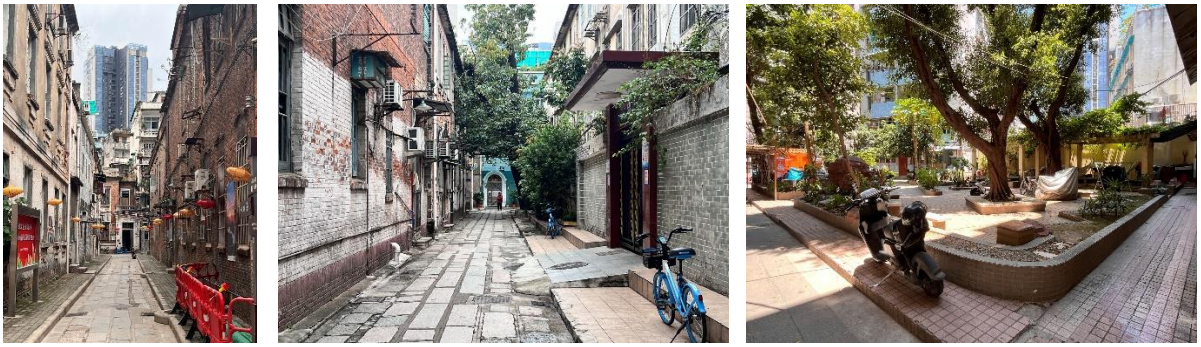
Refer to Alexander's Pattern 52 "NETWORK OF PATHS AND CARS", and Pattern 73 “HEIGHT/WIDTH RATIO” from "The Pattern Book #1".

……The historical district of Nanhuaxi is demarcated by four principal thoroughfares. The area situated between the parallel Nanhuaxi Road and Tongfuxi Road is bisected by a street, which emerged subsequent to the enclosure of the Shuzhu Canal. This structural arrangement has fostered the dendritic proliferation of an interconnected network of minor pathways. Entrances, characterized by traditional archways, are strategically positioned at the intersections with the major roadways. The internal spatial organization of the district's roadways prioritizes pedestrian movement, thereby cultivating a tranquil ambiance.

In urban modernist planning, vehicular traffic was prioritized, relegating pedestrian movement to a secondary status[3]. Consequently, contemporary urban blocks often exhibit discontinuous pedestrian pathways, lacking a cohesive network, thereby diminishing street ambiance and recognizability. Conversely, traditional alleyway networks, arising organically from the interstices between buildings over time, have been preserved through overlapping and informal arrangements. These alleyways, characterized by spatial comfort and high walkability, tend to concentrate human activity and are generally well-maintained. Through on-site investigations and data acquisition, insights into the public's perception and utilization of these alleyway spaces can be gleaned. Employing H to denote the height of the building facade and D to represent the width between facades, the subsequent table correlates the D/H ratio with the corresponding characteristics of the alleyway space. According to "The Aesthetic Townscape," when D/H is less than 1, pedestrians may experience a sense of confinement and desolation, typically utilizing the space solely for transit. At D/H = 1, individuals may engage in small-scale recreational activities involving 3-4 people. When D/H exceeds 2, approximating the characteristics of a plaza, the space becomes conducive to street art performances and small-scale commercial activities[81].

D/H Ratio	Spatial Characteristics of Pedestrian Paths
<1	Moderate enclosure with a slight sense of confinement
≈ 1	Enclosed yet secure, no oppressive feeling
≈ 2	Balanced enclosure with comfortable spaciousness
≈ 3	Defined spatial presence without excessive openness
≈ 6	Maximum D/H ratio to sustain spatial coherence

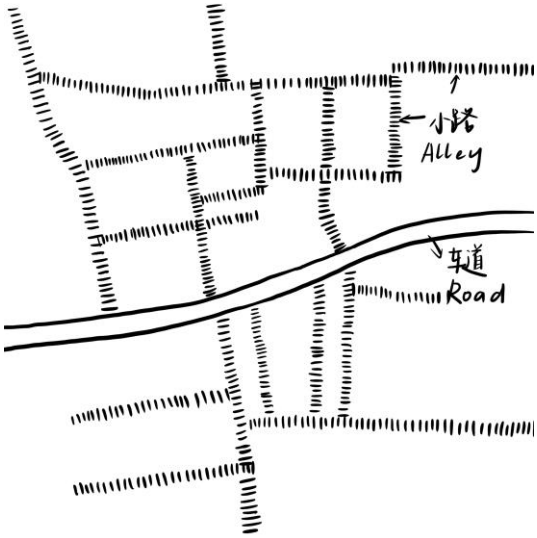
Figure 4-4 D/H ratio and spatial characteristics of pathways (Source: literature[81])



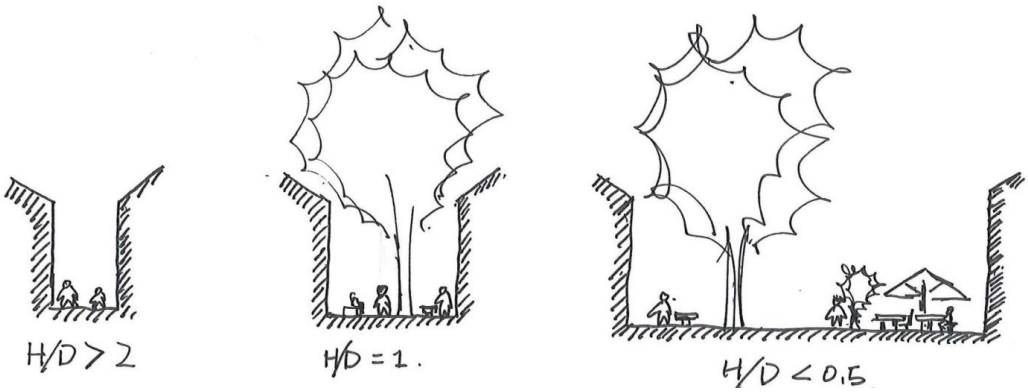
a) D/H＜1　　b) D/H≈1　　c) D/H＞2

Figure 4-5 Spatial characteristics of Nanhuaxi street and alley (Source: author)

Consequently, the preservation of pedestrian-oriented alleyway networks is advocated. The utilization or reshaping of these thoroughfares should be predicated on their distinct characteristics. The objective is to establish a highly navigable and recognizable network of alleyways, thereby fostering opportunities for social interaction and prolonged engagement among individuals.



a) Plan Analysis (Source: author)



b) Section Analysis (Source: literature[81])

Figure 4-6 "STREET NETWORK" schematic illustrations

Facilitate the flow of north-south thoroughfares and east-west residential streets by establishing thematic pedestrian tour routes. Design a cohesive streetscape that is both pleasant and identifiable, based on the height-to-width ratio of the streets and surrounding resources—such as "THREE-WAY INTERSECTION" (4), "RICH BUILDING EDGE" (9), "LANDSCAPE AT THE PATH CORNER" (16), and "CHINESE DRYING" (29). This approach aims to construct a new network system of streets and alleys.

3 ADJACENT WATERS

Refer to Alexander's Pattern 25 “ACCESS TO WATER”.

……Considering the natural fluvial processes that shaped the waterways, the preservation or, where applicable, the restoration of these intrinsic attributes is imperative. Such measures enhance the experiential quality and humanistic dimension of pedestrian environments, thereby cultivating valuable public spaces. The Shuzhu Canal, once a pivotal element in the spatial organization of Nanhuaxi district, was distinguished by several key features: the riverbanks, the shade provided by willow trees, and the presence of ancient bridges. To protect and leverage these features, this model analyzes the public areas adjacent to the water, promoting a balanced interaction between humans and the aquatic environment.

Water's significance is paramount to human existence; nonetheless, urban populations frequently encounter restricted access to aquatic environments[3].

The establishment of multifaceted and enduring human-water interactions facilitates the expansion of life's scope[80]. The former waterways, however, have suffered severe pollution, thereby becoming inaccessible. The construction of paved surfaces has subsequently concealed these features, necessitating the rerouting of water underground. Moreover, the existing rivers and lakes are located at a considerable distance from residential areas. It is thus imperative to consider strategies that facilitate interaction between built environments and aquatic elements, such as enabling pedestrian access and constructing infrastructure for rainwater management. In Freiburg, Germany, the implementation of narrow, shallow canals throughout the streets of the medieval core has revitalized the historical stream systems[79]. The Bächle, with a typical width of 20-50 cm and a depth of 5-10 cm, fulfills several roles. These encompass thermoregulation and sanitation, the demarcation of pedestrian zones from tram lines, and the definition of spaces suitable for public gathering and relaxation. Moreover, it has become a notable recreational resource, offering children of different age groups opportunities for boating, wading, and aquatic activities.

a) Qing Dynasty
(Source: *China, in a Series of Views, Displaying the Scenery, Architecture, and Social Habits, of that Ancient Empire*, Vol. III , London: Fisher, Son, & Co., 1843, p. 10.)

b) Republic of China Era
(Source: google)

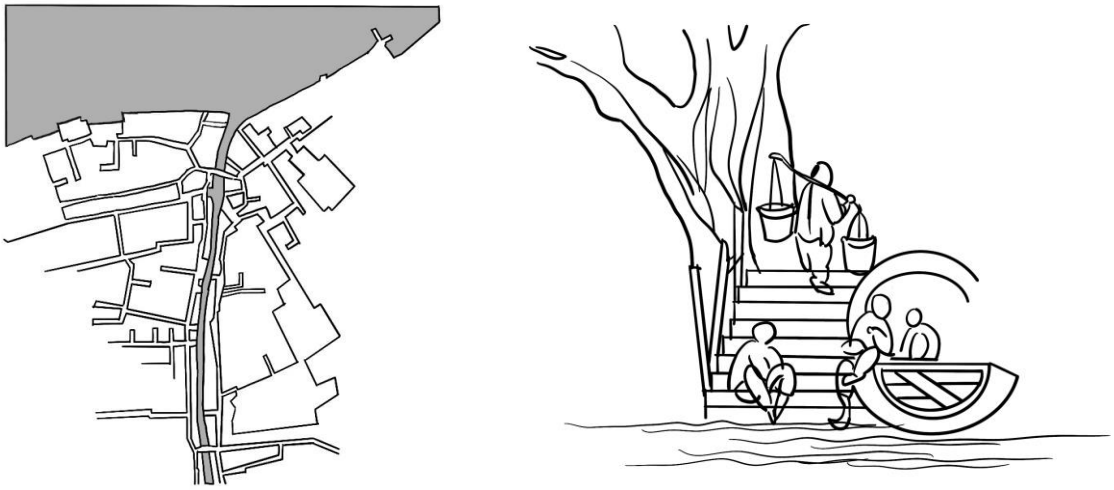
Figure 4-7 Scenes of people descending steps to approach the watercourse

a) Consistency between stream and vehicle track morphology

b) Children playing along the stream

Figure 4-8 Harmonious coexistence of people and streams in Germany' s Bächle Project
(Source: literature[79])

Subsequently, the conservation of natural waterways is recommended, incorporating pedestrian pathways along the banks to enhance public access for recreational pursuits. Moreover, the integration of residential constructions within the riparian zone is sanctioned, provided spatial regulations are observed.



a) Occasional intermittent extensions of alleys to waterfronts

b) Conversations by the watercourse and cargo transport via stairs

Figure 4-9 "ADJACENT WATERS "schematic illustrations (Source: author)

The width of the public zone surrounding aquatic environments varies according to the spatial configuration, facilities, and types of activities present. At times, it manifests as a simple stone-paved promenade along the riverbank, while at other instances, it extends several meters upward as a public planting area. This area exhibits characteristics of "DYNAMIC BOUNDARIES" (8) and "MIXED USE" (11), accommodating diverse human activities. Residents of the adjacent community must traverse a "TRANSITIONAL SPACE" (14) to access the water body, engaging in "SPACE APPROPRIATION" (12) of the surrounding area.

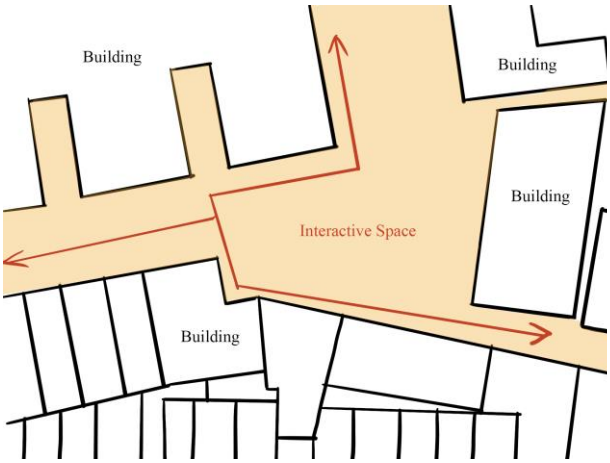
4 THREE-WAY INTERSECTIONS

Refer to Alexander's Pattern 50 “T JUNCTIONS”.

……The intersections within pedestrian-oriented networks diverge from the conventional orthogonal configurations prevalent in urban environments. These pathways typically converge at three-way junctions, thereby fostering enhanced social cohesion among residents.

The spatial configurations of the numerous three-way intersections within the Nanhuaxi district present significant, yet underutilized, opportunities. The varying morphologies of these intersections demonstrably impact the safety of residents and influence the dynamics of social interaction.

Alexander, in Pattern 50 "T JUNCTIONS," articulates that T-shaped intersections can effectively diminish the frequency of accidents within urban environments. Within neighborhoods, the configuration of T-junctions not only mitigates accidents but also enhances the availability of spaces where residents and others can linger[3].



a) Floor Plan (Source: author) b) Conceptual diagrams (Source: author)

Figure 4-10 "THREE-WAY INTERSECTIONS " in Nanhuaxi

Consequently, the intersection nodes, beyond serving as conduits for pedestrian traffic, also function as pivotal spatial nodes for public interaction. The availability of residual, non-programmed space fosters active neighborly engagement among residents.

Figure 4-11 "THREE-WAY INTERSECTIONS" schematic illustrations (Source: author)

The evolution of this model will impact the locational choices for constructing informal spaces at the tri-junction, offering alternative sites for "LANDSCAPE AT THE PATH CORNER" (16), "INFORMAL PAVILION" (17), and "OUTDOOR ROOM" (18). When necessary, the ground floor of buildings can be utilized to expand these spaces. "STREET-FACING SECURITY GRILLES" (19) can function as "eyes on the street," enhancing the safety of activities involving children and the elderly[10].

5 MARKET OF MANY SHOPS

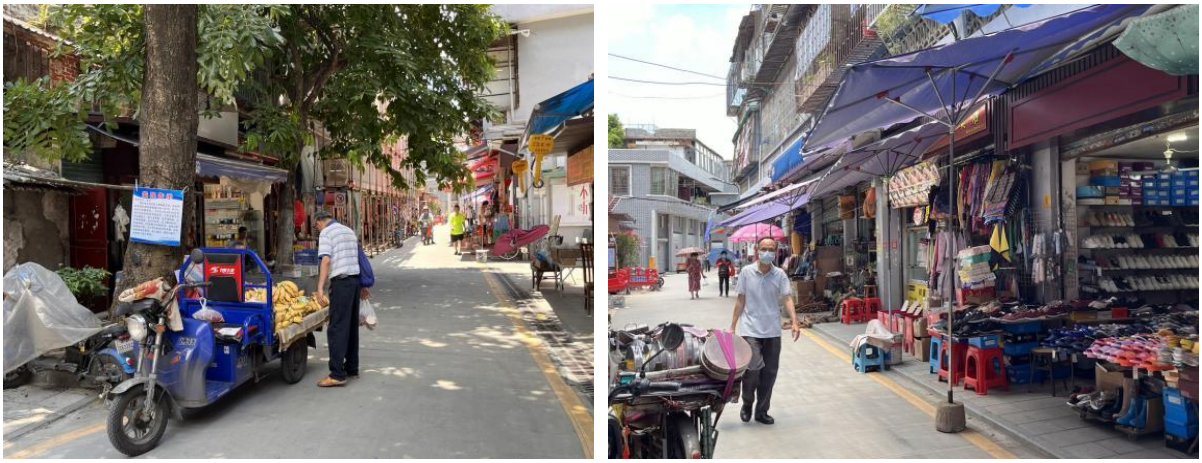
Refer to Alexander's Pattern 46 “MARKET OF MANY SHOPS”.

……The actualization of the nexus between commerce and community precipitates the emergence of the mixed-use commercial center as a catalyst and focal point for the

encompassing region. This configuration furnishes a diverse array of venues for retail, residential living, pedestrian activity, and recreational pursuits, thereby delineating the morphological and economic attributes of the marketplace.

Compared to the diverse and extensive food offerings in large shopping malls, the individual vendors in comprehensive markets, selling various flavored foods and household items from small stalls, offer a more human touch. In contrast to the impersonal rows of shelves and brief interactions with cashiers in malls, vendors in comprehensive markets possess a deeper understanding of their products, allowing them to leverage their expertise and showcase the sensory qualities of their food to customers.

For instance, at the end of a row of shops in Longdao Wei, Nanhuaxi, a vendor sells herbal tea. If you inform her that you have a sore throat and seek a recommendation, she will not only prepare a suitable herbal tea concoction but also patiently explain the method of consumption and precautions. Whether you are a first-time visitor or a regular customer, her primary concern is whether you have selected a tea that meets your needs and whether you remember to heat it before consumption. From homemade foods to furniture, the items sold in comprehensive markets represent local traditional culture, attracting tourists, increasing residents' income, and playing a significant role in social interactions.



a) Mobile vendors in market　　b) Expanding the operational scope

Figure 4-12 "MARKET OF MANY SHOPS" conceptual diagrams (Source: author)

Therefore, the establishment of a diverse marketplace, superseding the modern department store, is proposed. Each market would be comprised of numerous, autonomous, specialized boutiques (e.g., cheese, butcher, patisserie, produce). This structure permits individual establishments to cultivate their own commercial environments, tailored to their specific expertise and requirements.

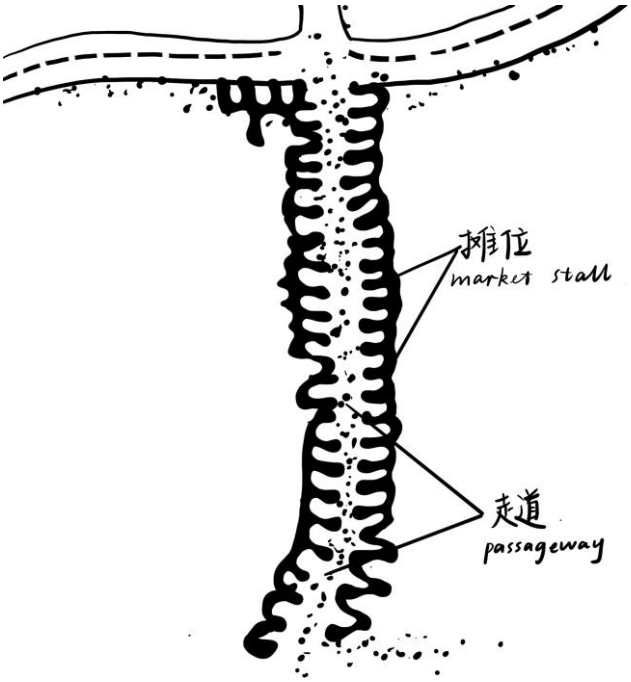


Figure 4-13 "MARKET OF MANY SHOPS" schematic illustrations (Source: author)

Ensure that pedestrian pathways maintain sufficient width to accommodate both small delivery vehicles and dense crowds, ideally ranging from 1.8 to 3 meters. The shopping center comprises individual stores, where operators have the option to extend their commercial space by installing "CANVAS ROOFS" (28) to adapt to various weather conditions. In scenarios with complex usage demands, the design can reference the concept of an "OUTDOOR ROOM" (18). This approach can enhance the "STREET NETWORK" (2) and, through "SPACE APPROPRIATION" (12) and "EATING IN THE STREET" (13), establish "DYNAMIC BOUNDARIES" (8) within the market, encouraging people to linger and patronize the diverse array of shops.

6 MOBILE VENDORS

Refer to Pattern 4 “HAIRDRESSER” from the “Hanzheng Street Pattern Language”.

……Neighborhoods comprise communities, which are invigorated by the small groups that generate vitality and character.

Barbers, cobblers, and vegetable vendors represent industries characterized by relatively low capital investment and skill requirements. Their practitioners primarily consist of marginalized urban populations or migrant workers. Due to China's comparatively exclusionary urban transformation model over the past decade, these individuals have either been displaced to the urban periphery or face urban fabrics that are not conducive to their operations. Consequently, these professions are gradually disappearing. Furthermore, this individual model tends towards homogenization, predominantly manifesting in forms (c) and (d): either

concentrated within markets or coexisting with other shops along streets or within large shopping malls. New urban transformation projects necessitate provisions for the existence of these professions, thereby fostering a more diverse utilization of urban space. The methods by which mobile vendors utilize urban space and connect with people are as follows:

a) MOBILE VENDORS + DISPERSED CLIENTELE

The casual laborer, operating a bicycle, solicits business along the street. Upon encountering a customer, the laborer accompanies the customer to a different location to perform work or transport goods. At this juncture, the laborer enters the customer's private domain, establishing a direct association with the customer.

a) Conceptual diagrams (Source: left by author, right from google)

b) Schematic illustrations (Source: author)

Figure 4-14 "MOBILE VENDORS + DISPERSED CLIENTELE" pattern

b) MOBILE AND RELATIVELY STABLE VENDORS + DISPERSED CLIENTELE

Vendors utilize mobile carts to operate within relatively stable urban spaces daily. These locations may include streets, alleys, or spaces under the eaves of buildings, or even a 1-meter area in front of restaurants or retail establishments. Various vendors tend to cluster together, sharing urban space. Furthermore, vendors interact with other professionals within the city's public spaces.

a) Conceptual diagrams (Source: author)

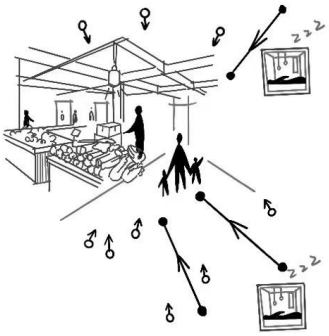
b) Schematic illustrations (Source: author)

Figure 4-15 "MOBILE AND RELATIVELY STABLE VENDORS + DISPERSED CLIENTELE" pattern

c) CENTRALIZED VENDORS + MOBILE CUSTOMERS

The farmers' market (Fulong East Market) is composed of various vendors who work in close proximity. Customers shop in designated areas, while vendors and repair personnel interact within the internal public spaces, fostering connections with other vendors and customers.

a) Conceptual diagrams (Source: google)



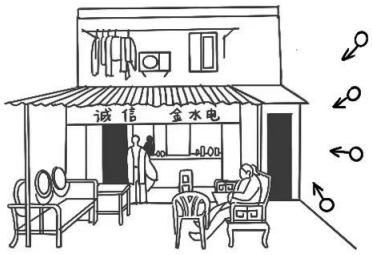
b) Schematic illustrations (Source: author)

Figure 4-16 "CENTRALIZED VENDORS + MOBILE CUSTOMERS" pattern

d) FIXED VENDORS + MOBILE CUSTOMERS

The operator converts a portion of their private space into a workspace. Frequently, they reside in a raised loft area while providing services such as haircuts or repairs to clients on the ground floor. Alternatively, they may inhabit the rear section of the property and conduct business in the front. This model results in the customer's entry into the vendor's personal domain, thereby creating an overlap between the vendor's private life and their public-facing work.

a) Conceptual diagrams (Source: author)



b) Schematic illustrations (Source: author)

Figure 4-17 "FIXED VENDORS + MOBILE CUSTOMERS" pattern

Therefore, the proposal advocates for the development of a "MARKET OF MANY SHOPS" (5) alongside other appropriate community structures and open spaces. These areas would be strategically positioned adjacent to high-traffic pedestrian zones and offered at

significantly reduced rental rates to diverse community groups or mobile vendors. This approach aims to facilitate activities, pilot business ventures, and foster a dynamic commercial environment.

Stalls are typically positioned in areas with high foot traffic or nearby—referred to as "INTERCHANGE" (15)—and are designed to be small and compact, facilitating easy access akin to individual retail outlets. Additionally, they can be integrated with vacant shops, utilizing external spaces to create stalls, thereby forming a "RICH BUILDING EDGE" (9) that aids in connecting the "MARKET OF MANY SHOPS" (5) with other dispersed locations. These stalls can also be configured to provide spaces for people to linger—termed "EATING IN THE STREET" (13).

7 CASCADE OF CANOPIES

Refer to Alexander's Pattern 116 “CASCADE OF ROOFS” and Pattern “OVERLAPPING AND INTERSECTING CANOPIES” from the Masahiro-cho urban planning ordinance's “Standards of Beauty”.

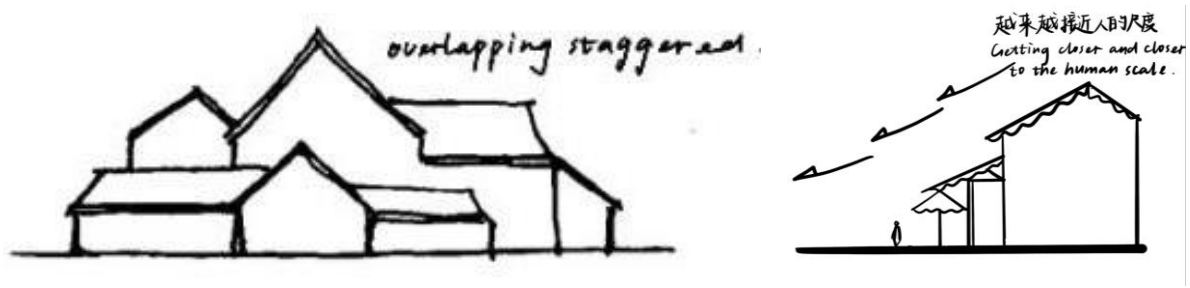
……While constructed spontaneously by individuals, the consistent materials and angled design of the awnings create a compelling harmonious order, establishing a distinctive visual signature for the urban landscape of the area.

The layered eaves and awnings, a defining feature of both the historical buildings adjacent to the former Shuzhu Yong and the modern shops along Longdaowei market, are directly related to Guangzhou's humid and rainy climate. By viewing the entire building or complex as a roofing system, the most important architectural components are protected by the largest, highest, and widest roofs. Smaller awnings then integrate and overlap with these primary roofs, creating a stable, self-supporting system that reflects the hierarchical arrangement of the social spaces below. This design supports continuous outdoor activities and extended occupancy. Residential awnings generally surpass standard floor heights, while commercial awnings are either equal to or less than the standard floor height.

a) Waterfront taverns of the Qing Dynasty b) Modern streetside shops

Figure 4-18 "CASCADE OF CANOPIES" conceptual diagrams (Source: google)

Consequently, the placement and dimensions of the roof or canopy dictate the hierarchy of the spaces they encompass, differentiating between more permanent, significant storage areas and relatively temporary, secondary resting spaces. Proper arrangement and differentiation not only ensure natural lighting and ventilation but also serve as a distinctive regional identifier, leaving a lasting impression.



a) Front Elevation (Source: literature[70]) b) Side Elevation (Source: author)

Figure 4-19 "CASCADE OF CANOPIES" schematic illustrations

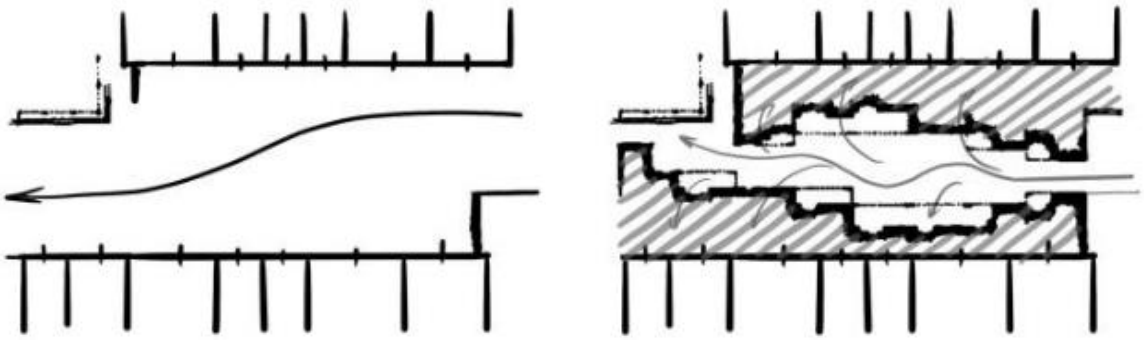
The closer one gets to pedestrian activity areas, the lower the eaves become. The strategic integration of "INFORMAL PAVILION" (17) and "OUTDOOR ROOM" (18) plays a crucial role in creating this environment, with "EATING IN THE STREET" (13) occasionally contributing to the dynamic.

8 DYNAMIC BOUNDARIES

Refer to Pattern 17 “CONTINUOUSLY VARIED BORDERS” from the “Hanzheng Street Pattern Language”.

……The pedestrian experience is enhanced by the shop's outdoor seating areas, which are defined by overlapping and interwoven awnings. Furthermore, the neighborhood is adorned with various forms of flora and trees in front of the residents' homes.

The design of streets should prioritize creating enclosed spaces that encourage lingering, rather than merely facilitating transit. This can be achieved through subtle protrusions in the street's plane, the strategic placement of seating, or the incorporation of overhead structures like beams or canopies. Furthermore, integrating retail spaces with the sidewalk, allowing pedestrians to traverse through exhibition areas while walking, is recommended.



a) Streets without commercial appropriate b) Streets with commercial appropriate

Figure 4-20 "DYNAMIC BOUNDARIES" schematic illustrations (Source: author)

The dynamism of boundaries can also be achieved through the strategic placement of potted greenery. In Guangzhou's climate, the seasonal variations in vegetation subtly communicate the passage of time to observers.

a) Lush greenery in spring alleyways b) Lantern-adorned winter alleyways

Figure 4-21 "DYNAMIC BOUNDARIES" conceptual diagrams

(Source: a from google, b by author)

Consequently, the heterogeneity of the environmental composition can engender visual richness. Juxtaposing building facades with varying aesthetics can cultivate a sense of place, thereby fostering more engaging sensory and pedestrian experiences, as well as a stronger sense of identity for individuals and communities. These visual distinctions render streets or neighborhoods more discernible and readily identifiable.

This model is frequently observed in the "MARKET OF MANY SHOPS" (5), and can be facilitated through "SPACE APPROPRIATION" (12), "EATING IN THE STREET" (13), and "TRANSITIONAL SPACE" (14).

9 RICH BUILDING EDGE

Refer to Alexander's Pattern 160 “BUILDING EDGE” and Pattern “OVERLAPPING DETAILS” from the Masahiro-cho urban planning ordinance's “Standards of Beauty”.

……The architectural edge achieves humanization and shapes humane streets only when it expresses life. This pattern contributes to the formation of pedestrian pathways, thereby refining the outdoor spaces of the architectural complex.

The initial intent of building setbacks was to ensure adequate sunlight and fresh air for each structure, thereby safeguarding public welfare. However, the practical consequence has been the degradation of streets as social spaces.

Buildings should actively contribute to the formation of outdoor spaces, expressing intricate details that encompass not only physical attributes but also the nuances of daily life. Physical details embody the legacy of traditional decorative arts, while the subtleties of life revitalize monotonous or deteriorating facades. Within the alleyways, structures predominantly feature gray brick and white walls. Informal entities enrich the architectural and street-facing facades through the strategic application of diverse materials, fostering a more engaging visual experience.

For instance, when street-facing facades consist entirely of walls, neighborhood committees and residents enhance the street's aesthetic depth by constructing sunshades along the walls. At the entrances of certain shops, proprietors employ vegetation to improve the appearance of their storefronts, thereby increasing their visibility. Furthermore, in some residential buildings, residents utilize climbing plants, such as ivy, to cover entire facades, thereby improving the building's appearance while also providing cooling and insulation.

Figure 4-22 "RICH BUILDING EDGE" conceptual diagrams (Source: author)

Consequently, the diverse materials and chromatic variations employed in the interior finishes contribute to a rich spatial ambiance. Furthermore, in accordance with the principles outlined in "FINDING LOST SPACE —— THEORIES OF URBAN DESIGN"[82], the outdoor spaces fronting the buildings have been reconfigured and redefined, thereby revitalizing the fragmented and lifeless streetscape. To accommodate the street's morphology, the facades of the buildings may deviate slightly from a perpendicular alignment.

Figure 4-23 "RICH BUILDING EDGE" schematic illustrations (Source: author)

To achieve the effect of a rich architectural edge, one can alter the boundary's form through the implementation of "CASCADE OF CANOPIES" (7) and "DYNAMIC BOUNDARIES" (8), or by focusing on the detailed elements of the building's façade, such as "STREET-FACING SECURITY GRILLES" (19). Additionally, the functional complexity of the boundary can be enhanced by incorporating features like "OUTDOOR ROOM" (18) and "INFORMAL PAVILION" (17), which provide activity spaces for the elderly and children or attract customers

for commercial engagement.

10 UNDER THE ARCADE

Refer to Alexander's Pattern 119 “ARCADES”, and Pattern 11 “URBAN PORTICOES” from "The Pattern Book #1".

……By employing the arcade, the comfort of pedestrian flow and movement is maintained even under adverse weather conditions.

The arcade functions as a series of living theaters, offering potential stages for diverse urban activities and facilitating a flexible transition from private to public realms. Research indicates that the underutilized spaces beneath the arcades, lacking sufficient guidance, are not fully exploited, with limited pedestrian dwell time beyond functional necessities.

Historically, porticos have been employed across various nations and cultures. From Greek temples to Mayan palaces, these covered spaces serve as transitional zones between open and enclosed environments. Similar to Bologna, Italy, arcades are extensively integrated into the urban fabric of Guangzhou, forming a key architectural feature known as "qilou." The qilou's porticos provide shelter for pedestrians and businesses during both sunny and rainy conditions. Individuals creatively utilize this "gray space" to suit their needs, such as setting up tables and chairs for customers or positioning counters to attract business, thereby shaping the urban life of old Guangzhou.

a) conceptual diagrams (Source: google)

b) schematic illustrations (Source: author)

Figure 4-24 "UNDER THE ARCADE" pattern

Consequently, in urban areas characterized by high pedestrian traffic, the strategic placement of porticos or covered walkways, either integrated into building exteriors or as independent structures, is imperative. These architectural elements serve to enrich the

experiential quality of the locale, thereby facilitating comfortable pedestrian movement irrespective of seasonal weather conditions. Within the sheltered confines of these porticos, informal activities such as queuing, social interaction, and dining are encouraged. Furthermore, these spaces can be utilized to temporarily extend the display areas of commercial establishments, thereby augmenting the tax revenue generated for the local government.

The establishment of a living theater beneath the arcade necessitates the allowance for temporary spatial utilization, employing models such as "SPACE APPROPRIATION" (12) and "EATING IN THE STREET" (13) to foster diverse social interactions, enabling individuals to discover their optimal state of personal comfort. Within this environment, individuals may engage in discussions or lean against the columns.

11 MIXED USE

Refer to Pattern 9 “MIXED USE” from the “Hanzheng Street Pattern Language”.

……The concept of mixed-use development signifies the integration of diverse urban activities within a singular spatial framework. This approach is evident in contexts such as ADJACENT WATERS (3), THREE-WAY INTERSECTION (4), and MARKET OF MANY SHOPS (5). The provision of column-free, adaptable spaces caters to a spectrum of behavioral needs, thereby enriching the experiential qualities of the locale.

Varying interpretations of space facilitate a heterogeneous mix of functions. The tables situated at the storefront, for instance, serve dual purposes: they provide seating for patrons during operational hours and accommodate logistical preparations during off-peak times. Furthermore, these tables transform into venues for recreational activities, such as card games and casual social gatherings, after business hours.

a) Customer seating during business hours　　b) Logistics preparation during midday break

Figure 4-25 "MIXED USE" conceptual diagrams (Source: google)

Establishing an adaptive system within the open space is crucial. Such a system should provide a range of combinations and possibilities, accommodating diverse user behaviors and optimizing spatial efficiency. For example, the site could be allocated for use by mobile vendors during the day, and then repurposed for residents' private vehicle parking in the evening.

Figure 4-26 "MIXED USE" schematic illustrations (Source: author)

The phenomenon of mixed usage is frequently observed in "SEATINGS FOR SMALL GROUPS" (25)—Cantonese-style solid wood sofas—and "CANTONESE FOLDING TABLE" (31), where the inviting design naturally encourages individuals to engage with and fully utilize the facilities.

4.2 Unit Space Pattern Language

Unit space pattern language serves as a description of spatial generation norms and mechanisms, representing an abstract expression of spatial formation. The informal spaces of the Nanhuaxi neighborhood exhibit diverse spatial strategies based on their hierarchical levels, including the outward extension of primary building functions, the introduction of new functions into existing spaces, and the renovation of old functions. The overall informal spaces vary in size and exhibit a relatively scattered layout. Eight patterns are extracted for analysis, categorized into four types of areas: community-level roads, community-level nodes, community-level boundaries, and neighborhood-level outward spaces.

4.2.1 Community-level Road-based Unit Space Pattern

The informal spaces within the Nanhuaxi district community are primarily characterized by the public areas of the internal streets. This analysis will examine the pattern language of the road-based informal spatial units within the historical Nanhuaxi district, employing various strategic perspectives.

12 SPACE APPROPRIATION

Refer to Pattern 2 “SPACE APPROPRIATION” from the “Hanzheng Street Pattern Language”.

……The appropriation of space can engender a secondary layer within the streetscape or UNDER THE ARCADE (10), characterized by DYNAMIC BOUNDARIES (8) and a CASCADE OF CANOPIES (7), thereby augmenting the vitality and recognizability of the MARKET OF MANY SHOPS (5).

The appropriation of public space by residents, effectively bisecting the street, invites passersby into commercial establishments, thereby diminishing or eliminating the thoroughfare's transport function. A street initially designed for vehicular transit is thus transformed into a public realm where pedestrians meander and shopkeepers take midday reprieves.

Mobile food vendors and day laborers frequently occupy interstitial urban spaces, such as street corners, alcoves, and recesses. Traditional shop interiors, often constrained in size, compel suppliers and delivery services to utilize adjacent vacant areas for storage, further contributing to the clutter and congestion of the streetscape (Figure 4-27-a). The strategic placement of tables, chairs, and the construction of stone steps by residents fosters communal spaces for rest and social interaction (Figure 4-27-b).

Furthermore, certain merchants extend their display areas onto the street, integrating with

existing elements such as trees and walls. Tree branches serve as makeshift shelves and signage supports, while seating beneath the canopy creates "rooms" and spatial definition, simultaneously ensuring the trees' maintenance and integration within the street's context (Figure 4-27-c and Figure 4-27-d). Low-income residents, unable to afford permanent retail spaces, display their wares on walls, utilizing minimal public space (Figure 4-27-e).

a) b)

c) d) e)

Figure 4-27 "SPACE APPROPRIATION" conceptual diagrams (Source: author)

This paradigm transforms urban spaces into dynamic, interactive, adaptable, ephemeral, inclusive, and diverse environments, thereby actualizing the public nature of physical space.

Consequently, in the design of public spaces, to accommodate appropriation, a site should maintain neutrality towards diverse uses while simultaneously possessing a controlled, recognizable identity. This approach preserves spatial diversity and inclusivity, effectively mitigating the issue of spatial disarray. A degree of neutrality will facilitate unforeseen uses. Conversely, when a space is explicitly designed for a singular purpose, alternative uses are often impeded[83].

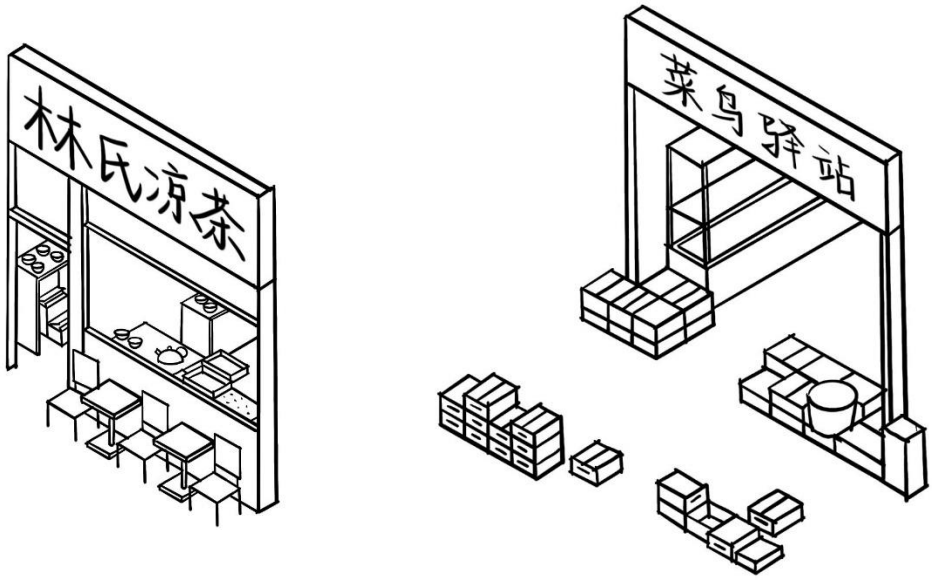


Figure 4-28 "SPACE APPROPRIATION" schematic illustrations (Source: author)

Individuals frequently employ idle or highly adaptable furniture, objects, and carts to occupy public spaces—such as "SEATINGS FOR SMALL GROUPS" (25), "CANTONESE FOLDING TABLE" (31), plastic mesh baskets, and cardboard boxes.

13 EATING IN THE STREET

Refer to Pattern 3 “EATING IN THE STREET” from the “Hanzheng Street Pattern Language”.

……The neighborhood is characterized by numerous naturally occurring public gathering spaces. These spaces serve to unite local residents, thereby dissolving spatial segregation through flexible "DYNAMIC BOUNDARIES" (8), and also function to promote the urban brand and attract visitors, thus representing the city's identity. Moreover, this model facilitates the connection of interstitial zones between the "MARKET OF MANY SHOPS" (5) and residential areas, as well as the transitional spaces from the storefronts of "UNDER THE ARCADE" (10) to the transit areas, thereby invigorating the streetscape by providing supplementary commercial spaces.

Individuals congregating in the public realm, whether standing or seated, consuming food, assert both personal identity and a sense of private territory. This interaction with neighbors not only strengthens community bonds but also cultivates a robust sense of place.

In the current multifaceted urban environment, high-profile gated communities, middle-class high-rises, and urban villages are often segregated. Yet, invariably, there exists a backstreet, a locus for food vendors, where all manner of street food can be found. This street transcends these disparate communities, yet is shared by all. Residents from diverse backgrounds, irrespective of their socioeconomic status, converge to dine. Those arriving in luxury vehicles,

clad in suits, share breakfast with those subsisting on meager incomes. In this manner, distinct community identities are interwoven. These spaces, clustered near automobiles and pedestrian walkways, possess a character consistent with the neighborhood, perhaps comprising freely parked mobile carts, diminutive shacks, seating arrangements under awnings, or a simple table, all becoming integral components of the larger communal landscape.

Figure 4-29 "EATING IN THE STREET" conceptual diagrams (Source: author)

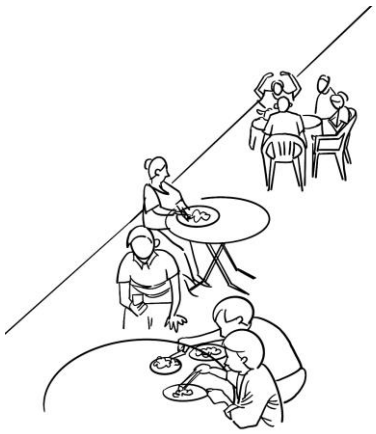


Figure 4-30 "EATING IN THE STREET" schematic illustrations (Source: author)

Consequently, the design of public spaces should endeavor to incorporate linear spatial elements that facilitate activities such as outdoor dining, thereby fostering a sense of belonging within the urban fabric. Strict adherence to spatial dimensions is crucial to prevent any impediment to the functional efficacy of thoroughfares.

Providing individuals with structural elements such as walls or columns for support—referred to as "COLUMN CONNECTION" (20)—and offering "SEATINGS FOR SMALL GROUPS" (25), "CANTONESE FOLDING TABLE" (31), or other highly adaptable seating options. In open-air settings, utilizing "CANVAS ROOFS" (28) as makeshift canopies, and to enhance air circulation, strategically incorporating "WINDOW OPENING" (23) in the surrounding barriers.

4.2.2 Community-level Boundary-defined Unit Space Pattern

Boundaries function as linear components within the urban framework, extending beyond mere roadways. Within shared public spaces, these demarcations typically signify the transition between public and private spheres, frequently appearing as physical separations such as building facades, vegetation, or constructed elements. As a critical point of interaction for pedestrians encountering commercial establishments, the strategic design and application of these boundaries significantly impact both the economic success of businesses and the initial impression of the Nanhuaxi district.

14 TRANSITIONAL SPACE

Refer to Pattern “TRANSITIONAL SPACE” from the Masahiro-cho urban planning ordinance's “Standards of Beauty”.

⋯⋯Within the hierarchical organization of spatial publicness, a seamless transition between levels is imperative.

The separation of varying levels need not be exclusively realized through the utilization of walls. As demonstrated in the "Shu Zhu Yong" street, the strategic arrangement of interwoven vegetation functions as a "soft partition," thereby evoking a sense of a secluded sanctuary. In Figure 4-31-b, the shift between the architectural courtyard and the street is mediated by portals, enabling a seamless transition from the comparatively private inner courtyard to the more public thoroughfare. In contrast to structures that directly interface with the street, the inclusion of transitional spaces cultivates a feeling of serenity. The route from the street to the entrance traverses this transitional zone, thereby augmenting the user's sense of security.

a)

b)

c)

Figure 4-31 "TRANSITIONAL SPACE" conceptual diagrams
(Source: a from google, b & c by author)

Figure 4-32 "TRANSITIONAL SPACE" schematic illustrations
(Source: redraw based on literature[70])

Consequently, a space conducive to social interaction must feature accessible locations,

appropriate scales, dynamism, and shared spatial hierarchies while ensuring privacy. A transitional space should be established between the street and the courtyard. The path from the street to the courtyard should traverse this transitional space, which is distinguished by variations in light, surface textures, and heights, particularly through changes in scenery. The form and scale of the transformed space must also be adapted to the specific context.

The design of fenestrations (23) can be emulated to maintain the façade's distinctive characteristics, with greenery serving as an indispensable element for the transition of flexible boundaries. Provision for such elements can be made—referencing "SMALL PANES" (30)—allowing residents to independently adorn the "TRANSITIONAL SPACE" with "POTTED GREENERY" (26).

4.2.3 Community-level Node-centric Unit Space Pattern

Nodes serve as focal points within a given area, exemplified by intersections. In contrast to city-scale public spaces, the scale of Nanhuaxi district is relatively intimate, fostering a cohesive community with strong internal connections. Consequently, the nodal public spaces invariably interact with the established boundaries, thereby shaping the spatial experience.

15 INTERCHANGE

Refer to Alexander's Pattern 34 “INTERCHANGE”.

……The inherent monotony frequently linked to bus stops can be effectively addressed through a network-based strategy. The core of this approach resides in the intricate relationships within the micro-systems surrounding these transit hubs. A well-functioning micro-system is characterized by strong interconnections, mutual reinforcement, and the strategic integration of supplementary amenities, thereby cultivating a diverse range of experiential possibilities.

The integration of transit hubs serves to connect communities with the external environment and foster internal linkages, thereby evolving into indispensable social nodes within daily life. These transit-oriented locations inherently exhibit a vibrant dynamism. The potential for each bus stop to function as a nexus within this network varies considerably. In one scenario, a bus stop might strategically facilitate access to a secluded area, perhaps enhanced by the presence of a mature tree, thereby subtly communicating a sense of place. Conversely, the design may necessitate the incorporation of social amenities: a coffee kiosk, a tensile canopy, and comfortable seating to encourage lingering and enhance the pedestrian experience.

Figure 4-33 "INTERCHANGE" conceptual diagrams (Source: author)

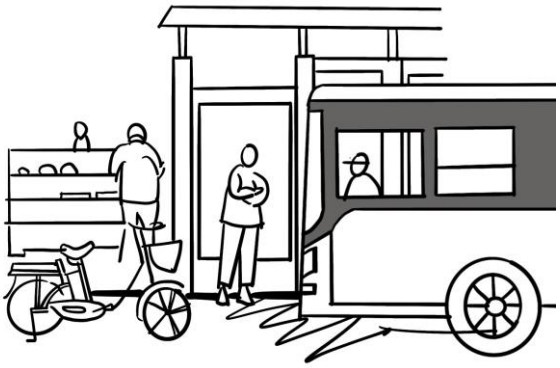


Figure 4-34 "INTERCHANGE" schematic illustrations (Source: author)

Therefore, the strategic placement of bus stops should be prioritized, transforming them into localized hubs of public interaction. These structures should be conceived as integral gateways, facilitating transit to neighboring areas, professional districts, and urban centers. Site selection must be meticulously planned to ensure synergistic functionality with adjacent activities, incorporating essential elements such as a newsstand, readily accessible route maps, and weather-protective shelters, complemented by ample seating. Furthermore, these transit nodes should be thoughtfully integrated with ancillary amenities, including but not limited to, corner stores, cafes, and strategically positioned landscaping.

Establish a comprehensive gateway leading to the neighborhood adjacent to the transit station, or position the transit station at the primary entrance of the community. Address the environmental arrangement in accordance with "INFORMAL PAVILION" (17) and "MIXED USE" (11). Provide venues for "EATING IN THE STREET" (13), and arrange "SEATINGS FOR SMALL GROUPS" (25), "COLUMN CONNECTION" (20), "COURTYARD ENCLOSURE MATERIALS" (22), and "SMALL PANES" (30) based on principles of sun exposure, wind protection, and scenic views.

16 LANDSCAPE AT THE PATH CORNER

Refer to Pattern “THE BUILDING INTERACTS WITH THE HUTONGS” from the Masahiro-cho urban planning ordinance's “Standards of Beauty”.

……In a community, the "THREE-WAY INTERSECTION" (4) often addresses residents' daily recreational requirements. Nevertheless, the "STREET NETWORK" (2) lacks completeness without the integration of numerous smaller, distributed landscape spaces that serve as natural landmarks.

The "LANDSCAPE AT THE PATH CORNER" constitutes a critical identification node

within the community's spatial framework. As junctures where two or more pathways converge, these corners serve as pivotal intersections within the transit network, facilitating directional changes for individuals. Their inherent capacity to offer expansive vistas renders them favored locales for social interaction. Strategic placement of amenities such as cafes, boutiques attuned to the environment, and significant elements at these junctures contributes significantly to the community's orientation and sense of place.

Figure 4-35 "LANDSCAPE AT THE PATH CORNER" conceptual diagrams (Source: author)

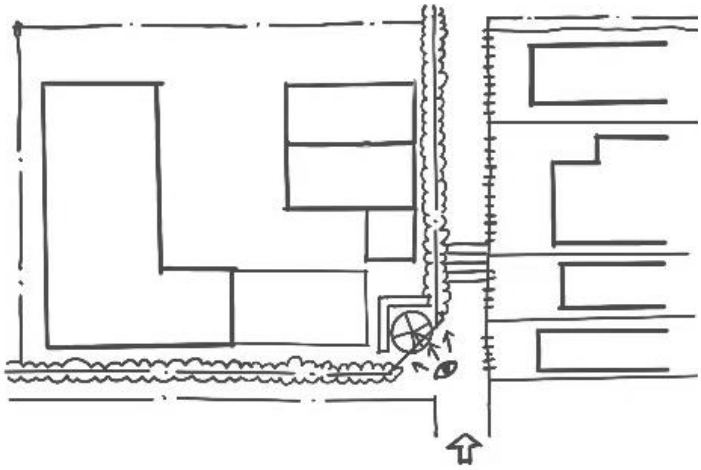


Figure 4-36 "LANDSCAPE AT THE PATH CORNER" schematic illustrations (Source: author)

Consequently, the strategic placement of appealing vertical landscaping at the alleyway's corners serves to invigorate the atmosphere, thereby enhancing its visual interest and facilitating wayfinding.

The configuration of its form necessitates a comprehensive consideration of the architectural ensemble. It may be established independently or evolve vertically from informal pavilions, integrating historical relics, "RAISED FLOWERS" (27), or "POTTED GREENERY" (26), alongside rainwater harvesting and solar capture mechanisms to achieve a sustainable micro-landscape.

17 INFORMAL PAVILION

Refer to Alexander's Pattern 69 “PUBLIC OUTDOOR ROOM”.

……Within the public realm paradigms of "STREET NETWORK" (2) and "THREE-WAY INTERSECTION" (4), informal pavilions can serve a pivotal function, fostering development within the surrounding typologies.

In contemporary towns and neighborhoods, there is a notable absence of spaces along the street that encourage prolonged, leisurely engagement. Young adults seek out corner cafes to

pass the time; the elderly desire sun-drenched locales for social gatherings; children require small patches of sand for play, interaction with plants, or water features; and parents often utilize these opportunities for informal social interaction. The need for such spaces, which delicately balance defined and undefined boundaries, is crucial for fostering spontaneous and innovative activities within a neighborhood. For instance, the strategic placement of a sun umbrella and a few seats or steps could serve as a gathering point for young people and a place for the elderly to enjoy tea and conversation. The indoor activity spaces provided in modern community planning often see limited use, as individuals are hesitant to enter enclosed environments. What is needed for informal pavilions is a framework that sufficiently defines the space, inviting natural pauses and engagement.

Figure 4-37 "INFORMAL PAVILION" conceptual diagrams (Source: google)

Figure 4-38 "INFORMAL PAVILION" schematic illustrations (Source: author)

Consequently, within each neighborhood and professional enclave, the strategic placement of a public space, such as an informal pavilion, is recommended. This structure, featuring a roof supported by columns, should be situated adjacent to a primary thoroughfare.

At the confluence of several pathways, an informal pavilion is strategically positioned at a "THREE-WAY INTERSECTION" (4). The pavilion's spatial boundaries are defined by a "SITTING WALL/STOOP" (24), and it is supported by columns beneath "CANVAS ROOFS" (28), creating an "OUTDOOR ROOM" (18). Adjacent to this structure, an open-air courtyard is sometimes established for the parking of shared bicycles. Residents are encouraged to personalize the space by adding "POTTED GREENERY" (26), thereby fostering a unique and individualized environment.

4.2.4 Neighborhood-level Outward-oriented Unit Space Pattern

Neighborhood-level informal spaces are defined as areas outside of structures within private property, typically uncovered and open-air. Driven by evolving personal needs or shifts

in architectural function, some originally private open spaces have been reconfigured, transitioning into publicly accessible areas. Despite these spaces aligning with the characteristics of community-level informal spaces, their private ownership necessitates their classification as neighborhood-level informal spaces.

18 OUTDOOR ROOM

Refer to Alexander's Pattern 163 “OUTDOOR ROOM”.

……These outdoor spaces contribute to the formation of a "INFORMAL PAVILION" (17).

The populace necessitates access to a diminutive outdoor enclave. This partially enclosed area, while situated in an exterior context, emulates the characteristics of an interior room. Occupants within this space experience activities akin to those within a conventional room, yet benefit from the infusion of sunlight, breezes, and the essence of the outdoors. This setting facilitates work under solar exposure and the enjoyment of sunbathing. Furthermore, such a space can serve as an ancillary area for commercial production during the preparation of seasonal goods, thereby streamlining both production and operational processes. Although it bears resemblance to the "INFORMAL PAVILION" (17), the "OUTDOOR ROOM" is distinguished by its surrounding walls and partial roofing, whereas the "INFORMAL PAVILION" (17) features a roof but is largely devoid of walls.

Figure 4-39 "OUTDOOR ROOM" conceptual diagrams (Source: author)

Therefore, people often enclose it at the corner of the house with pillars, partially cover it with trellises or canvas, and create “boundary walls” around it using fences or “SITTING WALL/STOOP” (24). Since these spaces are predominantly self-constructed by the users, they are prone to issues of disorganized aesthetics.

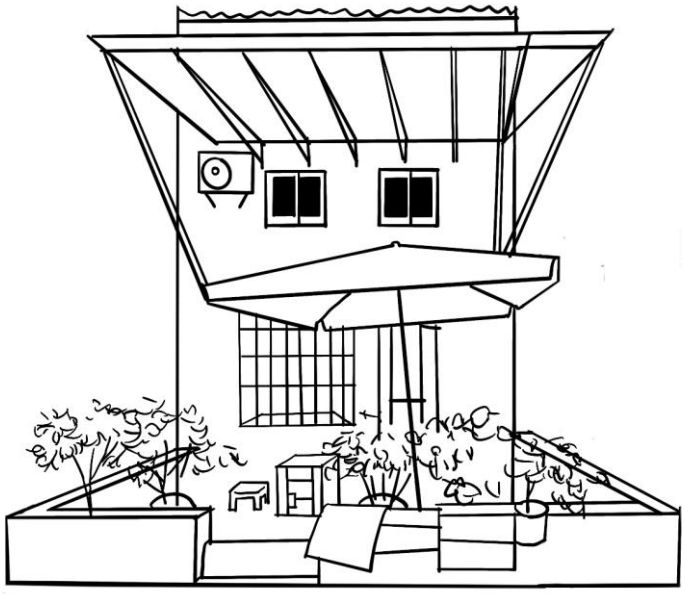


Figure 4-40 "OUTDOOR ROOM" schematic illustrations (Source: author)

The formation of enclosed outdoor micro-spaces frequently relies on the construction of "COLUMN CONNECTION" (20), garden fences, "SITTING WALL/STOOP" (24), trellises, or semi-transparent "CANVAS ROOFS" (28). Occasionally, the arrangement of "FLOOR SURFACE" (21), "COURTYARD ENCLOSURE MATERIALS" (22), and "WINDOW OPENING" (23) is also considered. These spaces are transformed into lively environments through the incorporation of "POTTED GREENERY" (26), "RAISED FLOWERS" (27), and "CHINESE DRYING" (29).

19 STREET-FACING SECURITY GRILLES

Refer to Pattern 12 “PARASITISM” from the “Hanzheng Street Pattern Language”.

……In the antiquated urban neighborhoods, the facades of residential dwellings are frequently obscured by silver-hued, grid-like enclosures, often referred to as "cages," that envelop the street-facing windows.

Within the context of China's rapid urbanization, a significant portion of early residential structures lacked community-based property management and security services. This deficiency left residents vulnerable, particularly those inhabiting lower-level units, fostering a sense of unease regarding their personal safety and the security of their homes. Consequently, economically viable security window grilles emerged as an essential measure for homeowners seeking to safeguard their privacy, personal well-being, and possessions.

The integration of these security grilles has profoundly shaped the spatial character of older neighborhoods, enriching the visual facades of these communities. Predominantly

constructed from aluminum alloy, these grilles present a uniform silver-white aesthetic, characterized by a diverse array of lattice patterns. While the grilles themselves may not be aesthetically pleasing, residents have creatively adapted them to mitigate their perceived oppressiveness and expand their living spaces. This has led to the personalization of these grilles through decorative elements, such as the strategic placement of potted plants within the narrow spaces between the grilles and windows. As a result, a vibrant tapestry of daily life unfolds, with verdant foliage spilling outwards, garments fluttering in the breeze, and the pragmatic arrangement of cleaning implements, all contributing to a more dynamic and colorful facade.

a) Drying inside the grille b) Planting inside the grille c) Stack Sundries

Figure 4-41 "STREET-FACING SECURITY GRILLES" conceptual diagrams (Source: author)

The integration of security measures, such as the installation of projecting window enclosures, augments the dwelling's spatial dimensions. These extensions, typically fabricated from aluminum alloy, protrude outward by 15-45 cm. This design element provides a framework for the judicious management of residents' spontaneous modifications, thereby harmonizing the allocation of space with the proportional distribution of various items. Simultaneously, it serves to aesthetically enhance the window and the building's facade. This strategic intervention also encourages an outward perspective from the interior, fostering a proactive engagement with external activities. The ultimate objective is to cultivate an inviting and functional outdoor environment.

a) b)

Figure 4-42 "STREET-FACING SECURITY GRILLES" schematic illustrations (Source: author)

The anti-theft window constitutes an extended spatial dimension of the original fenestration, which can adopt the configuration of “WINDOW OPENING” (23) as reference. Through the application of the “SMALL PANES” (30) design paradigm, the grille network undergoes redesign and subdivision, thereby maintaining traditional aesthetics while avoiding monotony. Post-installation of security windows, occupants gain unobstructed access to operable sashes, allowing for solar ingress and ventilation through aerated apertures. The strategic placement of “POTTED GREENERY” (26) serves as fenestration ornamentation, fostering visual engagement where observers naturally extend beyond the window plane, establishing interactive dynamics with the streetscape. Supplemental sunshade panels are occasionally integrated into the security window system, functioning dualistically as privacy screens and solar attenuators against intense afternoon radiation.

4.3 Structural Pattern Language

The Structural Pattern Language serves as a reference for the internal configuration of informal spaces, specifically concerning spatial dimensions or construction materials. During the research process, it was observed that the construction structures within informal spaces predominantly consist of light steel frame structures, with the ceiling height generally maintained at approximately a single-story level.

20 COLUMN CONNECTION

Refer to Alexander's Pattern 227 “COLUMN CONNECTION”.

……In the articulation of structural details, the selection of diverse structural systems, along with the specification of their foundational elements, the arrangement of columns, and the methods of component connection, synergistically contribute to the comprehensive spatial orchestration.

The interconnection between materials during the construction of informal spaces is an important part of spatial construction design. The principles of reasonable force, giving full play to the characteristics of the materials, construction feasibility, simplicity, and aesthetics should be followed.

Due to the humid climate of Guangzhou, steel is more common in the frame structure system, mainly light steel, which is often connected by welding, bolts, etc., as shown in Figure 4-43. Steel is used to facilitate the temporary fixing of components on the actual construction site and can be adjusted appropriately after being put in place. Many steel components that need to be welded will be fixed with bolts first, and the position and size of the bolt holes reserved on the components are also determined according to the needs.

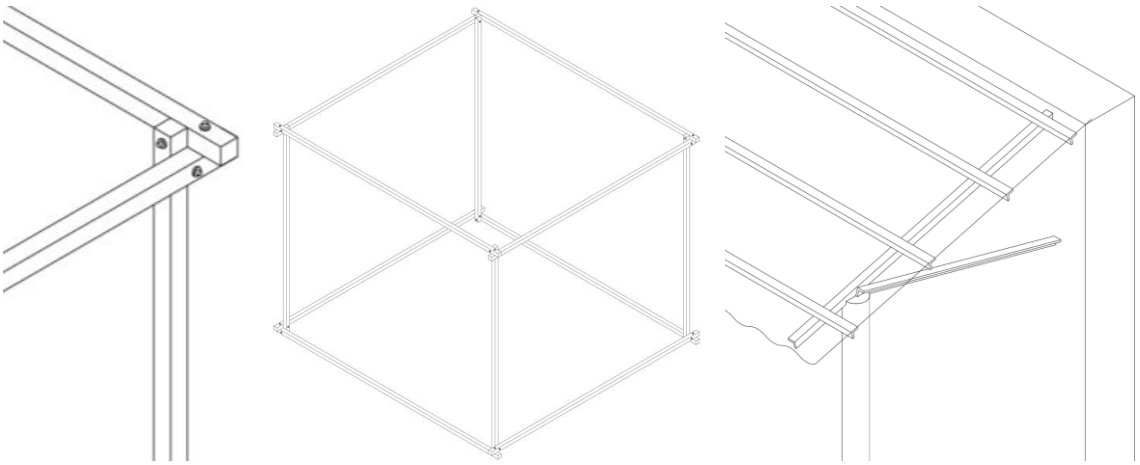
a) Light steel bolted connections

b) Light steel welding

Figure 4-43 Steel connection methods (Source: author)

Consequently, this model furnishes a demonstration of partial steel material application

within frame structure connections, serving as a practical construction reference. The connection methodology illustrated in Figure 4-44 is applicable.



a) Light steel bolted connections (Source: literature[60]) b) Light steel welding (Source: author)

Figure 4-44 Steel connection methods schematic illustrations

Upon establishing the "COLUMN CONNECTION" (20), the spatial framework can be constructed. Subsequently, the formulation of other structural components within the spatial configuration commences, such as the "FLOOR SURFACE" (21) and "COURTYARD ENCLOSURE MATERIALS" (22) ……

21 FLOOR SURFACE

Refer to Alexander's Pattern 233 “FLOOR SURFACE”.

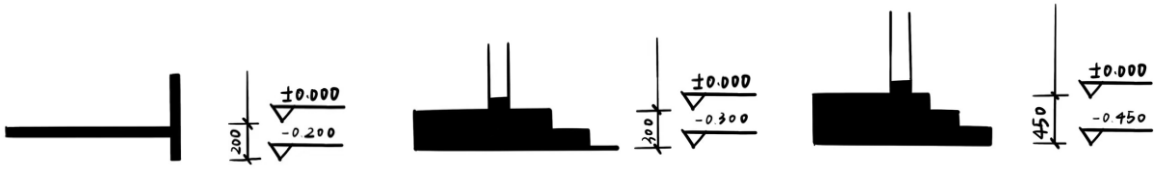
……Within the constructed site, the fundamental spatial framework is established through "SPATIAL TRANSFORMATION" (14), followed by a progressive consolidation of the space. This model outlines the elevation and construction methodology for the ground level of the spatial configuration.

The base ground level should be elevated to a certain degree, and appropriate materials should be selected for its construction. Where the base ground level of a space interfaces with the ground, a portion of the construction is directly placed upon the ground. Another portion of the construction is typically elevated above the base ground level to facilitate more convenient use of the space. This is not only to balance height differences but also to aid in dehumidification and moisture prevention.

a) H≈200mm b) H≈300mm c) H≈450mm

Figure 4-45 "FLOOR SURFACE" conceptual diagrams (Source: author)

Elevated ground surfaces are advantageous for dehumidification and moisture prevention. It is recommended that the ground floor be elevated between 100-450mm. Additionally, the differential height can be addressed by using compacted soil for leveling or employing a strip framework as a foundation to elevate the ground floor, thereby supporting the walls. Flat panel materials can be used for surface coverage (see Figure 4-46-a).



a) H≈200mm b) H≈300mm c) H≈450mm

Figure 4-46 Ground floor level height (Source: author)

Upon the completion of the foundational ground construction, it is imperative to proceed with the selection and refinement of other structural components within the space. This includes determining the form of enclosure surrounding the area, such as the "COURTYARD ENCLOSURE MATERIALS" (22), and selecting the dimensions of the "WINDOW OPENING" (23).

22 COURTYARD ENCLOSURE MATERIALS

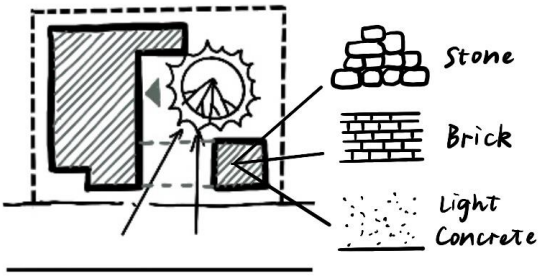
Refer to Alexander's Pattern 207 “GOOD MATERIALS”.

……The selection and arrangement of enclosure materials within residential courtyards should be carefully considered to balance visibility and privacy. While allowing for a degree of outward visual permeability, the design must simultaneously ensure a level of seclusion for the occupants' activities within the space.

In the realm of urban design, it is imperative to cultivate a multi-layered, open, and ordered neighborhood spatial environment. This environment must cater to the diverse spatial needs of residents with varying behavioral patterns. Each space should afford views to larger,

encompassing spaces, thereby ensuring a cohesive and ordered spatial composition. The materials used for enclosure serve as a critical structural element, facilitating a clear transition between private and public realms. Such demarcation of territories fosters a sense of security and protection, which, in turn, invariably encourages social interaction.

a)



b)

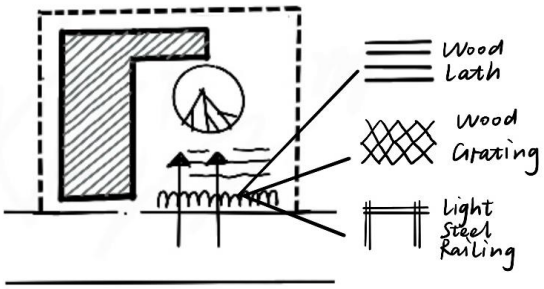


Figure 4-47 "COURTYARD ENCLOSURE MATERIALS" conceptual diagrams (Source: author)

Figure 4-48 "COURTYARD ENCLOSURE MATERIALS" schematic illustrations (Source: redraw based on literature[70])

In the construction of informal spaces, the selection of enclosure materials may exhibit some variability; however, the overarching principles of economy, aesthetics, and cohesion must be adhered to. For informal spaces related to residential living that require sunlight and social interaction, reference can be made to the reuse of Figure 4-47-b.

Strategic apertures within the perimeter walls afford passersby glimpses of the internal landscape, while the utilization of wrought-iron fencing delineates the courtyard's boundaries, thereby enabling pedestrians to observe children at play within the courtyard. Simultaneously, the children within the courtyard maintain a visual connection with the happenings of the street, fostering a reciprocal relationship between the private and public realms.

23 WINDOW OPENING

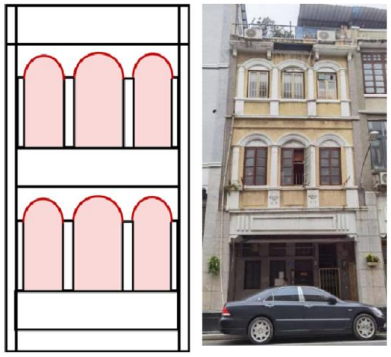
Refer to Alexander's Pattern 221 “NATURAL DOORS AND WINDOWS”.

⋯ ⋯ The facilitation of social interaction among residents necessitates careful consideration. Within informal spaces designed for daily life services, the "BUILDING EDGE"

(9) offers opportunities for relative privacy, whereas recreational informal spaces benefit from a more open configuration. Furthermore, the dimensions of window openings within the enclosing structures must be tailored to the specific functions of each space.

Windows, as essential spatial mediators, establish a dynamic interplay between interior and exterior realms. They offer illumination, ventilation, and a point of connection, allowing occupants to experience diurnal and seasonal shifts while simultaneously fostering interaction with the external environment. The evolution of window design reflects the progression of decorative arts, symbolizing the cultural essence of a neighborhood. Historically, the second story of brick-and-timber structures often employed lightweight wooden panels with casement or latticed windows. By the 1930s, Art-deco style in Guangzhou featured simplified facades with geometric patterns and window apertures[84].

a) Typical threshold windows



b) Integration of pilasters with small windows

c) Integration of pilasters with large windows

d) Art-deco style

Figure 4-49 "WINDOW OPENING" schematic illustrations and conceptual diagrams

(Source: conceptual diagrams self-captured, references for schematic diagrams[84])

Consequently, the selection of window apertures should not only fulfill the requirements of daily life but also consider the continuation of traditional styles. Furthermore, the varying height dimensions of window apertures on a single wall can exert different influences on human interaction. To ensure a degree of privacy, the height of the window aperture should not be less than 800mm. Conversely, if an open form is desired to facilitate communication and interaction,

the overall height and size of the window aperture should not be less than 1000mm.

Leveraging the provided Unit Space pattern language and Structural Pattern Language selections, a preliminary design scheme for establishing an informal space has been essentially realized. The subsequent phase involves incorporating elementary spatial arrangement elements to refine the space……

4.4 Spatial Component Pattern Language

Spatial detail pattern language comprises the formative elements within a space. These patterns, however, cannot independently construct a complete spatial entity. Their efficacy is realized through integration with other patterns, collectively orchestrating the spatial experience and encapsulating the shared experiential knowledge of the inhabitants.

24 SITTING WALL/STOOP

Refer to Alexander's Pattern 243 “SITTING WALL” and Pattern “BUILDING EDGE” from the Masahiro-cho urban planning ordinance's “Standards of Beauty”.

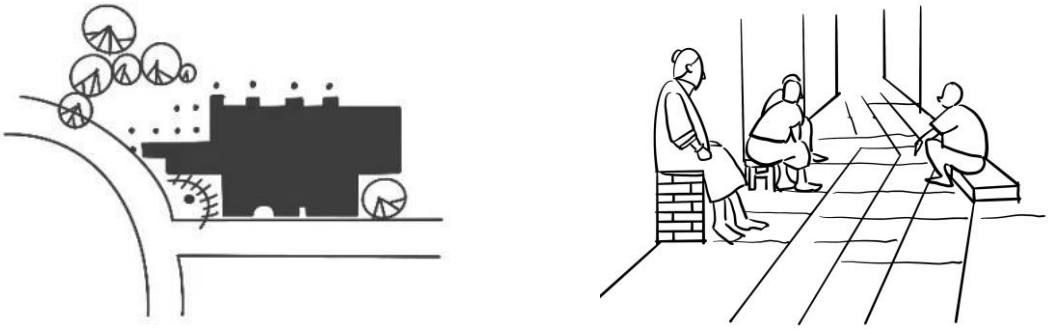
……The architectural edge is frequently misconstrued as a mere linear delineation, devoid of substantial depth. This perspective is fundamentally flawed. The strategic placement of "SITTING WALL/ STOOP " elements serves to define and enclose the outdoor spaces, which are otherwise characterized by a lack of spatial definition.

The utilization of architectural constructs extends beyond their interior confines, encompassing the manipulation of the external environment. The perimeters of open-air spaces often serve as focal points for human interaction, particularly when these edges are enlivened with engaging elements, thereby encouraging prolonged engagement. Furthermore, the peripheral zones adjacent to residential structures play a crucial role in the articulation of personal identity. Residents' personalized appropriation of these spaces, whether through cultivation, storage, ornamentation, or social gatherings, exemplifies this. The individualized requirements of each household are accommodated within these private edge spaces. This intimate interface between public and private spheres fosters communal interaction and facilitates the formation of social bonds.

a) b) c)

Figure 4-50 "SITTING WALL/STOOP" conceptual diagrams (Source: author)

Therefore, the exterior wall should not be perceived as a mere demarcation between interior and exterior spaces, but rather as a site for engaging with the external environment. Envisioned as an integral component of the landscape, it should be designed to encourage interaction, observation, and utilization by those in proximity. The incorporation of textured wainscoting and steps along the facade, complemented by the residents' placement of seating and planters, serves to enrich the building's periphery. These elements, including the wainscoting, establish secondary boundaries within the outdoor space, with the low walls measuring approximately 400mm in height and a minimum width of 300mm.



a) Schematic Plan
(Source: redraw based on literature[70])

b) Schematic Rendering (Source: author)

Figure 4-51 "SITTING WALL/STOOP" schematic illustrations

The area can be adorned with "POTTED GREENERY" (26), "RAISED FLOWERS" (27).

25 SEATINGS FOR SMALL GROUPS

Refer to Alexander's Pattern 242 “FRONT DOOR BENCH” and Pattern 251 “DIFFERENT CHAIRS”.

……The strategic placement of seating arrangements, encompassing both public and private groupings, serves as a critical element in defining the character of entry spaces and the delineation of architectural boundaries.

Public spaces extend beyond parks and plazas. Their activation can be instigated through

subtle interventions. Strategic placement of elements, such as a solitary chair on a sidewalk, can subtly communicate an invitation to pause. Observation of street life is a fundamental human behavior. Within these informal settings, "SEATINGS FOR SMALL GROUPS" are frequently observed, often characterized by the presence of solid wood sofas. The strategic placement of seating within the alleyway fosters social interaction among residents, thereby facilitating casual conversations with passersby.

Jan Gehl posits that the presence of people inherently draws others, thereby initiating new activities in proximity to existing ones[85]. The strategic placement of seating, frequently situated in proximity to residential areas and thoroughfares, serves as a crucial mechanism for public engagement, particularly for the elderly demographic. Functionally, these chairs are indispensable, providing support for rest and facilitating a range of daily activities, thereby augmenting the utility of the space. Furthermore, the establishment of small-scale gathering points within each neighborhood, rather than a singular centralized location within the community, fosters a symbiotic relationship between older and younger residents. This approach also provides essential mutual support for the elderly within their residential environment.

Figure 4-52 "SEATINGS FOR SMALL GROUPS" conceptual diagrams (Source: google)

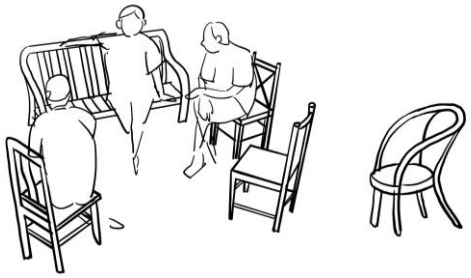


Figure 4-53 "SEATINGS FOR SMALL GROUPS" schematic illustrations (Source: author)

Consequently, when designing informal spaces, consideration should be given to incorporating seating near doorways or along the street. Alternatively, the direct placement of benches or other seating options can be implemented. The presence or absence of seating significantly influences the congregation of individuals on the street. The distance between individual seating elements should be sufficient to facilitate comfortable conversation[86]. Furthermore, avoid uniform seating arrangements; instead, curate a diverse selection. Incorporate pieces of varying scales, from expansive to intimate, and of diverse ages, from antique to contemporary. Employ a range of materials, including woven wicker, solid wood, and upholstered textiles.

In addition to seating arrangements, the incorporation of other external spatial elements, such as "potted greenery" (26) and "raised flowers" (27), can contribute to the creation of semi-private areas. At the periphery of gathering points, it is beneficial to provide elderly individuals with manageable activities and tasks, particularly those involving the education and care of children.

26 POTTED GREENERY

Refer to Alexander's Pattern 246 “CLIMBING PLANTS” and Pattern “COVERED WITH GREENERY” from the Masahiro-cho urban planning ordinance's “Standards of Beauty”.

……The transition from interior to exterior spaces is often delineated through the strategic placement of greenery, floral arrangements, or arboreal elements. Reflecting the innate human desire for a connection with nature, "BUILDING EDGE" (9) incorporates potted plants. This allows for the observation of seasonal transformations in foliage and the auditory experience of leaves rustling in the breeze. These natural components are crucial for human well-being, and they also contribute to air purification, noise mitigation, privacy enhancement, and the reduction of the urban heat island effect.

The rigid demarcation provided by solid walls at the periphery of informal spaces fails to address the residents' inherent need for a connection to nature. The historical district of Nanhuaxi, situated at the confluence of the former Shuzhu Creek and the Pearl River, boasts a

rich legacy of merchant gardens from the Thirteen Hongs era. This enduring experience of daily life and the aesthetic sensibilities cultivated over time have instilled in the residents a persistent desire to cultivate a beautiful natural environment. Potted plants and greenery serve as a primary expression of this longing for nature. Whether observed along the low-lying alleyways or on elevated window sills, one encounters a diverse array of potted plants, varying in size. The inhabitants of the district utilize not only various planters for cultivating flowers and greenery at the spatial boundaries but also engage in the cultivation of vegetables and fruits. These plants serve as a transitional layer from the interior to the exterior, simultaneously beautifying the environment and embellishing the external spaces, thereby creating a district covered with greenery.

a)

b)

Figure 4-54 "POTTED GREENERY" conceptual diagrams (Source: google)

Consequently, the strategic placement of potted plants and greenery around informal spaces can serve to embellish the exterior environment, thereby accommodating residents' inherent desire for a connection with nature.

Figure 4-55 "POTTED GREENERY" schematic illustrations (Source: author)

The cultivation of these verdant elements necessitates no intricate vertical greening systems; rather, it relies on straightforward methodologies and nuanced detailing. These include the strategic deployment of planters, the utilization of wire mesh, the incorporation of trellises, and the construction of uncomplicated metallic or timber frameworks.

27 RAISED FLOWERS

Refer to Alexander's Pattern 245 “RAISED FLOWERS”.

⋯ ⋯ The perimeters of architectural structures present optimal locations for floral arrangements, which serve to aesthetically enhance these areas.

Conventional, elongated planting beds frequently suffer from excessive depth and exposure, with their low elevation rendering them inaccessible to pedestrians. Floral displays should be designed for approachability, thereby encouraging interaction and the appreciation of their fragrance. It is advisable to avoid the utilization of low, narrow planting beds. Instead, consider the strategic placement of plantings within low beds enclosed by seating walls, or along pathways, entry points, and the perimeters of structures.

a) b)

Figure 4-56 "RAISED FLOWERS" conceptual diagrams (Source: author)

Figure 4-57 "RAISED FLOWERS" schematic illustrations (Source: author)

Consequently, the cultivation of floral arrangements can serve to soften the edges of architectural structures, pathways, and exterior spaces. Elevating the planting beds facilitates direct interaction with the blooms, or provides seating for contemplation. The borders of these raised beds should be robustly constructed, thereby accommodating incidental seating and encouraging prolonged engagement with the landscape.

28 CANVAS ROOFS

Refer to Alexander's Pattern 244 “CANVAS ROOFS”.

……The "OUTDOOR ROOM" (18) achieves aesthetic appeal through the implementation of "CANVAS ROOFS," which serve to modulate light and provide protection from the elements.

In the variable climatic conditions of Southern China, where the seasons fluctuate unpredictably, "CANVAS ROOFS" are strategically implemented. These structures are particularly beneficial during the summer months, providing diffused light and partial shade, or during the autumn and winter seasons, offering protection against fog and dew. The "CANVAS ROOFS," with their vibrant aesthetic, resemble luminous citrus fruits, thereby injecting a dynamic visual element into the streetscape.

To optimize functionality, these "CANVAS ROOFS" are designed with a folding mechanism, allowing them to be retracted via ropes or cables. This design facilitates the effortless opening and closing of the canopies, thereby adapting to the changing environmental needs.

Figure 4-58 "CANVAS ROOFS" conceptual diagrams (Source: author)

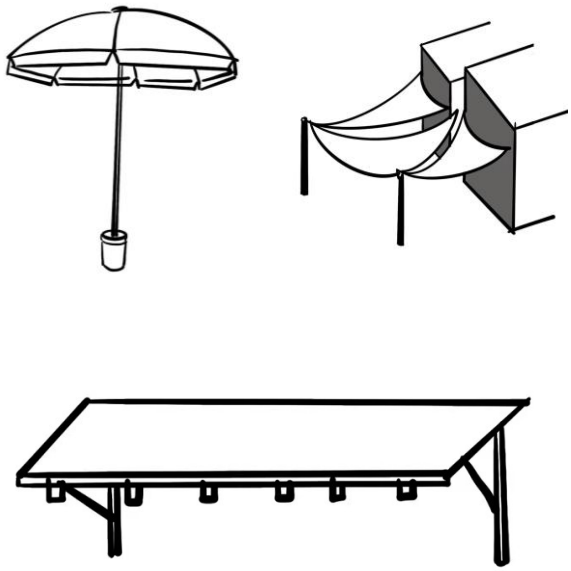


Figure 4-59 "CANVAS ROOFS" schematic illustrations (Source: author)

29 CHINESE DRYING

Refer to Pattern 5 “CHINESE DRYING” from the “Hanzheng Street Pattern Language”.

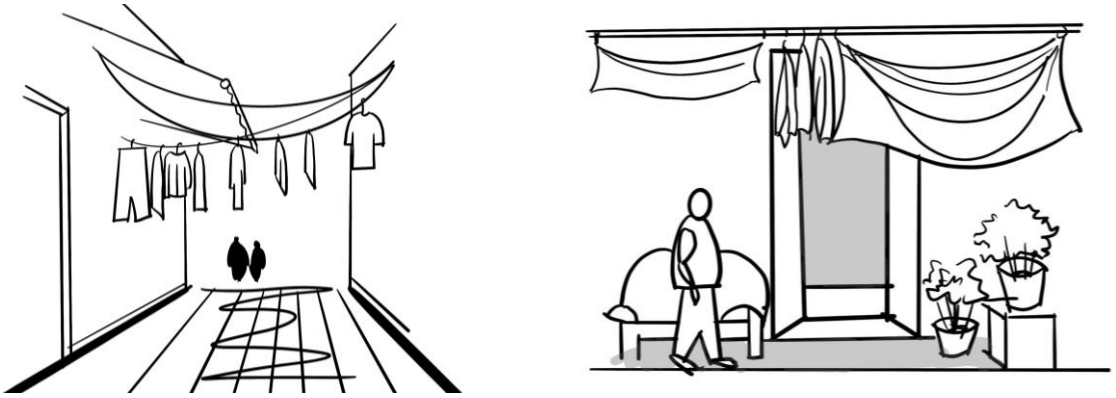
……The humid climate of Southern China, characterized by a monsoon season lasting one to two months, profoundly influences the utilization of public spaces. During periods of solar exposure, residents strategically employ open areas for communal drying, resulting in a vibrant transformation of residential architecture.

The genesis of this pattern frequently manifests within the traditional Chinese urban fabric. Consider, for instance, the practice of stringing clotheslines across alleyways or draping laundered garments and blankets over the facades of open structures. This extends the residents' private lives onto the building's exterior, thereby articulating their individual identities. Occasionally, this arrangement permeates the public realm at the urban scale, as evidenced by the display of bedding on public exercise equipment. In these instances, the dichotomy between the private and the public spheres becomes entirely blurred.

a) b) c)

Figure 4-60 "CHINESE DRYING" conceptual diagrams (Source: a & c by author, b from google)

Consequently, the deliberate integration of communal laundry facilities within residential designs proves advantageous, as it fosters social interaction, cultivates a vibrant living environment, and strengthens community identity.



a) b)

Figure 4-61 "CHINESE DRYING" schematic illustrations (Source: author)

This model can be effectively implemented by extending a robust cord between walls or erecting bamboo poles within repurposed spaces, thereby ingeniously leveraging other foundational infrastructures during the "MIXED USE" period.

30 SMALL PANES

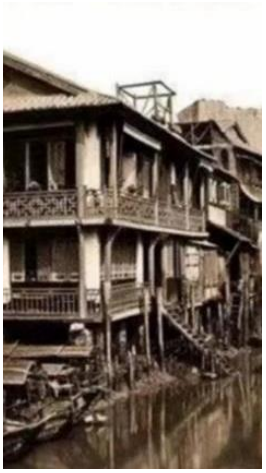
Refer to Alexander's Pattern 239 “SMALL PANES”.

……This protocol elucidates the glazing specifications for the "WINDOW OPENING" (23) assembly.

The prevailing notion that expansive glass panes offer a more direct engagement with nature is, in fact, a misconception. Conversely, it is the smaller windows, subdivided by multiple panes, that foster a deeper connection with the external environment. This effect is achieved by amplifying the distinctiveness and diversity of the views, compelling the observer to contemplate the ever-changing panorama framed by the window's divisions. A singular vista,

when segmented by six small panes, transforms into a series of six distinct compositions. This design principle is notably prevalent in the traditional street houses of Guangzhou, exemplified by the "Manchurian windows" of Lingnan architecture. These windows, adorned with colored glass, incorporate etched motifs of flora, fauna, landscapes, and auspicious symbols.

a) Six Landscape Paintings (Source: literature[3])



b) Lingnan Manchurian Windows (Source: google)

Figure 4-62 "SMALL PANES" conceptual diagrams

Consequently, the division of each window into numerous small panes, none exceeding 0.36 square meters, is proposed. Subsequently, the width and height of each window can be divided by the number of panes, resulting in a variable number of panes per window, contingent upon its dimensions. By standardizing the dimensions of the individual window or door units, a cohesive decorative uniformity across the entire block can be achieved.

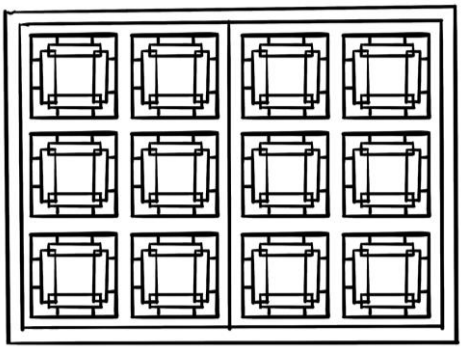


Figure 4-63 "SMALL PANES" schematic illustrations (Source: author)

The window sashes can be designed as folding leaves, while "SMALL PANES" can be crafted with greater refinement to filter light.

31 CANTONESE FOLDING TABLE

……This design not only addresses the imperative for efficient spatial utilization but also imbues the furniture with dual value—both practical and aesthetic—through the minimalist

elegance of its mechanical structure.

In the context of compact contemporary living environments, the adaptability and multifunctionality of furnishings are paramount. A folding table, supported by an X-shaped iron frame, exemplifies this principle. Its design facilitates rapid deployment and retraction, accommodating temporary dining, work, or social engagements while maximizing available floor space.

Consequently, the tabletop should be articulated with an X-shaped folding iron frame, with the intersection of the frame incorporating a locking hinge to ensure stability under load when deployed. The tabletop thickness should be maintained between 1.5 and 2 centimeters, utilizing lightweight materials to minimize overall weight. The iron frame must be constructed from corrosion-resistant steel, with a cross-section width of no less than 3 centimeters to guarantee structural integrity. When folded, the overall thickness should not exceed 15 centimeters, allowing for convenient storage against a wall.

Figure 4-64 "CANTONESE FOLDING TABLE" conceptual diagrams (Source: author)

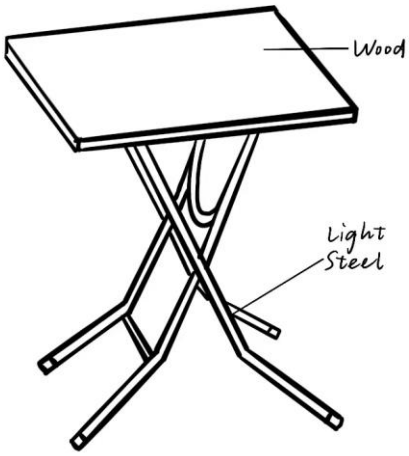


Figure 4-65 "CANTONESE FOLDING TABLE" schematic illustrations (Source: author)

The folding table, when paired with "SEATINGS FOR SMALL GROUPS" (25), offers a flexible, modular living environment. Furthermore, the X-frame structure of the folding table can be refined to incorporate an adjustable-height mechanism, thereby accommodating a wider array of spatial requirements and augmenting its adaptability.

4.5 Integrating Core Values of the Goal with Pattern Language

When a pattern's implementation contributes to achieving an objective outlined in Chapter 3, the "pattern node" and the "objective node" can be linked via an edge within Gephi. The numerical value assigned to the edge weight is contingent upon a qualitative assessment of the relationship between the pattern and the core values of the objective, as detailed in the table below. This process necessitates the involvement of experts in practical projects; however, due to the experimental nature of this study, the determination of pattern relationships will be based on empirical data collected during the site survey of Nanhuaxi district.

Table 4-2 The value ranges and descriptions for each edge connecting one pattern and one design goal

Value of the weight of the edge (range)	Meaning
0	The pattern does not help in achieving the goal
1-5	The pattern is mildly suitable to address the goal
6-10	The pattern is strongly related to the goal

Source: literature[57]

The qualitative assessment of the potential for a pattern to achieve these multiple objectives is quantitatively transformed into numerical values ranging from 1 to 10, which are then assigned to each edge. For instance, "MARKET OF MANY SHOPS" (5), comprising numerous small shops, facilitates a diverse range of commercial activities, allowing each vendor to cultivate a business environment tailored to their specific expertise and requirements. The strategic implementation of this pattern in the organization of public spaces can serve a multitude of purposes. The goods sold within the market, ranging from artisanal foods to handcrafted furniture, embody local cultural traditions, thereby attracting tourists, augmenting resident income, fostering neighborhood interactions, and strengthening social cohesion.

Upon the completion of all "pattern-goal" associations and the initiation of the "Force Atlas" layout algorithm, the subsequent figure emerges (Figure 4-66). This visualization strategically arranges the patterns around their most pertinent objectives, thereby facilitating a more comprehensive articulation of the pattern language in alignment with the design objectives.

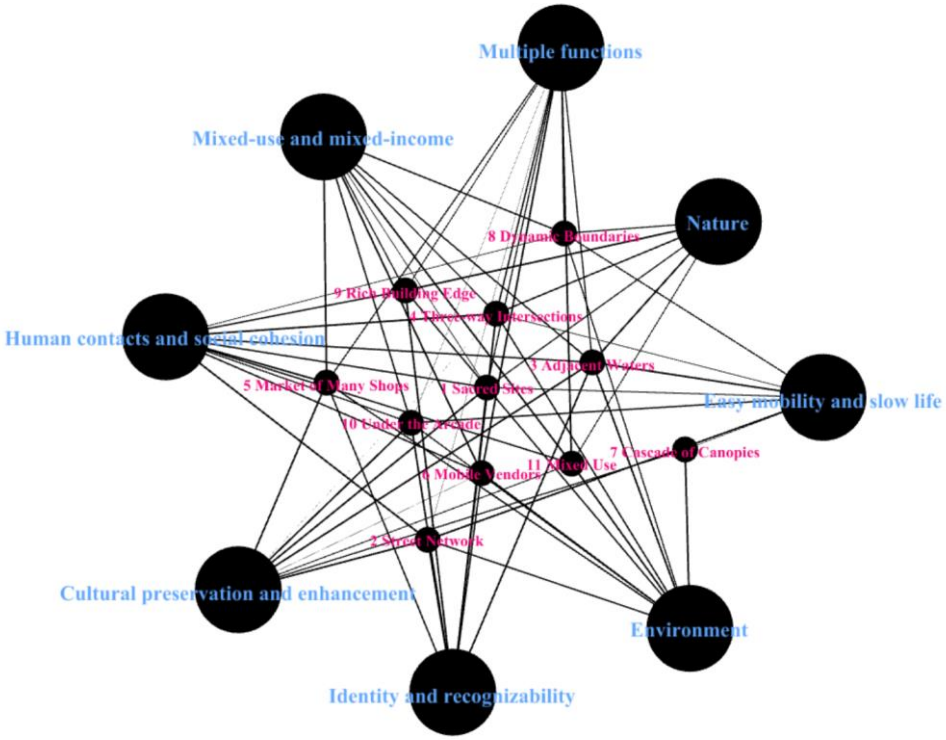


Figure 4-66 Diagram illustrating the relationship between sub-goals and patterns (Source: author)

4.6 Pattern Language Structure Construction

Drawing upon the comprehension of the Alexander pattern language structure as delineated in Section 2.1.2, and integrating the specific content of the preceding patterns, the "Relationship with Subsequent Smaller Patterns" within each composite space pattern, along with the "Relationship with Preceding Larger Patterns" within each unit space pattern, will serve as the criteria for assessing the correlation between composite and unit pattern classes in the network diagram. The edge weight values are detailed in the following Table 4-3.

Table 4-3 The value ranges and descriptions for each edge connecting patterns

Value of the weight of the edge (range)	Meaning
0	The pattern does not help in constructing the composite space pattern
1	The pattern is directly related to the composite space pattern

Source: author

For instance, the "DYNAMIC BOUNDARIES" (8) scenario can be actualized through the strategic placement of seasonal "POTTED GREENERY" (26) to embellish "POTTED GREENERY" (14), or by concentrating on areas of "SPACE APPROPRIATION" (12) and "EATING IN THE STREET" (13). Based on the aforementioned statements, it is feasible to assign edge weights to "DYNAMIC BOUNDARIES - SPACE APPROPRIATION,"

"DYNAMIC BOUNDARIES - EATING IN THE STREET," and "DYNAMIC BOUNDARIES - SPATIAL TRANSFORMATION." In accordance with the pattern language theory of Alexander, and in conjunction with relevant literature on spatial studies, the correlation logic between various composite space patterns and unit space patterns is constructed as follows:

1 SACRED SITES are integrated with historical remnants through the strategic application of flexible green partitions, as detailed in "SPATIAL TRANSFORMATION" (14). Alternatively, "SPACE APPROPRIATION" (12) is employed to invigorate informal activities on bridge surfaces and along the waterfront, thereby amplifying the public significance of the location. Furthermore, "EATING IN THE STREET" (13) and "RICH BUILDING EDGE" (9) are implemented to embed the site within the fabric of daily life, thus preserving its historical identity.

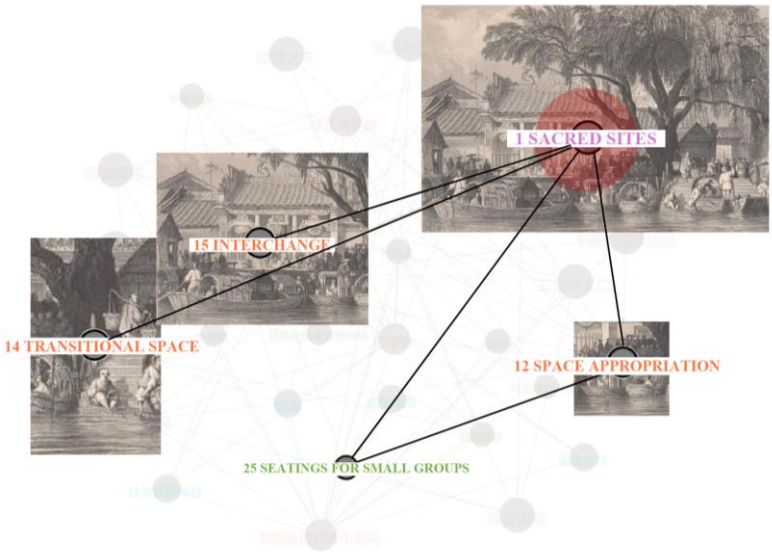


Figure 4-67 The interrelationship between "SACRED SITES" and other patterns (Source: author)

2 STREET NETWORK, capitalizing on "SPACE APPROPRIATION" (12), seeks to repair fragmented pedestrian routes, thus creating a "RICH BUILDING EDGE" (9). This is further facilitated by "INTERCHANGE" (15), which serves to link the community internally and externally. The "LANDSCAPE AT THE PATH CORNER" (16) and the "INFORMAL PAVILION" (17) act as key landscape nodes within the "THREE-WAY INTERSECTION" (4), integrating "OUTDOOR ROOMS" (18) and "STREET-FACING SECURITY GRILLES" (19) to enhance the street's capacity for habitation and its overall legibility. Moreover, the design strategically incorporates "EATING IN THE STREET" (13) and "TRANSITIONAL SPACES" (14) to enrich the pedestrian's sensory experience and improve the street's overall suitability for human activity.

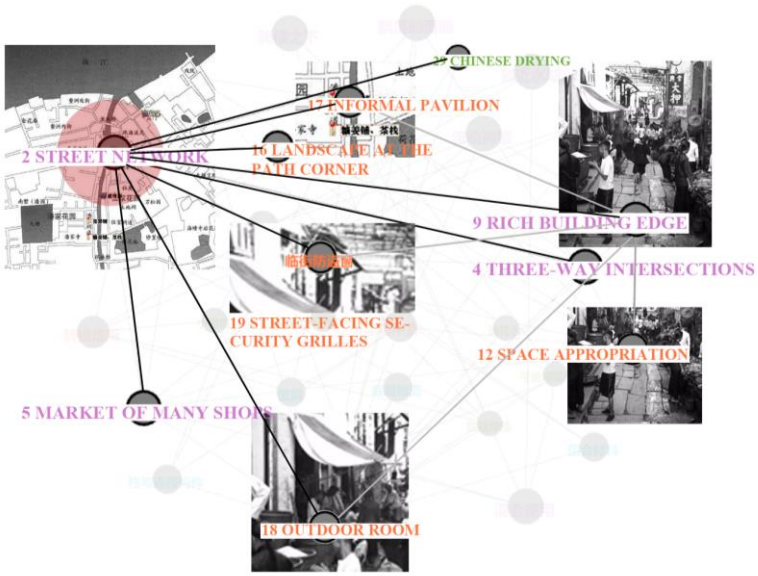


Figure 4-68 The interrelationship between "STREET NETWORK " and other patterns (Source: author)

3 ADJACENT WATERS are intended to be accessed via a series of steps and verdant landscaping that constitute a "TRANSITIONAL SPACE" (14), guiding residents toward the water's edge. This approach is further enhanced by the integration of a "RICH BUILDING EDGE" (9) and "SPACE APPROPRIATION" (12) along the riverbank, thereby establishing a multi-layered open space that fosters human interaction with the water. The breadth of the public zones surrounding the water body will be modulated in response to the spatial characteristics, amenities, and programmatic diversity of the surrounding environment. This design is characterized by "DYNAMIC BOUNDARIES" (8) and a "MIXED USE" (11) approach.

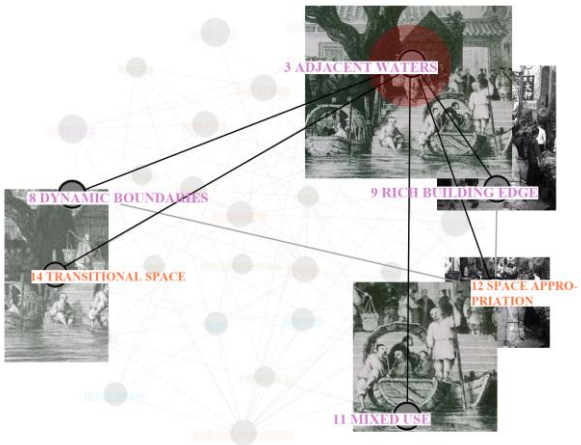


Figure 4-69 The interrelationship between "ADJACENT WATERS" and other patterns (Source: author)

4 THREE-WAY INTERSECTION is transformed into a vibrant node of neighborhood interaction through the "INFORMAL PAVILION" (17), which serves as a gathering core. This is achieved in conjunction with the "LANDSCAPE AT THE PATH CORNER" (16), the

"OUTDOOR ROOM" (18), and the customized ornamentation of the "STREET-FACING SECURITY GRILLES" (19).

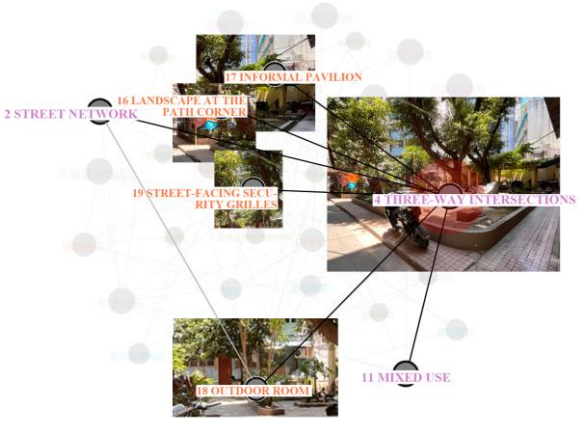


Figure 4-70 The interrelationship between "THREE-WAY INTERSECTION" and other patterns

(Source: author)

5 MARKET OF MANY SHOPS integrates the flexible format of "MOBILE VENDORS" (6) with the linear spatial layout of "EATING IN THE STREET" (13) to connect commercial units. It expands outdoor service areas through "SPACE APPROPRIATION" (12), while leveraging "RICH BUILDING EDGE" (9) to enhance the vibrant street-level atmosphere of the market facade.

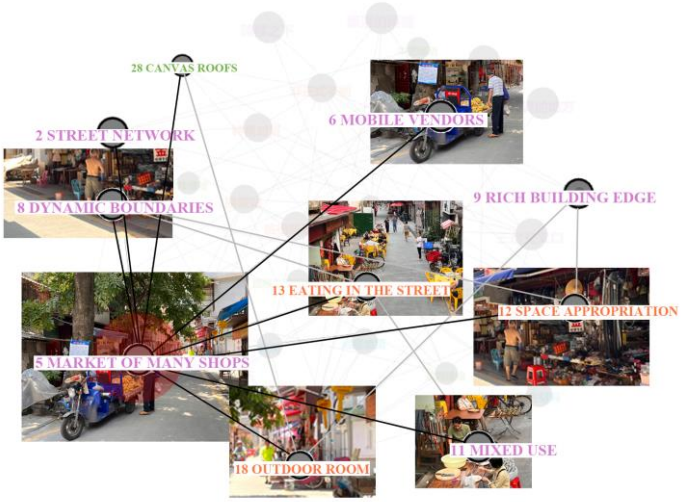


Figure 4-71 The interrelationship between "MARKET OF MANY SHOPS" and other patterns

(Source: author)

6 MOBILE VENDORS rely on an autonomous network of shops within the "MARKET OF MANY SHOPS" (5), leveraging the aggregation effects of "SPACE APPROPRIATION" (12) and "EATING IN THE STREET" (13) to establish a diverse, temporary public realm. This is achieved through strategic placement in or near high-traffic areas such as "TRANSITIONAL SPACE" (14) and "INTERCHANGE" (15).

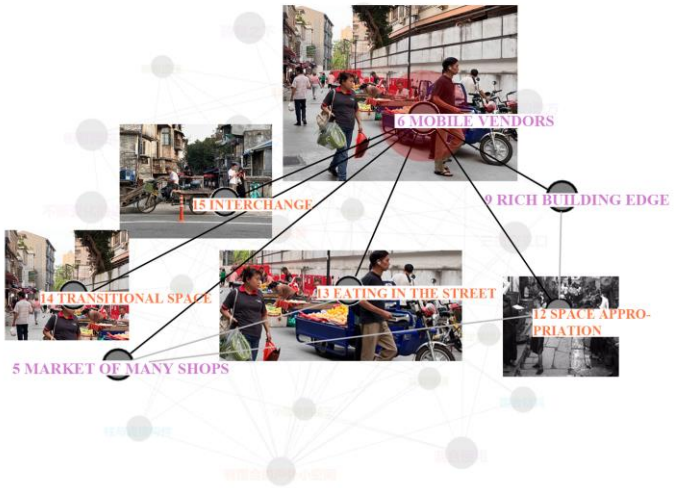


Figure 4-72 The interrelationship between "MOBILE VENDORS" and other patterns

(Source: author)

7 CASCADE OF CANOPIES is strategically composed of "EATING IN THE STREET" (13), "INFORMAL PAVILION" (17), and "OUTDOOR ROOM" (18), resulting in a layered network of sheltered activity zones. This arrangement, facilitated by "SPACE APPROPRIATION" (12), establishes a "RICH BUILDING EDGE" (9), thereby accentuating the site's unique character. The vertical positioning of "CANVAS ROOFS" (28) corresponds to the duration and significance of the designated spaces, with more permanent and essential areas elevated, while temporary and secondary rest areas are situated closer to human scale.

Figure 4-73 The interrelationship between "CASCADE OF CANOPIES " and other patterns

(Source: author)

8 DYNAMIC BOUNDARIES are established to diversify street interfaces and foster a sense of identity through the strategic placement of seasonal "POTTED GREENERY" (26)

within "TRANSITIONAL SPACES" (14). Alternatively, these boundaries can be defined by the dynamic interplay of "SPACE APPROPRIATION" (12) and the concentrated activity of "EATING IN THE STREET" (13).

Figure 4-74 The interrelationship between "DYNAMIC BOUNDARIES " and other patterns

(Source: author)

9 RICH BUILDING EDGE establishes a layered facade through the strategic implementation of "CASCADE OF CANOPIES" (7). The aesthetic integration of "STREET-FACING SECURITY GRILLES" (19) complements the humanizing interventions of "SPACE APPROPRIATION" (12) and "OUTDOOR ROOM" (18), specifically the incorporation of an "INFORMAL PAVILION" (17), collectively serving to mend the fragmented street interface.

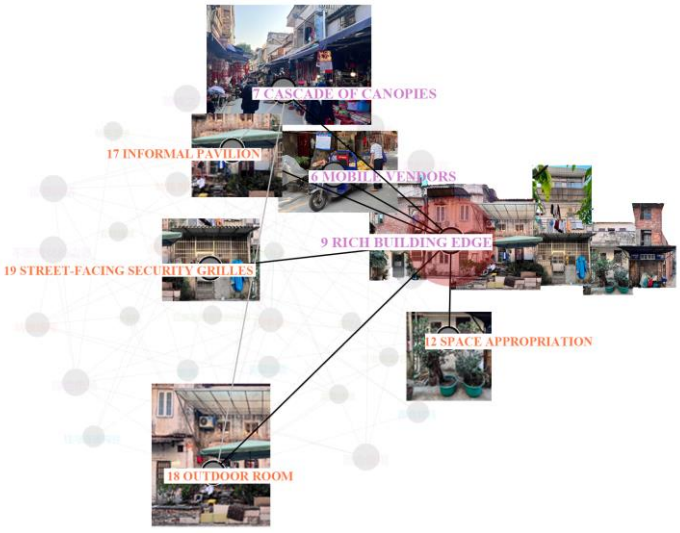


Figure 4-75 The interrelationship between "RICH BUILDING EDGE" and other patterns

(Source: author)

10 UNDER THE ARCADE, the "SPACE APPROPRIATION" (12) of outdoor tables, chairs, and display cabinets, along with the aggregation effect of "EATING IN THE STREET" (13), revitalizes the "gray space" of the arcade. "MIXED USE" (11) imbues the portico with

multifunctional attributes, thereby enhancing the flexible transition of public life.

Figure 4-76 The interrelationship between "UNDER THE ARCADE" and other patterns (Source: author)

11 MIXED USE, the strategic integration of "MOBILE VENDORS" (6) with "SEATINGS FOR SMALL GROUPS" (25), alongside the flexible spatial characteristics of "EATING IN THE STREET" (13) and "TRANSITIONAL SPACE" (14), allows for a wide array of activities to be accommodated within a single site.

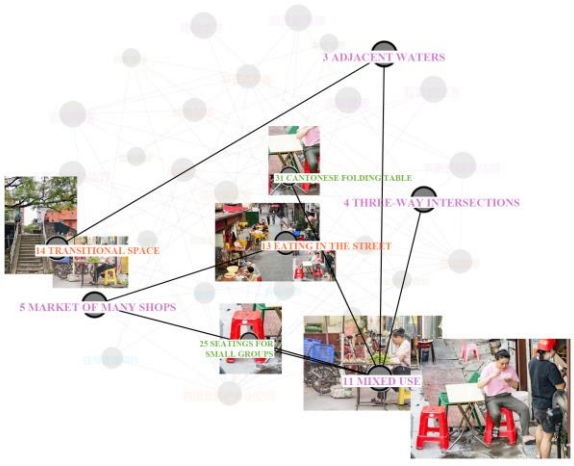


Figure 4-77 The interrelationship between "MIXED USE" and other patterns (Source: author)

The aforementioned correlation indicates that the Composite Space Pattern Language, through the specific strategies of the Unit Space Pattern Language, transforms abstract spatial principles into actionable physical entities. This process establishes a multi-layered, networked structure that collectively supports the dynamic generation and continuous evolution of

informal spaces within the Nanhuaxi neighborhood. The subsequent figure illustrates the network structure of the relationships between patterns, generated by importing the data results into Gephi software (Figure 4-78).

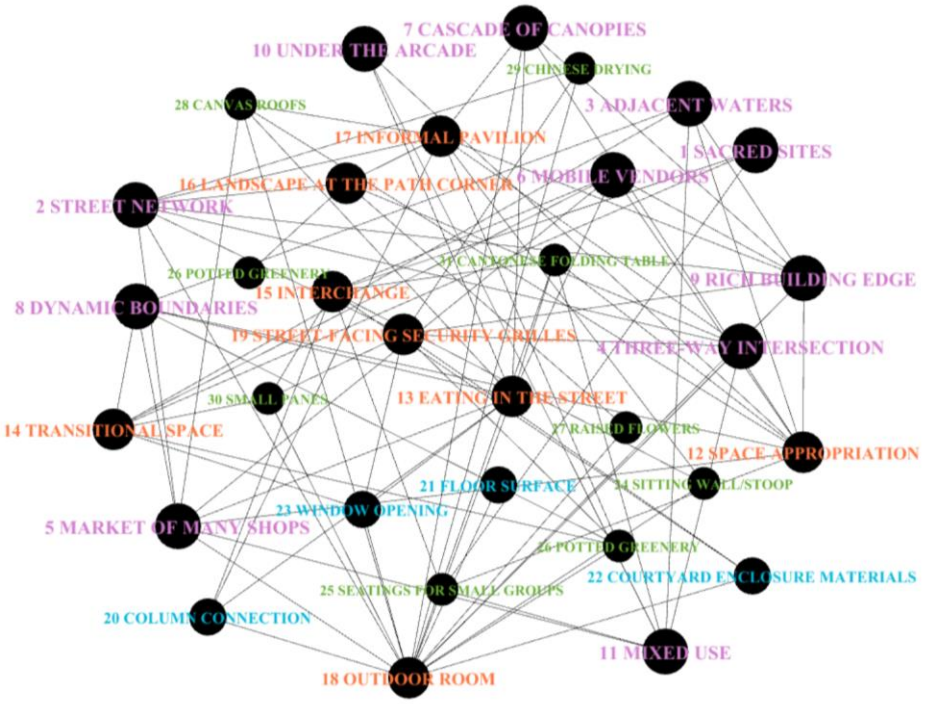


Figure 4-78 Pattern language associated matrix (Source: author)

4.7 Chapter Summary

This chapter systematically extracts and articulates the informal spatial pattern language of the Nanhuaxi historical district, constructing a localized pattern language network based on a four-dimensional framework: "Composite Space Pattern Language—Unit Space Pattern Language—Structural Pattern Language—Spatial Detail Pattern Language." Through composite patterns such as "SACRED SITES" and "STREET NETWORK," the study unveils the district's natural and cultural heritage. Furthermore, it analyzes the dynamic relationship between space and behavior using unit patterns like "EATING IN THE STREET" and "OUTDOOR ROOM." Utilizing pattern language network analysis software (Gephi), the research visualizes the hierarchical relationships and synergistic effects among patterns, subsequently identifying core patterns strongly associated with the renewal objectives. This process culminates in the creation of an operational "pattern-scenario" translation toolkit. The findings underscore the necessity of balancing planning regulations with resident autonomy for the organic integration of informal spaces. The outcomes of this chapter provide a refined design grammar for the organic renewal of historical districts, facilitating the instrumental translation from theory to practice.

Chapter 5 Application of Pattern Language Theory from the Perspective of Organic Renewal

Initially, the urban renewal process is segmented into three distinct phases, predicated on an the classification evaluation model for management units. Subsequently, employing the ANP method, the relative significance of each sub-objective within each phase is assessed, integrating project-specific contextual and spatial characteristics. Finally, a phased design experiment of pattern languages is conducted, the steps of which are as follows:

(1) Core sub-objective influencing factors are mapped onto a spatial SWOT analysis to ascertain the issues necessitating resolution within the phased project.

(2) Coefficients associated with the core sub-objectives are utilized as weighted values for the edges of the Gephi model. Composite space patterns pertinent to the phased project's schemes are identified via the model, as detailed in Chapter 4. Only the top four ranked sub-objectives' corresponding composite space patterns are considered.

(3) Through Gephi software queries, patterns logically and directly linked to the selected composite space patterns are determined. The fundamental pattern languages, strongly correlated with the core sub-objectives of the phased project, are organized to address specific project issues and serve as the basis for scenario depiction in subsequent experiments.

(4) Scenarios are depicted utilizing the patterns, establishing a shared vision for neighborhood development.

(5) A top-down planning scheme is formulated, providing expert guidance on the updating of unit space pattern languages, while encouraging bottom-up, autonomous updates by informal activity entities, adhering to pattern language application guidelines.

In response to the identified deficiencies in the current pattern language system for informal space generation in Nanhuaxi as established in prior research, this study proposes targeted renewal design strategies for individual informal spaces. These strategies aim to address the diverse functional requirements from residents, merchants, tourists, and urban citizens. The refined pattern language derived from these renewal schemes is subsequently applied to informal space construction practices. The updating steps for unit informal space pattern languages are: ① Determine the spatial location and dimensions; ② Select the structural patterns for space construction; ③ Choose the enclosure materials and other component patterns; ④ Conduct individual designs, considering diverse usage requirements.

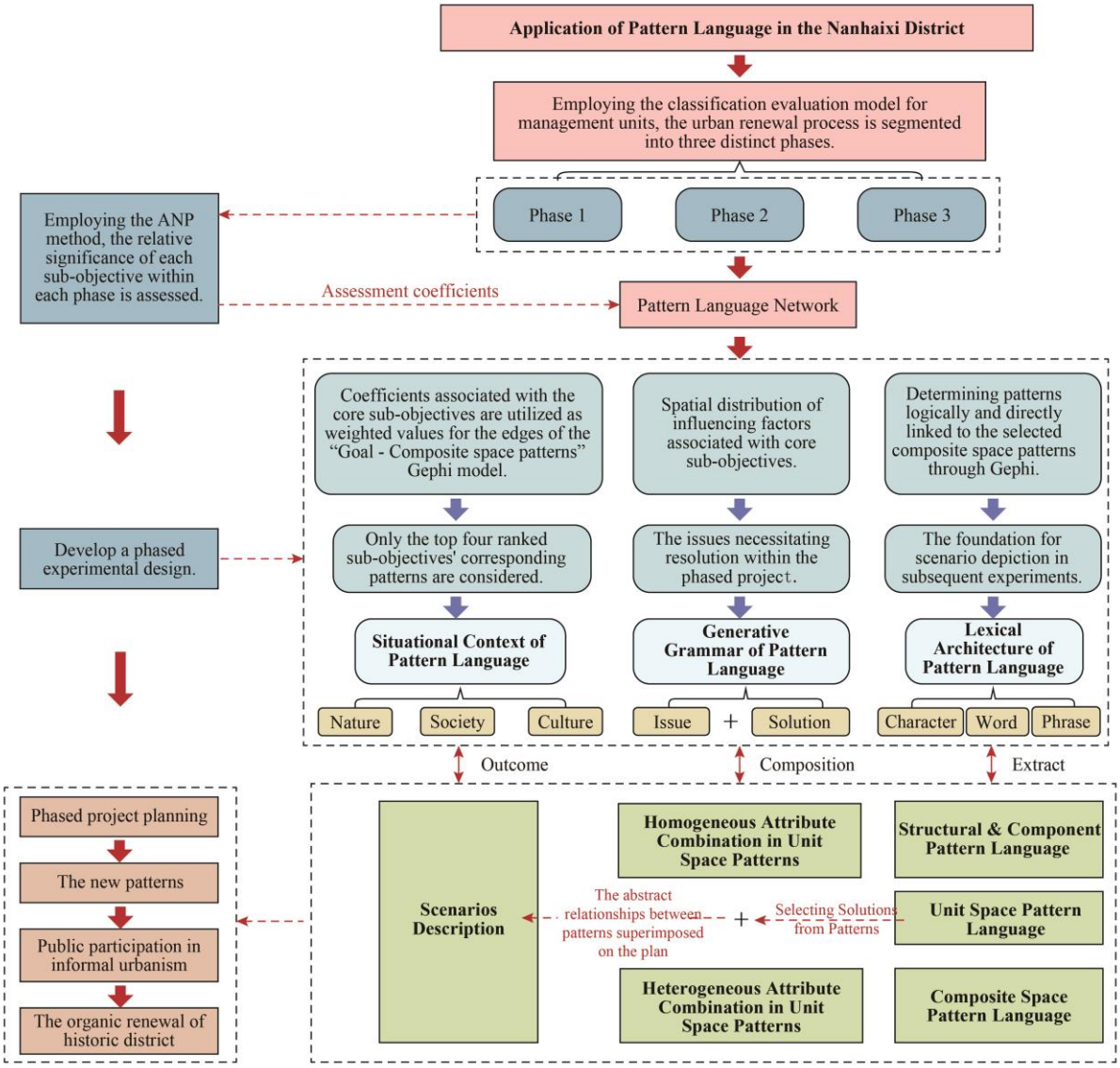


Figure 5-1 The Nanhaixi Pattern Language Theory application framework (Source: author)

5.1 Master Plan

5.1.1 Implementation Strategy

Chapter 3 sets out the basic goals of the project. The following sections will discuss the specific issues related to its implementation.

Nanhuaxi district's protracted evolution has engendered a rich historical morphology, characterized by a multifaceted, collage-like streetscape. Concurrently, the involvement of diverse entities across various periods has resulted in a complex and intricate property rights structure within Nanhuaxi. Consequently, referencing Liu Jiaqi's classification of management units proposed in their master's thesis on Nanhuaxi district, a qualitative evaluation method is employed to stratify the implementation strategy into three phases, based on the degree of spatial preservation and potential for utilization[74]:

Phase 1: Remediation Phase, targeting spaces with moderate historical value and utilization potential, poor spatial conditions, but high local attachment.

Phase 2: Enhancement Phase, focusing on spaces with considerable historical value, favorable spatial conditions, but limited utilization potential and local attachment.

Phase 3: Improvement Phase, addressing spaces with moderate historical value, but high utilization potential and local attachment.

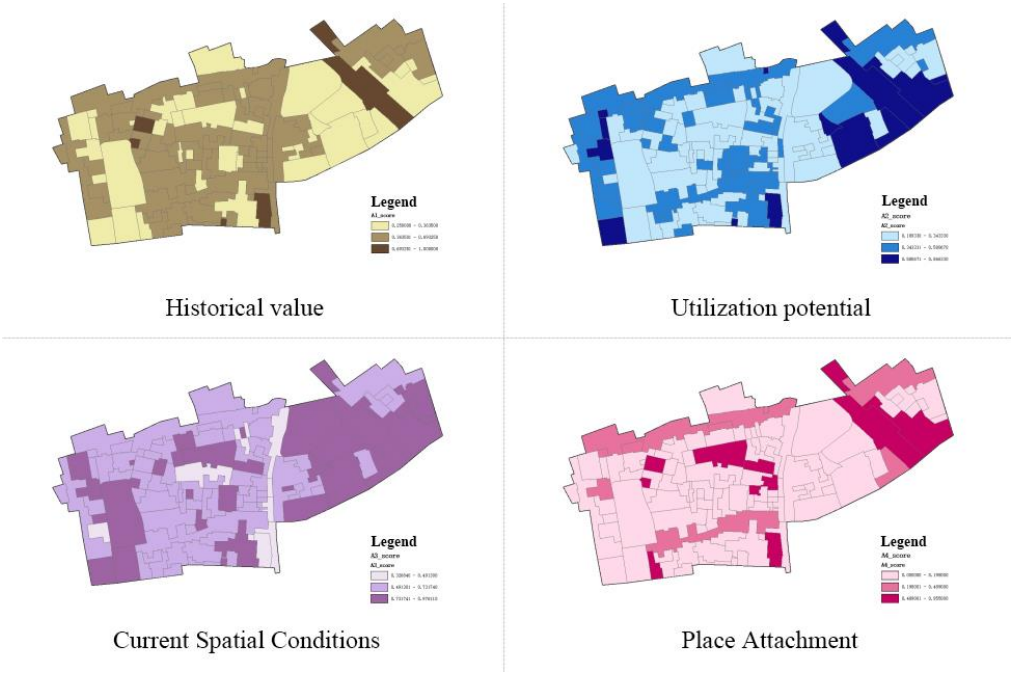


Figure 5-2 Assessment of Indicator Metrics (Source: literature[74])

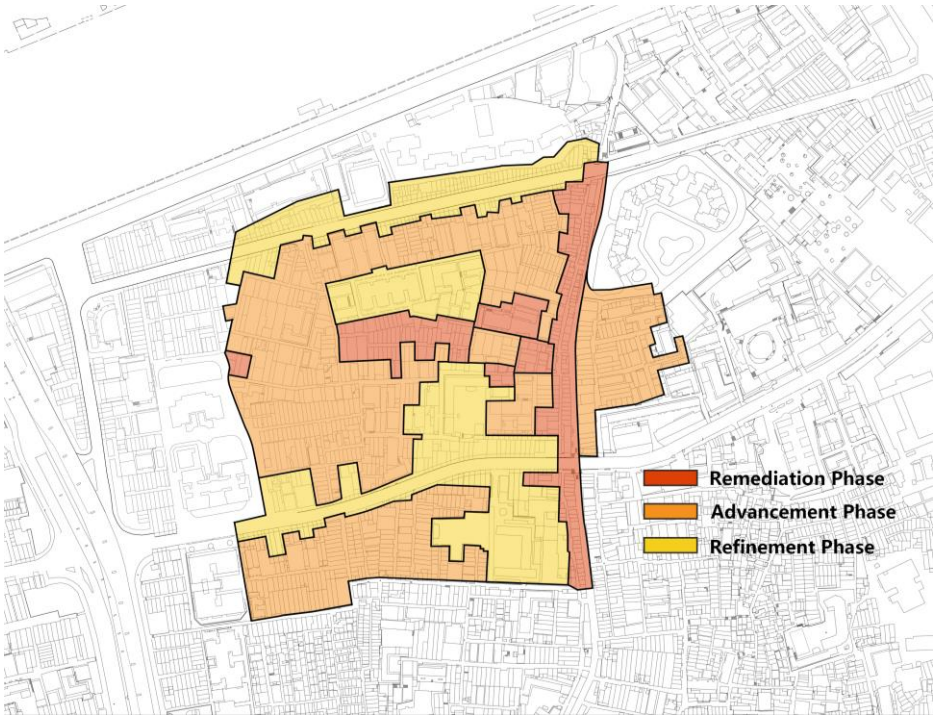


Figure 5-3 Mapping the phasing of urban renewal (Source: redraw based on literature[74])

5.1.2 Core Sub-objectives of Phased Plans

Based on the overarching objectives of each project phase, the relative significance of each aspect is assessed. Subsequently, an evaluation of the importance of each sub-objective relative to others is conducted, utilizing existing datasets and other pertinent information. As Aurelio David and Alessandra Oppio noted in the Case Study in Chapter 2, this process necessitates support from two primary domains: firstly, expert knowledge and technical proficiency are required to evaluate the relative importance of each element; secondly, the cluster represents a strategic level, thereby encompassing the political sphere, which involves resource allocation and policy formulation[57]. Given the experimental nature of this research, the author, leveraging existing literature and the findings from the analysis of the current state of Nanhuaxi in Chapter 3, contributes expert and decision-maker insights to evaluate and conceptualize three reconstruction scenarios for the development of Nanhuaxi district across three phases:

Phase 1: Remediation, focusing on street and water management, facilitating the integration of local resources, harmonizing historical character, and uncovering site-specific features.

Phase 2: Advancement, emphasizing the exploration of micro-spaces and the enhancement of neighborhood vitality.

Phase 3: Refinement, with plans to integrate new and existing business formats, thereby augmenting the area's activities and functions.

The following rankings of core sub-goals for each phase were generated using the Super Decisions software.

Table 5-1 Ranking of Sub-objectives in the Remediation Phase

Cluster	Weight	Sub-objectives	Local Weight	Global Weight	Ranking
Site	0.18368	Easy mobility and slow life	0.389699477	0.07158	6
		Multiple functions	0.610300523	0.1121	5
Health	0.47574	Environment	0.510152604	0.2427	1
		Nature	0.489847396	0.23304	2
Social	0.26753	Cultural preservation and enhancement	0.466228087	0.12473	4
		Identity and recognizability	0.533771913	0.1428	3
Equity	0.07304	Human contacts and social cohesion	0.407995619	0.0298	8
		Mixed-use and mixed-income	0.592004381	0.04324	7

Source: Super Decision calculation results

Table 5-2 Ranking of Sub-objectives in the Advancement Phase

Cluster	Weight	Sub-objectives	Local Weight	Global Weight	Ranking
Site	0.46685	Easy mobility and slow life	0.413387598	0.19299	3
		Multiple functions	0.586612402	0.27386	1
Health	0.16027	Environment	0.366069757	0.05867	6
		Nature	0.633930243	0.1016	4
Social	0.0953	Cultural preservation and enhancement	0.565897167	0.05393	7
		Identity and recognizability	0.434102833	0.04137	8
Equity	0.27759	Human contacts and social cohesion	0.294102814	0.08164	5
		Mixed-use and mixed-income	0.705897186	0.19595	2

Source: Super Decision calculation results

Table 5-3 Ranking of Sub-objectives in the Refinement Phase

Cluster	Weight	Sub-objectives	Local Weight	Global Weight	Ranking
Site	0.26506	Easy mobility and slow life	0.309590281	0.08206	5
		Multiple functions	0.690409719	0.183	3
Health	0.08605	Environment	0.346542708	0.02982	8
		Nature	0.653457292	0.05623	6
Social	0.50649	Cultural preservation and enhancement	0.512349701	0.2595	1
		Identity and recognizability	0.487650299	0.24699	2
Equity	0.14241	Human contacts and social cohesion	0.370198722	0.05272	7
		Mixed-use and mixed-income	0.629801278	0.08969	4

Source: Super Decision calculation results

5.2 Phased Experimental Design

Subsequently, a series of linguistic patterns will be selected for each phase scenario to guide the construction of informal spaces, thereby facilitating the organic renewal of the historical Nanhuaxi district.

5.2.1 Remediation Phase

5.2.1.1 Identifying the Problems

Given the historical district's deficiency in plazas, parks, and recreational areas, the Longdaowei Market concentrates the majority of individual economic activities and pedestrian traffic within Nanhuaxi district, thereby constituting the primary public space of the historical district. Other lanes extend perpendicularly to this, developing in an east-west orientation. Beneath the surface of Longdaowei lies the former Zhujiang River tributary, Shuzhu Creek.

Due to inadequate urban development protection, Shuzhu Creek, having become a "foul creek," was covered and converted into an underground sewage channel during the 1960s and 1970s. Furthermore, the spatial definition of roadways within the lanes is problematic, with a disordered arrangement of public and private spaces. Despite the narrowness of the roads, many residential areas exhibit spatial wastage and low utilization rates in their external display areas. Therefore, it is imperative to enhance spatial continuity and organize the road aesthetics. This phase of the project aims to "reproduce" the former appearance of the water streets through technical means and to reorganize the lane network, thereby uncovering the unique characteristics of the lanes. The built environment of Nanhuaxi street and alley serves as the primary intervention site for this phase of the project.

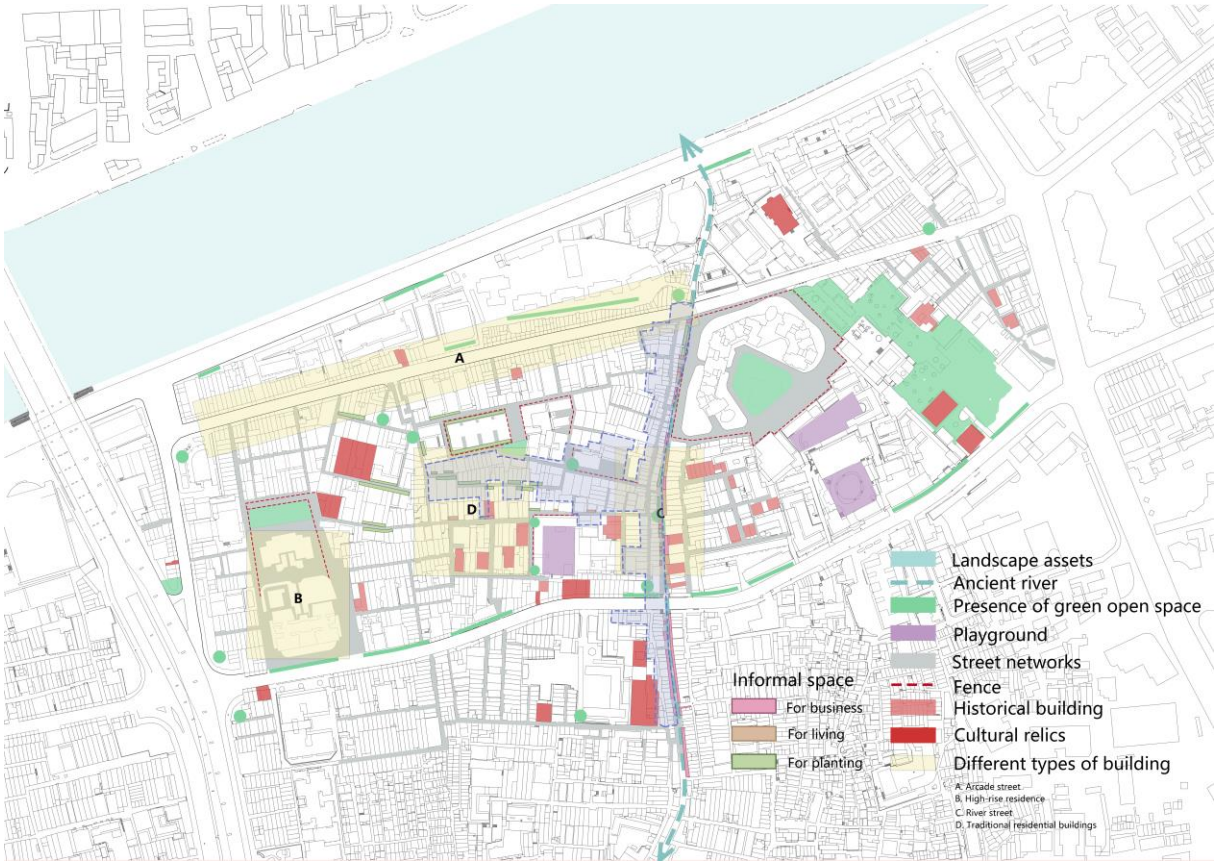


Figure 5-4 Spatial distribution of influencing factors associated with sub-objectives (Source: author)

The identified issue:

① Pedestrian path is discontinuous, with commercial establishments or vacant storefronts interspersed along certain segments.

② The ad-hoc construction of spaces along building edges presents a heterogeneous aesthetic, diminishing the recognizability of the streetscape and hindering the effective articulation of local character.

③ The historical waterway, known as "Shuzhu Creek," has been transformed into a polluted channel and subsequently covered. The restoration of natural resources and the revitalization of the area's inherent characteristics are imperative.

④ The presence of security bars on the facades of multi-story self-built structures detracts from the street's visual appeal and creates a sense of enclosure for pedestrians.

⑤ Unregulated encroachment on public space in front of residences and businesses occasionally impedes pedestrian movement, and the enhancement of green space aesthetics is warranted.

⑥ Post-renovation, the market's commercial performance has been suboptimal, with a dispersed arrangement of businesses. Standardization is required to enhance the commercial street's distinctiveness and attract foot traffic.

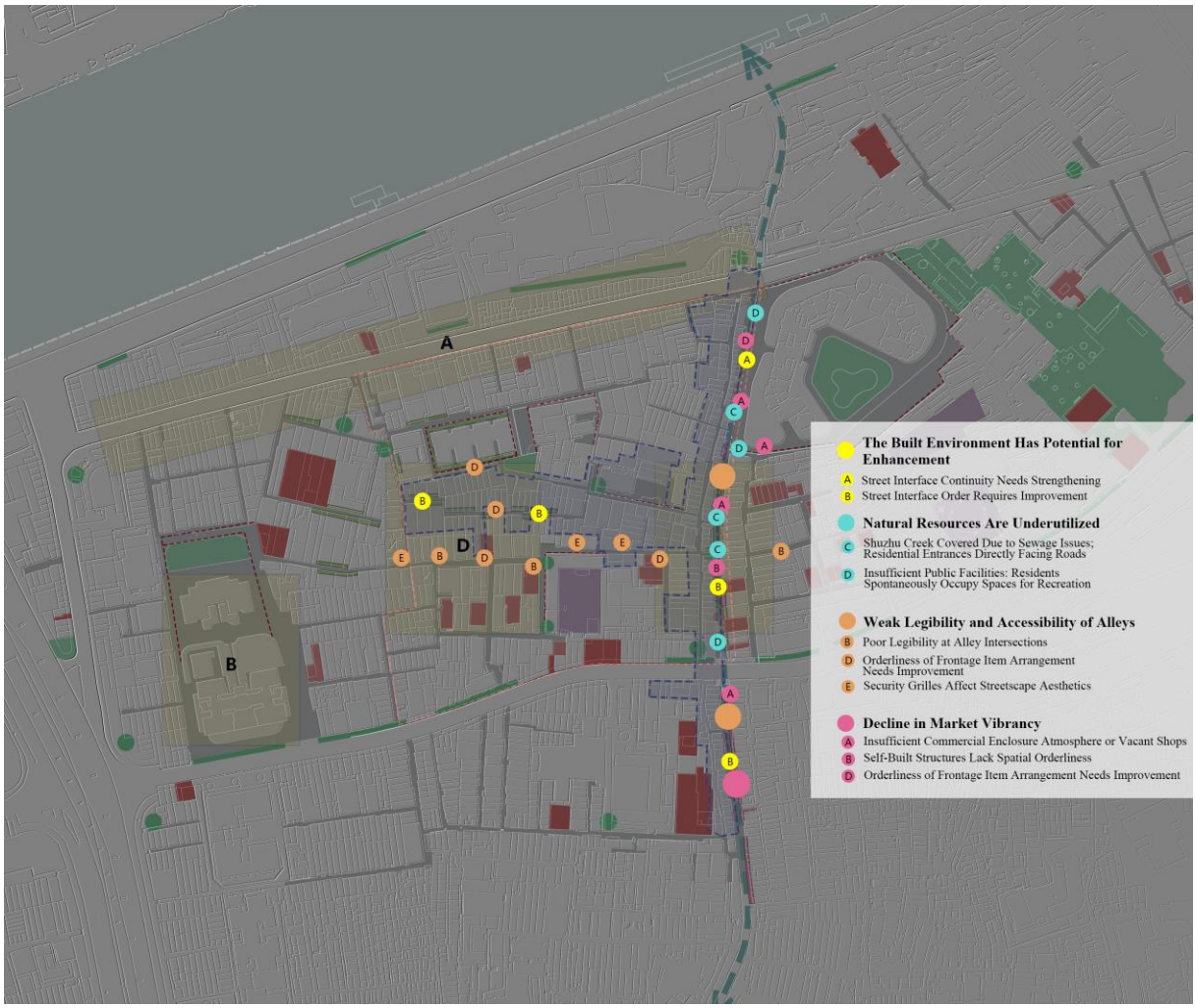


Figure 5-5 Analysis of issues in the remediation phase (Source: author)

5.2.1.2 Selecting Solutions from Patterns

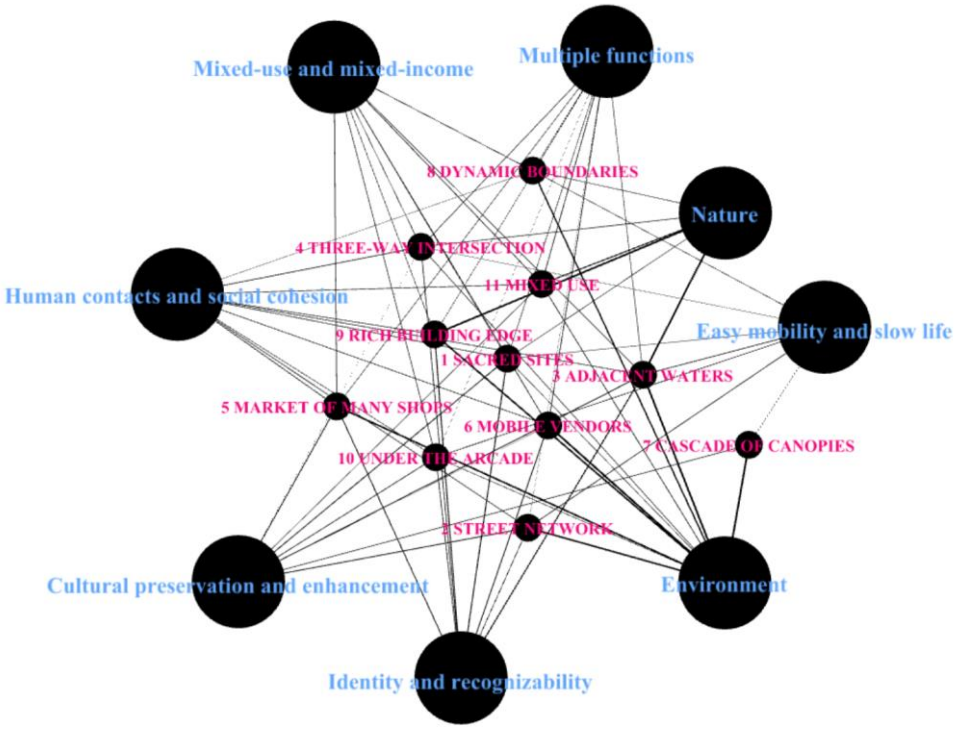


Figure 5-6 Diagram illustrating the relationship between sub-goals and composite space pattern

(Source: author)

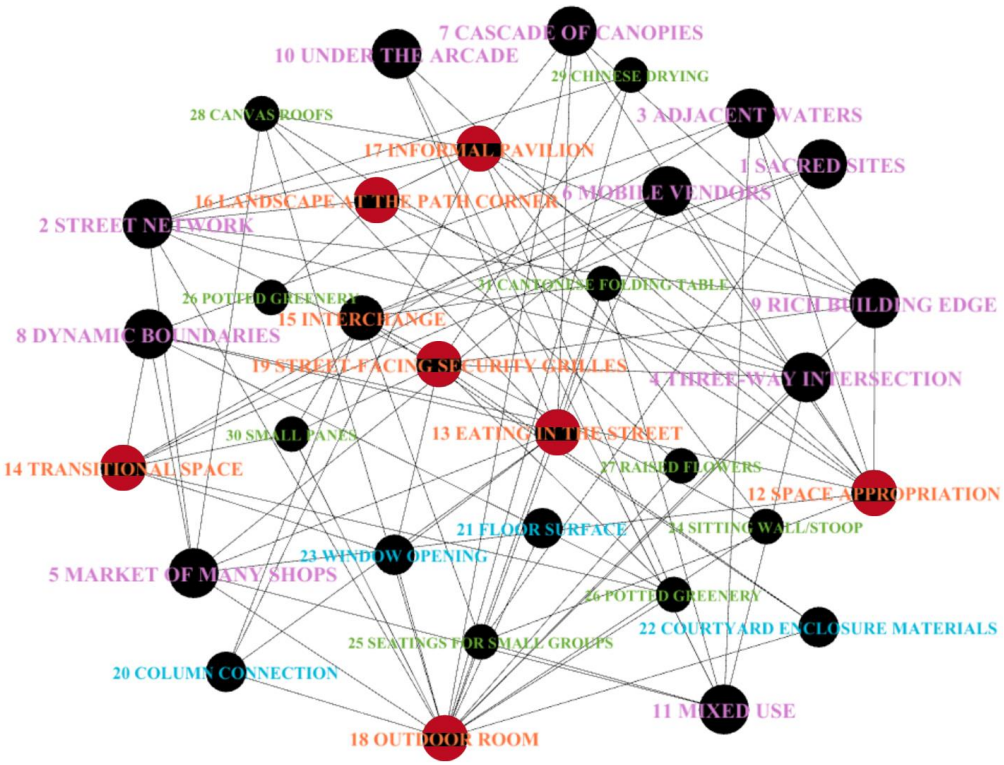


Figure 5-7 Diagrammatic representations of patterns associated with core sub-objectives

(Source: author)

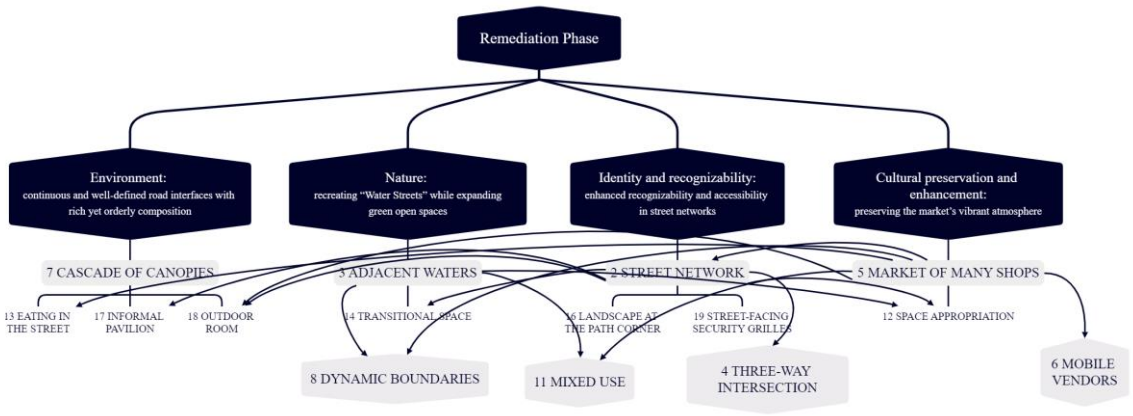
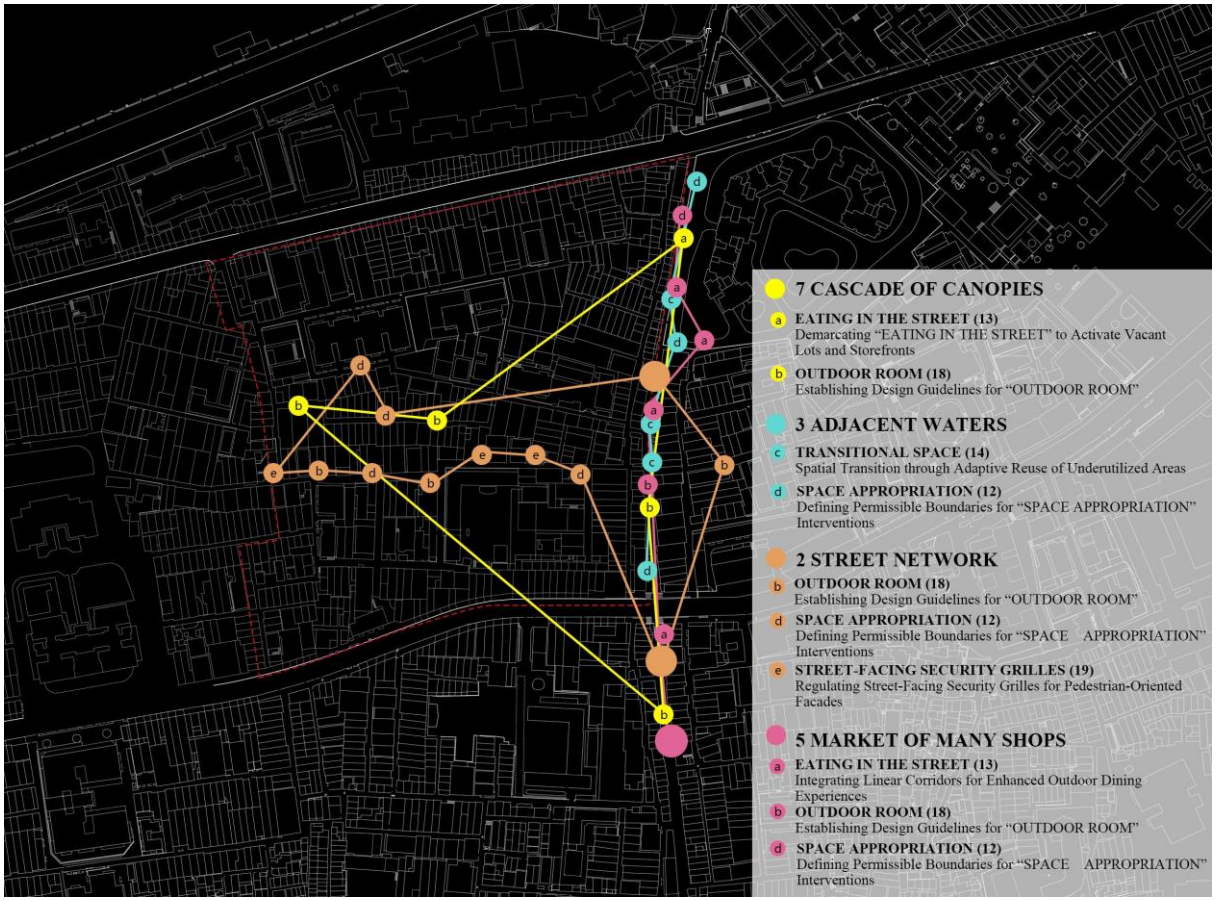


Figure 5-8 Patterns network in the remediation phase (Source: author)

5.2.1.3 Locating Solutions to Maps



"3 ADJACENT WATERS + 5 MARKET OF MANY SHOPS: integrated markets adjacent to waterways." and "7 CASCADE OF CANOPIES + 2 STREET NETWOR: street network characterized by life under canopies."

Figure 5-9 The abstract relationships between patterns superimposed on the plan (Source: author)

Description of the scenarios derived from the selected pattern languages:

The setting is a community adjacent to a body of water, characterized by its clean and well-

maintained interconnected streets and alleyways. Along the waterways, a dense arrangement of small shops and stalls selling produce and sundries is observed. The vendors are predominantly original inhabitants of the area, with many operating their stalls directly from under awnings erected in front of their residences. These overlapping, yet orderly, awnings create an impression reminiscent of falling leaves. On the balconies of residential buildings, clotheslines extend horizontally, resembling musical staves, with shirts and sausages swaying rhythmically in the breeze. Walking along the water's edge evokes a sense of returning to the "Shuzhu Yong" of yesteryear, with the banks lined with water pines and weeping willows. Historically, this canal was known as the "Grain Transport River," as it was used to transport grains, fruits, and vegetables produced in "Henan" to the city in exchange for daily necessities. Presently, the crops cultivated near the water channels are sold in the market, with the proceeds allocated to the maintenance and management of the streets. A short walk through the community's alleys reveals aged buildings, complemented by a variety of repurposed chairs that were once discarded. These chairs have been creatively reused by the residents. An elderly woman, seated at her doorstep, is seen selecting vegetables while conversing with her neighbor, who is simultaneously modifying an old wooden chair. Further exploration leads to an alleyway adorned with greenery and flowers, where young pomelos are bearing fruit. An elderly woman peels a pomelo while observing passersby, and a cat naps on a courtyard wall. Following the shadows cast by the awnings, one can encounter the tranquility and restorative ambiance of this lifestyle.

a) Water Market Street b) Art Alley

Figure 5-10 "Remediation Phase" scenarios description (Source: author)

5.2.1.4 Planning Analysis

(1) Water Management and Public Space: The initial phase involves the excavation of canals and the implementation of wastewater treatment protocols, ensuring that the treated

water meets established standards before being channeled into open waterways.

(2) Following the excavation of the canal, a redesign of the waterfront public realm is imperative to facilitate a seamless transition from the residential zone to the water's edge—"ADJACENT WATERS" (3). The establishment of an urban agricultural zone, informed by the principles of "TRANSITIONAL SPACE" (14), will involve the strategic placement of soil structures along the open-air canal. This will encourage community participation in planting vegetation and crops, thereby fostering a natural progression from constructed environments to the natural world. Furthermore, the utilization of treated wastewater-derived fertilizers and recycled canal water for irrigation purposes is proposed. The resulting agricultural yields can then be allocated for local consumption or commercial distribution, within the defined parameters of "SPACE APPROPRIATION" (12).

(3) Enhancements to the road network and the public realm of the streets and lanes are proposed, alongside the definition of thematic streets and the renovation of street facades. Strategically positioned within the site, streets and lanes that effectively link significant historical elements and accessible public spaces can be designated as thematic streets within the historical district.

①Water Market Street:

The existing operational model and commercial activities of the market should be preserved, with the aim of moderately stimulating commercial activity within the district. It is imperative to ensure that the construction of "SPACE APPROPRIATION" (12), " EATING IN THE STREET " (13), and "OUTDOOR ROOM" (18) is carefully coordinated with the newly constructed canals. For instance, the integration of linear spaces along the stream, conducive to outdoor dining and other activities, and the temporal allocation of parking spaces should be considered. The planning of waterside activity spaces in each section should be informed by the behavioral characteristics and needs of informal activity participants, thereby maximizing the freedom of space utilization for individuals.

② Art Alley and Garden Alley:

Guidance should be provided for the utilization of residential and commercial frontages, including the construction of "OUTDOOR ROOM" (18), "SPACE APPROPRIATION" (12), and the arrangement of existing "STREET-FACING SECURITY GRILLES" (19). The Art Alley should emphasize the reuse of old furniture, while the Garden Alley should highlight the cultivation of vegetation and crops, thereby enhancing the distinctiveness, recognizability, and pedestrian-friendliness of the alleyways.

(4) Unified Canopy System: To accommodate the variable weather conditions prevalent in southern regions, both shopkeepers and "MOBILE VENDORS" (6) are permitted to utilize "CANVAS ROOFS" (28), provided that the eaves are positioned lower in areas with high pedestrian activity. Furthermore, similar styles and colors of awnings should be adopted for businesses or activities of the same type.

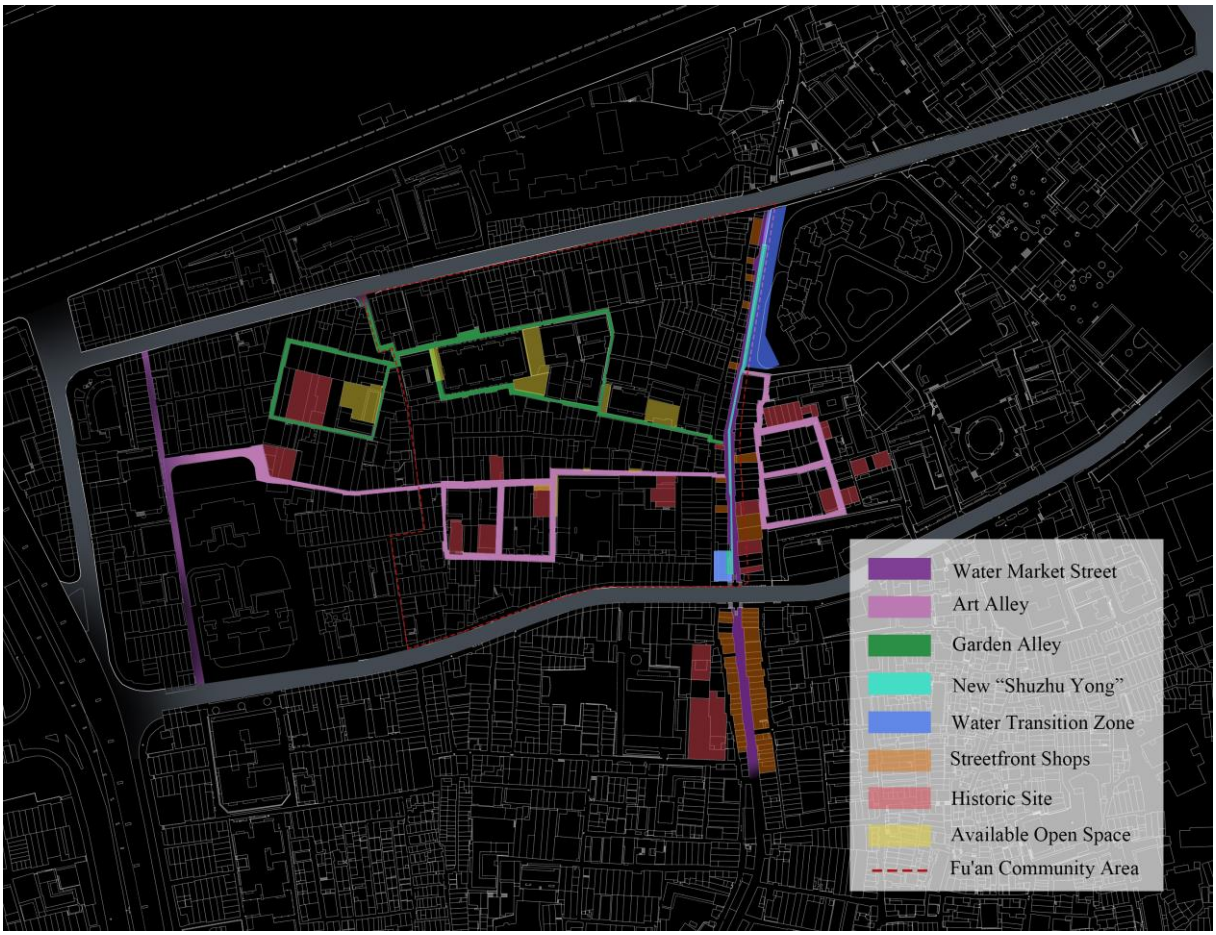


Figure 5-11 Overall plan analysis (Source: author)

5.2.1.5 The New Unit Space Patterns

a. EATING IN THE STREET

25 SEATINGS FOR SMALL GROUPS + 26 POTTED GREENERY + 28 CANVAS ROOFS

① For Fixed Shops and Residents: The dining areas along the waterfront should be demarcated by the water's edge, with a maximum width of one standard “CANVAS ROOFS” (28) unit, while maintaining a 2-meter clearance for pedestrian pathways. Tables and chairs can be arranged independently to furnish the space.

② For Mobile Vendors: Mobile vendors are permitted to operate within the designated "spatial appropriation" zones along the waterfront, selecting the size, form, and color of their “CANVAS ROOFS” (28) based on their business type. Each vendor is authorized to arrange

their space independently within the specified awning parameters.

Both models can incorporate the use of small “SEATINGS FOR SMALL GROUPS” (25) and “POTTED GREENERY” (26) to enhance the spatial aesthetics.

a) Operational area with canopy folded b) Operational area with canopy fully expanded

Figure 5-12 New "EATING IN THE STREET" pattern for mobile vendors (Source: author)

b. OUTDOOR ROOM

b1. New “OUTDOOR ROOM” in Residential Living Contexts

20 COLUMN CONNECTION + 21 FLOOR SURFACE + 25 SEATINGS FOR SMALL GROUPS + 26 POTTED GREENERY + 27 RAISED FLOWERS + 28 CANVAS ROOFS + 29 CHINESE DRYING

Informal spaces associated with residential life exhibit greater flexibility in terms of privacy and openness. Consequently, a wider array of materials and configurations can be employed for enclosure and openness. These spaces primarily cater to sunlight exposure and social interaction.

"Enclosed outdoor small spaces" in residential contexts typically serve functions such as drying laundry, washing, cooking, and storing miscellaneous items, with a size generally less than 10 m2. Consequently, residents can determine the dimensions of these spaces based on the available area for construction or the required space for specific activities. Construction methods may involve building low walls with lightweight bricks or employing light steel welding and binding techniques, topped with canvas canopies. This approach allows for individual adjustments to accommodate varying site conditions and spatial requirements.

Residents' selection of enclosure forms and materials for informal spaces can be informed by their existing construction experience, utilizing appropriate materials. As illustrated in the

figures, folding doors, wire mesh, bamboo lattices, and climbing vines are commonly used by residents in the neighborhood for constructing informal spaces. The combinations shown can meet the openness requirements of informal spaces related to residential life while also being simple to construct.

Residents can enrich the "living" scenes according to their preferences, utilizing “SEATINGS FOR SMALL GROUPS” (25), “POTTED GREENERY” (26), “RAISED FLOWERS” (27), and “CHINESE DRYING” (29). It is advisable to limit the selection of component types to no more than two. Residents in themed streets should arrange objects (old furniture, potted plants) that highlight the characteristics of the site after renovation—participating in community old-item renovation activities. For example, the Figure 5-13-a illustrates a space suitable for washing and cooking, while the Figure 5-13-c depicts a space for leisure and drying.

a) Integrated Sanitary-Culinary Type | b) Recreational Horticultural Type | c) Leisure-Integrated Drying Type

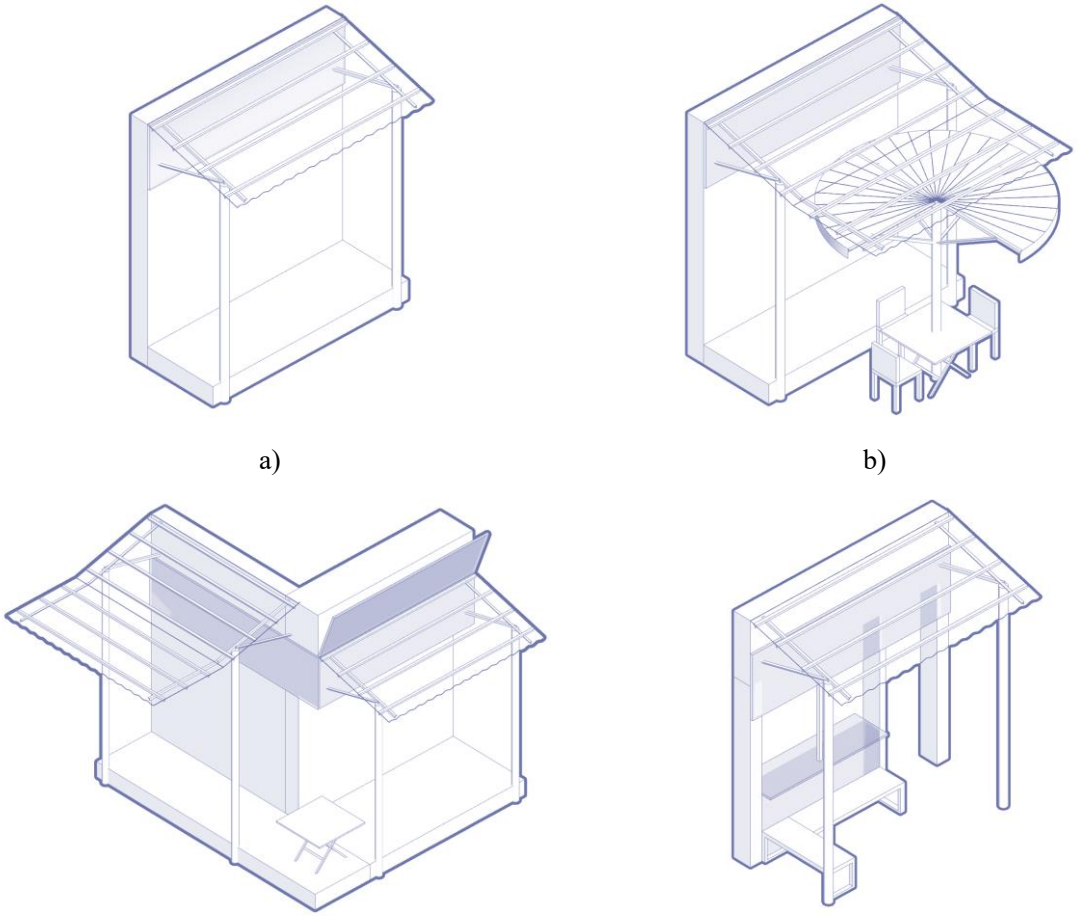
Figure 5-13 New "OUTDOOR ROOM" pattern in Residential Living Contexts (Source: author)

b2. New “OUTDOOR ROOM” in Production-Operational Contexts

20 COLUMN CONNECTION + 21 FLOOR SURFACE + 25 SEATINGS FOR SMALL GROUPS + 26 POTTED GREENERY + 28 CANVAS ROOFS + 31 CANTONESE FOLDING TABLE

Given the requirements for frying and cooking, a degree of spatial privacy is necessitated to ensure hygienic food preparation. Simultaneously, adequate ventilation is essential; therefore, the design incorporates strategically placed windows within the solid enclosure. Display counters are positioned within the framework, complemented by an exterior area featuring folding tables, seating, and plant installations. Benches may be incorporated to accommodate customer waiting. The spatial dimensions can be determined by referencing the updated

diagrams. The remaining design elements are based on a modular system, allowing vendors to customize their spaces through the addition of shelving, “SEATINGS FOR SMALL GROUPS” (25), and other equipment, such as appliances.



a) b) c) d)

Figure 5-14 New "OUTDOOR ROOM" pattern in Production-Operational Contexts (Source: author)

c. TRANSITIONAL SPACE

25 SEATINGS FOR SMALL GROUPS + 26 POTTED GREENERY + 27 RAISED FLOWERS

The strategic placement of structures, vegetation, and cultivation zones within the public realm adjacent to the water body is designed to foster community engagement. Residents are encouraged to participate in the planting process, bringing seeds and seedlings to cultivate these communal spaces. These areas will serve as catalysts for local market interactions, with produce available for both internal and external exchange. The immediate consumption of harvested goods along the waterfront will create a natural setting for "EATING IN THE STREET" (13).

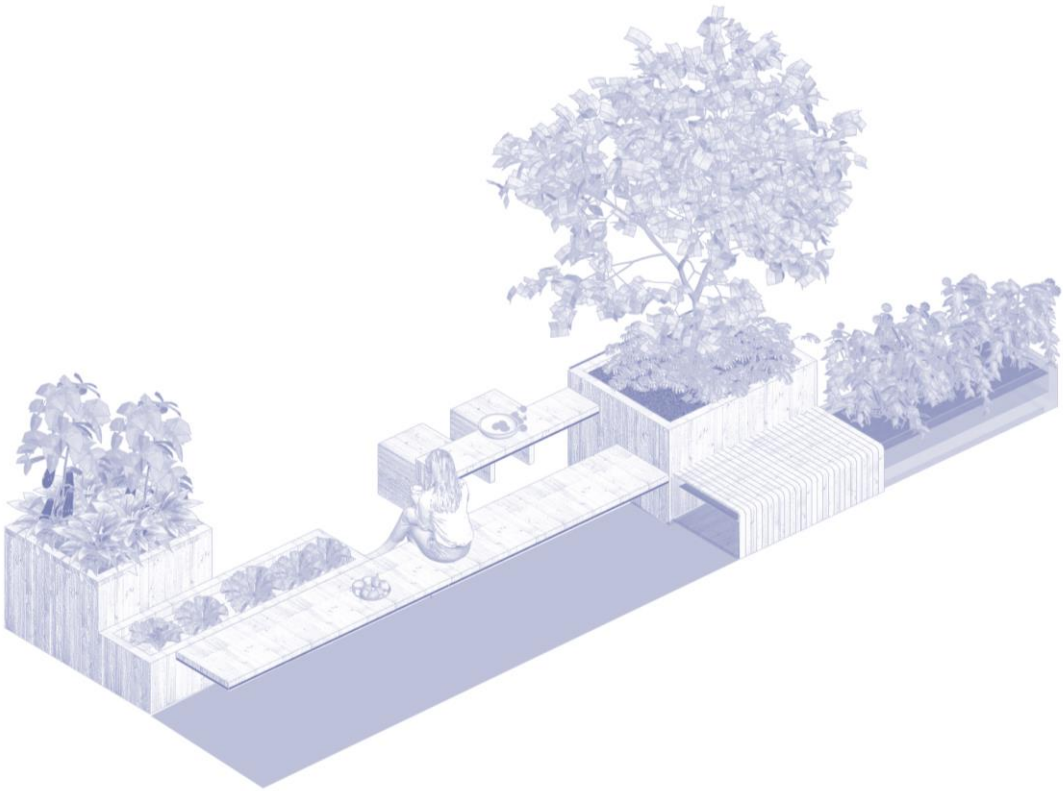
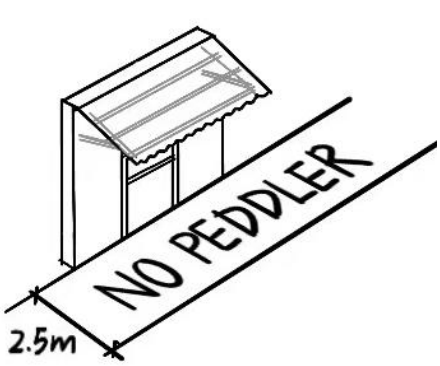


Figure 5-15 New "TRANSITIONAL SPACE" (Source: author)

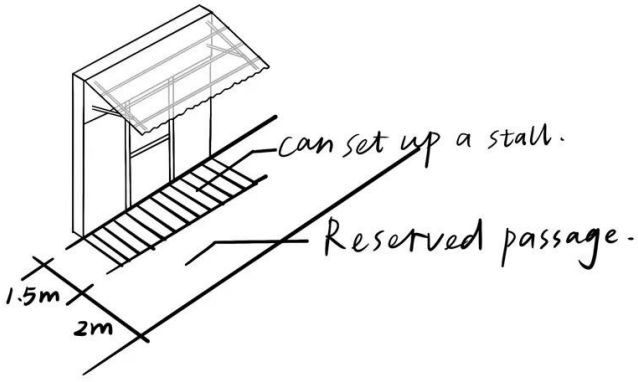
d. SPACE APPROPRIATION

d1. Production-Operational Contexts

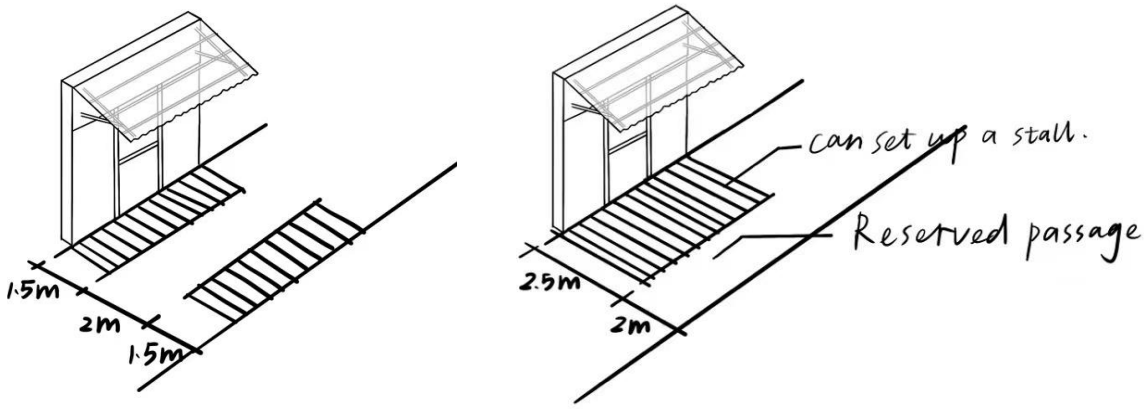
① From 7:30 AM to 7:00 PM daily, refrain from utilizing the pedestrian walkway for commercial activities. Should an expansion of your operational area onto the adjacent street be necessary, arrange merchandise according to the following guidelines, ensuring the maintenance of a clean and orderly environment. Utilize standardized containers, such as plastic baskets or cardboard boxes, for the organized display of goods or materials.



a) No street vending on sidewalks <2.5m width



b) Street Space Utilization with >2.5m Sidewalks (Minimum 2m Passage Reserved)



c) Bilateral vending layout with central passage (recommended for waterfront areas)

d) Unilateral Vending Layout with Peripheral Passage

Figure 5-16 New "SPACE APPROPRIATION" in Production-Operational Contexts

(Source: redraw based on literature[87])

d2. Residential Living Contexts

Based on the available space in front of a residence, personal items can be arranged as follows[79]:

① 10–15 cm: A narrow strip along the building edge can accommodate a row of potted plants, and may also serve as a resting spot for pets without causing disturbance.

② 15–50 cm: This width allows for larger potted plants, the parking of a bicycle, or the placement of a narrow bench.

③ 50–90 cm: Within this range, it is feasible to install a small canopy or eave to shield outdoor activities from adverse weather, providing a transitional buffer when entering or exiting the home, somtimes placing a small chair outside the door.

④ 90–150 cm: This space permits the establishment of a planting area, the placement of a small table with two chairs, or the storage of household bicycles.

e. STREET-FACING SECURITY GRILLES

23 WINDOW OPENING + 26 POTTED GREENERY + 29 CHINESE DRYING

The design should provide a framework for spontaneous resident activities.

① A balance must be struck between the display area and the proportion of various items. For instance, a window should feature one or two types of items; an excess will appear cluttered.

② Strategic placement of potted plants can purify the air and mitigate the oppressive feeling of security bars. Aluminum alloy materials should be employed, with their forms reflecting local design, unifying the facade's style, and highlighting regional characteristics.

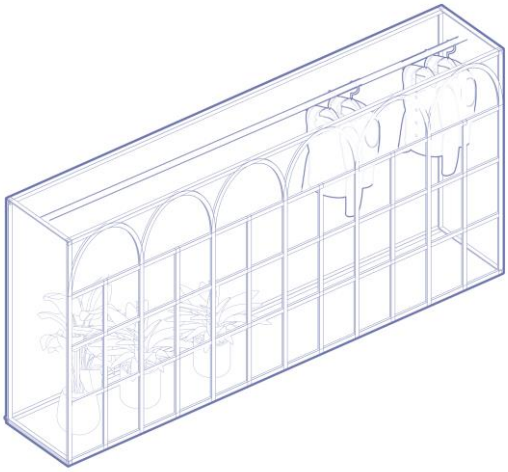


Figure 5-17 New "STREET-FACING SECURITY GRILLES" (Source: author)

5.2.1.6 Design Scheme Generation

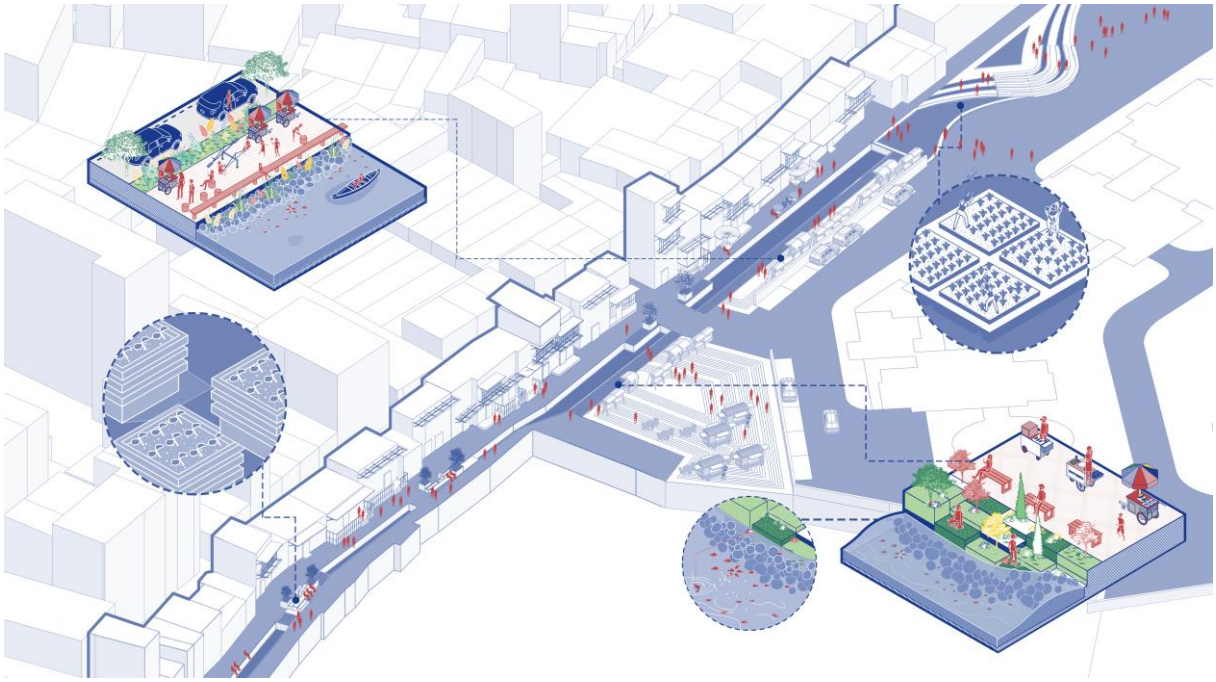


Figure 5-18 Remediation phase effect renderings (Source: author)

a) Before renewal

b) After renewal

Figure 5-19 Art alley renewal comparison (before/after) (Source: author)

a) Before renewal

b) After renewal

Figure 5-20 Garden alley renewal comparison (before/after) (Source: author)

5.2.2 Advancement Phase

5.2.2.1 Identifying the Problems

During urban development, a significant surge in population density has led to the conversion of open spaces into new constructions, thereby diminishing their availability for public use. Consequently, communal life is relegated to constricted alleyways. The need for social spaces is evident, and well-lit, healthful, and navigable alleyways are more appealing to visitors. Therefore, this project phase investigates the potential for expanding public spaces. The objective is to transform the internal alleyway network of the community into a vibrant space, maximizing the site's potential. Given the existing spatial capacity, the project proposes the transformation of the thematic alleyways identified in the "remediation phase" into comfortable, inviting, and easily navigable public pathways. Initially, the street aspect ratio concept will be employed to analyze the suitability of the alleyways. The placement of all nodes

within the project is determined based on the alleyway network and the area's functional characteristics.

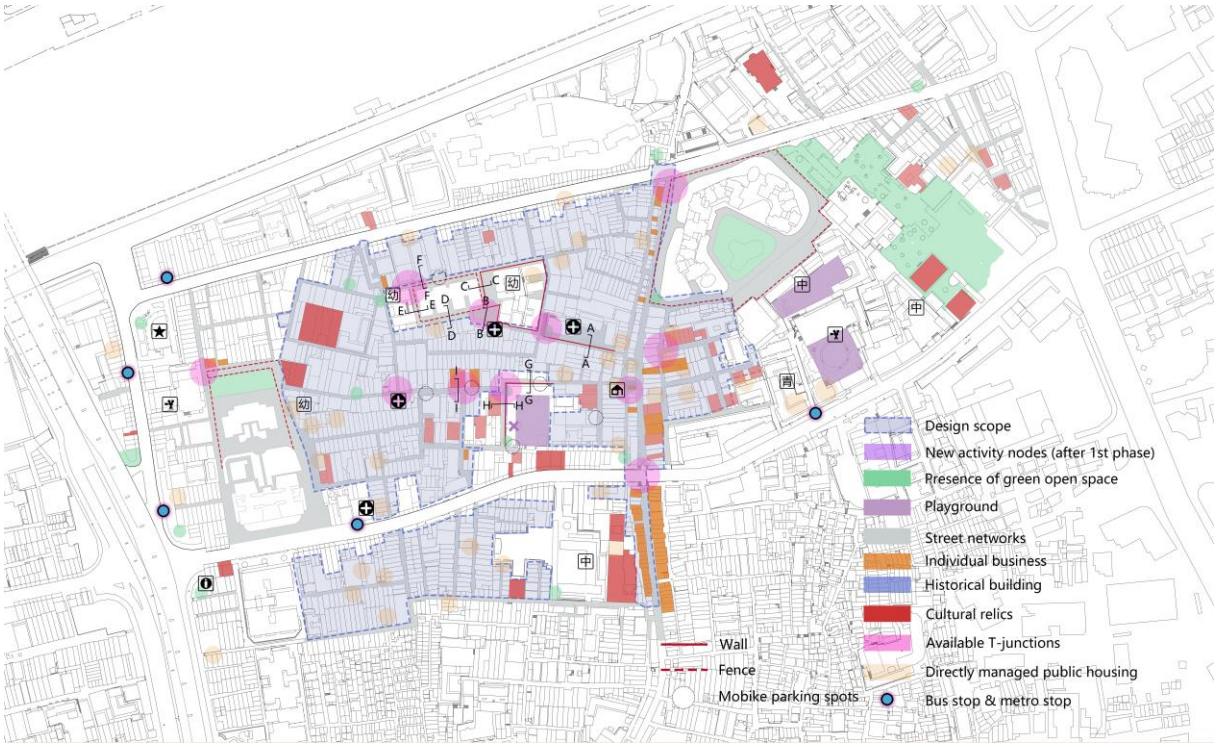


Figure 5-21 Spatial distribution of influencing factors associated with sub-objectives. (Source: author)

Figure 5-22 Analysis of Streetscape Spatial Suitability (Source: author)

The identified issue:

① The existing public realm within the district is deficient in both quantity and quality, compelling residents to utilize the interstitial spaces beneath eaves, thereby relegating public life to the confines of narrow alleyways.

② Despite the presence of a three-way intersection, which inherently fosters opportunities for social interaction, its potential remains largely untapped, notwithstanding its strategic placement at a major thoroughfare's convergence, thus offering high spatial accessibility.

③ Although the historical district of Nanhaixi is lauded as a "Guangzhou architectural museum of the late Qing and early Ming dynasties," boasting a diverse array of historical building typologies, tourists tend to avoid these alleyways. This avoidance stems from the underutilization of historical relics and the lack of appeal and suitability within these spaces.

④ Themed alleyways and activity nodes, while possessing distinct spatial characteristics and inherent potential within the street network, are primarily limited to pedestrian and vehicular transit, with minimal alternative uses, and the landscape relics are obscured within the built environment.

⑤ Newly constructed residential buildings in the Nanhaixi historical district are surrounded by ample outdoor public spaces; however, these areas are infrequently frequented due to the absence of fundamental amenities conducive to seating, social interaction, and physical activity, with these areas largely occupied by expansive flowerbeds.

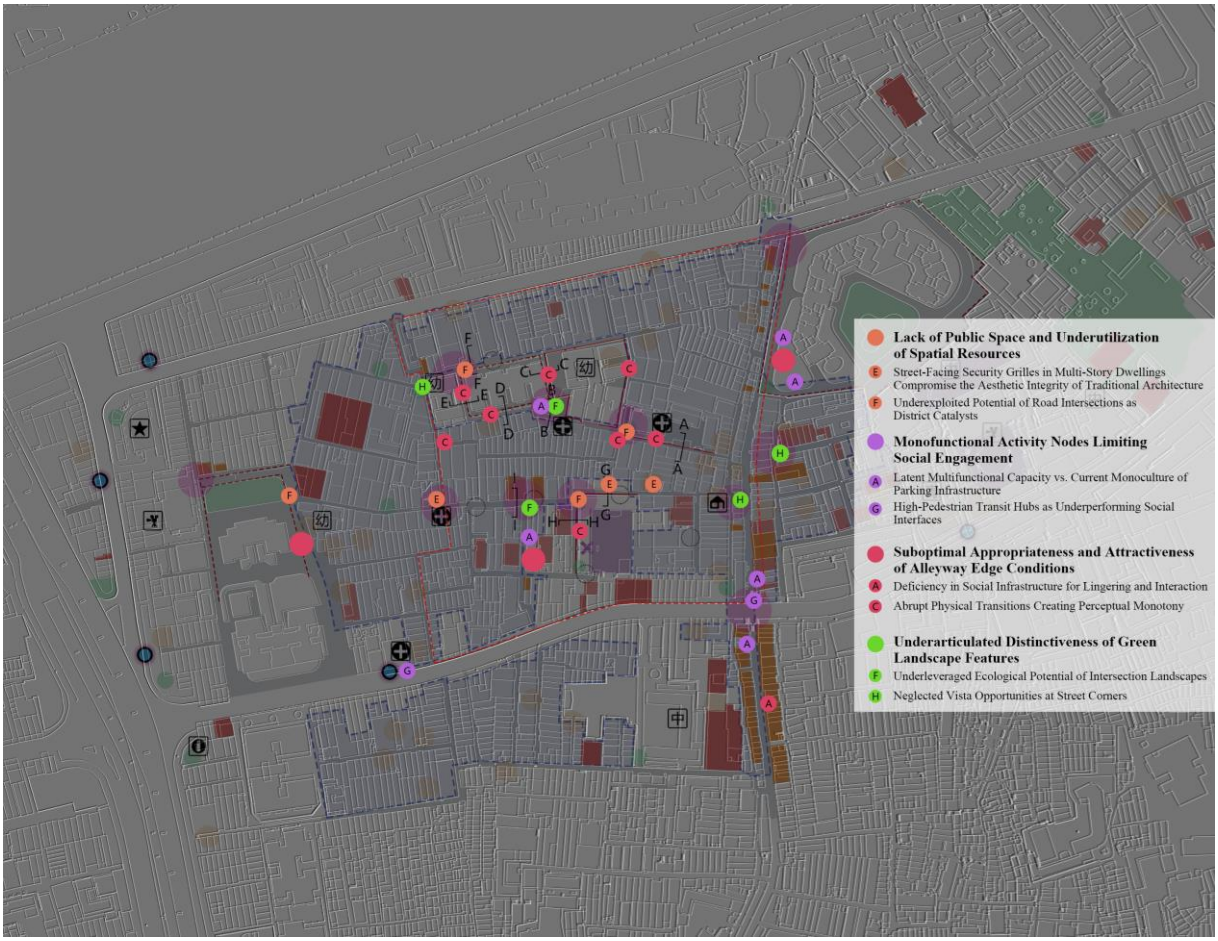


Figure 5-23 Analysis of Issues in the Advancement Phase (Source: author)

5.2.2.2 Selecting Solutions from Patterns

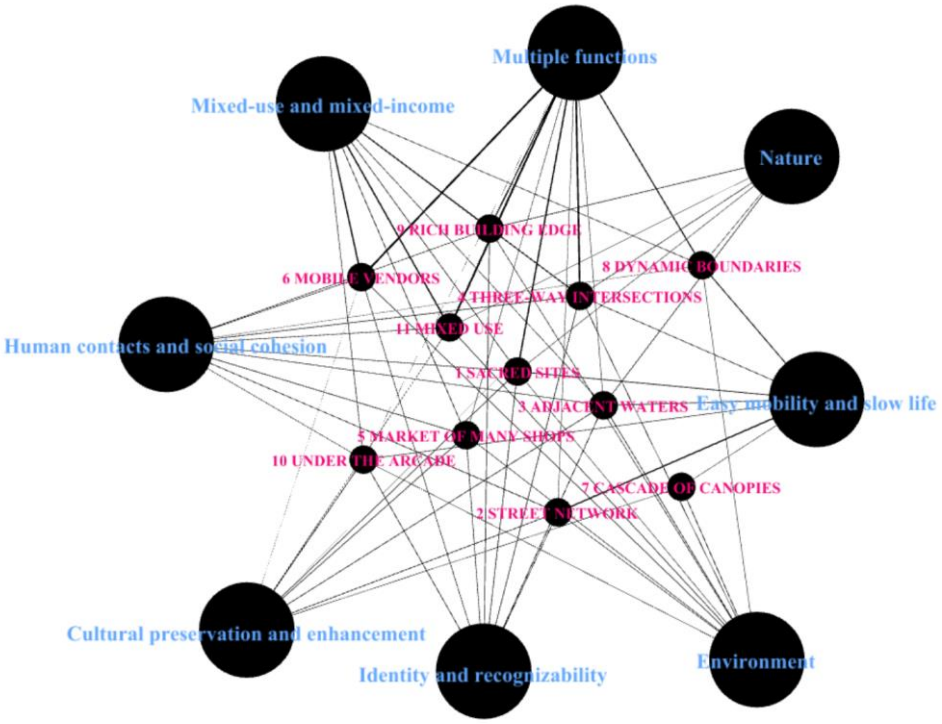


Figure 5-24 Diagram illustrating the relationship between sub-goals and composite space pattern

(Source: author)

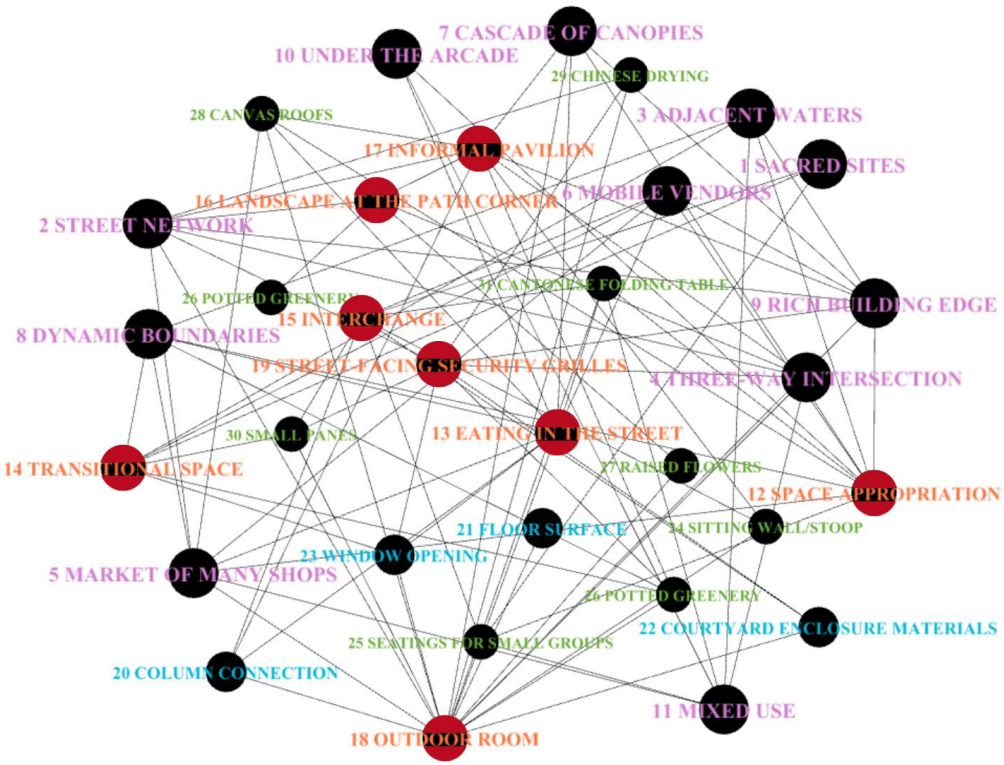


Figure 5-25 Diagrammatic representations of patterns associated with core sub-objectives

(Source: author)

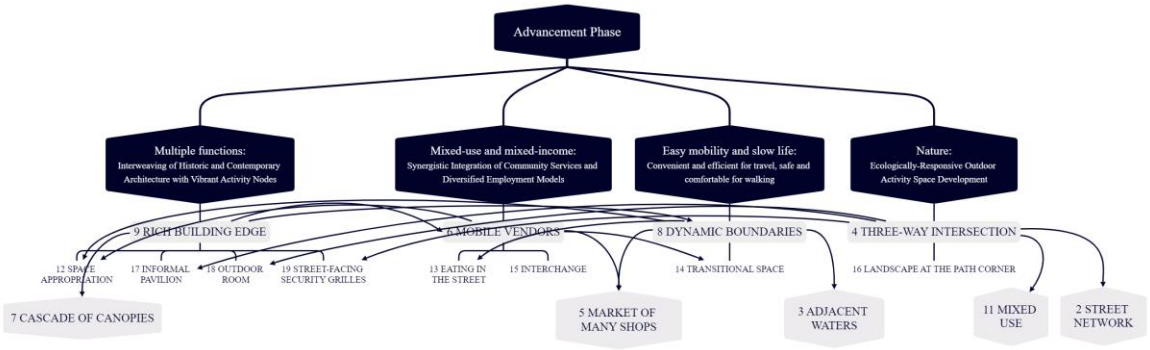
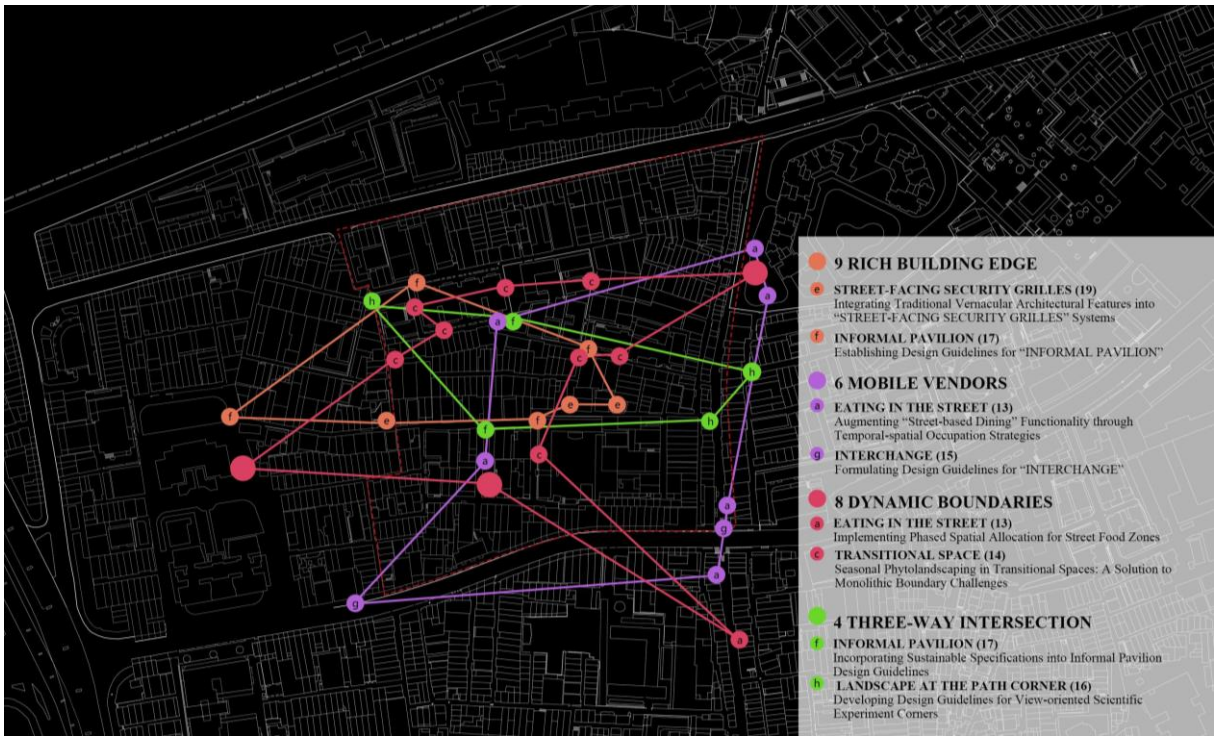


Figure 5-26 Pattern network in the advancement phase (Source: author)

5.2.2.3 Locating Solutions To Maps



"13 EATING IN THE STREET + 4 THREE-WAY INTERSECTION: The three-way intersection, facilitating pedestrian activity and offering opportunities for culinary experiences." & "9 RICH BUILDING EDGE + 8 DYNAMIC BOUNDARIES: The evolving architectural edge over time."

Figure 5-27 The abstract relationships between patterns superimposed on the plan (Source: author)

Description of the scenarios derived from the selected pattern languages:

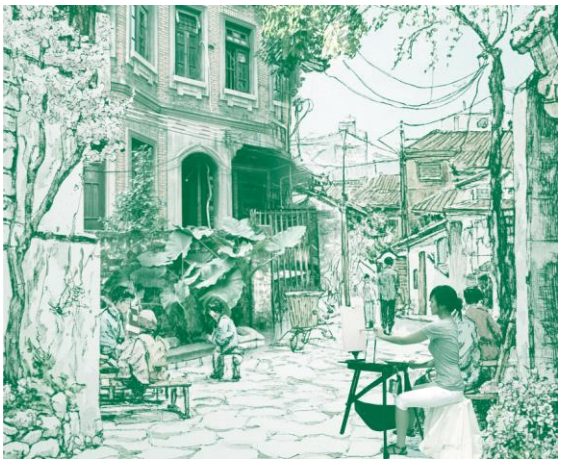
The weathered stone balustrades of the Shuzhu Bridge, etched with the passage of time, and the ancient banyan trees with their aerial roots dipping into the water, provide a shaded haven for the laborers who gather to play chess, recreating the dramas of yesteryear. Urban planners have deliberately preserved these seemingly "unnecessary" details, broadening the low walls of the bridge into stone benches and adding wooden platforms along the banks, thus

creating shared spaces for fishermen, art students, and delivery workers. At the street corners, vendors set up bamboo baskets to sell freshly harvested longans and bananas, drawing passersby to pause and inquire about the price.

In the Nanhuaxi district, a turn down any side alley reveals a distinct character from the main thoroughfares. The scale of the streets and the rhythm of pedestrian movement transform these spaces into natural social theaters, with each intersection acting as a small "living room."

Entering the art alleyways, Qizha South Street is lined with red-brick villas constructed by overseas Chinese in the late 1920s, interspersed with traditional blue-brick houses. A weathered wooden table, three rattan chairs, and a shared bicycle rack serve as an open-air studio for street artists. Charcoal pencils and colored inks are scattered across the table, with sketches of the ancient banyan tree at the intersection hanging on the chair backs. Further along, an expanded pavilion incorporates a compost bin on one side, where artists ferment waste paper and paint tubes into "ecological fuel" to power nighttime projection lamps. On the other side, a handcrafted clay washbasin is embedded, allowing passersby to clean their paint-stained fingers. When the projection lamps illuminate, the old walls become screens, displaying documentary films about the oral history of the alleyways, with tea drinkers and artists sharing the space, where art and life converge.

Leaving the art alleyways and entering the garden alleyways, an interactive point combines public space with agricultural facilities, where parents accompany their children in learning the basic principles of plant cultivation, and grandmothers lean out of windows to call them home for soup. At the corner, a firecracker flower climbs up a rusty iron trellis, cascading down in a torrent of orange blossoms in winter, even prompting delivery workers to take photos. In summer, it transforms into lush green foliage, under which children chase and play after school. In Nanhuaxi, the pavilions at the intersections are like cellular divisions: starting from a table and a chair, they grow into compost bins and flower racks, expanding into kitchens and bulletin boards, ultimately becoming vessels of neighborhood memories. When the artist's brush, the housewife's ladle, and the grandmother's scissors converge here, "informality" coexists, becoming the most vibrant capillaries of the historic district.



a) Art alley intersection

b) Garden alley intersection

Figure 5-28 "Advancement Phase" scenarios description (Source: author)

5.2.2.4 Planning Analysis

(1) Preserve the vernacular vitality of Nanhuaxi through the strategic allocation of low-rent spaces, specifically for "EATING IN THE STREET" (13) and "INTERCHANGE" (15). These spaces would be leased to diverse community groups or mobile vendors. Maximizing site utilization can be achieved through the implementation of a time-sharing model.

(2) Strategically position "TRANSITIONAL SPACES" (14) to delineate varying degrees of privacy, and facilitate resident-led construction or seasonal planting within these zones. This approach aims to enhance the recognition of spatial transitions and foster a sense of belonging among residents, thereby mitigating abrupt spatial shifts.

(3) The proposal advocates for the enhancement of residential frontages through strategic interventions. These include the implementation of distinctive "INFORMAL PAVILIONS" (17) and energy-efficient "STREET-FACING SECURITY GRILLES" (19). Furthermore, the plan suggests opening select residential gardens to both visitors and residents. This approach aims to cultivate a cohesive and enriched streetscape, thereby improving the site's accessibility and overall livability.

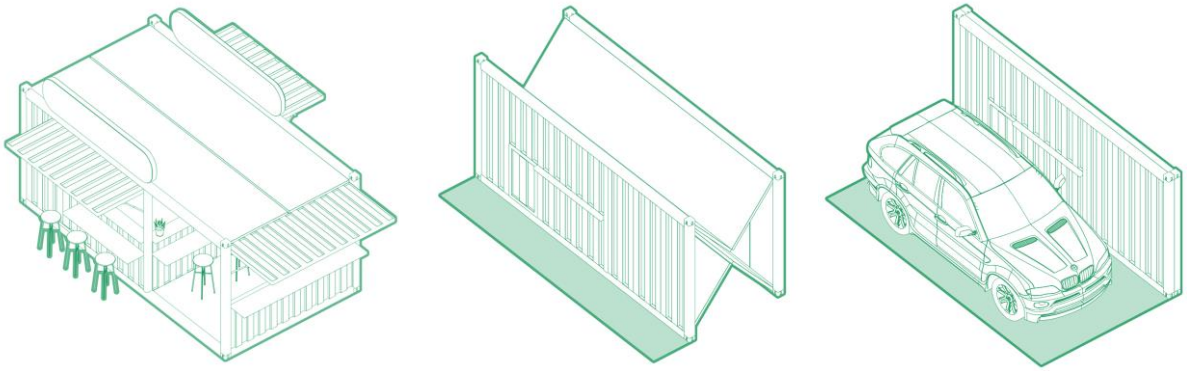
(4) Within the alleyway, the strategic placement of a series of diminutive public spaces—"THREE-WAY INTERSECTION" (4)—is proposed to augment the density and diversity of communal activity zones. The selection of self-organizing alternatives, specifically "INFORMAL PAVILIONS" (17) and "LANDSCAPE AT THE PATH CORNER" (16), is contingent upon the dimensional attributes of the site, thereby furnishing residents with a spectrum of infrastructural functionalities.

5.2.2.5 The New Unit Space Patterns

a. EATING IN THE STREET

20 COLUMN CONNECTION + 21 FLOOR SURFACE + 28 CANVAS ROOFS

The proposed intervention involves the reconfiguration of the boundary wall, strategically repurposing the parking area to accommodate ancillary spaces for food vendors during specific timeframes.



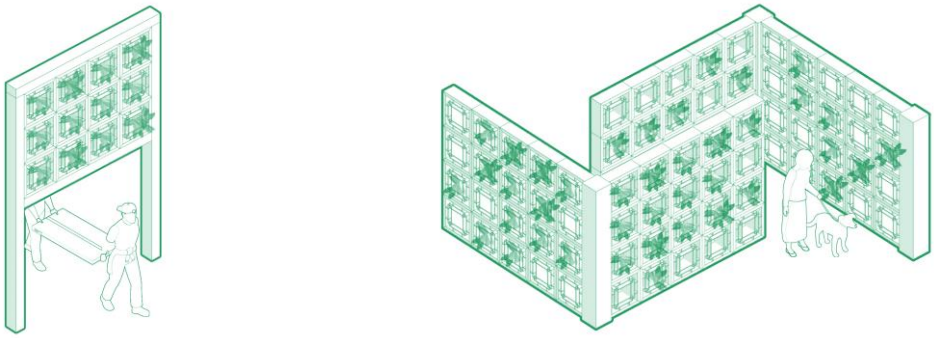
a) The folding wall is fully open | b) The folding wall is partially open | c) The folding wall is closed

Figure 5-29 New "EATING IN THE STREET" pattern (Source: author)

c. TRANSITIONAL SPACE

26 POTTED GREENERY + 30 SMALL PANES

In this phase, a novel approach to neighborhood development will be actualized through the dissemination of horticultural knowledge, thereby activating the transitional spaces within the architectural framework. The existing fenestration will be repurposed to transform these locales, with soil cultivation receptacles integrated within the panes, facilitating periodic community gardening initiatives.



a) Courtyard main gate | b) Courtyard enclosing wall

Figure 5-30 New "TRANSITIONAL SPACE" pattern (Source: author)

e. STREET-FACING SECURITY GRILLES

23 WINDOW OPENING + 26 POTTED GREENERY + 29 CHINESE DRYING

The proposed intervention entails the integration of a novel structural system, superimposed upon the existing architectural framework, thereby affording residential units supplementary semi-exterior spaces while concurrently ensuring privacy. This facade treatment draws inspiration from the original anti-theft window screen elevations, aesthetically incorporating the stylistic nuances of traditional vernacular dwelling window apertures.

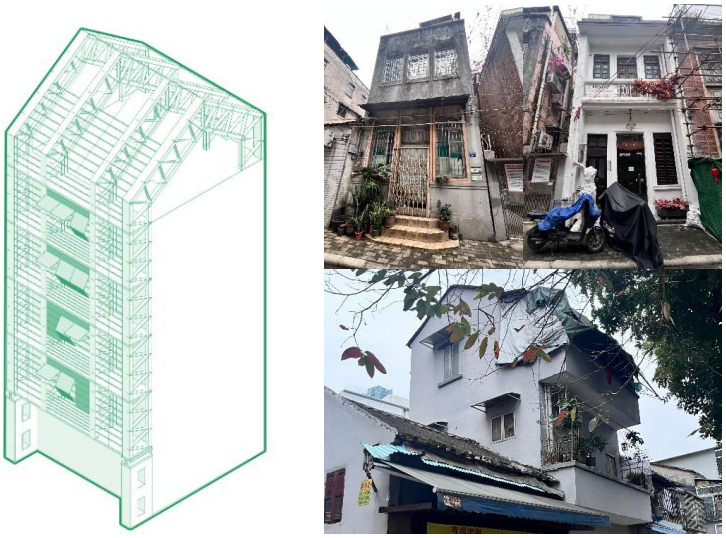


Figure 5-31 New "STREET-FACING SECURITY GRILLES" pattern (Source: author)

f. INFORMAL PAVILION

① *25 SEATINGS FOR SMALL GROUPS + 28 CANVAS ROOFS + 31 CANTONESE FOLDING TABLE*

The design prioritizes fundamental functions for human interaction, encompassing elements such as strategically placed bicycle-sharing stations.

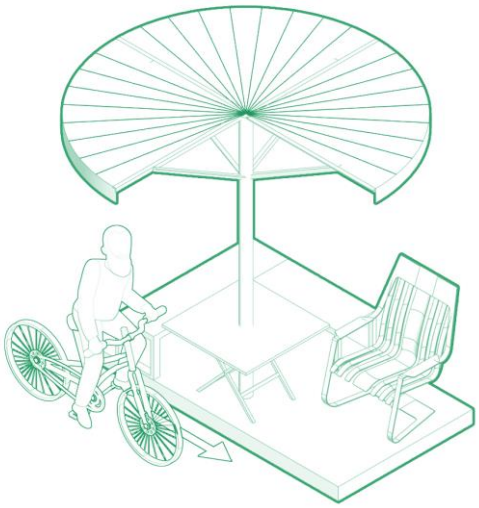


Figure 5-32 New "INFORMAL PAVILION" pattern Ⅰ (Source: author)

② *20 COLUMN CONNECTION + 21 FLOOR SURFACE + 25 SEATINGS FOR SMALL GROUPS + 28 CANVAS ROOFS + 31 CANTONESE FOLDING TABLE*

The modular design expands its functional scope through the strategic aggregation of two or four initial modules. This configuration augments the original functionalities by incorporating composting and sanitation facilities. Furthermore, the system facilitates the conversion of combustible waste generated from recreational activities into a sustainable energy source, thereby supporting the operation of small-scale applications.

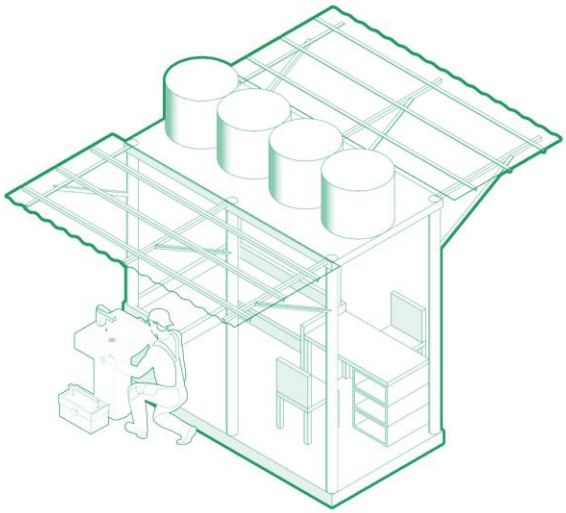


Figure 5-33 New "INFORMAL PAVILION" pattern Ⅱ (Source: author)

③ *20 COLUMN CONNECTION + 21 FLOOR SURFACE + 25 SEATINGS FOR SMALL GROUPS + 28 CANVAS ROOFS + 31 CANTONESE FOLDING TABLE + 26 POTTED GREENERY + 29 CHINESE DRYING*

As the location of the informal pavilions gained wider recognition, it became a customary destination for leisurely activities and social interaction. Residents with horticultural interests introduced their personal plant and produce displays, thereby initiating the function of a shared garden. Occasionally, the preparation of simple meals further fostered opportunities for communal exchange and collaboration.

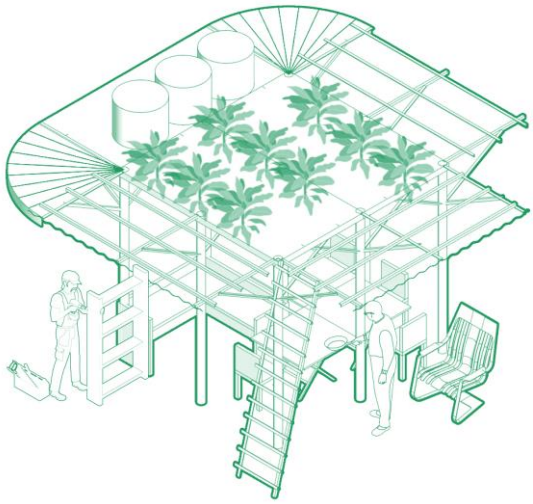


Figure 5-34 New "INFORMAL PAVILION" pattern Ⅲ (Source: author)

Furthermore, the informal pavilions within the art alleyways should emphasize the adaptive reuse of existing materials, while those in the garden alleyways should highlight the cultivation of diverse vegetation.

5.2.2.6 Design Scheme Generation

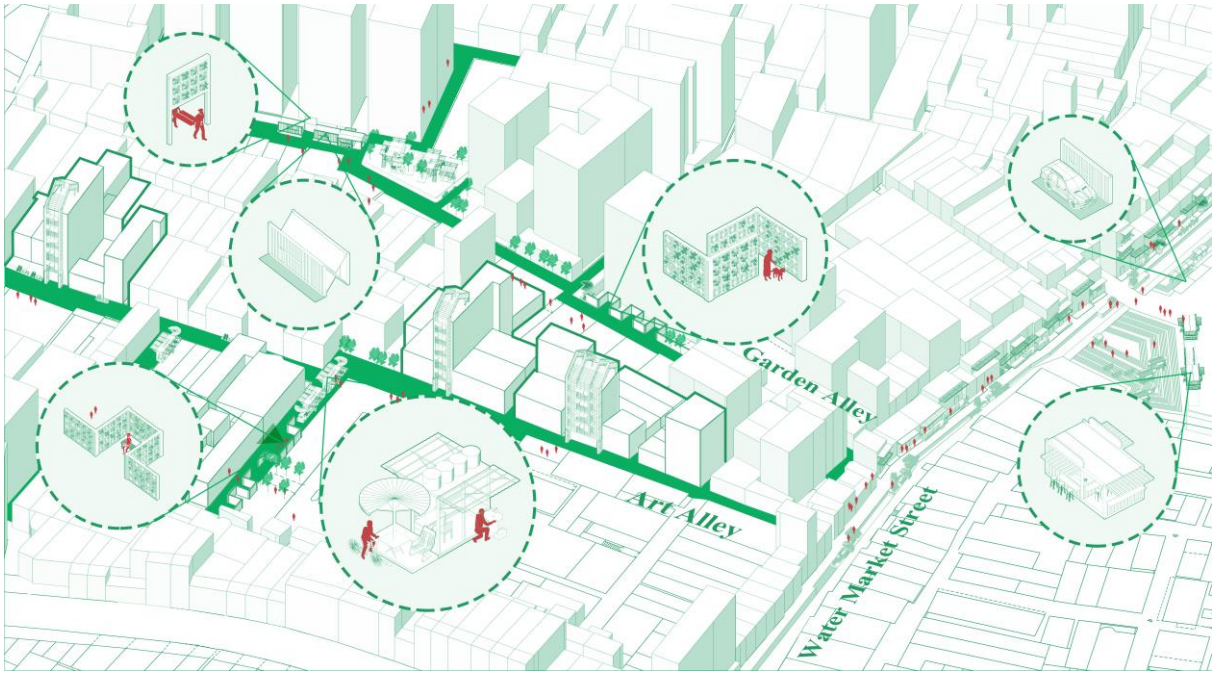


Figure 5-35 Advancement phase effect renderings (Source: author)

5.2.3 Refinement Phase

5.2.3.1 Identifying the Problems

The renovation of traditional urban spaces frequently overlooks the integration of cultural and recreational amenities, which subsequently leads to a homogenization of activities and a decline in communal engagement. The absence of public cultural programs significantly

contributes to the erosion of public spirit within these historic districts. Accessible, locally-rooted public spaces serve as vital conduits for social networks, collective memory, and the broader spectrum of civic life.

An analysis of the 237 commercial establishments within the study area reveals five primary categories: retail/wholesale (68%), essential services (13%), public utilities (3%), dining (12%), and tourism (4%). Within the retail/wholesale sector, the confectionery trade, particularly pastry businesses, constitutes a distinctive characteristic of the project site. During the Lunar New Year, the area experiences a surge in activity as residents, especially the elderly and homemakers, frequent Nanhuaxi to purchase festive pastries. This practice fosters social cohesion. Furthermore, these pastries have evolved into a tourism product, offering an opportunity to integrate the community's economic activities and represent the district's identity and cultural heritage. The Nanhuaxi historical district currently lacks adequate spaces to cultivate, organize, and sustain traditional cultural activities. The absence of open spaces, compounded by the region's humid climate, has resulted in the ground floors of the arcade buildings becoming extensions of daily life, a defining feature of Guangzhou. This project phase aims to enhance the quality of life for the local population by addressing social and cultural needs, while simultaneously leveraging tourism to stimulate economic activity, thereby bridging spatial divides and fostering regional economic growth. The arcade streets will serve as the primary intervention sites, expanding into usable community spaces, progressing from individual points to linear pathways, and ultimately forming a comprehensive network that integrates key public spaces within the community.

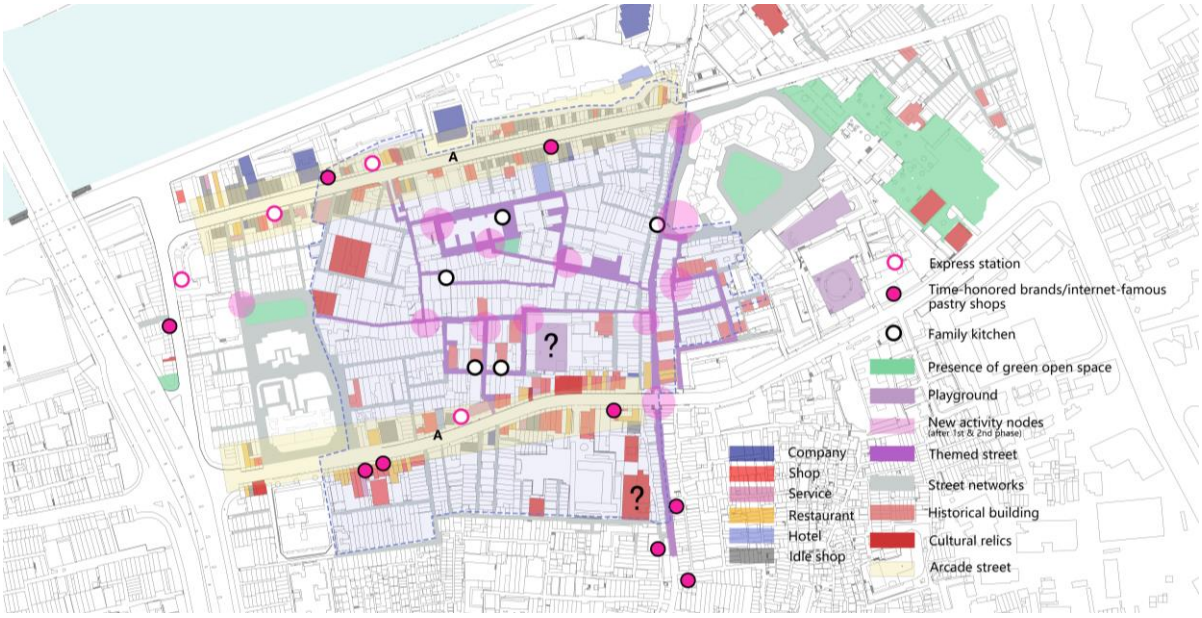


Figure 5-36 Spatial distribution of influencing factors associated with sub-objectives (Source: author)

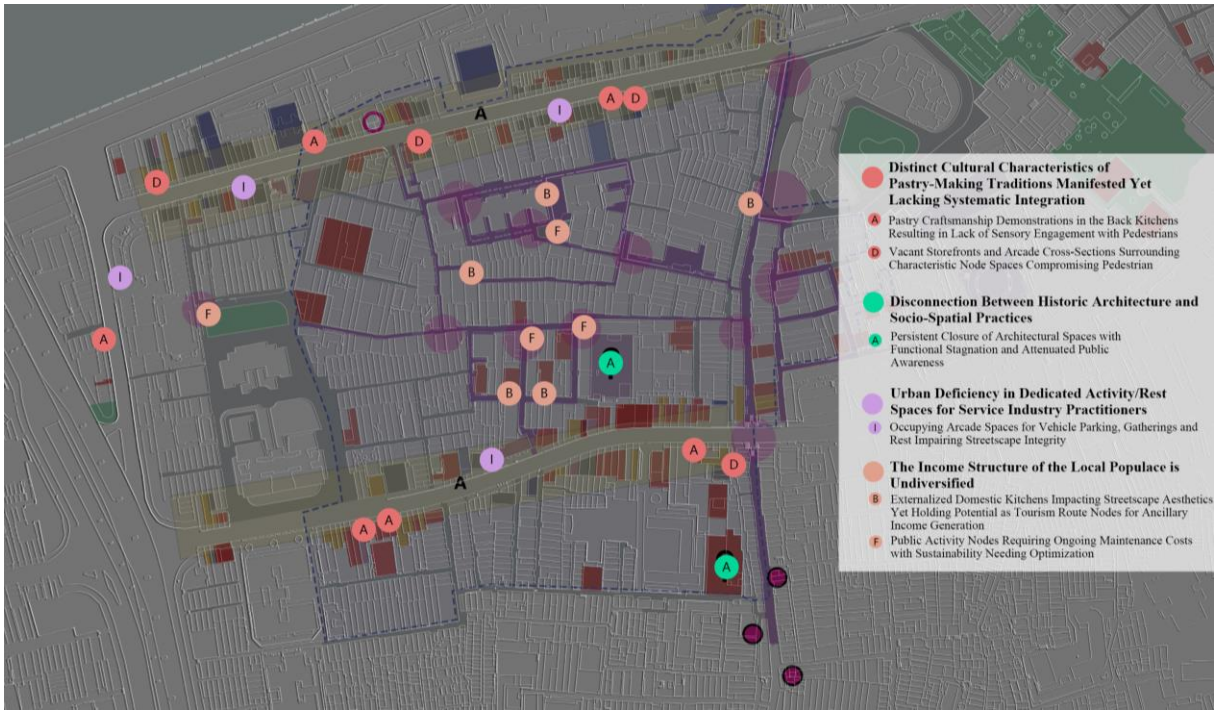


Figure 5-37 Analysis of issues in the Refinement Phase (Source: author)

5.2.3.2 Selecting Solutions from Patterns

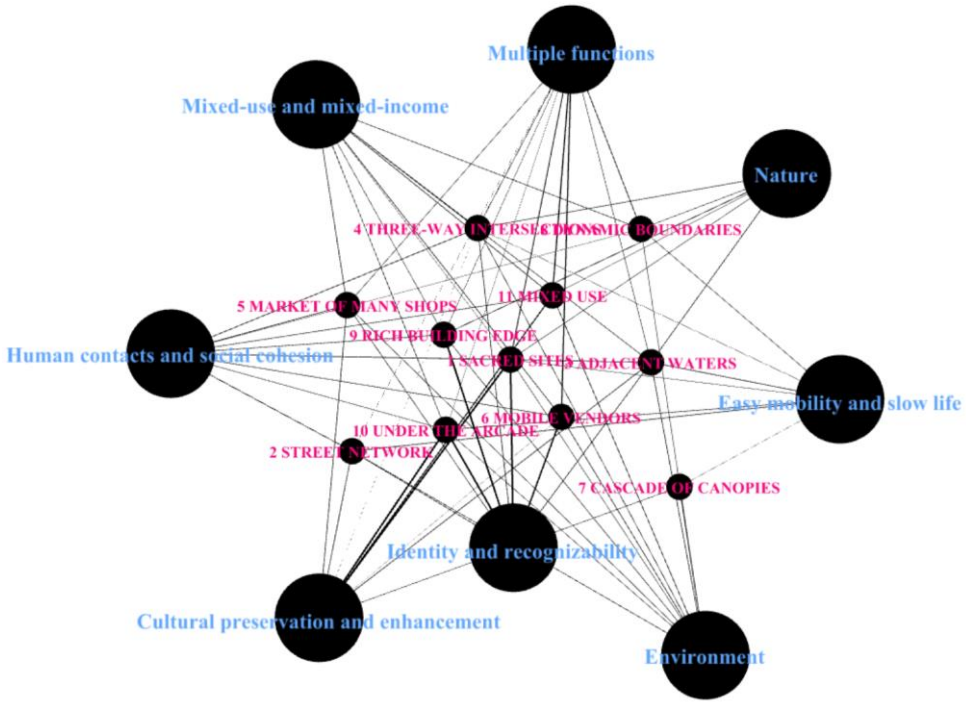


Figure 5-38 Diagram illustrating the relationship between sub-goals and composite space pattern (Source: author)

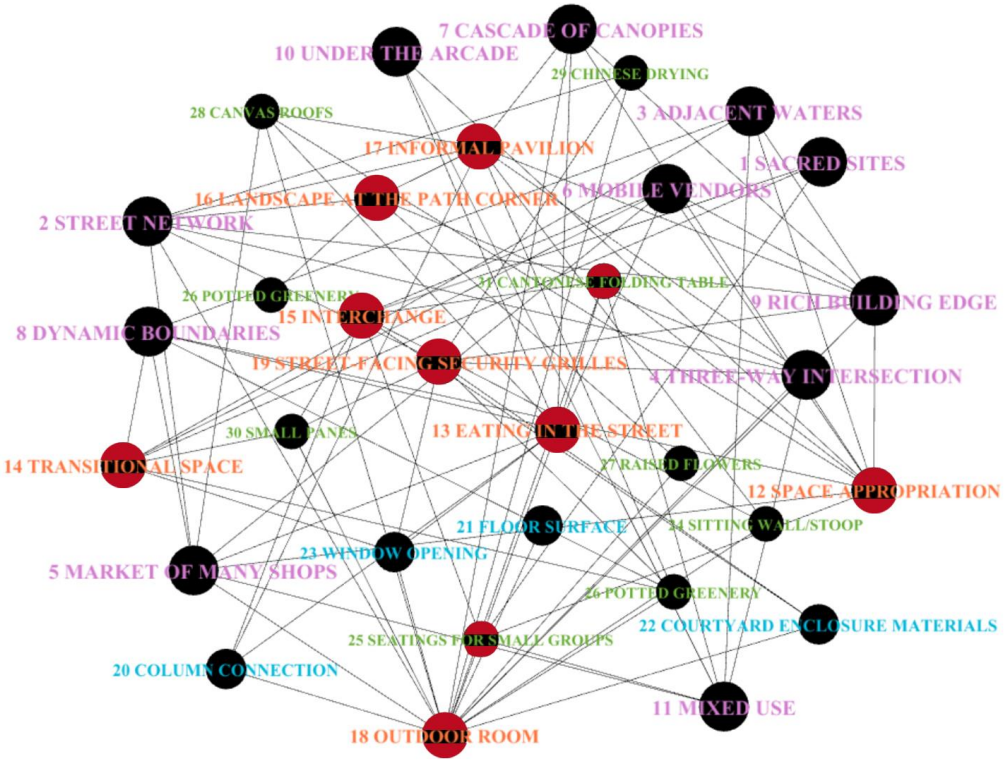


Figure 5-39 Diagrammatic representations of patterns associated with core sub-objectives

(Source: author)

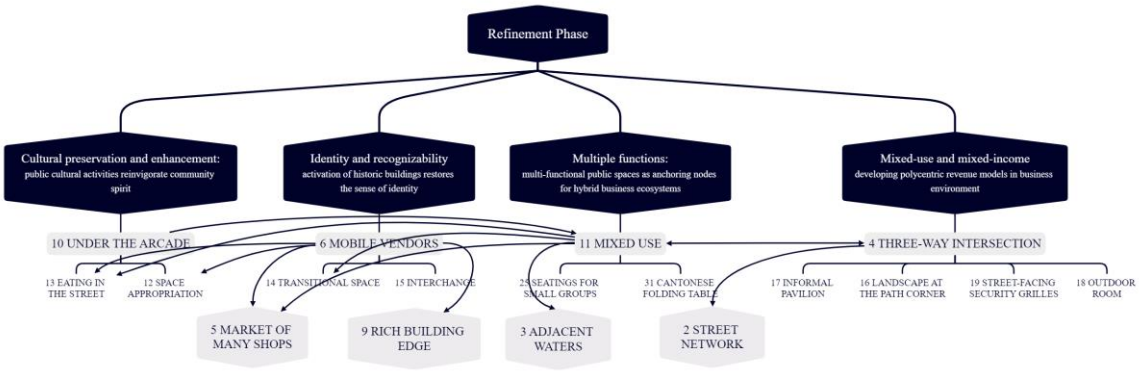
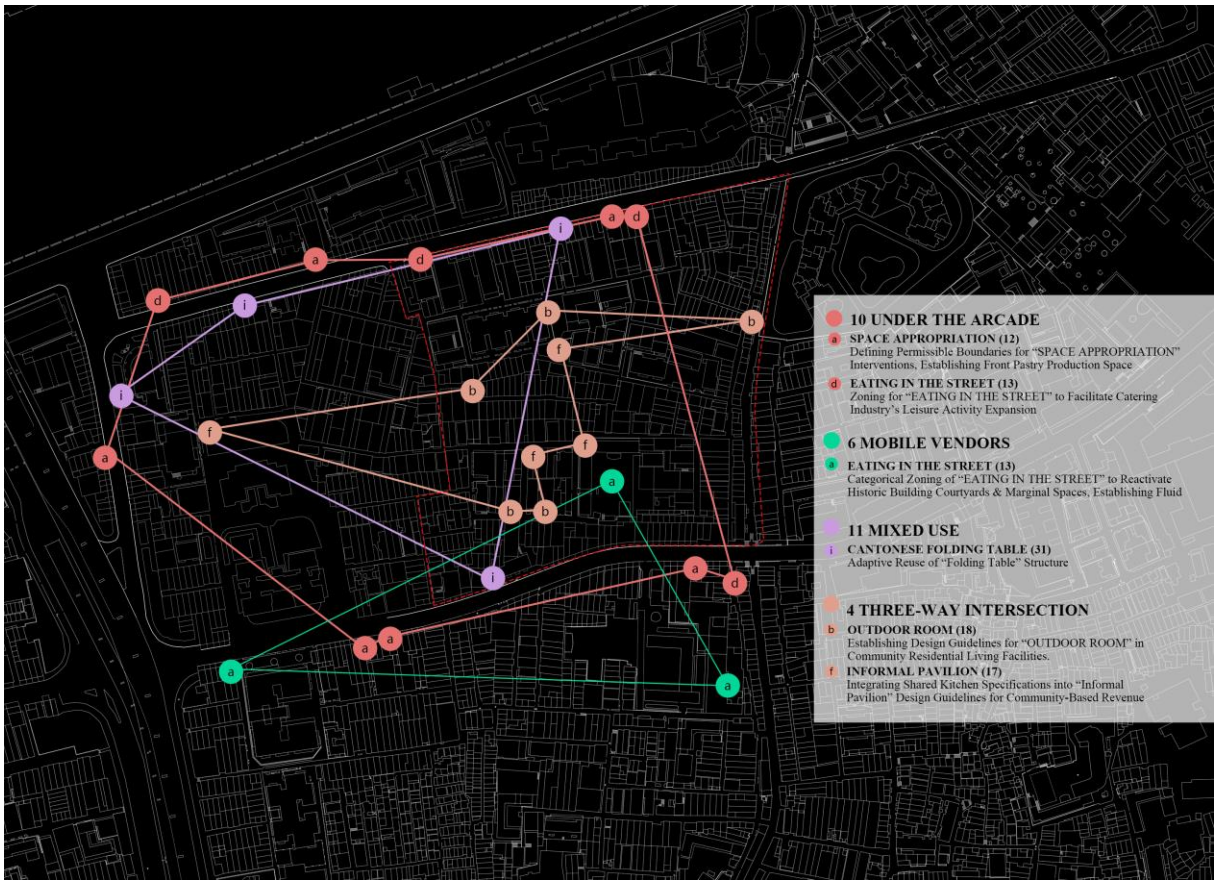


Figure 5-40 Patterns network in the refinement phase

(Source: author)

5.2.3.3 Locating Solutions to Maps



"10 UNDER THE ARCADE + 11 MIXED USE: Beneath the arcade, the cultural lives of diverse populations converge and coexist, fostering a dynamic interplay of mixed-use functions." & "6 MOBILE VENDORS + 4 THREE-WAY INTERSECTION: Mobile vendors roam the streets and alleys and home kitchens at three-way intersections bring culinary culture into every household."

Figure 5-41 The abstract relationships between patterns superimposed on the plan

(Source: author)

Description of the scenarios derived from the selected pattern languages:

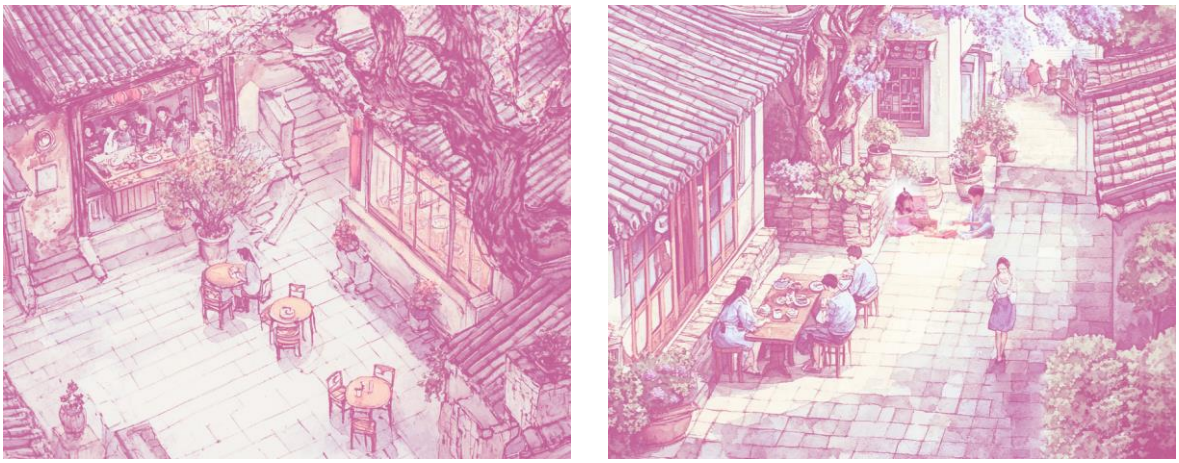
The Haizhu old street, a juxtaposition of vibrancy and tranquility, presents both scenic beauty and culinary delights. The arcade corridors function as a "gastronomic time tunnel," where a confluence of Western and Chinese pastries converge, each archway serving as a distinct, personalized theater. Cantonese pastry shops have replaced their street-facing brick walls with roller shutters, creating "enclosed outdoor spaces" where, on ordinary days, grandmothers craft chicken biscuits and almond cookies. The sounds of dough kneading within glass cases intermingle with the chatter of neighbors. During the pre-Spring Festival period, temporary exhibition stands overflow with red silk pastries, fried dumplings, and sesame balls. After customers scan QR codes for payment, the pastries are packaged in oil paper bearing the "Nanhuaxi Ancient Creek Story" emblem. During the humid rainy season, transparent rain

curtains are installed atop breakfast shops. Beneath the eaves, steam rises, and the sweet fragrance of glutinous rice balls harmonizes with the rhythm of raindrops on the curtains as the steamer lids are lifted.

At the arcade's corners, "shared millstones" are strategically placed, where housewives and their children participate in the process of grinding flour for festive pastries. The side rooms of the Pan family ancestral temple have been transformed into a transparent shared kitchen. Descendants of the Pan family occasionally demonstrate the traditional handmade "nine-layer cake" stacking method, with the dough encapsulating the generational craftsmanship secrets. Excess pastries are then sold in the market. Coriander is freshly harvested from the canals on the same day, rice is provided by relatives and friends, and cured meat is personally prepared by the neighbors. This "nine-layer cake" embodies the enduring neighborhood bonds. Under the shade of trees in front of the ancestral temple, an elderly man skillfully sets up a vintage folding table, arranges freshly baked nine-layer cakes, and brews tea to welcome visitors. Memories of the riverside stalls of yesteryear resurface, with the aroma of pastries intertwining with the medicinal fragrance from the neighboring herbal tea shop.

In front of the community residents' committee, residents have independently constructed a tea break workshop. In the early morning, grandmothers bring their own bamboo steamers and wooden molds, gathering around stone tables to knead red silk pastries, with the dough containing their private reserves of aged tangerine peel and olive kernels. Children squat by the stone crevices, collecting fallen flowers to string into natural garlands for decorating the pastries. In the afternoon, the stone tables transform into tea break corners, with thermoses containing dampness-dispelling tea, offering refreshment to passing delivery personnel. Delivery vehicles handle pastry ingredient distribution and package delivery during the day. At noon, they serve as temporary rest areas for delivery personnel. In the evening, they deploy retractable display racks, transforming into "street-side pop-up shops," with a cold chain area selling refrigerated ginger milk and a room-temperature area showcasing specialty pastries, also serving as a mobile live-streaming studio for pastry enthusiasts.

The revitalization plan for Nanhuaxi transcends mere spatial renovation, evolving into a taste-driven social experiment. Pastries become the key, decoding the memory genes of the historic district, continuing the spirit of Pan Zhencheng's adoption of Western market-oriented concepts, employing a "production, supply, sales, and after-sales 'one-stop' service," and embracing an open and inclusive mindset.



a) Courtyard shared kitchen b) Corner tea break workshop

Figure 5-42 "Refinement Phase" scenarios description (Source: author)

5.2.3.4 Planning Analysis

(1) Through a series of interventions within the arcade space, the facade's aesthetic is extended to the ground plane through decorative elements and spatial organization. The arcade functions as a harmonious composition of artwork and frame, transforming the classic arcade street into a dynamic sequence of theatrical stages. Revitalizing the arcade's inherent characteristics and spatial qualities, which can facilitate a range of outdoor leisure activities, including cafes, bars, and restaurants.

(2) To facilitate the advancement of pastry culture, five spatial typologies have been identified. The selection of these specific types for intervention was informed by a comprehensive analysis of the existing street network and infrastructural elements: the retail bakery kitchen, communal kitchens, domestic kitchens, mobile distribution and exhibition spaces, and courier/supply chain hubs.

① The residential kitchens at the three-way intersection primarily serve as communal spaces, offering refreshments to the local community and addressing the increasing demands of daily life.

② The adaptive reuse of the Pan Family Ancestral Hall's side structure now accommodates a communal kitchen, primarily designed to facilitate culinary experiences for visitors, community gatherings, and gastronomic training programs.

③ The arcade space's commercial kitchens are primarily dedicated to the daily processing and window display of pastries.

④ The open spaces fronting the newly constructed residential buildings are proposed for mixed-use exhibition areas. These areas will accommodate mobile vending spaces, utilizing

repurposed delivery vehicles. These vehicles, modified by delivery personnel on a voluntary basis, will serve dual functions: facilitating daily packaging and dispatch operations, and providing mobile stalls and live-streaming platforms for midday breaks and evening markets.

⑤ The distribution center and the raw material suppliers constitute indispensable components of the Nanhuaxi pastry network.

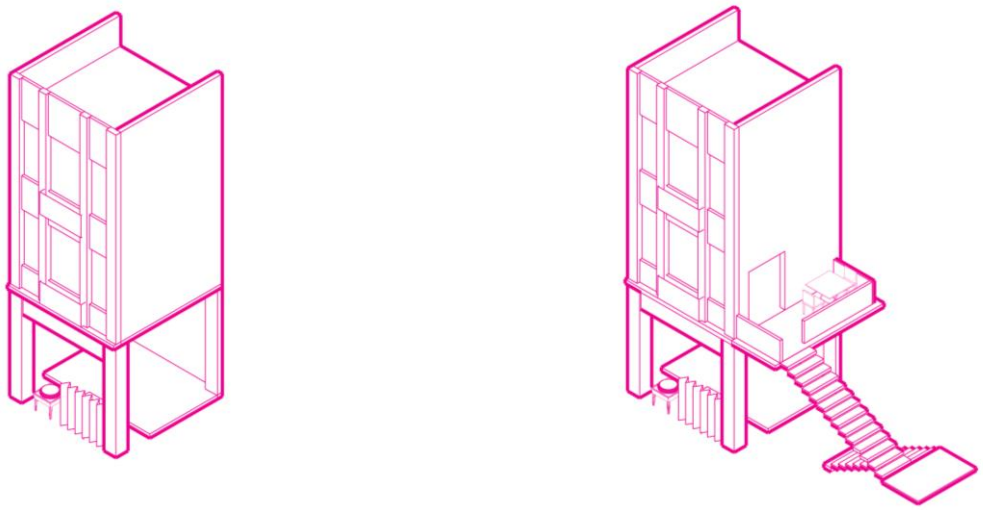
Given the fire code stipulations typically governing these zones, the strategic placement of temporary venues—specifically, "MOBILE VENDORS" (6) and "MIXED USE" (11)—aims to foster opportunities for social interaction, community engagement, and the mitigation of social fragmentation among local inhabitants.

5.2.3.5 The New Unit Space Patterns

a. SPACE APPROPRIATION

22 COURTYARD ENCLOSURE MATERIALS + 31 CANTONESE FOLDING TABLE

Within the parameters of "SPACE APPROPRIATION," the utilization strategy should be formalized, prioritizing the establishment of a pastry production zone.



a) Front-designed pastry production space

b) Operational area expansion to arcade building 2nd floor

Figure 5-43 New "SPACE APPROPRIATION" pattern (Source: author)

b. EATING IN THE STREET

① 25 SEATINGS FOR SMALL GROUPS + 31 CANTONESE FOLDING TABLE

Designate specific zones for "EATING IN THE STREET" adjacent to permanent establishments, utilizing vacant storefronts to extend dining and leisure activities beyond traditional indoor settings.

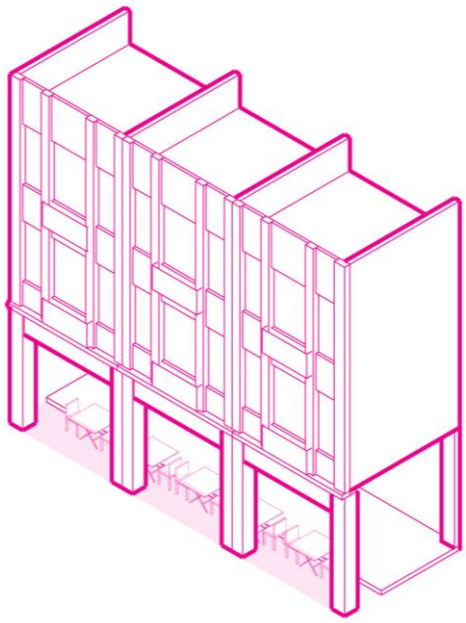


Figure 5-44 New "EATING IN THE STREET" pattern for fixed shops (Source: author)

② *20 COLUMN CONNECTION + 25 SEATINGS FOR SMALL GROUPS + 28 CANVAS ROOFS + 31 CANTONESE FOLDING TABLE*

To invigorate historical architecture and enhance site vitality, a comprehensive service model targeting mobile vendors is employed. This model encompasses a seamless integration of processes such as "creation—distribution," "production—exhibition," and "culinary—gathering," thereby attracting public interest.

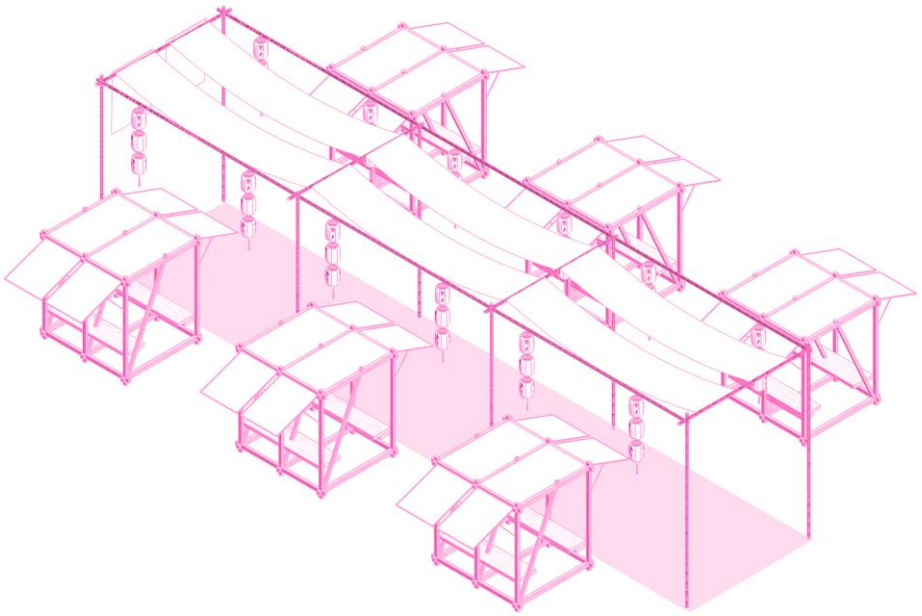


Figure 5-45 New "EATING IN THE STREET" pattern for mobile vendors (Source: author)

i. CANTONESE FOLDING TABLE

The "CANTONESE FOLDING TABLE" framework's repurposing strategically delineates functional zones, offering delivery personnel adaptable spaces for rest and live-streaming activities.

a) Mobile stall b) Live streaming studio c) Temporary rest area

Figure 5-46 New "CANTONESE FOLDING TABLE" pattern (Source: author)

6.2.3.6 Design Scheme Generation

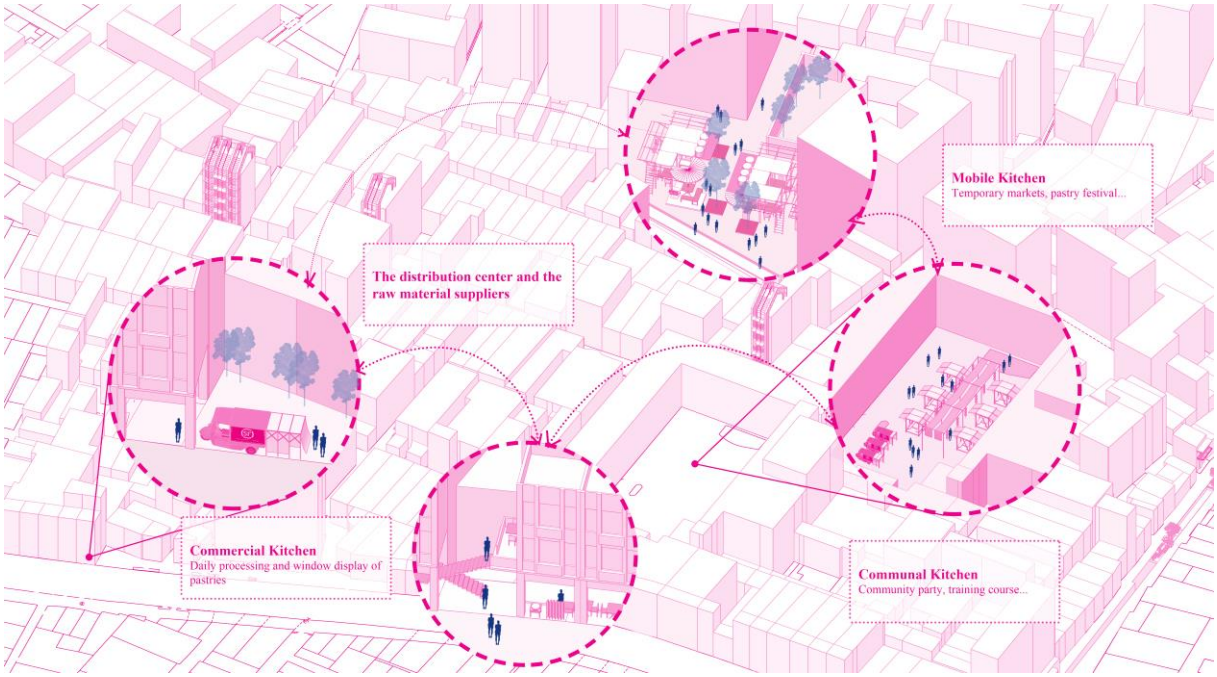


Figure 5-47 Refinement phase effect renderings (Source: author)

5.3 Chapter Summary

This chapter presents an empirical study structured around three phases—"Remediation," "Enhancement," and "Improvement"—to validate the efficacy of pattern language theory within Guangzhou's historical Nanhuaxi district. The remediation phase, centered on "Water Street Revival," aimed to reactivate historical elements, reconstructing the waterfront public realm

and contiguous street networks. The advancement phase focused on diversifying public spaces, employing patterns such as "INFORMAL PAVILION" (17) and "TRANSITIONAL SPACE" (14) to invigorate community life. The refinement phase integrated new and existing commercial activities, utilizing patterns like "UNDER THE ARCADE" (10) and "MIXED USE" (11) to foster cultural and economic symbiosis. The collaborative mechanism established during the experiment, involving "government—community planners—residents," effectively reconciled professional planning with local knowledge, confirming the viability of an organic renewal strategy that combines "top-down planning with bottom-up initiatives." Empirical findings demonstrate that pattern language theory offers a replicable technical pathway for the dynamic renewal of historic districts.

Chapter 6 Conclusion

6.1 Conclusion

This study investigates the informal spaces within Guangzhou's historical Nanhuaxi district, elucidating their fundamental role in maintaining social cohesion, preserving collective memory, and adapting to evolving lifestyles. These informal spaces, arising from bottom-up urban transformations initiated by residents, have evolved incrementally, addressing planning deficiencies and serving as crucial vehicles for the organic renewal of the district from a self-organized perspective. Based on Alexander's pattern language theory, the research establishes a four-dimensional language framework comprising "composite space pattern language," "unit space pattern language," "structural pattern language," and "spatial detail pattern language." This framework translates the implicit logic of informal spaces into an actionable renewal grammar, effectively resolving the dichotomy between physical space restoration and social relationship reconstruction inherent in traditional renewal approaches. Empirical research, employing a three-stage "remediation-enhancement-improvement" experiment, validates the feasibility of an organic renewal strategy that integrates "top-down planning with bottom-up initiatives" guided by pattern language theory. Furthermore, the study proposes a collaborative mechanism involving "government-community planners-residents," utilizing a visual pattern library to lower the barriers to public participation, thereby providing a new paradigm for inclusive governance in historical districts. The organic integration of informal spaces mitigates both "symbolic preservation" and "gentrification crises," while also promoting sustainable district development through business integration and functional restructuring, demonstrating the superiority of "dynamic restoration" over static preservation. Ultimately, this research provides a pathway for historical district renewal that balances the preservation of historical context with contemporary functional needs, revealing the critical role of self-organization in balancing urban order and diversity, and offering theoretical and practical references for the revitalization of similar districts.

6.2 Reflection

While this study has yielded certain advancements in both theoretical construction and practical application, several limitations persist. Initially, Due to limitations in time and resources, this study's empirical analysis primarily focuses on the Nanhua West Historic District in Guangzhou. While this area is representative, the diversity of informal spaces, the general applicability of patterns, and regional differences require further verification through

comparative analyses of additional cases. Such efforts will contribute to the continuous refinement of the content and application mechanisms of pattern language and enhance the emphasis on the preservation of historical and cultural dimensions. Secondly, the selection of pattern sample spaces, the summarization of core characteristics, and the scoring of pattern correlations involved a degree of subjective judgment due to the nature of the research experiment, lacking precise quantitative analysis. Furthermore, in the practical application section, the limited sample size, although the pattern language method possesses practical characteristics, may have influenced the research outcomes due to the author's design capabilities. Subsequent discussions with expert designers are required to continuously refine the pattern language library, thereby strengthening the research findings. Finally, although the localization framework of pattern language theory has been initially adapted to the domestic context, the consideration of local cultural contexts and policy environments remains insufficient. It is necessary to integrate institutional design to optimize the tool chain, enhancing the theoretical depth and practical compatibility. Simultaneously, the research emphasizes spatial and social dimensions, with limited integration of economic mechanisms and digital technologies. Future exploration could involve intelligent renewal pathways from interdisciplinary perspectives.

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Appendix

Appendix 1 People's Daily Life and Satisfaction Survey on Nanhuaxi Informal Spaces

I. Basic Information Section

1. Your Identity: [Single-choice Question]

〇Local resident (50%) 〇Business owner (30%) 〇Citizen/Tourist (20%)

2. Which of the following best describes your resident status? [Single-choice]

(This question is displayed only if "Local Resident" is selected in Question 1)

○Local Indigenous Resident (40%) ○Migrant Resident (40%) ○New Residential Community Resident (20%)

3. Your Age Group: [Single-choice Question]

〇Under 12 years old (8%) 〇12-18 years old (16%) 〇19-30 years old (14%) 〇31-50 years old (28%)

〇51-65 years old (20%) 〇Over 65 years old (14%)

4. Your Occupation: [Single-choice Question]

〇Student (24%)

〇Administrative/Institutional staff (10%)

〇Private enterprise employee (14%)

〇Self-employed (22%)

〇Retired (24%)

〇Other _____* (6%)

II. Behavioral Characteristics (Single-choice Questions)

5. Have you ever engaged in behavioral activities in the following spaces (or similar spaces):

[Single-choice Question]

○Yes. (80%)

○No. (Please skip to question 11.) (20%)

6. Most frequent informal spaces visited [Multiple-choice Question]

☐Open spaces in front of ordinary residences or between residential buildings (22.5%)9

☐Arcade eaves spaces (15%)

☐Intersections of internal community lanes (25%)

☐Storefront extended spaces (47.5%)

☐Parking lots or marginal spaces in new residential areas (25%)

☐Temporarily built activity venues (e.g., small gathering places, simple sheds) (10%)

☐Other _____* (2.5%)

7. Frequency of using these informal spaces: [Single Choice]

○Occasionally throughout the year (Skip to Q11) (7.5%)

○Several times monthly (10%)

○1-2 times weekly (22.5%)

○3-4 times weekly (47.5%)

○Daily (12.5%)

8. Engagement in stationary/transitional activities (waiting, sitting): [Single Choice]

○Never (12.5%)

○Occasionally (15%)

○Sometimes (55%)

○Frequently (7.5%)

○Always (10%)

9. Primary activities in these spaces [Multiple Choice]

☐Walking (32.5%)

☐Tea drinking (20%)

☐Socializing (35%)

☐Shopping (32.5%)

☐Recreation (singing, dancing, games) (12.5%)

☐Reading (27.5%)

☐Drying clothes (20%)

10. Social interaction frequency with friends/family/neighbors: [Single Choice]

○Never (2.5%)

○Occasionally (7.5%)

○Sometimes (45%)

○Frequently (27.5%)

○Always (17.5%)

11. Suggested improvements for these spaces: [Multiple Choice]

☐Greenery (40%)

☐Shading structures (35%)

☐Seating (32.5%)

☐Interactive installations (22.5%)

☐Display boards (7.5%)

☐Parking spaces (40%)

☐Other _____* (5%) Fitness equipment

12. How familiar are you with the following food stores: [Multiple Choice]

Ying Kee Eatery	Bao De Bakery	Guoqiang Bakery	Chunxin Pastry House	Sisters' Cake Shop
				

○Familiar

○Unfamiliar

III. Residents' Satisfaction Survey on Informal Public Spaces

13. Spatial Interface [Matrix Scale Question]

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The boundaries of informal spaces are clear and continuous	○	○	56%	○	○
The spatial scope of adjacent informal space boundaries is appropriate	○	64%	○	○	○
The material selection for boundaries of adjacent informal spaces is suitable	○	○	○	52%	○
The color scheme for boundaries of adjacent informal spaces is appropriate	○	○	○	60%	○
The boundary design of adjacent informal spaces demonstrates rich variation	○	76%	○	○	○

14. Spatial Quality [Matrix Scale Question]

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The improvement measures for informal public spaces in my community are reasonable, enhancing neighborhood environment	○	82%	○	○	○
Informal public spaces effectively complement the lack of community facilities	○	74%	○	○	○
Informal public spaces demonstrate diverse functional uses	○	○	○	56%	○
Maintenance status of facilities/landscape in informal public spaces is satisfactory	○	○	60%	○	○
Satisfied with renovated storefront signage design	○	62%	○	○	○

15. Perspectives on Renewal from Economic, Social, and Cultural Dimensions (Residents) [Matrix Scale Question]

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Economic: Enhanced property values	○	68%	○	○	○
Economic: Cost-effective property services	○	56%	○	○	○
Social: Improved interactions with merchants	○	46%	18%	32%	○
Social: Increased decision-making power in neighborhood affairs	○	52%	○	○	○
Cultural: Preservation of original local culinary atmosphere	○	○	56%	○	○
Cultural: Enhanced historical-cultural streetscape	○	○	64%	○	○

16. Perspectives on Renewal from Economic, Social, and Cultural Dimensions (Business Owners) [Matrix Scale Question]

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Economic: Increased business revenue	○	○	62%	○	○
Economic: Growth in rental costs	○	58%	○	○	○
Social: Improved resident-merchant relations	○	46%	28%	20%	○
Social: Enhanced decision-making influence in neighborhood affairs	○	44%	18%	22%	○
Cultural: Preservation of original local culinary atmosphere	○	○	56%	○	○
Cultural: Enhanced historical-cultural streetscape	○	○	58%	○	○

17. Perspectives on Renewal from Economic, Social, and Cultural Dimensions (Citizens/Tourists) [Matrix Scale Question]

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Economic: Noticeable increase in consumption level	○	63%	○	○	○
Economic: Reasonable cost-experience ratio	○	○	70%	○	○
Social: Gradual reduction of familiar stores	○	66%	26%	○	○
Social: stringent street management	○	38%	48%	○	○
Cultural: Preservation of original local culinary atmosphere	○	○	56%	20%	○
Cultural: Enhanced historical-cultural streetscape	○	○	58%	○	○

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