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South China University of Technology

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城市触媒视角下的顺德碧江村旧厂房社区化更新策略研究

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Study on the Community-Oriented Regeneration of Old Industrial Buildings in Bijiang Village, Shunde, from the Perspective of Urban Catalyst Theory

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摘　　要

在国家城镇化从增量扩张向存量提质转型的背景下，旧厂房的再利用已成为城市高质量发展的重要议题。珠三角地区因长期乡村工业化积累，遗留了大量散布于传统聚落内部的旧厂房。这类旧厂房因规模有限、产权碎片化、与居住社区在空间上高度耦合，既难以纳入大型工业园区式的统一整合开发，也与文化旅游、文化创意等常见工业遗存更新路径存在错位。然而，既有研究对这一类型的关注明显不足，在历史文化保护约束与产权复杂条件并存的在地语境下，如何实现其从生产空间向社区公共空间的功能转型，目前尚缺乏系统的理论回应与实践路径。

本研究以广东省佛山市顺德区北滘镇碧江村旧厂房为研究对象，在城市触媒理论框架下，探索碧江村中旧厂房社区化更新的规律与路径。碧江村是国家级历史文化名村，其聚落空间由传统宗族肌理与改革开放以来的工业化介入共同叠加而成，是珠三角村级工业遗存嵌入历史聚落这一典型问题的集中体现。

在研究方法上，本研究综合运用实地踏勘、问卷调查、居民访谈与大数据平台人群分析，对碧江旧厂房片区的空间系统、人群需求与旧厂房本体条件进行系统调研。研究通过 146 份有效问卷与多轮居民访谈，从居民日常活动行为与集体记忆两个维度识别在地真实需求，并依据《城市居住区规划设计标准》（GB 50180-2018）对片区公共服务设施缺口进行定量评估，使设计策略建立在对真实社区需求的系统回应之上。

在研究结论上，其一，对于深度嵌入碧江村肌理的小规模旧厂房，其更新的首要任务不是建筑本体的全面改造，而是打开封闭边界、释放被长期圈占的存量空地，以开放空间供给为触媒效应形成的空间前提。其二，触媒节点的选址与功能配置以产权明确的集体用地为优先介入对象，以填补设施缺口的公共性功能为核心配置。其三，针对产权碎片化这一结构性制约，渐进式分期更新不仅是应对现实约束的策略选择，也是触媒理论在集体土地制度语境下的具体落实；第二期启动应以产权协调完成度与第一期触媒效应的可观测使用证据为维度判断依据，避免盲目推进。其四，以村集体为核心主体、商业运营与社区自治双轨并行的运营框架，是保障更新成果公共性与可持续性的制度关键。

本研究在设计实践层面，以碧江村彰义路为纵向主轴、西侧滨水步道为景观边界的“多核共振”社区生活网络框架，分两期植入社区活动中心、中部社区公园、西侧滨水功能带与门户商业四类触媒节点，形成从触媒节点到触媒网络的渐进扩散路径。研究成

果对珠三角地区同类型历史聚落中存量工业空间的社区化更新实践具有一定的参照意义。

关键词：旧厂房更新；城市触媒；社区化更新；存量空间；历史文化名村

Abstract

Against the backdrop of the national urbanization transition from incremental expansion to stock enhancement, the reuse of old industrial buildings has become an important issue in the high-quality development of cities. The Pearl River Delta region has left behind a large number of old industrial buildings scattered within traditional settlements due to the accumulation of industrialization in the countryside over a long period of time. Due to their limited scale, fragmented property rights, and high spatial coupling with residential communities, these old industrial buildings are not only difficult to be included in large-scale industrial parks, but also misaligned with the common paths of industrial remnants regeneration, such as cultural tourism and cultural creativity. However, existing studies have paid insufficient attention to this type, and there is a lack of systematic theoretical responses and place-based practice paths on how to realize its functional transformation from production space to community public space under the local context of the coexistence of historical and cultural protection constraints and complex property rights conditions.

This study takes the old industrial buildings in Bijiang Village, Beijiao Town, Shunde District, Foshan City, Guangdong Province, as the research object, and explores the law and path of community-oriented regeneration of the old industrial buildings in Bijiang Village under the framework of Urban Catalyst Theory. Bijiang Village is a national-level Historic and Cultural Village, whose settlement space consists of a superposition of traditional clan fabric and industrial intervention since reform and opening up, which is a concentrated manifestation of the typical problem of village-level industrial remnants embedded in historical settlements in the Pearl River Delta.

In terms of research methodology, this study comprehensively utilizes field surveys, questionnaire surveys, resident interviews and crowd analysis on the big data platform to systematically investigate the spatial system, crowd demand and ontological conditions of the old industrial buildings in Bijiang. Through 146 valid questionnaires and multiple rounds of resident interviews, the study identifies the real needs of local residents from the dimensions of residents' daily activity behavior and collective memory, and quantitatively evaluates the gaps of public service facilities in the area based on the Standard for Urban Residential Area Planning and Design (GB 50180-2018), so as to make the design strategy based on a systematic response to the needs of the real community.

In terms of research conclusions, one, for the small-scale old industrial buildings deeply embedded in the Bijiang Village fabric, the primary task of its regeneration is not the comprehensive transformation of the building body, but the opening of the closed boundaries and the release of the existing stock space that has been captured for a long period of time, so that the supply of open space is the spatial prerequisite for the formation of a catalyst effect. Secondly, the site selection and functional configuration of catalyst nodes prioritize the intervention of collective land with clear property rights, and the public functions to fill the gap of facilities are the core configuration. Third, for the structural constraint of property rights fragmentation, incremental regeneration is not only a strategic choice to cope with the real constraints, but also a concrete implementation of the catalyst theory in the context of the collective land system; the start of the second phase should be based on the completion of the coordination of property rights and the observable use of evidence of the first phase of the catalyst effect, so as to avoid blindly advancing. Fourth, the operation framework with the village collective as the primary agent and the dual-track operation of commercial operation and community autonomy is the key to guarantee the public nature and sustainability of the regeneration results.

In this study, the design and practice of the “multi-core resonance” community life network framework is based on Zhangyi Road of Bijiang Village as the vertical axis and the west waterfront walkway as the landscape boundary, and four types of catalyst nodes are implanted in two phases: a community activity center, a community park in the middle of the village, a west waterfront functional zone and gateway businesses, which form a gradual diffusion from catalyst nodes to catalyst network. Path. The results of the study have certain reference significance for the community-oriented urban regeneration of existing stock spaces in similar historical settlements in the Pearl River Delta region.

Keywords： Old Industrial Buildings Regeneration; Urban Catalyst Theory; Community-Oriented Regeneration; Stock Space; Historic Cultural Village

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Chapter 1 Introduction

1.1 Research Background

1.1.1 Importance of old industrial buildings regeneration and reuse in the context of stock-based urban regeneration

In recent years, under the guidance of national macro policies, China's urban development is shifting from the stage of large-scale incremental expansion to a new stage that focuses on improving quality and efficiency of stock. This shift has been emphasized in top-level planning: for example, the National Territorial Spatial Planning Outline (2021-2035) explicitly calls for the integration of incremental and stock space, vigorously revitalizing existing stock space, and scientifically and orderly promoting the redevelopment of under-utilised land, so as to improve the quality and efficiency of land use; and the Urban Regeneration Action deployed during the same period is also positioned as a means to promote the development and development of old factory buildings, with the aim of improving the quality and efficiency of old factory buildings. The "Urban Regeneration Action" deployed during the same period is also positioned as an important initiative to promote the high-quality development of cities, marking the transformation of China's urbanization from incremental expansion to stock optimization[1]. Under the trend of increasingly tight spatial resources, urban spatial restructuring and functional compositing, revitalizing existing stock space has become a key path for high-quality urban development. China is optimizing the allocation of urban spatial resources through systematic renovation of old urban areas, revitalization of industrial heritage, and improvement of infrastructure to alleviate the pressure of new construction land, optimize the internal spatial pattern, provide carriers for emerging industries and diversified urban functions, and realize the transformation of growth mode from expansion of epitaxial scale to enhancement of connotation and quality[2].

As typical industrial remnants, old industrial buildings have natural advantages in terms of spatial scale; they carry the industrial memory and urban culture of a specific historical period, and have unique cultural value. However, the transformation of old industrial buildings is often accompanied by controversies and challenges: in the practice of urban regeneration, it is a game field involving the government, enterprises, communities and village collectives; it is also the intersection of preserving the industrial history and realizing the functional regeneration; and it is also a key type of space that needs to crack the contradiction between the original structure and the modern demand.

1.1.2 Regional background of Pearl River Delta manufacturing transformation and stock of industrial land redevelopment

Since the reform and opening up, the Pearl River Delta has witnessed rapid economic development in villages and towns, resulting in the formation of thousands of village and township industrial clusters. Data from the Department of Natural Resources of Guangdong Province in 2020 showed that the Pearl River Delta village industrial agglomerations covered about 1.5 million mu, accounting for 31% of the total industrial land area in the Pearl River Delta[3].In the 1990s, in order to adjust the economic structure, China began to implement the industrial-to-service transformation policy, which requires heavily polluting, energy-consuming, and inefficient industrial enterprises to relocate, renovate, or shut down production in a focused, hierarchical, regional, and time-period manner.

Therefore, under the overall trend of the country shifting from incremental expansion to stock-based urban regeneration, the pressure and impetus for stock-based urban regeneration in the Pearl River Delta has become more prominent. On the one hand, due to the long-term superposition of industrialization and urbanization in the region, the Pearl River Delta has a high land development intensity and limited space for new construction land, and there is an urgent need to revitalize existing stock space and redevelop under-utilised land to gain development space; on the other hand, the upgrading of the industrial structure and the requirement for the "high-quality development of the manufacturing industry" have further raised the demand for high-quality industrial space and supporting environment. On the other hand, the upgrading of industrial structure and the requirement of "high-quality development of manufacturing industry" have further raised the demand for high-quality industrial space and supporting environment, which makes the improvement and upgrading of existing industrial land become an important hand to support the industrial transformation.

In this context, Guangdong Province's territorial spatial planning has clearly put forward the "stock priority", emphasizing the acceleration of the revitalization of inefficient stock of land, actively and steadily promote the "three old" transformation, and strengthen the evaluation and standard control of saving and intensive land use. Foshan City also pointed out in the overall planning of land space that the development intensity of land is relatively high, the allocation of land resources needs to be optimized, and there is an urgent need to explore new paths for the revitalization and utilization of existing stock space and under-utilised land.

1.1.3 Reality and dilemma of Bijiang old industrial buildings transformation

Bijiang is located in the northeast of Shunde District, Foshan City, Guangdong Province, with a profound history and culture, which has cultivated many cultural celebrities, and is a "Historic and Cultural Village of China" and a "Traditional Village of China"[4]. Since 2003, Bijiang has carried out a number of historical preservation and development plans. At present, there are 16 ancestral halls, 3 temples, 1 ancient bridge, 1 private school and 291 Guangfu vernacular dwellings in Bijiang Village. These tangible cultural heritages not only constitute the deep historical and spatial heritage of Bijiang Village, but also weave a spatial picture of Guangfu vernacular dwellings with a complete scale and a clear vein.

On the other hand, since the reform and opening up, Shunde's "rural industrialization" has gradually formed an industrial pattern of "villages lighting fires and households smoldering" through a bottom-up model, which has brought significant economic benefits. As a representative of Shunde's development of village-level industry, Bijiang has built village-level industrial plants, and a number of large-scale enterprises have emerged in the home appliances, garments, plastics, footwear and other industries. In the 1990s, Bijiang responded to the "industrial-to-service transformation policy" and began to move from small-scale decentralized to modernized large-scale production. Many enterprises gradually moved away from the center of the village to Bijiang Industrial Zone, Kunzhou Industrial Zone and Duning Industrial Zone outside the village. In this process, some of the old industrial buildings in the village were left behind, caught in the dilemma of decaying material space and lagging institutional logic. As a product left over from the period of industrial development, the old industrial buildings are an important witness to the collective industrial development of Bijiang Village. Compared with the large-scale industrial areas outside the village, the old industrial buildings located in the village show a higher degree of coupling with the residential community in terms of spatial and social relations: in the physical dimension, the proximity distribution and path connection strengthens their accessibility and accessibility to the daily activities of the community; in the socio-cultural dimension, the old industrial buildings, as a local place, carry the residents' collective memories and daily practices, and they have a symbolic and emotional basis for being transformed into a carrier of public life. In the socio-cultural dimension, the old factory building as a local place carries the collective memory and daily practice of the residents, and has a symbolic and emotional basis for transformation into a carrier of public life. Therefore, the old industrial buildings in the village can be regarded as potential nodes of the community public space system, realizing the transformation of function and governance from production space to public space.

The deep historical and cultural deposits of Bijiang Village and the imprints of modern industrial development are like two intertwined spatial fabrics that together construct its unique spatial qualities. In recent years, Shunde District has proposed to strengthen grass-roots governance, promote rural revitalization, achieve the goal of "Harmonious Shunde" construction, and put forward the requirements of the Shunde District Community Building Programme. In addition, Bijiang also proposed to give full play to its own advantages and characteristics as a national Historic and Cultural Village. At present, Bijiang in the past combined with the guidance of the higher authorities and focus on investment in the protection of historical space, preservation of traditional villages, village style coordination and harmony of the physical environment has been a long-term and solid accumulation and results. However, at present, the focus of community building is on old ancestral halls, old public buildings and other key actors, and there is still a lack of effective design and implementation of public spaces such as old industrial buildings.



Figure 1-1 Aerial view of Bijiang Village
(Source: photo by the author)

1.2 Research Questions, Purpose and Significance

1.2.1 Research Questions

This study focuses on the following core question: In the local context of Bijiang Village, how can the existing stock space, which has been closed by the industrial land for a long time, be rebuilt through incremental regeneration as the key actor to rebuild the network of public space in the district, respond to the needs of the residents in their daily lives, and realize the effective activation of community vitality?

Focusing on this core question, this study further develops three levels of sub-questions: first, how does the spatial closure of Bijiang's old industrial buildings specifically affect the public life of the neighboring communities, and what is the root cause of its spatial structural problems? Secondly, how can the theoretical and practical experience of the regeneration of old industrial buildings be effectively translated and applied in the special local conditions of Bijiang? Thirdly, how can the intervention strategy of taking the community as the key actor of regeneration realize the gradual implementation under the limited financial conditions and complex property rights structure, and drive the recovery of the overall vitality of public space in the district through the catalyst effect?

1.2.2 Research Purpose

This study takes the old industrial buildings in Bijiang Village, Shunde District, Foshan City, Guangdong Province, as the research object, and explores the law and path of community-oriented regeneration of old industrial buildings in historical ancient villages under the framework of Urban Catalyst Theory. There are three specific purposes:

First, to establish a community-oriented regeneration strategy for old industrial buildings applicable to the local context of Bijiang. We clarify the theoretical fit mechanism between catalyst theory and community-oriented regeneration, summarize the relevant case revelations, and provide methodological support for the identification of catalyst nodes, functional configuration, and implementation of operational paths for Bijiang's old industrial buildings.

Secondly, we diagnose the core spatial contradictions of Bijiang old industrial buildings and propose targeted regeneration strategies. Through a systematic analysis of the spatial system of the area, the needs of the population and the physical conditions of the old industrial buildings, we identify the structural barriers that constrain the integration of the old industrial buildings into the community life network, and deduce the logic of siting and functional positioning of the catalyst intervention accordingly.

Thirdly, we have completed the design of community-oriented regeneration of Bijiang old industrial buildings. Taking the catalyst node as the anchor point and phasing as the time sequence, we will complete the complete transformation from strategic framework to spatial design, and form the design results that can be used as reference for implementation.

1.2.3 Research Significance

Existing industrial remnants regeneration theory and practice are often placed under the context of cultural tourism, cultural office, cultural consumption, and the direction of regeneration is also limited to a single path such as cultural and creative neighborhoods, cultural

public buildings, and industrial landscape parks. However, the conditions of the old industrial buildings in Bijiang Village and their close proximity to the local community determine that such spaces are not entirely suitable for the general path of industrial remnants regeneration. As the post-modern "human-centered" design idea takes root, the stock-based urban regeneration is more concerned with the real needs of each individual. In the past, the development model oriented to the benefits of the government, enterprises and investors neglected the interests of the community as the key actor. Therefore, it is hoped that by studying the spatial needs and behavioral preferences of different groups of people, mainly residents, we can renew and build the spatial places of old industrial buildings, explore the community as the key actor of the regeneration model, and retrieve the community agency that has fallen by the wayside.

From the perspective of community-oriented regeneration, this study proposes targeted regeneration strategies for old industrial buildings in Bijiang Village, a special spatial type that is closely adjacent to the living space, to harmonize the different functions and styles of historical buildings, residential communities and old industrial buildings in Bijiang Village, and to help maintain the integrity and authenticity of the historical environment. Discussing the regeneration of old industrial buildings in a community context is a response to the needs of the residents, a supplement to public service facilities, and a space for activities and socialization, which is conducive to upgrading the quality of the community environment, ensuring the degree of public participation, and enhancing the cohesion and sense of belonging of the original residents of the historical village.

1.3 Research Objects and Contents

1.3.1 Research Objects

The research object of this study is the old industrial buildings and the community spatial environment in which they are located in Bijiang Natural Village, Beijiao Town, Shunde District, Foshan City, Guangdong Province, as shown in Figure 1-2 Research Scope .

In terms of research scope, this study takes Bijiang Natural Village as the overall research scope, covering its historical settlement fabric, public service facility system, pedestrian and cycling network, existing value element system and other spatial dimensions, in order to support the systematic research and judgment on the conditions and problems of old industrial buildings regeneration.

In terms of design objects, this study focuses on the old industrial buildings in the northwest part of Bijiang Natural Village (locally known as Zhangyi Precinct), and takes the

nodes that have the conditions for community-based renovation as the design objects. The node design includes building units, their internal courtyards and street-facing frontage. The reason for choosing the old industrial buildings in this area as the design object instead of the large-scale industrial parks in the periphery is that: the old factory buildings scattered in the village texture have the highest degree of spatial coupling with the daily life of the neighboring communities, and they have the geographic basis and practical urgency for the transformation into community public space. Its closed status has the most direct impact on the rupture of the overall public space network of Bijiang, constituting the most valuable spatial entry point for catalyst intervention.



Figure 1-2 Research Scope
(Source: Drawn by the author)

1.3.2 Research Content

Focusing on the core issue of "how to realize community-oriented regeneration of old industrial buildings in Bijiang Village through the mechanism of urban catalysts", this research is carried out at the following four levels:

Theoretical research level. To sort out the development and core concepts of community-oriented regeneration of old industrial buildings and Urban Catalyst Theory, to summarize the transferable experiences through typical case studies, and to construct the theoretical analysis framework of this study (Chapter 2).

Background cognitive level. From the three dimensions of regional spatial evolution, policy and institutional framework, and the distribution characteristics of old industrial

buildings, we clarify where the old industrial buildings in Bijiang come from and what context they are in, so as to provide a macro background basis for the subsequent analysis (Chapter Three).

Status quo research level. From the four dimensions of spatial system, crowd composition and public life, physical characteristics of old industrial buildings, and external spatial characteristics of old industrial buildings, a systematic investigation of the current situation of Bijiang's old industrial buildings is carried out, so as to summarize the core contradictions and deduce the direction of the regeneration (Chapter Four).

Strategy and design level. Under the support of the first three levels, the regeneration strategy and phased design scheme based on Urban Catalyst Theory is proposed: the first phase completes the acupuncture implantation of catalyst nodes and the formation of community network, and the second phase promotes the diffusion of catalyst effect and the improvement of community network.

1.4 Literature Review

1.4.1 Current status of research on community-oriented regeneration of old industrial buildings

The research on the reuse of old industrial buildings has gradually evolved from focusing on the "monumental protection" at the material level to the "community-oriented regeneration" focusing on the daily life of the community.

The research on the protection of old industrial buildings in China started relatively late, and the early theoretical construction was mainly based on the established standards in the West, which was not only slightly weaker than the theory of the protection of ancient buildings in China, but also limited to the static identification of historical and artistic values. With China's accession to the Convention Concerning the Protection of the World Cultural and Natural Heritage (1985) and the release of a series of programmatic documents such as the Wuxi Recommendations (2006) and the Beijing Initiative (2010), the domestic industrial heritage protection system has become increasingly mature. This process has promoted the transformation of the value of old industrial buildings from mere "monumentality" to "dynamic value" focusing on the local context and practical utilization, and the functional connection between old industrial buildings and the city and community has gradually become the focus of research.

In the specific research level of community-oriented regeneration of old industrial buildings, domestic academics have roughly experienced three stages. Early studies focused on

the possibility of transforming old industrial buildings into residential support or public facilities: Wu Musheng explored the genius loci of old industrial buildings through design practice and proposed a strategy to protect and utilize old industrial buildings in modern residential planning[5]; Jin Zhiqiang and Liu Bo explored the feasibility of transforming old industrial buildings into community support and public service facilities under the framework of regulations[6].Since then, research perspectives have gradually expanded to economic synergy and social network construction: Liu Lihua points out that the reuse of industrial remnants has the advantage of promoting the synergistic development of economy and society[7]; Zhang Xichen and Xu Wenjie take Wuxi as an example to demonstrate the important role of old industrial buildings as a carrier of community public services in cultivating new economic growth points and shaping community identity[8]. Around 2020, research has been further segmented and diversified, and perspectives such as "community social network", "community servicing", and "community consumption" have been introduced, exploring how old industrial buildings can be transformed from "negative urban spaces" into autonomous and dynamic community venues through the creation of community building oriented to community services and self-governance.

Since the 21st century, foreign studies have gone beyond the static protection of "monuments" and turned to in-depth exploration of the interactive relationship between old industrial buildings and the neighboring residents and social structure, and have shown a pattern of parallel promotion of advocacy research and critical reflection . At the level of advocacy research, Carol Berens has systematically elaborated the role of redeveloping industrial sites in solving the complex financing and planning problems of cities, and emphasized the importance of transforming abandoned sites into vibrant new communities[9]; while the relevant conference papers of ICOMOS and Hevermann's research further emphasized the mechanism of public participation in the context of the community[10]. At the level of empirical and critical research, Jasna Cizler et al. confirmed the key role of introducing the power of established residents in tapping the socio-economic potential of a site through a quantitative and qualitative analysis of the transformation of an industrial wasteland in Austria[11]. Meanwhile, some scholars pay attention to the social conflicts brought by regeneration, such as Ben Jones, who takes the gentrification of industrial communities in the UK as an example and analyzes the impact of the redevelopment process on the collective memory of the working class[12]; Richard Lloyd puts forward the concept of "New Bohemia" based on the case of Chicago, and criticizes the over-reliance on consumer space. Richard Lloyd proposed the concept of "New Bohemia" based on the case of Chicago, criticizing the regeneration strategy of over-reliance on consumer

space, and advocating the defense of the rights of the community in regeneration[13], while Venda Louise Pollock attempted to establish a theoretical framework that transcends post-industrialism and integrates daily social life and spatial transformation by documenting the 30-year de-industrialization process in Glasgow[14].

In summary, the research on the regeneration of old industrial buildings has gradually returned from the early monumental preservation and industrial cultural tourism development to a path centered on the daily life of the community, and the old buildings are being redefined as a key spatial resource to promote community integration and community coexistence. However, there are still two limitations in the existing research: first, the existing research is mostly based on the case analysis of general urban industrial buildings, and there is a lack of targeted theoretical response to the specificity of the old industrial buildings in Bijiang Village, i.e., the complexity of industrial space superimposed on the traditional urban fabric and the collective village tenure structure; second, the macro-level research focuses on the large-scale industrial parks, and there is a lack of targeted theoretical response to the community-oriented regeneration of small-scaled old factory buildings. Secondly, macro-level research focuses on large industrial parks, and there is a lack of systematic and in-depth analysis on micro issues such as property rights, space utilization and coordination of historical values in the community-based regeneration of small-scale old factory buildings.

1.4.2 Current Research Status of Urban Catalyst Theory

Since its introduction, Urban Catalyst Theory has experienced a theoretical deepening process from single material space intervention to the synergistic evolution of multi-dimensional social systems, and this evolutionary trajectory constitutes the main line of the literature in this section.

The origin of Urban Catalyst Theory can be traced back to the late 1980s. The concept was first proposed by American architects Wayne Otto and Don Logan in their book American Urban Architecture - Catalysts of Urban Design (1989), and its core proposition is to activate the existing elements of the city through the strategic introduction of new elements, so as to push forward the continuous and gradual regeneration of the urban structure. Early catalyst practice was dominated by the implantation of large-scale iconic buildings or plazas at a single point, and the completion of the Guggenheim Museum in Bilbao is often regarded as a landmark case in this phase[15]. However, the limitations of monolithic catalysts have gradually emerged with the advancement of the practice, and it is difficult to respond to the complex needs of urban regeneration in the existing stock space era, and the theoretical perspective has then shifted

from isolated spatial interventions to the attention of the overall linkage and dynamic activation of the Urban Catalyst effect in the city.

Since the introduction of the theory of catalysts in the late 1990s, domestic studies have shown a clearer evolution in stages. Early studies focused on the identification of point catalysts and single-point interventions: Jin Guangjun systematically explained the classification of catalysts in the form of "point, linear, and surface", and demonstrated the stimulation mechanism of the chain reaction triggered by the intervention of specific catalysts on the surrounding environment. Zhang Mu took Shanghai Xintiandi as an example, and examined the demonstration effect of catalysts in commercial development and revitalization of historical space[16]; Zhang Mu took Shanghai Xintiandi as an example, and examined the demonstration effect of catalysts in commercial development and revitalization of historical space[17]; Zhang Mu took Shanghai Xintiandi as an example, and examined the demonstration effect of catalysts in commercial development and revitalization of historical space as well as in commercial development. "In the case of Shanghai Xintiandi, the demonstration effect of catalysts in commercial development and revitalization of historical space is examined[17]. Since then, the research horizon has gradually expanded to economic synergy and spatial network construction: Lu Jiwei and Han Jing have taken the rail station area as an example to demonstrate the catalytic significance of transportation hubs as catalysts for urban multifunctional spatial networks[18], while Yun Yingxia and Tian Jian have explored the old city regeneration mode guided by catalyst Theory, emphasizing on the search for the economic synergy between public interest and market operation[19]. Around 2020, the research was further subdivided: Zhao Rui et al. sorted out the trend of Catalyst Theory's extension from Urban Design to Rural Planning and micro-regeneration[20]; Jiang Lei et al. put forward the catalyst time-sequence strategy focusing on social interaction and community participation in the light of the industrial remnants regeneration practice [21].

In the same period, foreign studies have formed a parallel pattern of macro strategy advocacy and empirical critical reflection: Timothy S. Chapin takes sports facilities as a starting point and argues the strategic guiding role of large-scale public facilities in reshaping the urban spatial structure and promoting the regional economic renaissance[22]; Carl Grodach focuses on the flagship cultural facilities such as museums and explores their core driving role of catalysts[23]; and Carl Grodach focuses on the cultural facilities such as museums and explores the role of the cultural facilities in the urban spatial structure of the city. catalysts[23]; and Carl Grodach focuses on flagship cultural facilities such as museums, exploring their central driving role as catalysts [24]. At the same time, critical studies have become increasingly important:

Juliet Davis's empirical study of London's Thames Embankment Park expands the conceptual boundaries of Urban Catalyst Theory in the context of complex practices[24]; Ashima Krishna's study of India's historic cities reveals the multiple conflicts that catalysts have caused between political games and economic interests[25]; Beck and Brooks' study of the city of Bengaluru reveals that catalysts can be used for a wide range of purposes, such as to promote the development of the city's cultural and cultural industries.); Beck and Brooks, on the other hand, take the perspective to the community level, exploring the impact of social enterprises and cultural heritage development as urban catalysts on community relations[26].

In summary, urban catalyst research at home and abroad generally shows a trajectory from single physical space transformation to multidimensional synergistic evolution of society, economy and culture. However, as far as the research object of this paper is concerned, there are still two limitations of the existing results: first, the existing research tends to generalize the catalyst effect, and pays insufficient attention to the context-dependence of industrial remnants or historic and cultural districts with unique cultural genes, and the lack of quantitative assessment and value screening system restricts the accurate landing of catalyst strategies in complex locations; second, the existing results mostly focus on the activation of microscopic nodes or the activation of macro-cities. Secondly, the existing results mostly focus on the horizontal analysis of micro-node activation or macro-urban impacts, and the vertical tracking of the dynamic evolution of the meso-scale neighborhood network and catalyst effect is still insufficient, which has weakened the value of the theory in guiding the practice of urban catalyst Theory.

1.5 Research Methodology and Research Framework

1.5.1 Research Methods

(1) Literature Research Method

We systematically search and sort out the relevant academic literature on community-oriented regeneration of old industrial buildings and Urban Catalyst Theory, summarize the current status of domestic and international research and theoretical evolution, and construct the theoretical foundation of this study. At the same time, we collect and organize the local records, historical documents and policy documents of Bijiang Village, so as to sort out the logic of the historical formation of Bijiang's industrial space and the background of the policy evolution, and to provide a basis for the development of site knowledge and regeneration strategies.

(2) Field survey method

Through several field surveys, systematic observation and recording of Bijiang's old industrial buildings and neighboring communities were carried out, covering the current status of old industrial buildings, street frontage characteristics, spatial frontage and spatial fabric, as well as the composition of the population in the area and their activity patterns in different time periods. At the same time, the questionnaire survey is used to collect the evaluation of the use of the existing public space and the demand for regeneration from the local residents, so as to provide a local basis for the development of functional configuration and spatial strategy.

(3) Typology Method

The old industrial buildings in the area are systematically categorized in terms of building structure, spatial form, current use, ownership conditions and other dimensions, and a typology analysis framework for old industrial buildings is established to identify the spatial characteristics and transformation potential of each type of building, and to serve as a basis for the development of differentiated demolition and transformation strategies.

(4) Spatial analysis method

Based on the CAD base map and 3D modeling, the architectural layout, spatial fabric and land boundaries within the design scope are systematically sorted out, and the quantitative assessment of the public service facilities rationing status of the area is carried out in combination with the Standard for Urban Residential Area Planning and Design (GB 50180-2018) to identify the facility gaps and spatial breaks, so as to provide quantitative support for the formulation of the regeneration strategy.

(5) Big Data Analysis

With the help of big data platform to obtain the distribution of crowd activities and spatial and temporal characteristics of Bijiang Area, analyze the distribution pattern of vitality centers within the area and the surrounding areas, and assist in judging the reasonableness of the siting of catalyst nodes and the direction of public thoroughfare layout.

1.5.2 Research Framework

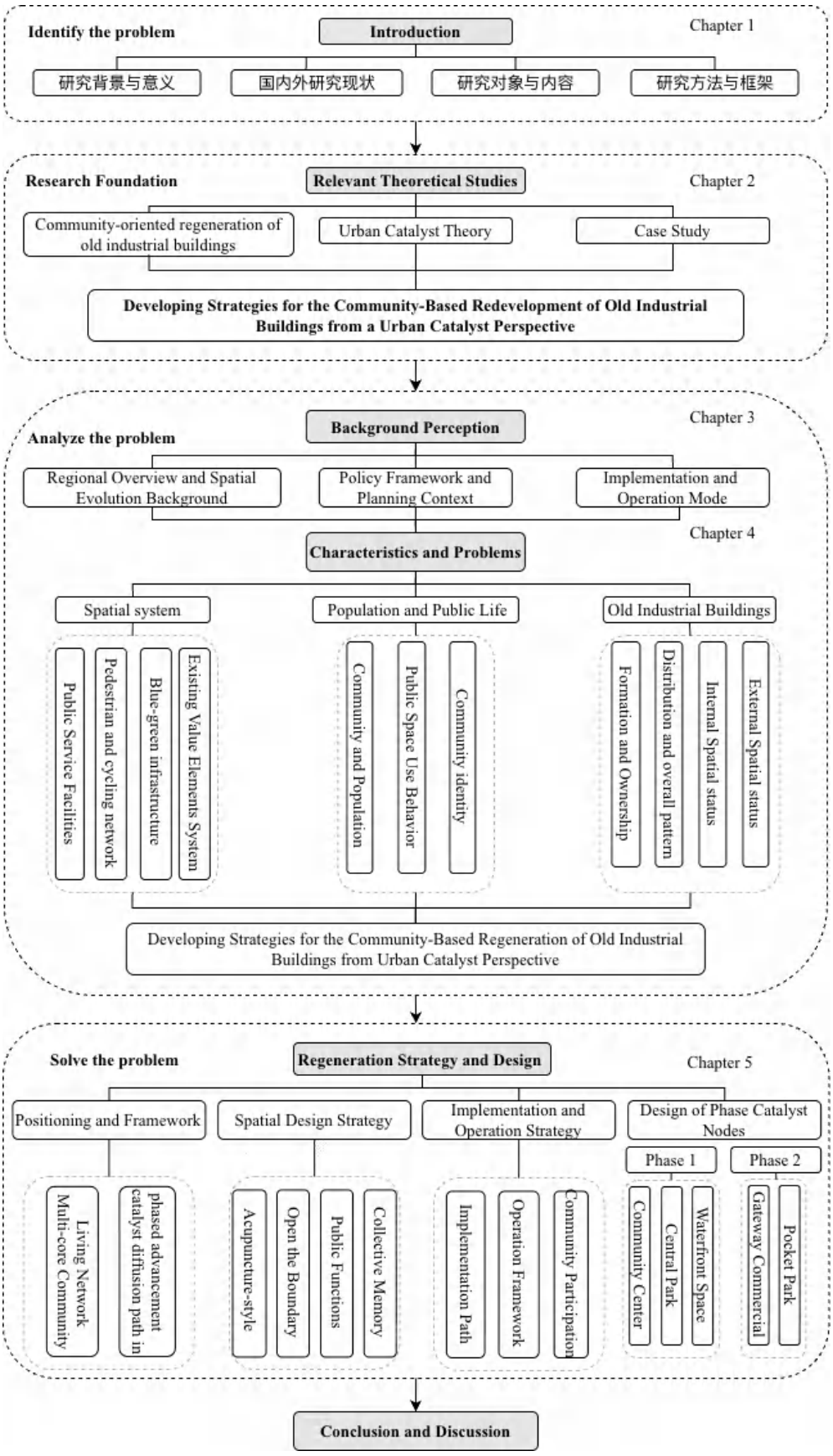


Figure 1-3 Research Framework
(Source: Drawn by the author)

The overall framework of this study consists of four parts, namely, problem formulation - theory construction - status quo study - strategy design. Starting from the background of stock-based urban regeneration and the reality of Bijiang's old industrial buildings, the study puts forward the core problem, and then constructs a regeneration strategy through the compilation of community-oriented urban regeneration, Urban Catalyst Theory and case studies. Then, the policy background, spatial system, crowd demand and old industrial buildings in Bijiang are investigated in order to identify the core contradiction and deduce the direction of regeneration; finally, the regeneration strategy and design plan are transformed into a complete research loop with the catalyst node as the anchor point and the time sequence of phasing and gradual progression.

Chapter 2 Relevant Theoretical Studies

2.1 Community-Oriented Regeneration of Old Industrial Buildings

Community-oriented regeneration of old industrial buildings is the core topic of this study. Before discussing how old industrial buildings in Bijiang can be reintegrated into the community life network through community-oriented regeneration, it is necessary to first clarify the connotation of the relevant core concepts, elucidate the theoretical logic of the transformation of old industrial buildings from "remnants of industrial production" to "places for community life", and clarify the specific context and goal orientation of community-oriented regeneration in the present study. The specific context and goal orientation of community-oriented regeneration in this study are clarified.

2.1.1 Definition of Core Concepts

1. Old industrial buildings and Bijiang old industrial buildings

In this study, “old industrial buildings” belong to the category of industrial remnants in a broad sense. Industrial remnants refer to abandoned or unused industrial sites that have retained certain industrial production relics and remnants of industrial production activities, but whose historical and cultural values do not yet meet the statutory criteria for industrial heritage. In the system of industrial remnants, different from the macro-scale old industrial areas, the "old industrial buildings" referred to in this paper focuses on the more microscopic old industrial buildings.

Based on the above definition and the specificity of the research object, this paper defines “Bijiang old industrial buildings” as the industrial space and its ancillary environment located in Bijiang natural villages, which have lost their manufacturing function during the process of counter-industrialization and have the possibility of redevelopment. This not only refers to the building units, but also the surrounding semi-outdoor space and spatial fabric. In the context of community, these old industrial buildings are close to the residential community and have strong spatial accessibility, providing a physical basis for integration into the community life.

2. Community

“Community” is a basic concept in sociology, and its connotation has been enriched with the evolution of social patterns. The concept was first proposed by German sociologist Ferdinand Tönnies in 1887. He defined “community” as the “Gemeinschaft” of the juridical society of the industrial age[27]. The "community" of this period was a group of people based

on blood ties, geographic ties, shared cultural awareness, and a sense of belonging and identity, as opposed to a "society" based on individual will, rational contract, and law[28].

In the 1920s, American sociologists expanded the term to mean "the community in which people live and work", and used the English word "community" instead of Tennessee's "Gemeinschaft"[29]. In the 1930s, Fei Xiaotong, a Chinese sociologist, introduced this concept into China and defined it as "a mutual aid and cooperation group formed within a region"[30]. With the continuous evolution of ideological concepts and theoretical foundations, the connotation of "community" in different disciplines has been more clearly defined and broadly expanded . In the perspective of urban and rural planning, "community" is not only a social group, but also a basic functional unit in the urban spatial organism. In this study, the term "community" refers specifically to the composite local community as the key actor within the Bijiang Natural Village, which is composed of the original residents, and also includes the foreign renting population and commercial operators.

3. Community-oriented Regeneration

In this paper, "community-oriented urban regeneration" is defined as a stock-based urban regeneration process that takes the community as the key actor, takes local community residents as the main service targets, and aims to protect the rights and interests of community residents, improve the living service facilities, improve the quality of cultural activities, and strengthen the sense of belonging to the community[31]. Specifically for this study, the community-oriented urban regeneration of old industrial buildings is not a simple building repair, but refers to the transformation of unused or abandoned old factory buildings into public places or supporting facilities serving the surrounding community residents through functional conversion and spatial reconstruction, thus realizing the reintegration of existing industrial stock space with the daily life of the community. The core difference from general urban regeneration is that community residents are not only passive beneficiaries of the regeneration results, but also participate in the decision-making and operation of the key actor.

4. Community-oriented regeneration of old industrial buildings and the concept of adjacency

Community-oriented regeneration of old industrial buildings intersects with the concepts of "industrial heritage preservation" and "organic regeneration" in practice, but their connotations and focuses are different and need to be analyzed. "Industrial heritage conservation" emphasizes the identification, protection and inheritance of industrial remnants with historical, scientific, technological, social or architectural values, and its core logic is the preservation of values, and the objects usually have a certain threshold of legal or academic recognition[32]. The old industrial buildings in Bijiang involved in this study are mostly ordinary

productive buildings constructed after the reform and opening up, with limited overall historical and cultural value, which makes it difficult to be included in the scope of industrial heritage protection, but their spatial forms and industrial memories are still of community identity significance, so this study adopts the concept of "community-oriented regeneration" rather than "heritage preservation" as the core framework. Therefore, this study adopts "community-based regeneration" rather than "heritage protection" as the core framework.

"Organic regeneration" was proposed by Mr. Wu Liangyong, emphasizing that urban construction should follow the inner order of the city, and achieve the goal of overall harmonious regeneration in an appropriate scale, appropriate size, and step-by-step manner[33]. Community-oriented regeneration of old industrial buildings and organic regeneration have a high degree of consistency in the operational logic of "incremental regeneration" and "respecting the existing texture". However, the difference between the two is that community-based regeneration more clearly takes "the satisfaction of community residents' needs" and "the reconstruction of community community" as the value orientation, rather than only remaining in the continuation of spatial form.

2.1.2 The Evolution of Theory of Old Industrial Buildings Regeneration

Regeneration of old industrial buildings is not a spur-of-the-moment strategy, but a process of long-term evolution of urban regeneration theories. Looking at the relevant theories and practices at home and abroad, we can find that the value of old industrial buildings and the way of utilizing them have gone through a profound transformation: from single material protection to social function expansion, and from "monumental" to "daily life" return.

At the level of international experience, the early theory of old industrial buildings was mainly based on static identification, emphasizing the screening and preservation of the historical and artistic value of industrial buildings, and treating industrial buildings as "monuments" witnessing industrial civilization. The logic of conservation at this stage is centered on preservation, and there is a clear separation between it and the living community life. With the advancement of practice, academics have gradually realized that static conservation divorced from the social context can hardly bring sustainable vitality to old industrial buildings, and the interaction between them and the surrounding residents and social structure has begun to receive attention. At the same time, advocacy and empirical studies have been carried out on topics such as financing and planning paths for industrial land redevelopment, and public participation mechanisms in community contexts, etc. Critical perspectives have also gradually entered the research field: scholars have revealed social

contradictions triggered by the intervention of commercial capitals in the process of regeneration, including the impacts on collective memories, the erosion of community autonomy and the problems of false prosperity caused by the over-reliance on consumer space. Scholars have revealed the social contradictions caused by the intervention of commercial capital in the process of regeneration, including the impact on collective memory, the erosion of community autonomy, and the over-reliance on consumer space, which has brought about the false prosperity of vitality, and have attempted to establish a theoretical framework that integrates daily social life and spatial transformation.

At the level of domestic theoretical development, the research path of the regeneration of old industrial buildings is closely related to the process of improving the industrial heritage protection system. With China's accession to the Convention Concerning the Protection of the World Cultural and Natural Heritage (1985) and the release of programmatic documents such as the Wuxi Recommendations (2006) and the Beijing Initiative (2010), the domestic industrial heritage protection system has become more and more mature, and the recognition of the value of old industrial buildings has also shifted from the purely "monumental" to the "dynamic value" that focuses on the local context and the realistic utilization, which has provided a theoretical prerequisite for the research on the regeneration of old industrial buildings[34]. This provides a theoretical premise for its regeneration research[34]. On this basis, the community-oriented regeneration of old industrial buildings in China has gone through three progressive stages. Early research focused on the material space level, exploring the possibility of transforming old industrial buildings as residential support or public facilities, with the core issue being the feasibility of functional conversion at the technical and regulatory levels; thereafter, the research perspective was expanded to economic synergy and social network construction, and old industrial buildings began to be regarded as a spatial carrier for stimulating regional vitality and cultivating new economic growth points; around 2020, the research was further oriented to the sociological dimension, with the "community social network" as the main theme of the study. "Community social network"[35], "community servicization"[36], "community transformation"[37], "community consumption"[38], "community development"[39], and "community development"[40]. The perspectives of "community transformation"[37], "community consumption"[38], and so on, have been introduced to explore how old industrial buildings can be transformed from once "negative urban spaces" into autonomous and vibrant community venues through community building oriented towards community services and self-governance.

In the local context of the regeneration of old industrial buildings in the Pearl River Delta, the formation mechanism and transformation practice of village-level industrial parks constitute an unavoidable institutional and spatial background[39]. Since the reform and opening up, the Pearl River Delta region has gradually formed a large number of village-level industrial clusters based on the collective land system and the historical accumulation of village industrialization, which has become an important carrier to support the rapid development of the regional economy[40]. However, this rough development path has also created a series of structural problems, such as inefficient land use, fragmented spatial fabric, and chaotic industrial structure, which are becoming more and more significant as the pressure for industrial upgrading continues to accumulate[41].

In the face of these difficulties, the Pearl River Delta region has taken the "Three Olds Redevelopment" policy as the core institutional tool to promote the systematic improvement of village-level industrial land. The practice cases in Nanhai District show that the policy intervention has achieved initial results in optimizing land use and repairing the urban spatial structure; the industrial cluster-oriented transformation mode has also been proved to be helpful in enhancing the competitiveness of the parks and alleviating the pressure of tight land resources[42]. However, there are obvious limitations in the policy implementation of the existing transformation practices: the policy preference for industrial-to-commercial-residential redevelopment has led to the "industrial hollowing out" of the local manufacturing industry[43]. Although the introduction of the "industrial protection zone" policy aims to protect industrial development space, the difficulty of land integration and the complexity of the benefit distribution mechanism still constrain the progress of the transformation process[44].

The discussion of village industrial transformation in the above studies mainly focuses on the industrial economy and land policy level, and pays relatively little attention to the spatial dimension of the community in the transformation process. Some studies have begun to touch on this topic: some scholars have proposed micro-renovation strategies such as natural ecological continuation and transportation reconstruction from the perspective of spatial structure to improve the external environmental quality of village-level industrial parks; some studies have also pointed out that the renovation and enhancement of public space has an important supportive role in attracting talents and promoting high-quality development, and that there is a built-in mechanism between the renovation of village-level industrial parks and the reconstruction of public space that promotes each other [3]. However, the perspective of the above research still takes the park as a whole as the main object, and there is a lack of systematic and in-depth discussion on how the spatial transformation of small-scale old industrial buildings

embedded in traditional settlements and highly intertwined with the daily life of the community can respond to the public life needs of the local residents and how to effectively activate the vitality of the community within the constraints of the framework of historical and cultural preservation[45]. This research gap is where this paper focuses on the problematic awareness of community-oriented regeneration of old industrial buildings in Bijiang.

In summary, the theoretical evolution of the regeneration of old industrial buildings is essentially a process of value focus migration from conservation to spatial reuse, and then to the reconstruction of community life. The above evolution shows that different function-oriented regeneration practices have formed their own characteristic type systems and design strategies, which provide a referable operational framework for the community-oriented regeneration of old industrial buildings in Bijiang.

2.1.3 Types and Strategies of Regeneration of Old Industrial Buildings

The practice of regeneration of old industrial buildings has formed a clearer differentiation of types. Comprehensive practice at home and abroad, the regeneration and reuse of old industrial buildings can be divided into the following five basic types: cultural heritage and museum display, cultural and creative industrial parks, urban commercial complexes and cultural tourism, public recreation and landscape parks, as well as community-oriented regeneration and living that benefits people's livelihoods. Different types show significant differences in functional orientation, spatial strategies and operation modes, corresponding to different site conditions and regeneration objectives. In this section, the core practices of each type are summarized in turn, on the basis of which the typological orientation of this study is clarified.

I. Industrial Museums and Cultural Exhibits

This type mainly targets industrial heritage with outstanding historical, technological or artistic values, and focuses on the preservation of authenticity by transforming old industrial buildings into industrial-themed museums or art exhibition halls for the continuation of historical memories and the display of industrial culture[46]. Representative cases include the Museum of Science and Industry in Manchester, UK, Qingdao Beer Museum, and Shenyang China Industrial Museum.

In terms of spatial strategy, the core of the project is "original protection", which maximizes the preservation of industrial traces such as the exterior of the old building, the workshop environment, large-scale machinery and equipment, production lines and railroad tracks. On the premise of not destroying the main structure, the lighting can be improved by

adding skylights or partially removing floor slabs, and a clear flow of visitors can be planned[47]. In terms of operation strategy, the main focus is on popularization of science and education and cultural heritage, combining modern technologies such as virtual reality, augmented reality, and touch screen to enhance the immersive experience of visitors on the basis of static display[48]; in addition, old employees of the original factory are hired as tour guides and interpreters to convey historical memories as first-hand witnesses.

The limitation of this type is that the applicable object must have a high historical or industrial heritage recognition value, and for the ordinary productive factory buildings constructed after the reform and opening up, the access threshold is difficult to meet, and the scope of application is relatively limited.

II. Cultural and creative industrial park

Cultural and creative industrial parks are one of the most common paths for the reuse of old industrial buildings at home and abroad. Relying on the advantages of open space and plasticity of old industrial buildings, the parks introduce cultural creativity, art design and technology research and development industries to form a creative industry cluster. Representative cases include Beijing 798 Art District, Shenzhen Overseas Chinese Town Creative Culture Park, Shanghai No. 8 Bridge and so on.

In terms of spatial strategy, the advantages of large-span industrial building and high ceilings are utilized to carry out flexible horizontal and vertical segmentation, and to divide into artist studios, galleries, and office areas for independent design enterprises with appropriate scales[49]. The renovation emphasizes the juxtaposition of the old and the new, retaining historical elements such as rough red bricks and huge steel frames, and incorporating modern materials such as glass and metal for contrast. In terms of operation strategy, the park focuses on attracting the creative class of culture, art, science and technology, forming an industrial chain agglomeration effect, and making the park a platform for urban cultural exchanges and a creative incubator by regularly organizing creative bazaars, art exhibitions, lectures and other activities[50].

The service targets of this type are mainly the creative class and foreign consumers, with limited relevance to the daily lives of neighboring original residents, risk of gentrification and community exclusion effects. This limitation is evident in the subsequent operation of several creative parks in China.

III. Commercial Complex and Cultural Tourism Development Category

On the basis of retaining part of the industrial elements, commercial complexes and cultural tourism development are integrated with commercial, office, tourism, shopping,

entertainment and other industries through the commercial operation of multi-functional spaces, so as to create urban consumer landmarks with unique experiences. Representative cases include Ghirardelli Square in San Francisco, the New Town of Vienna Gas Storage Tanks, and the Shanghai International Fashion Center.

In terms of spatial strategy, a mixed development mode is adopted, whereby the internal space is extensively reconstructed to adapt to the commercial flow on the basis of retaining part of the industrial style, and even new large-volume modern buildings are constructed outside the old structure to increase the commercial area. Focusing on the openness of the street-facing frontage and the visual attractiveness of the entrance, large windows, plazas and waterfront outlooks are often set up. The operation strategy of is dominated by purely commercialized operation, where industrial elements are refined into "cultural symbols" and marketing gimmicks to attract a wide range of urban and foreign tourists through the integration of high value-added businesses such as food and beverage, shopping, hotels, showrooms, and entertainment[51].

This type of commercial logic-driven regeneration often reduces industrial remnants to a decorative backdrop for consumer scenes, and the historical memory and community relations of the site are systematically erased instead of being truly sustained.

IV. Landscape Parks and Public Recreation

Landscape parks and public open spaces are mainly designed for heavy industrial sites with large land area and low building density to carry out ecological and landscape transformation and restoration, so as to transform industrial remnants into urban public open spaces. Representative cases include North Duisburg Landscape Park in Germany, Qijiang Park in Zhongshan, Guangdong, and Yangpu Riverside in Shanghai.

In terms of spatial strategy, large-scale industrial structures such as blast furnaces, trusses, and railroad tracks are combined with natural vegetation and transformed into amphitheaters, rock-climbing walls, ecological planting pools, or walking corridors, realizing the fusion of "industrial outer shell + green core"[52]. In terms of operation strategy, it is oriented to ecological protection and public welfare, and is open to the public for free or at a low price as a city-level public open space, and enhances the vitality and cohesion of the public space by organizing community gatherings, outdoor performances, and other activities[38].

This type of public nature is stronger, but its applicable conditions are usually large area factory land, for deeply embedded in the traditional settlement fabric, plot size is limited in Bijiang old industrial buildings, the overall transplantation of the feasibility is not high;

however, its open space approach to open borders, implantation of greening and public activity venues, in the level of local intervention still has a reference value.

V. Communityization and living that benefit people's livelihoods

Community-oriented regeneration transforms old industrial buildings into community public service facilities or living spaces that are closely connected to the surrounding residents, in order to make up for the shortcomings of public services in old communities. Representative cases include Xi'an Old Vegetable Market, Xi'an Three Five One One TFEP, and Shanghai Sanyinqiao Community Park.

In terms of spatial strategy, a "micro-regeneration and light transformation" approach was adopted, whereby the closed walls of the original factory area were removed to sew up the boundary between the factory and the city, so that the building could be seamlessly connected to the surrounding neighborhoods and alleys. The interior of the building is opened up and convenient facilities such as a vegetable market, community service center, neighborhood activity room and fitness area are implanted; the transparency of the building is enhanced by enlarging the window and door openings on the façade and increasing the glass curtain wall, which promotes the interaction of sightlines and behaviors within and outside the community[34]. In terms of operation strategy, it relies on the "15-minute living circle" and focuses on serving the daily needs of the surrounding residents, avoiding excessive high-end commercialization. Adopting the operation mode of public-commercial integration, mixing basic services such as fresh food supermarkets, affordable food and beverage, and convenient maintenance with public welfare facilities such as community libraries and cultural lecture halls, and through the development of activities such as parent-child interactions and community neighborhood festivals, the old factory building is built into a public living room of the community with a sense of warmth[53].

In summary, the regeneration of old industrial buildings at home and abroad can be mainly divided into five basic types, each of which has significant characteristics and certain limitations in terms of functional orientation, spatial strategies and operation modes. The ultimate purpose of sorting out the core practices and applicable conditions of the above five types is to identify the most suitable type of orientation for this study, taking into account the specific conditions of the actual site and the objectives of the regeneration.

2.1.4 Positioning and Principles of Bijiang Old Industrial Buildings Regeneration

I. Positioning of old industrial buildings in Bijiang

Based on the five types of framework summarized in 2.1.3, the positioning of Bijiang's old industrial buildings can be clearly judged. Most of Bijiang's old industrial buildings are ordinary productive buildings constructed after the reform and opening up, with limited overall historical and cultural value, and do not have the threshold of heritage recognition required for the regeneration of industrial museums; there is a fundamental contradiction between the context of the Historic and Cultural Village in which it is located and the large-scale commercial development of commercial complexes; although the category of Cultural and Creative Industrial Parks has a certain value of reference in spatial approach, its functional orientation to serve the creative class is not the same as that of Bijiang's original inhabitants, who are the main focus of the regeneration of Bijiang. Although there is some reference value in the spatial approach of cultural and creative industrial parks, its functional orientation of serving the creative class does not match with the community as the key actor of the original residents in Bijiang.

Therefore, the regeneration of Bijiang's old industrial buildings should be positioned as community-oriented regeneration as the key actor , with community services as the key actor in terms of functional orientation, and at the same time, draw on the revenue balancing mechanism of the mixed operation mode to maintain the sustainable operation of public welfare functions; in terms of spatial approach, it can be referenced to the experience of the Landscape Park category in terms of community building and greening implantation, as well as the experience of the Cultural and Creative category in terms of industrial memory retention and interface transformation. In terms of spatial approach, we can refer to the experience of the landscape park category in open space creation and green implantation, and the cultural and creative category in industrial memory retention and interface transformation.

II. Limitations of the existing research framework and the specificity of Bijiang's situation

When the research results of community-oriented regeneration of old industrial buildings are directly applied to the Bijiang context, there are still three levels of mismatches, which not only reveal the limitations of the existing research framework, but also constitute the necessity for this study to be based on the local conditions of Bijiang.

First, the specificity of the geographical context. Existing studies have focused on standard industrial sites in urban centers, and the logic of regeneration is based on the premise that the nature of the site is relatively homogeneous and the historical and cultural attributes are weak. The context of Bijiang's old industrial buildings is different: Bijiang is a national Historic and Cultural Village, whose settlement fabric is superimposed by traditional clan fabric and industrialized intervention. The old industrial buildings of Bijiang are not the product of

planning will, but the result of bottom-up growth under the collective land system of Shunde since the reform and opening up, deeply embedded in the traditional settlement fabric, coexisting with clan history and lane-and-alley network for a long period of time, and forming a complex spatial attribute of village-industrial double superposition. This attribute makes the community-oriented regeneration of Bijiang's old industrial buildings not only respond to the logic of revitalization of industrial remnants, but also look for feasible paths within the framework of protection of Historic and Cultural Village.

Secondly, the spatial scale is specific. Existing research often focuses on large-scale industrial parks or industrial transformation issues at the regional level, and pays relatively little attention to small-scale, scattered, deeply embedded in the traditional settlement fabric of old industrial buildings. The old industrial buildings in Bijiang that we focus on in this study are neither large-scale integrated industrial parks nor isolated monolithic industrial remnants, but rather a number of small-scale industrial plots with limited scale and relatively centralized distribution, which are embedded in the traditional settlement texture in the form of islands. At this scale, the core issue of regeneration is not only the functional conversion of the buildings, but also the open space of , the restoration of the spatial fabric of the neighborhood and the reconstruction of pedestrian accessibility. Existing researches are still insufficient to provide a direct reference for the regeneration of old industrial buildings in Bijiang.

Third, the locality of demand structure. Existing studies tend to focus on community demand in general public space, but lack in-depth analysis of the demographic structure of a specific community and the current situation of facility provision. Beijiao Town, where Bijiang is located, has a strong economic base, with a certain foundation of commercial service facilities and the initial development of cultural and tourism business. Against this background, what Bijiang's old industrial buildings need to fill is not the gap of commercial value, but the lack of public space directly related to residents' daily public interaction, all-age activities and healthy life. The specificity of this demand structure means that the community-oriented regeneration of Bijiang's old industrial buildings cannot simply copy the commercial-oriented revitalization model, but must take the supply of public space and the activation of community vitality as the core objectives, and make localized adaptation and deepening on the basis of the existing research framework.

III. The core principles of community-oriented regeneration of old industrial buildings in Bijiang

Based on the above positioning judgment and contextual analysis, this study extracts four core principles for community-oriented regeneration of Bijiang's old industrial buildings, which

will run through the whole process of design and be implemented in the design of functional configurations and operational mechanisms at each node.

Public Priority: Functional configurations should be oriented to responding to community demand gaps rather than maximizing commercial value. The renovated space of old industrial buildings should be truly open space for local residents, ensuring low threshold and high accessibility, so that the results of the regeneration can effectively benefit the all-age population of the neighboring community.

Low-cost intervention: Priority is given to retaining the main structure, with interface transformation, functional conversion and outdoor space remediation as the main means to lower the initial transformation threshold. This principle not only responds to the fragmentation of property rights of old industrial buildings in Bijiang, which makes it difficult to develop them as a whole at one time, but also matches the progressive logic advocated by the theory of catalyst, which is to activate the whole in a small way, and creates the conditions for phased advancement.

Community participation throughout the whole process: Introducing the residents' participation mechanism at each stage of planning, design, construction and operation, so that the community as the key actor in the process of regeneration is transformed from a passive beneficiary of the regeneration results. This principle echoes the tradition of participatory community building that Bijiang has been accumulating since 2019 - community-oriented regeneration is to take the community as the key actor of regeneration, and the renovation of old industrial buildings is a spatial extension of Bijiang's tradition of community building, rather than a one-way implantation of external forces.

Sustainable operation: Establishing a multi-party collaborative operation framework with the village collective as the core, supporting the long-term operation cost of public welfare space with moderate commercial functions, and preventing the systematic erosion of community public nature by commercial logic. In the core nodes, the village collectives will take the lead in the operation, and in the supporting spaces, they will moderately introduce private self-operated businesses, forming an internal cross-subsidization mechanism to ensure that the results of the regeneration will be sustainable in the long term.

The above four principles point to one core judgment: the community-oriented regeneration of Bijiang's old industrial buildings can neither apply the logic of industrial land regeneration in urban centers nor copy the commercial development-oriented village revitalization model, but requires a differentiated path that can simultaneously respond to the requirements for the protection of Historic and Cultural Villages, the demand for microscale

spatial restoration, and the gaps in the local community's public life. These four principles require a set of methodological framework that can deal with multiple ownerships and realize progressive intervention, which is highly compatible with the multiple constraints of the local conditions of Bijiang's old industrial buildings, and constitutes the core theoretical support of this study's strategic framework.

2.2 Urban Catalyst Theory

2.2.1 Origin and Core Connotation of Urban Catalyst Theory

Urban Catalyst Theory emerged in the late 1980s in the context of urban regeneration practice in the United States. At that time, the central city of the United States was generally facing the predicament of decay, and the early urban regeneration mostly adopted the radical means of large-scale demolition and construction, which had little effect due to the copying of European theories and neglecting the local cultural lineage. Against this background, American architects Wayne Attoe and Donn Logan published American Urban Architecture - Catalysts of Urban Design in 1989, formally proposing the concept of urban catalysts.

The original definition of the two scholars described urban catalysts as strategically introduced new elements that revitalize existing elements in the city without radically altering them, and when the catalyst stirs up such new life, it also influences the form, character, and quality of the urban elements that are introduced in its wake[15]. This definition is centered on two points: catalysts act on existing elements rather than replacing them; and the purpose of catalysts is not to produce a single end-product, but rather to serve as a starting point for a chain of subsequent regeneration, contributing to a continuous and gradual evolution of the urban fabric. The term "catalyst" is originally a chemical concept that refers to a catalyst that can change the rate of reaction without being consumed by a small intervention[16], and has been introduced into the field of urban studies as a spatial intervention that can accelerate the process of urban development.

On the basis of the theoretical framework of Otto and Logan, domestic scholar Jin Guangjun further defines Urban Catalyst Theory as a new element that can lead to changes in the city and accelerate or change the speed of urban development, i.e., through the intervention of a specific catalyst intervention, it triggers a certain kind of "chain reaction", thus promoting the sustained and gradual development of the city[16]. Based on the original definition, this formulation emphasizes the dynamic and processual nature of the catalyst mechanism.

Centered on the above core definition, the catalyst theory forms a conceptual system composed of catalysts and catalyst effects.

The catalyst is the spatial medium that triggers the reaction of urban regeneration, and it is the main body of the catalyst theory. The catalyst effect is the catalytic influence on the surrounding urban environment after the catalyst intervention, which is the core mechanism of the catalyst theory. The occurrence of catalyst effect is not homogeneous, but presents several typical characteristics: first, attenuation effect, the radiation intensity of the catalyst decreases in a gradient from the center to the outside of , but it is often easy to produce active interactions and new mutations in the fringe area[16]; second, feedback effect , the surrounding environment, when activated, will, in turn, enhance the value of the original catalyst elements, forming a symbiotic relationship[54]; third, superposition effect Third, the superposition effect, when the influence area of multiple catalyst points overlap, the local energy will be multiplied and strengthened, and the overall benefit is greater than the simple sum of the elements[54]. The extension of the catalyst effect in time and space is a dynamic evolutionary process of "element intervention--energy transfer--chain reaction--network formation", which usually undergoes three steps: firstly, identifying and implanting original catalyst points with stimulation potential; secondly, shaping the catalyst medium by means of spatial integration, traffic suture, functional conversion, etc., so that the impact energy can be transferred outward, and the catalyst network can be promoted. Secondly, the catalyst effect is shaped by means of spatial integration, transportation stitching, functional replacement, etc., so as to transfer the influence energy outward and promote the resonance of the old and new elements; finally, the direction of the catalyst effect is dynamically guided and corrected through policy support and rolling development, so as to expand the catalyst effect from a single element to a linkage network on a neighborhood or even a city scale. The value of the catalyst effect lies in the fact that it makes progressive development an operable path.

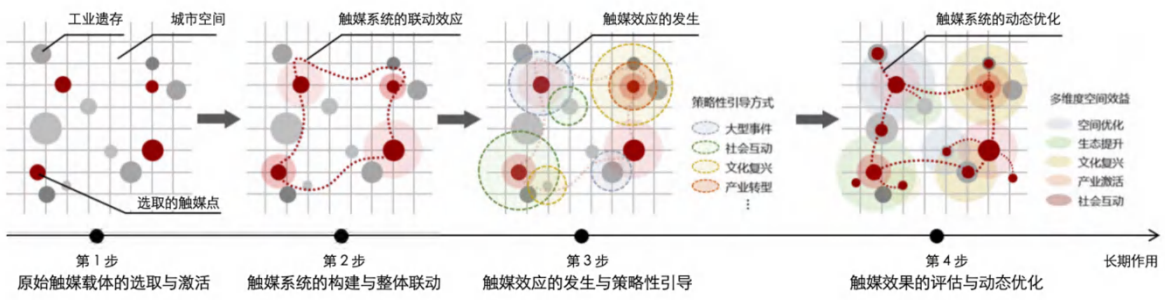


Figure 2-1 Schematic diagram of the reaction process of urban catalyst effect
(Source: Reference[21])

2.2.2 Types of Urban Catalysts and Mechanisms of Action

Catalysts cover a wide range, including both physical catalysts with physical form - such as building monoliths, open space, transportation infrastructure, etc., and non-physical catalysts

without physical bearing - such as development policies, urban events, cultural activities, etc[16]. The impact of the former is usually spatially limited, while the latter's effect is often more intrinsic and long-lasting. Tangible catalysts are material catalysts with a physical spatial form, ranging from landscape vignettes, architectural monoliths, to functional areas developed in a piecemeal fashion, and their impacts on the city are usually more direct, with perceptible spatial limits [16]. Intangible catalysts, on the other hand, refer to abstract elements that do not have a physical carrier, including development policies, planning guidelines, large-scale urban events (e.g., world expositions, sports games), and folk cultural activities, etc., whose impacts tend to be intrinsic and long-lasting, and whose scope of coverage is more difficult to be bounded. In specific urban regeneration practices, tangible and intangible catalysts usually work in tandem with each other, and a catalyst strategy that relies solely on physical spatial interventions without the support of policies and events is often unsustainable.

Urban catalysts can be categorized into point catalysts, linear catalysts, and areal catalysts according to the external spatial form, which is mainly for material catalysts[16]. Point catalysts, i.e. specific construction projects, generally recognizable and iconic, starting point, local radiation effects, such as monolithic buildings, plazas, traffic nodes, etc.; Linear catalysts, several linear spaces, with directionality and continuity, guiding the flow of people or traffic, spreading to the borders of the two sides, such as the street, waterfront, rail transit lines; Gal catalysts, i.e. pieces of the development of the area, with complexity and readability, the peripheral influence of a great deal of influence, a strong edge effect, such as urban strong edge effect, such as the central area of the city, historic district, residential area. The three types of point, linear and surface catalysts can be transformed and nested with each other, or together they can form a complete catalyst network.

According to the service scope and level, city-level catalysts can be divided into two categories: city-level regeneration catalysts and community-level catalysts. The service scope of city-level catalysts covers the whole city area, with a high degree of functional composite, and has a strong value of displaying to the outside of and the ability to drive; the service scope of community-level catalysts is limited to the community or the neighboring area, which focuses on improving the quality of the daily life of the community, and promotes the social revitalization of micro-regeneration level[19]. This study focuses on the old industrial buildings in Bijiang, whose regeneration positioning mainly belongs to the category of community-level catalysts, while taking into account certain functions of city-level catalysts.

In addition to the above categorization, urban catalysts can also be classified according to the type of project development, the dominant function and industry, and the form of industrial

heritage (see Table 2-1 for details). All of these segmentation frameworks have direct methodological reference value for the identification and extraction of catalyst elements of Bijiang old industrial buildings in this study.

Table 2-1 Urban Catalyst Classification

Classification	Specific classification	Core Characteristics	Typical examples
1. By material properties	Physical catalysts (physical catalysts)	Possesses a physical spatial form; impacts are usually external, short-term and spatially limited.	Fountains, steps, single buildings (museums/transit stops), established commercial or residential areas.
	Non-physical form catalysts (Invisible/soft catalysts)	Abstract elements that are not physically carried; impacts are usually intrinsic, long term, and large in scope.	Development policies, guidelines, construction trends, major urban events (Olympics/Expo), folklore activities. 2.
2. By external spatial form	Point Catalysts	Specific construction projects; recognizable and iconic, starting point, local radiation.	Monolithic buildings, squares, transportation nodes.
	Linear Catalysts	Linear space; directional and continuous, guiding pedestrian/vehicular flow, spreading to both boundaries.	Streets, waterfronts, rail lines.
	Facial Catalysts	Complexity and legibility of the developed area, great influence on the surrounding area, strong "edge effect". *(Note: points, lines and surfaces can be interchanged and nested)*	City center, historic district, residential area. 3.
3. According to the type of project development	Formal development	Government or developer-led large and medium-sized, landmark/pilot projects; economic or policy-driven.	Civic plaza, city center park.
	Informal Development	Networked public spaces formed by citizens' bottom-up efforts to remodel abandoned and vacant plots of land.	Abandoned corners, temporarily eliminated parking spaces.
4. By dominant function and business form	Five major function types	Different development intensities and scales according to core carrying functions.	Center business type, culture and exhibition type, leisure and commercial type, professional market type, open space type.
	Three major development directions	Divided according to the macro-orientation of urban development.	Urban function catalyst, urban culture catalyst, urban ecological catalyst.
	Industry-driven classification	Segmented for the functions in industrial heritage regeneration.	Commercial function catalyst, leisure function catalyst, special industry catalyst (creative industry/tourism industry, etc.).

5. By Service Scope and Level	City-level catalysts for urban regeneration	Serving the entire city area; high degree of functional complexity and strong driving force for subsequent regeneration.	It is a business card for the city's external communication.
5. By Service Scope and Functionality	Community-level Catalysts	Serving the community or neighborhood; aiming to improve the quality of life and promote micro-regeneration.	Community-level micro-regeneration projects.
6. Specific Subdivision of Industrial Heritage	Physical form	Physical segmentation specific to industrial remnants.	Site forms (mining sites/industrial plazas), individual facilities (industrial buildings/equipment installations).
	Intangible forms	The cultural and spiritual core of the industrial remnants.	Cultural content (genius loci / regional characteristics / urban culture / industrial culture).

(Source: drawn by the author)

The role of urban catalysts is not a one-time static implantation, but a dynamic evolutionary process from local intervention to overall linkage, and its diffusion path usually goes through the following three stages:

The first stage is the implantation and local activation of the original catalyst. On the basis of fully evaluating the location conditions, cultural resources and spatial potential, the flagship nodes with stimulation ability are selected as the starting point for catalyst implantation, which will trigger preliminary changes in its direct neighborhood, forming perceptible spatial and functional changes.

The second stage is the shaping of the catalyst medium and energy transfer. The original catalyst has a limited radiation range, so it must be shaped by means of spatial integration, path stitching, and functional supplementation, so as to spread the influence energy outward. In this stage, the old elements activated and the new elements introduced resonate with each other, forming new catalyst nodes and driving the common development of a wider area. At the same time, the attenuation, feedback effect and superposition effect are synchronized to shape the spatial pattern of catalyst diffusion.

The third stage is the formation and dynamic guidance of catalyst network. As the chain reaction continues to advance, multiple point catalysts are gradually connected into a neighborhood-scale or even city-scale catalyst network. This process requires the synergy of policy support, market operation and multi-phase rolling development, as well as dynamic

correction according to the actual deviation of the reaction path, in order to ensure that the catalyst effect continues to spread in the expected direction and realize incremental regeneration.

The evaluation of the effect of catalyst intervention usually requires a comprehensive consideration of the macro comprehensive benefits and the micro spatial quality at two levels. At the macro-benefit level, it mainly includes the economic dimension (whether it drives the appreciation of the surrounding land, attracts investment, and promotes industrial agglomeration) and the socio-cultural dimension (whether it enhances the sense of place identity, perpetuates the historical lineage, and promotes the harmonious interaction of community participation and social relations) [55]. At the micro-spatial level, the evaluation indicators usually cover the rationality of the functional structure and the composite and complementary nature of the industry, the accessibility and connectivity of the public space (which can be quantitatively assessed with the help of tools such as space syntax), the continuity of the pedestrian and cycling network transportation system, the coordination between the architectural style and the surrounding environmental texture, and the degree of excavation and reuse of the site's historical and cultural resources . In addition, SWOT analysis is often introduced in the pre-project planning to prejudge the dominant influencing factors in order to eliminate the negative spillover effects and ensure the effectiveness of catalyst interventions[16].

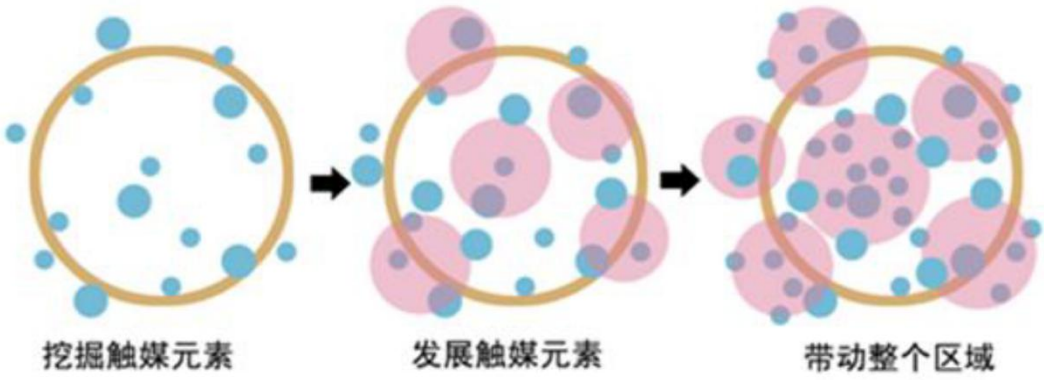


Figure 2-2 Schematic diagram of catalyst action stages
(Source: reference [56])

2.2.3 The Potential of Old Industrial Buildings as Urban Catalysts

The core premise of the Urban Catalyst Theory is that the selected catalyst element must have the inherent potential of triggering a chain reaction - it should be able to respond to the implantation of external functions as well as produce a perceptible catalyst effect on the surrounding environment. As a special category of existing stock space, old industrial buildings are structurally compatible with the operating conditions of the catalyst mechanism in three dimensions: spatial, social and economic attributes, which constitutes the basic premise of this study to position old industrial buildings as catalyst elements.

In the context of old industrial buildings, the core of the amendment lies in the following three points: using industrial buildings or production relics with historical value as the original catalyst point instead of blindly implanting brand-new buildings[57]; shaping the cultural medium by retaining industrial materials and spatial memories, and at the same time, dismantling closed interfaces and installing additional connecting paths to shape the spatial medium, so as to realize the suture between the old factory area and the surrounding urban network[58]; adopting a The strategy of catalytic flexible design and phased development is adopted to reserve space for secondary regeneration and dynamically adjust the catalytic path according to market feedback to avoid the risk of one-time blueprint construction[59].

Old industrial buildings have inherent conditions to become effective catalysts in terms of spatial form. As far as the building itself is concerned, industrial buildings are usually characterized by large-span structures, high-rise spaces and simple rectangular planes, which provide great flexibility for diversified functional conversion - whether it is for cultural display, community service or commercial business, the spatial adaptation can be realized at the cost of small structural modifications. Compared with new buildings, the spatial elasticity of old industrial buildings enables them to accommodate the multi-functional composites required by the catalyst theory without the need for large-scale structural reconstruction. In terms of spatial interface, old industrial buildings usually have continuous and clear building boundaries, with closed walls and single entrances forming a clear separation from the surrounding residential fabric. This closed interface state is of course the root of the current spatial fragmentation problem, but it also means that once the interface is transformed and opened up by means of removing walls, adding entrances, and implanting street-facing frontage functions, it will produce significant visual and spatial changes, creating a perceptible catalyst effect. In other words, the closed nature of the interface of old industrial buildings itself constitutes a possibility of transformation, and the spatial contrast before and after its activation is precisely the material basis for the catalyst effect to be recognized and spread.

Catalyst theory emphasizes that effective catalyst elements should not only be able to change the surrounding material environment, but also be able to trigger the positive response of the residents in the emotional and behavioral dimensions. Old industrial buildings have a social foundation in this dimension that is difficult to replace with other newly built facilities. Factory buildings built during the industrialization period often carry the collective memory of labor and life experiences of the residents in the surrounding communities. Even if the production function is lost with the retreat of the industry, these buildings, as the material witnesses of the community's common experience in a specific historical period, still retain a

unique emotional weight in the collective memory of the residents. Activating old industrial buildings as public places for the community is not a simple reproduction of the past, but rather the use of familiar spatial forms as a carrier to re-establish the emotional connection between residents and the place, and then cohesion of community identity. This is highly consistent with the core proposition of the catalyst theory of improving established elements rather than replacing them. The social value of old industrial buildings does not lie in its historical rank, but in its emotional adhesion as a community memory node, which is an important condition for the diffusion of the catalyst effect in the social dimension.

In addition, the activation process of old industrial buildings itself has the potential of community mobilization. Compared with the newly implanted foreign buildings, the renovation of old industrial buildings is more likely to gain the willingness to participate and the psychological identity of local residents, which will help to form a bottom-up community consensus during the regeneration process, thus providing a social impetus for the continuous diffusion of the catalyst effect.

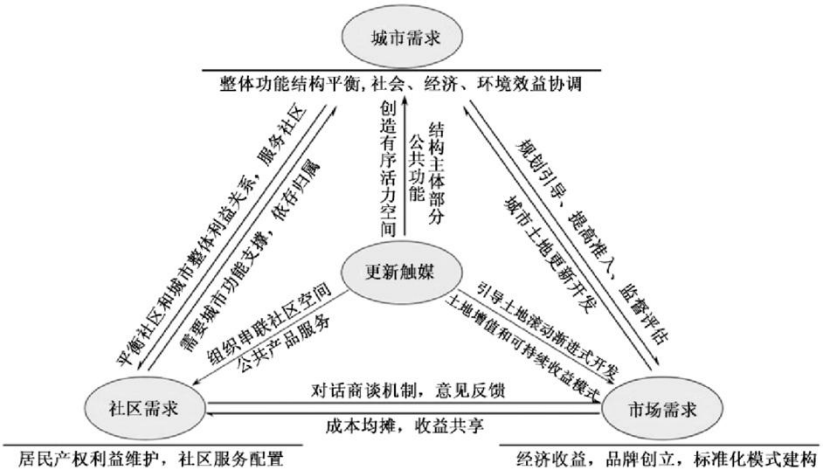


Figure 2-3 Regeneration catalyst makes all parties benefit
(Source: reference [19])

The logic of incremental regeneration in catalyst theory requires that the initial intervention of the catalyst intervention has a low threshold - not only can it be initiated with limited capital, but also can trigger subsequent chain effects without relying on large-scale one-time investment. The economic characteristics of old industrial buildings are highly compatible with this requirement. Compared to large-scale demolition and reconstruction, adaptive reuse of old industrial buildings makes full use of the existing structural system and infrastructure and significantly reduces construction costs. Retaining the original structural framework and only remodeling the enclosure system and internal space is a common low-cost intervention path in the regeneration of old industrial buildings, and this light remodeling strategy is

consistent with the economic logic of the catalyst theory, which is to use a small amount of money to make a big difference, and to use the local area to drive the whole.

In terms of development chronology, old industrial buildings usually present the characteristics of decentralized distribution and different ownerships, which objectively requires that the regeneration be promoted in a batch and incremental regeneration instead of a one-time overall development. This passive phasing condition can be transformed into a proactive strategic advantage under the catalyst framework: priority is given to selecting plots with clear property rights and ripe conditions for renovation to establish the initial catalyst node, and then gradually drive the spontaneous follow-up of neighboring plots after the value of the land has been enhanced and a demonstrative effect has been formed, so as to realize a wider activation of the regeneration under the limited investment of funds. This path matches perfectly with the diffusion mechanism of the original catalyst chain, in which the energy transfer after the implantation of the original catalyst point promotes the follow-up of the subsequent plots.

To summarize, old industrial buildings are structurally compatible with the operating conditions of urban catalysts in the three dimensions of spatial elasticity, social memory and economic logic. This fit is not accidental, but is the result of the joint action of spatial and social attributes of old industrial buildings as remnants of the industrialization period, and constitutes the theoretical basis for this study to position Bijiang's old industrial buildings as a catalyst anchor point.

2.2.4 A Catalyst-Informed Methodological Framework for Old Industrial Building Regeneration

Based on the arguments in the previous two sections, this study establishes a set of community-oriented regeneration and analysis framework for old industrial buildings in the context of Bijiang Village using Urban Catalyst Theory as the core methodological tool. The framework consists of four interconnected segments, starting from the systematic assessment of site conditions, through catalyst site selection, type configuration and diffusion of effects, and ultimately pointing to the formation of the community spatial network.

I. Systematic analysis and overall control of the site and the plant

The science of catalyst site selection relies on the full knowledge of site conditions. This study divides the site analysis into three levels: the macro level covers the policy and planning background, location conditions and history, industrial development and urban fabric, aiming at focusing on the macro development trend of the site; the meso level analysis includes the current status of the public service facilities rationing, the slow pedestrian and cycling network and pedestrian accessibility, the blue-green system and the distribution of the open space, and

the community demographics and the current status of the public life, aiming at identifying the demand gap and the potential of the site in the urban The micro-level analysis focuses on the current situation of old industrial buildings, including the type of building structure, ownership and tenure conditions of old industrial buildings, and the street frontage characteristics and spatial boundaries of old industrial buildings, aiming to assess the feasibility of the transformation and catalytic potential of each site. The three levels of analysis together constitute the basis for judging catalyst site selection, so that the subsequent intervention strategy is based on objective spatial and social conditions.

On the basis of systematic analysis, overall control of the site as a whole is carried out, considering the intrinsic needs of the city to carry out the general direction of the functional layout and selection, and proposing design objectives and guidelines to ensure that the subsequent sessions are carried out on a certain framework, so that different functional catalysts can interact with each other.

II. Initial Catalyst Node Screening and Functional Configuration

On the basis of site analysis, this study determines the implantation location of catalyst nodes based on the basic conditions of each site. Through the implantation of catalysts and their surrounding public thoroughfares, the connection blocked by the closed boundary of the old industrial buildings is rebuilt, and the spatial skeleton for the diffusion of the catalyst effect is established. The initial configuration of catalysts is carried out by point catalysts. The point catalysts correspond to specific functional nodes, which are the original catalyst effect points. The selection of functional types must take into account the daily life needs of the community and moderate cultural and tourism services, and form a clear hierarchical node system through the differentiated configuration of multiple types of functions. Specifically, this link is based on demand judgment, mainly considering the position of the catalyst node in the overall control, the corresponding type of public service gaps and specific service targets, and comprehensively characterizing the functions of each candidate catalyst node, with the goal of forming a perceptible catalyst effect at the most critical spatial nodes with minimal intervention costs.

III. Generation of catalyst effect

After the implantation of the catalyst nodes, the diffusion of the catalyst effect follows the chronological logic of incremental regeneration, forming perceptible spatial changes and functional demonstrations; then, with the help of the radiation and diffusion of the catalyst effect, the point catalysts will be linked together as a consecutive spatial experience channel, and the function supplementation and environmental remediation at the interface will slow down the decay of the catalyst effect, leading the neighboring parcels that are still not yet ripe

to follow up, and realizing the spontaneous incremental regeneration. The following is the result of the gradual and spontaneous regeneration of the neighborhood. The improvement of the blue-green infrastructure and the street frontage is taken as the construction content of the linear catalyst, and synchronized with the construction of the point catalyst nodes in each phase, so as to strengthen the spatial continuity of between the catalyst effects in each phase. This logic of phasing not only responds to the objective constraints brought about by the dispersed property rights of old industrial buildings, but also maintains consistency with the core mechanism of catalyst theory, which is to drive the overall progressive regeneration by local activation.

IV. Formation of catalyst network

With the completion of the construction of the catalyst nodes and the continuous spread of the catalyst effect, the discrete catalyst points are gradually connected into a catalyst network covering the community space. This network is spatially manifested as an open space system composed of point catalyst nodes and linear catalyst thoroughfares, and socially corresponds to the spatial carrier for the reconstruction of the community's public life. This is the target state of community-oriented regeneration of old industrial buildings pursued by this study. From a macroscopic perspective, this network itself constitutes a "surface catalyst" in the sense of catalyst theory. It is no longer just a collection of discrete nodes, but as a spatial system with overall effectiveness, it plays an activating role in the larger urban structure, leading to the linked regeneration of the surrounding areas. The significance of community-oriented regeneration of old industrial buildings in Bijiang does not stop at spatial restoration within the community; the formation of its catalyst network has the potential to become an important driving force in the process of existing stock-based urban regeneration in Beijiao Town, Shunde.

2.3 Case Study

Based on the previous summary and discussion of the community-oriented regeneration of old industrial buildings and Urban Catalyst Theory, this section will select a number of different types of old factory building renovation cases, sort out the specific methods of each case in terms of regeneration background, spatial design, implementation and operation, etc., and summarize the methodology suitable for the community-oriented regeneration of Bijiang's old industrial buildings available to the subsequent chapters, which will provide the basis of the case for the subsequent chapters.

2.3.1 High-Density Urban Village Regeneration with Multiple Needs: Nantou Ancient City, Shenzhen

I. Regeneration Background: A High-Density Urban Village with Multiple Needs

Nantou Ancient City is located in the Nanshan District of Shenzhen, and is a "village-city" space with a history of more than 1,700 years of urbanization and 40 years of rapid urbanization in the Special Administrative Region[60]. The regeneration of Nantou Ancient City mainly focuses on the old industrial buildings and village houses in the city. Among the users of Nantou Ancient City, there are both original residents who have been living here for many years and migrant workers who work in the enterprises around Nantou Ancient City. One of the main propositions of this case is how to integrate the needs of both, and provide a better and more vibrant living scene. Before the regeneration, the high density of "handshake buildings" in Nantou Ancient City had led to a lack of public facilities and a crowded living environment; the "purple line (heritage conservation boundary)" of the conservation plan of Nantou Ancient City had led to a long period of stagnation between the two conflicting propositions of heritage preservation and transformation of the village; the complex and detailed property rights situation in the village had led to a lack of public facilities and a crowded living environment; and the complex and detailed property rights situation in the village had led to a lack of public facilities and a crowded living environment. The complex and detailed property rights in the village and Shenzhen's master plan of "the residential land of urban villages zoned in the seven-year planning period shall not be included in the demolition and redevelopment type of urban regeneration unit plan, land preparation plan and shantytown renovation plan" have made it impossible for Nantou Ancient City to be renewed through the path of large-scale demolition and construction. Therefore, Nantou Ancient City objectively requires a differentiated regeneration path that can realize gradual activation within the framework of protection.

The comparability between Nantou Ancient City and Bijiang old industrial buildings is reflected in the following three points: first, both are in the context of historical settlement fabrics, and the regeneration must find feasible paths within the constraints of historical and cultural preservation; second, both face the core proposition of activating the vitality of public space and reshaping the order of local life; and third, both face the more detailed urban fabric and complex property rights relationships.



Figure 2-4 Street Scene in Nantou Ancient City
(Source: Reference[60])

II. Spatial Design Approach: Acupuncture-style to Reshape the Community Spatial System

The regeneration of Nantou Ancient City adopts the catalyst intervention strategy of "from point to point, incremental regeneration", adopts the concept of "urban curation", and abandons the concepts of "large-scale demolition and construction" and "building an antique neighborhood". The design team adopted the concept of "urban curation" and rejected the single model of "big demolition and construction" and "building an antique neighborhood", and insisted on the principles of "minimal demolition and construction" and micro-regeneration. The design team adopts the approach of "minimum demolition and relocation, partial demolition and compensation" to avoid excessive disturbance to the residents' daily lives. In response to the complexity of the current situation of urban villages, the design team proposes to "extract - refine To address the complexity of the urban village situation, the combination of "extracting - refining" the invisible cultural lineage and "remodeling - replacing" was proposed to replace the buildings and shape new spaces under the original conditions of the place.

Firstly, the design team sorted out and reshaped the spatial network of the cross street. The design team took the original "Cross Street" of the ancient city as the skeleton, and opened up the spatial vein that extends deeply from south to north. By linking up the South City Gate, Shuyuan Square, Binde Square, the factory area, and directly to the Community Stage and Zhongshan Park in the north, the design team reconstructed the sequence of public space and cognitive map of the old city.

Secondly, the design team reshaped the public space of the community. The design team demolished the original temporary tin huts and built a new community building on the original site, combining the two-way stepped roof and the preserved basketball court to enclose the core public activity and genius loci of the village, "Bao De Plaza". At the same time, the semi-open-air "Community Stage", which witnessed the early working culture in Shenzhen, was preserved, with sloping auditoriums and lifting curtains, allowing for a flexible transition between a closed theater and an open space for daily gatherings; at the same time, the ground floor of the old

industrial buildings was opened up and transformed into an open space for a market and a creative colony, remodeling the carrier for the community's cultural life.

At the same time, the team also explored the growth of "hybrid buildings" under high density. Faced with the complex ownership of urban village plots, the team explored the flexibility and natural growth of micro-complexes under multiple ownerships by adding rooftop courtyards and moderately expanding the street frontage while respecting the boundaries of existing ownerships.

In terms of street frontage and building façade, the team respected the original aesthetics and local materiality of the village. Instead of pursuing a neat and refined skin, the design presents a full spectrum of time slices from the end of the Qing Dynasty to the present day. For example, the mixed-color ceramic tiles from Foshan, Guangdong, which fit the scale of the urban village environment, are used on a large scale in the façade materials with rusted steel plates to reflect the original texture and diversity.

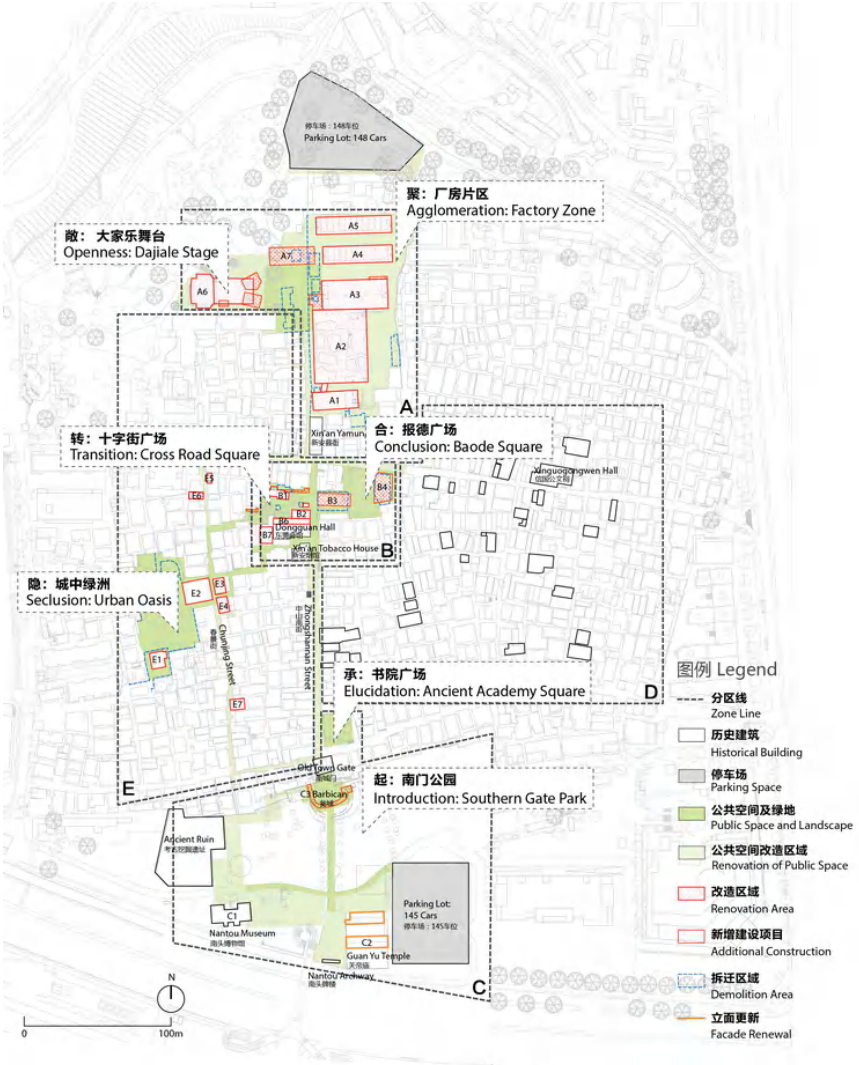


Figure 2-5 Map of Nantou Ancient City Renovation at the 2017 Deep Dual Exhibition Venue (Source: URBANUS)

III. Implementation and Operation: Stage-by-Stage Evolution Driven by "Shenzhen Shuang"

The regeneration of Nantou Ancient City is a comprehensive experiment in urban regeneration driven by a major urban event, with "capital + government" as the main body, and its operation mechanism shows a significant stage-by-stage evolution.

The regeneration of Nantou Ancient City is led by the Shenzhen Municipal Government, taking the opportunity of the 2017 Bi-City Biennale of Urbanism/Architecture (UABB) being located in Nantou, breaking the rigid boundaries of the streets and village collectives' regular management with the help of this international pioneering cultural event. The temporary nature of the exhibition has provided a window of time for some "non-compliant" spatial innovations, and has led to the subsequent "Nantou Ancient City Historic Preservation and Characteristic Style Pilot Comprehensive Improvement Plan", which has given a "green light" to subsequent spatial innovations. During the Sham Shuang period, multiple interventions and social design empowerment were involved. For example, Shum Yip Group and other enterprises initiated the "Regeneration Program", through the introduction of multi-disciplinary designers to carry out public welfare micro-renovation of five native street stores, in an attempt to stimulate the intrinsic kinetic energy of the business; the implementation of a number of social design projects (e.g., the "Nantou Milk Tea Shop"), which not only A number of social design projects (such as "Nantou Milk Tea Shop") have been implemented, not only to carry out spatial renovation of stores in Nantou, but also to go deeper into community research and business model incubation, to help tenants who have been rooted in Nantou for more than ten years to complete capacity building, so that they not only stay in Nantou, but also become the masters of the city.

After the closure of Shenzhen Shuang, Nantou has entered the stage of enterprise construction and unified rental operation in the late stage of regeneration. It is built and operated by a large real estate developer (Vanke). Under the guidance of "micro-regeneration" policy, facing the policy and time pressure, the operator adopted the mode of "leasing buildings along the main street" for overall regeneration and commercial investment, which greatly accelerated the implementation speed. In order to make Nantou Ancient City's living scene more refined, the operator controlled the types of businesses that entered Nantou Ancient City and refused to introduce low-end food and beverage, so that the Nantou Ancient City would have a more refined commercial and cultural tourism imagery.



a) UABB activities in the remodeled square b) Zhongshan South Street after remodeling

Figure 2-6 Nantou Ancient City after remodeling
(Source: URBANUS)

IV. Summary

Nantou Ancient City has carried out a series of design and renovation based on the real needs and the exhibition narrative of "Shenzhen Shuang", hoping to take the opportunity of "Shenzhen Shuang" to sort out the vein of public space in Nantou, and to provide a structural framework for the future enhancement of Nantou. These nodes of public space will serve as points of cultural events during the exhibition period, and will continue to serve as carriers of community life after the exhibition. In addition, the intervention of "Sham Shuang" also provides an entry point for Nantou Ancient City and other similar sites, communicating administrative decisions and residents' needs through cultural events, and effectively upgrading the environment of the urban village.

Table 2-2 Summary of Nantou Ancient City Regeneration Highlights

Categorization	Regeneration Highlights	Specifics
Spatial Design	Point by point and progressive activation; reshaping spatial sequences, core spaces, and cultural carriers; exploring the growth pattern of multi-ownership units; respecting the local materiality of buildings.	Remodeling of the "cross street"; demolition of the tin roofs, new buildings with a two-way stepped form, opening up the ground floor of the old industrial buildings; the use of ceramic tiles and steel plates that fit in with the scale of the urban village environment.
Implementation and Operation	The first stage is driven by a big event and operated jointly by the government and capital; the second stage introduces real estate developers to attract investment and normalize the operation.	Multi-party intervention, empowering community stores, stimulating commercial momentum; "Nantou Ancient City Historical Protection and Characteristic Style Pilot Comprehensive Improvement Plan" came into being; the latter part of the project adopts the mode of "leasing buildings along the main street" for overall regeneration and commercial investment, controlling the type of investment.

(Source: Drawn by the author)

2.3.2 Community-Oriented Industrial Space Regeneration: Shenyang Donmaouku Warehouse Complex Renovation

I. Case Overview and Regeneration Background

Shenyang Donmaouku Warehouse Complex is located in the south side of Shenyang East Railway Station, which is the first generation of the Republic's warehousing park constructed during the period of anti-Americanism and aid to North Korea in the 1950s, and is also the earliest construction, largest and best-preserved civil warehousing complex in Shenyang City, and it has an important status in the history of the development of the national warehousing and logistics industry. However, its heritage value was not formally recognized for a long time, and it was not included in the preliminary list of historical buildings in Shenyang City until 2019 when it was facing demolition.In 2020, after an expert demonstration, the government decided to retain seven characteristic historical buildings and a railroad line, and the rest of the site was used for real estate development, and in the conditions of the land grant, it required the developer (China Resources Land) to protect and reuse the seven historical buildings, but the property rights remains with the government.

The comparability between the Donmaku Warehouse Complex case and the Bijiang old factory building regeneration is reflected in the following two points: firstly, both belong to the reuse of existing stock space in the context of the residential community, and the direct goal of the regeneration is to improve the quality of public life in the community; secondly, both are facing the problem of spatial urban regeneration between the old industrial buildings and the newly built environment in the surrounding area, and need to explore the feasible paths of integrating old industrial buildings into the community under the premise of preserving the memories of the industrial space. It is necessary to explore the feasible path of integrating old factory buildings into the community under the premise of preserving the memory of industrial space. Different from the case of Nantou Ancient City, the Donmaku Warehouse Complex case provides a model of activating the public life of the community through the systematic functional conversion and integration of the old and new texture with the catalyst of old industrial buildings, which is a more direct reference for this study at the level of the transformation strategy of the old industrial buildings.



a) Aerial photo of Donmaouku Warehouse Complex before remodeling.



b) Warehouse before remodeling

Figure 2-7 Donmaouku Warehouse Complex before transformation.
(Source: URBANUS)

II. Catalyst intervention: implantation of nodes and systematic integration of old and new texture

The logic of Donmaouku Warehouse Complex's catalyst intervention is based on the design strategy of "preserving the warehouse as a gene and driving the growth of the overall public space system of the community", and it has outstanding operational experience in the positioning of the function of the catalyst nodes and the integration of the spatial fabric.

In terms of functional conversion of catalyst nodes, the design team differentiated the functional positioning of the seven preserved warehouses, with Warehouse 2 and Warehouse 4 as the core catalyst nodes, and Warehouse 4 was converted into a "Community Cultural Warehouse+" containing a wedding hall, a city exhibition center, a community art space, and a community garden, assuming the function of a community genius loci; Warehouse 2 was converted into a "Community Cultural Warehouse+" containing a wedding hall, a city exhibition center, a community art space, and a community garden, assuming the function of a community genius loci; while Warehouse 2 was converted into a community cultural warehouse, with the function of a community cultural warehouse, and the function of a community cultural warehouse was assumed. Warehouse 2 was positioned as a community library (Times Cultural Warehouse) and became a branch of the Dadong District Library with government support, reinforcing its openness and attractiveness to the neighborhood with clear public welfare attributes. Both core nodes choose to lead with highly public cultural functions, effectively avoiding the risk of community exclusion that may be brought about by a purely commercial function orientation.

In the integration of spatial system, the design team took the gable wall of the warehouse as the theme, and refined the characteristic elements of this industrial building into a common

design language to unify the old and new buildings, which was systematically applied in the form design of the community's commercial interface, the entrance of the residential area and the kindergarten and other new public buildings. The significance of this strategy lies not only in the harmonization of the landscape, but also in the synchronization of the forms, so that the preserved warehouses become the structural skeleton of the entire community's public space system visually and spatially, rather than an isolated historical relic. Multiple catalyst nodes thus enclose the Times Park together with the new public buildings, forming a continuous public space interface, realizing the scale leap from discrete nodes to face catalysts - the spatial network constituted by the preserved warehouses plays the role of activating the public life on the scale of the community as a whole.



Figure 2-8 Exterior view of warehouse 2# and 4# after remodeling.
(Source: URBANUS)

III. Communityization Balancing Strategy: Publicity Orientation and Dissolution of Psychological Thresholds

The Donmaouku Warehouse Complex provides a noteworthy case study in dealing with the relationship between a high-end development project and the residents of the surrounding old community.

The project is located in an area surrounded by a large number of old neighborhoods that lack the conditions for public space improvement, while "Time City", as a high-end residential development project, will easily form spatial barriers and social stratification between the old and new neighborhoods if it operates in a closed posture. In this regard, the design team's response strategy is embodied in two levels: one is to open space for the Times Park and core

public buildings to the surrounding community, so that the public space dividend of high-end development can spill over to the surrounding neighborhoods, and the accessibility of public space can dissolve the community boundaries; the second is to take the rustic old warehouse form as the overall tone of the public building complex, so that the new public building can visually resonate with the industrial history memory of the old community, and reduce the accessibility of the new environment to the surrounding residents. The momentary overcrowding after the opening of Warehouse 4 confirms the effectiveness of this strategy to a certain extent - the public-oriented configuration of catalyst functions is a key prerequisite for realizing host-guest sharing and avoiding community exclusion.

However, the Donmaouku Warehouse Complex case also has noteworthy limitations in terms of community-based balancing. The regeneration model is still essentially a top-down path led by a large state-owned developer, and the substantive participation of the original residents and the surrounding residents in the regeneration planning and functional positioning stage is very limited, and the response to the community's needs mainly relies on the subjective judgments of the design team and the developer, rather than on the basis of a systematic community research and co-construction mechanism.

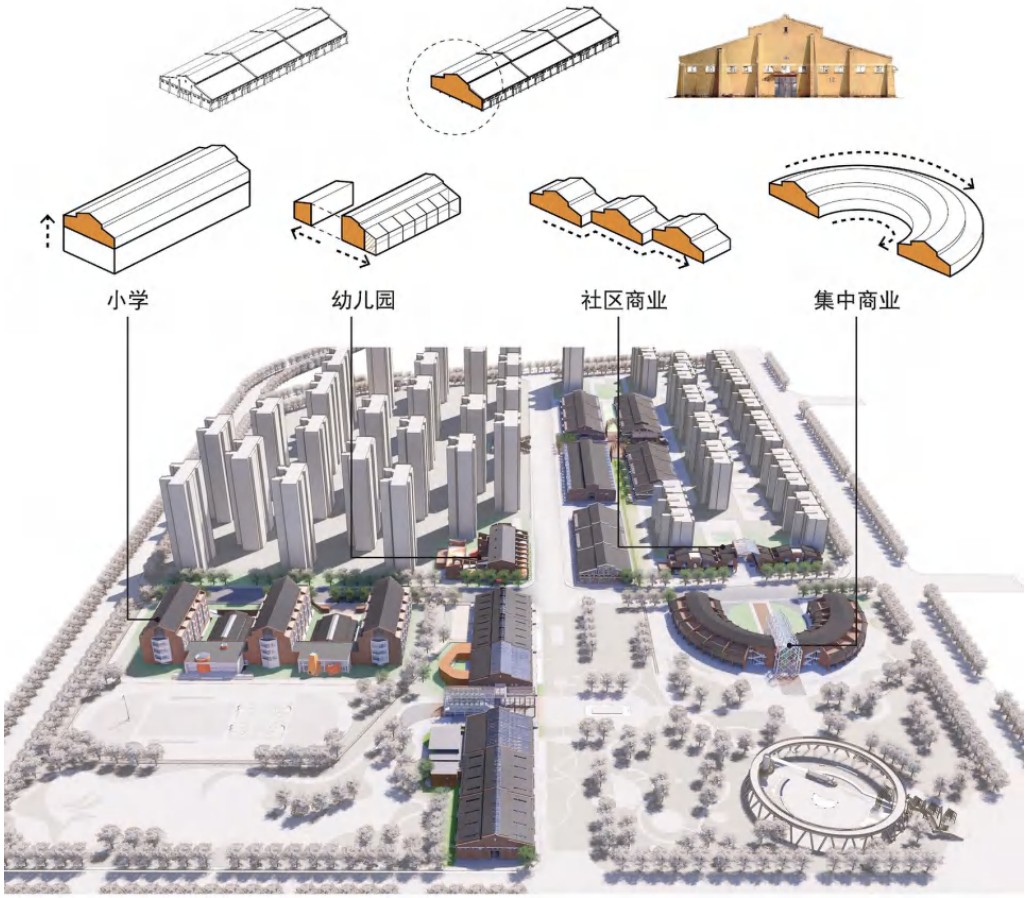
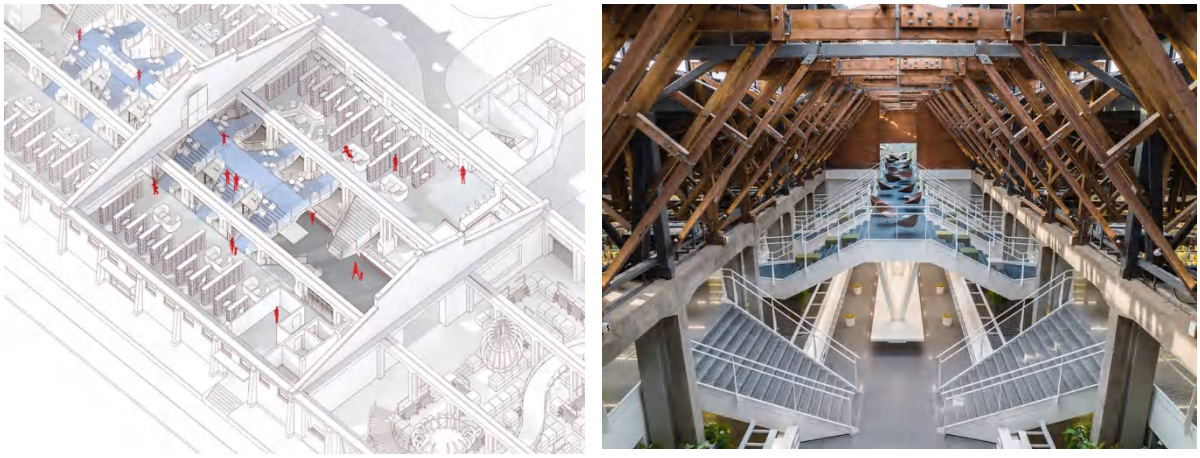


Figure 2-9 Extracting the mother theme to form a new building volume.
(Source: URBANUS)

IV. Summary

The case of Donmaouku Warehouse Complex provides the following two experiences with reference value for this study. Firstly, the positioning of public functions is a key prerequisite for the effectiveness of catalysts in old industrial buildings. Donmaouku Warehouse Complex's positioning of its core catalyst nodes as libraries, community art spaces, and other high public welfare functions, rather than prioritizing commercial returns, is the fundamental reason why its catalyst effect spreads effectively to the surrounding community, rather than forming a community exclusion. This is a direct methodological inspiration for the selection of catalyst types for old industrial buildings in Bijiang: in Bijiang, where commercial service facilities already have a certain foundation, the functional configuration of the regeneration of old industrial buildings should be based on the provision of public space as the key actor , in order to fill the gaps in the existing community as public living facilities. Secondly, the mother-theme refinement and form synchronization is an effective path for old industrial buildings to integrate into the community texture. The design strategy of integrating new and old buildings with the gable wall of the old warehouse as the main theme transforms the preserved warehouse from an isolated remnants into a structural reference of the overall spatial system, and realizes the organic articulation between the memory of the industrial space and the new environment of the community. This logic is a reference for the interface transformation of the old industrial buildings in Bijiang and the integration of the new facilities in the neighborhood.



a) Axonometric drawing of the bookstore　　b) The giant structure of the bookstore after remodeling

Figure 2-10 Donmaouku Warehouse Complex after remodeling
(Source: URBANUS)

However, the Donmaouku Warehouse Complex experience also has two limitations when transplanted to Bijiang. First, the difference in development volume and resource conditions. Donmaouku Warehouse Complex, relying on the nearly one million square meters of residential

development volume of China Resources Land, has sufficient funds to support high-quality renovation of public buildings, but this resource condition does not exist in the context of the regeneration of Bijiang's old industrial buildings, and Bijiang's renovation has to be based on a gradual and low-cost intervention path with limited capital investment. Second, the difference of ownership structure. The property rights of Donmaouku Warehouse Complex's preserved buildings are owned by the government, and the ownership relationship is relatively clear, whereas Bijiang's old industrial buildings involve village collectives, the government and enterprises, and other property rights, and the fragmentation of the ownership makes it more difficult to promote the holistic planning, and the path of regeneration must take into full consideration of property rights constraints in the stage of catalyst site selection.

Table 2-3 Summary of Donmaouku Warehouse Complex Update Highlights

Categorization	Regeneration Highlights	Specifics
Spatial Design	Differentiated functional conversion; synchronization of mother-theme refinement and form; scale leap from point catalyst nodes to catalyst nodes; lowering the psychological threshold with industrial style.	Highly publicized cultural functions dominate the design, forming a clear hierarchy of spatial functions; the gable wall form of the old warehouse is refined as a design motif, which is used as a common design language to unite the old and the new buildings; a number of catalyst nodes and the new building together enclose a continuous public space interface.
Implementation and Operation	Grafting public resources with public welfare attributes; Spillover of public space dividends; Bundling of protection obligations with land grant conditions	Through the introduction of the public library's institutional public welfare attributes, the openness and attractiveness of the public library to neighboring residents is strengthened; the Times Park and core public buildings are opened to the surrounding old communities; the government writes the requirements for the preservation and reuse of the historic buildings into the conditions of the land grant, and includes the developers as the key actor of preservation through the systematic constraints.

(Source: Drawn by the author)

2.3.3 Community Joint Development and Participatory Regeneration: Guangzhou Pantang Wuyue

I. Background of Regeneration: The Decline of Historical Villages and the Absence of Community as the Key actor

Pantang Wuyue is located on the shore of Lizhi Bay in Guangzhou's old Xiguan district, and is the only traditional settlement in Guangzhou's historic city center that has preserved the complete "fishbone" settlement fabric of the Qing Dynasty, and still continues the vernacular settlement pattern of multi-names and clans living together[61]. However, with the advancement of urbanization, Pantang Wuyue has been facing the ups and downs of "big demolition and construction" planning for a long period of time, and nearly half of the houses in the village have been left vacant after being expropriated by the government, with outdated infrastructures and a lack of space for public activities, and the whole village has been rigidly cut off from the adjacent Liwan Lake Park by the red-brick boundary wall, which has presented the appearance of a historical settlement in decline[62].

At the same time, the traditional regeneration path in Pantang Wuyue faces difficulties: firstly, the village has historical and cultural conservation value, and large-scale demolition and construction are subject to control constraints; secondly, the existing regeneration practices are generally led by the government or developers, and residents are in a passive position, so it is difficult for the community to get the real expression of their own cultural memories and demands in the regeneration decision-making. This "top-down" logic of regeneration leads to a long-term disconnect between the improvement of physical space and the reconstruction of community identity.

The comparability of the regeneration of Pantang Wuyue and Bijiang old industrial buildings is reflected in the following three points: first, both are historical villages in the Pearl River Delta region that have retained their traditional settlement fabric, and the regeneration has to look for feasible paths within the constraints of the framework of historical and cultural preservation; second, both are faced with the realities of the lack of public space and the decline in the vitality of the community, and the activation of the community's daily life is a common core proposition; third, both have a Thirdly, both of them have a certain accumulation of community building, and community residents have an intrinsic demand for local cultural identity, which provides a social foundation for the "bottom-up" participatory regeneration.

II. Spatial design approach: acupuncture micro-modification and spatial reproduction of "memory place".

The spatial regeneration of Pantang Wuyue strictly follows the bottom line of micro-regeneration, abandoning large-scale demolition and construction, and taking the refined acupuncture-style intervention as the core method to systematically improve the quality of the human environment under the premise of protecting the traditional fabric.

First of all, the design team practiced the strategy of "appropriate internal and external" building renovation. The exterior of the building continues the traditional style of Xiguan, uniformly restoring the green brick exterior wall and the hemp stone foundation, preserving and restoring the Tanglong door (traditional Cantonese sliding door) and other unique traditional components of Xiguan; the interior of the building adopts the dialectical approach of "indoorization of the streets and alleys, and internalization of the courtyards" by digging a patio and an internal courtyard to increase air flow and natural lighting, and improve the microclimate of the traditional residential area, thus realizing a combination of traditional style preservation and modernization. The balance between the protection of traditional features and the needs of modern life is realized[63]. In terms of material treatment, the design moderately includes modern elements such as floor-to-ceiling glass windows, glass brick walls and black steel structures, forming a dialogue between the old and the new with the old brick walls, avoiding the rigidity and monotony of antique restoration.

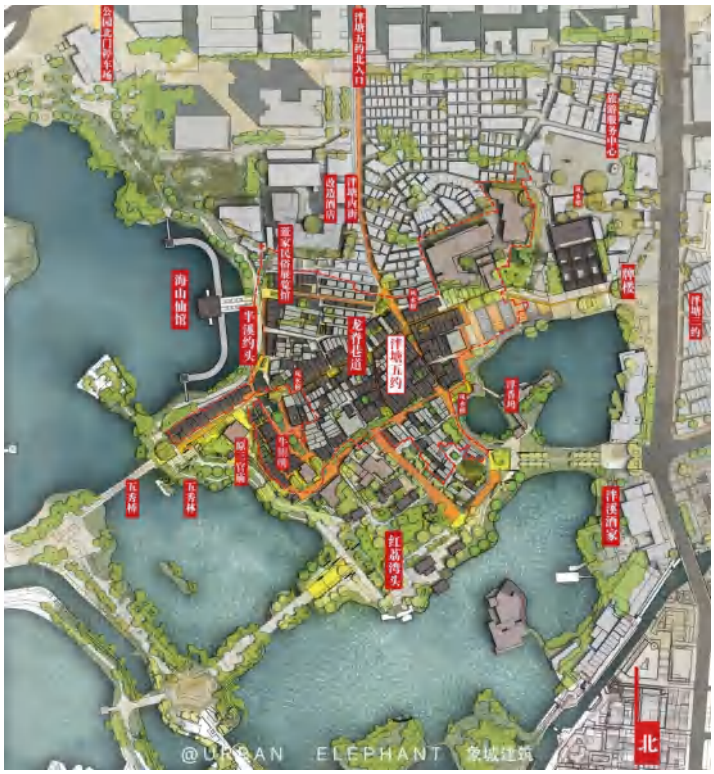


Figure 2-11 Pantang Wuyue Regeneration Plan
(Source: Xiangcheng Architecture)



Figure 2-12 Pantang Wuyue micro-regeneration plan structure diagram
(Source: Xiangcheng Architecture)

Secondly, the design team broke down the spatial barriers and reshaped the public space network. The micro-remodeling removes the wall that has long separated the village from Liwan Lake Park, and utilizes flower ponds and steps to dissolve the difference in terrain heights, realizing the full interoperability between the village and the park in terms of landscape, roads and sight lines. At the same time, through the moderate evacuation of houses, a number of pocket squares and resting nodes are created in the dense village fabric, and the underground pipe network and hemp stone paving are systematically sorted out to comprehensively improve the environmental quality of the public space[62].

On this basis, the design team focuses on the spatial reproduction and repair of "memory places". The planning team digs deep into the core nodes that carry collective memory, such as the San Guan Temple, Dun Ben Tang, and Wuyao Pavilion, and carries out key repairs and spatial remodeling. Taking the square in front of the San Guan Temple as an example, the design removes the original concrete trellis to open up the space, adds traditional martial arts stakes, and properly protects and displays the stone components of the historical door link unearthed during the construction, so that the historical landscape can be recreated. The activation of the above "memory places" not only strengthens the residents' local cultural identity, but also provides a spatial carrier with emotional temperature for the community's daily public life.

III. Implementation and Operation: Participatory Governance Path Driven by Joint Development

Pantang Wuyue is the first historic urban area micro-regeneration project in Guangzhou that relies on public capital for substantive spatial intervention. The core innovation of its operation mechanism lies in the integration of community residents into the whole process of micro-regeneration decision-making, and the exploration of a "government-led, planning-supported, community-driven, and multi-party-participation" path of joint development.

First, the community planner plays a key role in "bridge translation" and social mobilization. During their stay in the village, through long-term participatory planning research, regular micro-remodeling tea parties, and the systematic collection of residents' oral histories, the planners transformed the obscure language of planning into the residents' easy-to-understand and expressive life demands[64]. The planner took the lead in planning the "My Home in Wuyao" historical photo and model exhibition, and initiated a public call for the design of the gatehouse of San Guan Miao, which successfully awakened the local cultural identity of the residents, and gradually transformed them from passive bystanders to active participants in the planning decision-making process[63]. On this basis, the "Pantang Wuyue micro-regeneration joint development committee", which covers residents' representatives, community planners, NPC deputies, CPPCC members, the media, and experts and scholars, was formally set up at the end of 2018, led by the District Regeneration Bureau and the street. The committee set up a regular multi-party consultation platform, breaking down the traditional administrative barriers and directly coordinating the handling of complex interests such as the demolition of unauthorized building works, the siting of the gatehouse, and the construction conflicts, thus realizing the substantial decentralization and sharing of community governance power[63].

After the phased completion of the physical space renovation, the repaired public houses were handed over to the government-affiliated Culture, Commerce and Tourism Center for investment promotion and management, accurately introducing bookstores, cafes, and intangible cultural heritage-related cultural and creative industries such as Guangcai, enamel, and lion dances, so as to infuse the old village with modern commercial vitality and sustained blood-supporting functions. At the same time, the endogenous cultural power of the original residents has been fully activated. Residents have spontaneously reorganized Cai Li Fo Boxing training activities, enriched the daily inheritance of traditional folklore such as lion dances and dragon boat drums, and formed a dual-track mechanism of unified commercial operation and community cultural autonomy. This endogenous drive to resist over-commercialization with cultural self-awareness is the core feature that distinguishes Pantang Wuyue from general cultural and tourism-oriented historic and cultural district regeneration.



a) No. 12 14 Chung Pin Street, Wuyao　　b) Plaza in front of Sanguan Temple (Wuxiu Plaza)

Figure 2-13 Comparison of Pantang Wuyue before and after regeneration
(Source: Xiangcheng Architecture)

IV. Summary

The core experience of Pantang Wuyue lies in two points: transforming residents into the key actor of regeneration through the systematic construction of community planner on-site accompaniment and joint development committee, and realizing sustainable operation through the dual-track of unified commercial operation and community cultural autonomy. These two experiences have direct reference value for the community-oriented regeneration of old industrial buildings in Bijiang, but it should be noted that: Bijiang has to be based on the realistic conditions of self-financing by village collectives and the introduction of limited social capital; the joint development committee relies on the administrative system of the street, and the transplantation of the system has to be adapted to the grass-root level governance structure of Bijiang in the local context.

Table 2-4 Summary of highlights of Pantang Wuyue regeneration

Categorization	Regeneration Highlights	Specifics
Spatial design	Acupuncture-style renovation, abandoning major demolition and construction, and protecting traditional texture.	The exterior of the building continues the customary traditional style, uniformly repairing the exterior walls and stone foundations; the interior of the building "indoorization of the lane-and-alley network, internal courtyard", digging

		patios, putting in modern elements, forming a dialogue between the old and the new; reshaping the public space network, removing the walls, resolving the difference in heights, moderately thinning out, and digging deep into the core nodes of collective memory.
Implementation and Operation	Relying on public capital to make substantial spatial interventions, and truly including community residents in the whole process of regeneration decision-making.	Community planners are stationed in the village to conduct participatory research, understand residents' needs, solicit design proposals, and set up a "joint development committee" for multi-party coordination; after the completion of the reconstruction of , the cultural, commercial and tourism center will unify the investment and management of the project, so as to fully activate the community's endogenous cultural power.

(Source: Drawn by the author)

2.3.4 The Path of Village-Level Industrial Park Renovation under Collective Property Rights: Haizhu Tongchuanghui, Guangzhou

I. Background of Regeneration: Collective Property Rights Dilemma and Reform Motivation of Village-level Industrial Parks

Haizhu Tongchuanghui, formerly known as Dongfeng Village Industrial Park in Haizhu District, Guangzhou, is a typical form of village-level industrial park in Pearl River Delta region, which is constructed under the leadership of village collectives and developed as a low-end manufacturing area relying on collective construction land. Before the transformation, the park gathered a large number of low-end garment processing factories, with high building density, serious encroachment of unauthorized building works, dirty environment and prominent fire hazards, which is seriously inconsistent with the ecological location adjacent to the Haizhu Wetland, and is also incompatible with the urban image of Guangzhou's new central axis. At the same time, the complex property rights structure in the park constitutes the core obstacle to the transformation: the collective land ownership belongs to the village collective, the property rights of the above ground buildings are dispersed among multiple property owners, and the

contractual relationship of the original tenants is disjointed, so that any large-scale land requisition and demolition will face a very high risk of conflict of interest.

The comparability of Haizhu Tongchuanghui and Bijiang's old industrial buildings is reflected in the following two points: first, both are the remnants of village-level industrial parks growing from the bottom-up on collective construction land, facing similar property rights structural constraints and policy and institutional environments; second, both involve the coordination of the interests of multiple property rights holders, as well as common systemic issues such as the admission of collective land to the market and the participation of village collectives in revenue distribution. Haizhu Tongchuanghui is oriented to commercial complex and industrial upgrading, and its functional orientation is fundamentally different from Bijiang's regeneration direction which is centered on the daily life of the community, therefore, the reference value of this case mainly focuses on the level of property rights handling mechanism and implementation path.

II. Spatial design approach: industrial texture reorganization and ecological creative scene creation

Haizhu Tongchuanghui's spatial fabric transformation adopts a combination of "retaining, dismantling, reforming and constructing", with the priority goals of reducing building density and reshaping spatial fabric.

First of all, the design team systematically sorted out the overall layout of the park. It removes the tin shacks and illegal structures between buildings, eliminates fire safety hazards, and reorganizes the road network and group layout to form a clear spatial order[65]. Differentiated treatment is adopted for different types of factory buildings: large-space factory buildings are cut into office units with appropriate scales; super-high factory buildings are added with floor slabs for vertical zone increase after passing the structural inspection; and scattered small factory buildings are remodeled into continuous large spaces by opening up the partition walls or adding colonnades[66].

Secondly, the design team activated the internal space of the park through a system of corridors and courtyards. By removing the tin sheds that blocked the light and creating an inner courtyard to bring in natural light, the design team added corridors between the independent buildings, implanting functions such as exhibition, commerce, and recreation, forming a semi-outdoor space with vitality. At the same time, the main road is widened, the density of the branch road network is increased, pedestrian and vehicle traffic is separated, and a three-dimensional mechanical parking garage is built to release the ground space.

In the creation of landscape and cultural scenes, the design relies on the location advantage of the adjacent Haizhu Wetland, transforming the polluted orchard into an open park, adding walkways and sunny courtyards, and implanting greenery and graffiti landscapes on the roofs and building interfaces. At the same time, the historical memory of the site is excavated, the century-old lychee tree is preserved, the retired old dragon boat is put on display in the park square, and the old industrial buildings are transformed into a textile museum, realizing the spatial reproduction of industrial remnants and local culture memory.



Figure 2-14 Haizhu Tongchuanghui Renovation Plan
(Source: Reference[67])

III. Implementation and operation: the activation path of collective property rights of "micro-remodeling + long term rental operation".

The core innovation of Haizhu Tongchuanghui's operation and implementation lies in the breakthrough of the systematic bottleneck of the coordination of multiple interests under the collective property right, and the exploration of a transformation path that binds the village collective, the developer, the government, and the original property owner into a community of interests.

In terms of the development mode, the project abandons the comprehensive land acquisition and relocation that can easily cause huge conflicts of interest, keeps the collective land ownership unchanged, and adopts the market tool of "direct market entry of collective construction land", whereby the village collectively leases the land and the property right to the operator (Tongchuang Group) for a period of 20 years, and the rent is incremented by 10% every two years. This model enables the village collectives to obtain stable long-term income,

and at the same time, through joint ventures or agreed sharing mechanisms, integrates the government, village collectives, developers and owners of old properties into a community of interest that shares risks and benefits, effectively resolving the coordination obstacles brought about by fragmented property rights [65].

In terms of resource integration, the project introduces a local enterprise "Leader Feng Property Company" founded by village sages, which is responsible for land integration, tenant clearance and interest coordination in the early stage of the project by taking advantage of its geographical location; Tongchuang Group, a professional operator, is responsible for planning and design as well as investment and operation in the later stage of the project, thus forming an effective division of labor between local mobilization and professional operation[67]. At the same time, the Haizhu District Government established a multi-departmental joint meeting system to realize joint approval, and provided nearly 200 million RMB of credit support through the village-level industrial park renovation loan launched by the Bureau of Industry and Information Technology in cooperation with the bank, which opened up the institutional channel for the promotion of the renovation at the levels of both policy and capital.

In terms of industrial remodeling, the project did not completely erase the original garment industry genes, but relied on the location advantages of the Zhongda Fabric Market, implemented the "Taking away the cage and exchanging the bird", and accurately introduced the fashion design industry chain enterprises and live e-commerce, science and technology companies and other emerging business forms, realizing the high-end transformation of the industry in-situ[67].



a) Photograph of Dongfeng Village before remodeling



b) Haizhu Tongchuanghui after remodeling

Figure 2-15 Haizhu Tongchuanghui before and after renovation
(Source: Tongchuanghui)

IV. Summary

Haizhu Tongchuanghui provides this study with a feasible institutional path for the renovation of old industrial buildings at the village level under collective property rights: direct

market entry of collective construction land as the institutional tool, long term rental operation as the interest-bundling mechanism, and local township enterprises as the pre-mobilization main body, which effectively solves the coordination dilemma brought by fragmented property rights. This property rights treatment and implementation path has direct reference value for the promotion of the transformation of old industrial buildings in Bijiang, especially the practice of using the village collective as the core of interest coordination and introducing the long-term lease mechanism to stabilize the expectations of all parties, which is suitable for reference in the institutional environment of Bijiang.

Table 2-5 Summary of Haizhu Tongchuanghui Regeneration Highlights

Categorization	Regeneration Highlights	Specifics
Spatial Design	Integrating preservation, demolition, renovation, and new construction to reduce building density and reshape the spatial fabric.	The overall layout of the industrial park is reorganized by removing corrugated metal sheds and unauthorized structures, while applying differentiated interventions to various types of factory buildings. The internal spaces of the park are activated through a network of corridors and courtyards. Mechanized multi-story parking structures are built to free up ground-level space. By unearthing the historical memory of the site, new landscape and cultural scenarios are curated.
Implementation and Operation	The village collective, developers, government, and original property owners are integrated into a community of shared interests.	Collective construction land enters the market directly, with the village collective leasing land and property use rights to the operators. The project brings in local enterprises founded by native entrepreneurs. Leveraging the locational advantages of the Zhongda Cloth Market, emerging commercial typologies are precisely introduced.

(Source: drawn by the author)

2.3.5 Case Insights and Refinement of Regeneration Strategies

Each of the four cases has its own focus in terms of regeneration background, spatial approach and operation mechanism, but together they point to a number of strategic principles that have direct reference value in the community-oriented regeneration of old industrial buildings in Bijiang. In this section, the transferable experience of the above cases is refined from the two levels of spatial design and implementation and operation to form a strategic framework that guides the subsequent design chapters.

I. Spatial Design Strategies

Strategy 1: Acupuncture-style intervention to activate the maximum spatial effect with the minimum amount of construction and demolition.

All four cases have abandoned the rough path of large-scale demolition and construction to varying degrees, and have replaced overall removal with precise local intervention. Nantou Ancient City opened up the cross-streets with the principle of "minimum demolition and removal", and connected a number of key nodes to form a sequence of public space; Pantang Wuchuangyue opened up pocket plazas and rest nodes by moderately thinning out the dense fabric; Haizhu Tongchuanghui reorganized the spatial fabric rather than rebuilding it with the demolition of unauthorized building works and tin scaffoldings as a prerequisite. Together, these experiences show that in the context of historical settlements or village-level industrial parks with complex property rights and dense fabrics, acupuncture-style intervention is a prioritized strategy that balances implementability and spatial efficiency. The transformation of Bijiang's old industrial buildings should follow the same logic, prioritizing the demolition of temporary corrugated metal shed and unauthorized structures in order to release open space, and opening up boundaries and pathways as the first action rather than comprehensive redevelopment.

Strategy 2: Open up closed borders and rebuild spatial connections with neighboring communities

The breaking of closed boundaries is the common spatial starting point of the four cases. Pantang Wuyue demolished the wall separating the village from Liwan Lake Park, realizing the interoperability of landscape and pedestrian circulation; Nantouku Warehouse Complex opened up the ground floor of the old industrial buildings, transforming the closed industrial space into an open space that can be traversed; and Pantang Wuyue Warehouse Complex used the preserved warehouses to enclose the Times Park that is open to the community. The closure of the walls of old industrial buildings is the direct cause of the disconnection between the current

area and the community life network. Removing the walls, opening the courtyards, and opening up the walking paths are the spatial prerequisites for the formation of the catalyst effect.

Strategy 3: Activate the "memory place" to strengthen the community identity with industrial and local memories.

Donmaouku Warehouse Complex retains the gable wall form of the warehouse as the main theme, and integrates new and old industrial buildings to form a historically recognizable overall appearance; Pantang Wuyue focuses on the core nodes carrying collective memory, such as Sanguan Temple and Dunben Hall, to carry out repair and spatial reproduction; Haizhu Tongchuanghui retains the century-old lychee tree and retired old dragon boat, and transforms the old industrial buildings into the textile industry museum. The above practices show that the activation of industrial remnants and local memory not only has cultural value, but is also an effective means to cohesion of community identity and lower the psychological threshold of residents. The transformation of Bijiang's old industrial buildings can be based on the retention of typical industrial components and spatial characteristics, and transformed into a place identity that carries the collective memory of the community.

Strategy 4: Prioritize Public Functions and Respond to Real Community Needs with Low-Threshold Facilities

Donmaouku Warehouse Complex positions the core catalyst node as a library and community art space, and strengthens the attraction to the neighboring residents with clear public welfare attributes, and the overcrowding effect after the opening of the No. 4 Warehouse confirms the effectiveness of the public function positioning. Pantang Wuyue has truly responded to the residents' daily activity needs through the implantation of low-threshold public spaces such as pocket squares and martial arts practice areas. Functional configuration of old industrial buildings should be oriented to fill the gap of existing public services rather than maximizing commercial value, and only functions that truly respond to the daily needs of residents can form the basis for sustained popularity.

Strategy 5: Establishing a multi-party consultation mechanism with the village community as the core body.

The joint development committee of Pantang Wuyue and the mobilization mechanism of local villagers of Haizhu Tongchuanghui have revealed from different paths that under the background of collective land ownership, the village collective or community as the key actor is the key to coordinating multiple interests and promoting the implementation of regeneration. Pantang Wuyue to joint development committee to build a regular consultation platform, the residents' demands into the decision-making mechanism; Haizhu Tongchuanghui to lead the

abundant property company to play the advantage of geo-trust, reduce the cost of pre-integration. The transformation of Bijiang's old industrial buildings can be centered on village collective economic organisations, and a multi-party consultation platform covering residents' representatives, community planners and government departments can be established at the planning stage, so as to transform Bijiang's existing community building accumulation into institutional support.

Strategy 6: Stabilize the expectations of all parties with a long-term rental mechanism to achieve benefit sharing

Haizhu Tongchuanghui uses the direct market entry of collective construction land and 20-year long term lease as institutional tools to integrate the village collectives, the developer and the original property owners into a community of interest, effectively resolving the coordination dilemma brought about by fragmented property rights. For collective land with relatively clear property rights, the introduction of social capital can be explored in the form of long-term leases instead of one-time concessions, lowering the threshold for upfront renovation under the premise of guaranteeing sustained returns for the village collectives, so that all parties can form a stable expectation of long-term returns.

Strategy 7: Dual-track commercial operation and community self-governance, with moderate commercial support for sustainable public welfare

Pantang Wuyue has achieved a balance between commercial blood-creation and cultural autonomy through the dual-track mechanism of unified investment promotion by the government-affiliated Cultural, Commercial and Tourism Center and spontaneous folklore activities by community residents. Therefore, the village collective can coordinate the investment promotion and management of the core nodes, introduce low-threshold businesses that match the needs of the community, and at the same time reserve sufficient space and time for residents' self-organized cultural activities and daily use, so as to avoid the systematic erosion of the community's public nature by commercial logic.

Strategy 8: Breaking the deadlock with events or demonstration projects to reduce the resistance of regeneration initiation

Nantou Ancient City takes the Shenzhen-Hong Kong Biennale as an opportunity to break the administrative barriers of routine management by using the temporary nature of cultural events to fight for a policy window for spatial innovation. Therefore, in the regeneration initiation stage, the established tradition of local culture community building activities in Bijiang can be combined with the cultural or community events with public influence as an opportunity to gather consensus from various parties and activate the community's willingness

to participate in order to create favorable conditions for the establishment of the subsequent institutional regeneration mechanism.

By synthesizing the above eight strategies, two core judgments of community-oriented urban regeneration of Bijiang's old industrial buildings can be summarized: at the spatial level, the starting point of regeneration is to open up the closed boundaries and release the existing stock space, not to build new ones on a large scale; and at the institutional level, the main agent of the regeneration is the community as the core of the village collectives, not the external capital or planners.

Summary of the Chapter

This chapter revolves around two theoretical threads: community-oriented regeneration of old industrial buildings and Urban Catalyst Theory, which establishes the theoretical basis and methodological framework for the subsequent site research and design strategy of Bijiang's old industrial buildings.

The first section defines the core concepts, clarifies the specific connotations of "old industrial buildings", "community" and "community-oriented regeneration" in this study, and links the community-oriented regeneration of Bijiang's old factory buildings with the "industrial heritage preservation" and "urban catalyst". It also identifies the neighboring concepts of "industrial heritage protection" and "organic regeneration" to clarify the boundaries of this study. On this basis, the theoretical evolution of the regeneration of old industrial buildings is sorted out: from the early static identification of heritage value, to the spatial reuse and economic synergy, to the recent shift towards the reconstruction of the community social network and community service, the focus of the study has experienced a continuous migration from material protection to the reconstruction of social life. This evolutionary process indicates that the contemporary core proposition of the regeneration of old industrial buildings has shifted from "how to preserve" to "how to make them truly serve the local community life". Taking into account the geographical context of village-level industrial parks in the Pearl River Delta and the gaps in existing research, this study takes small-scale, scattered old buildings deeply embedded in the settlement fabric as the object of study, and focuses on "community-oriented regeneration" rather than "heritage preservation" or "industrial upgrading". The core framework is "community-oriented regeneration" rather than "heritage preservation" or "industrial upgrading", and it is located in the path of "community-oriented regeneration and living" that benefits people's livelihoods, so that the basic stance of prioritizing the public nature is clearly defined in terms of functional orientation. On the basis of clarifying the positioning of the type,

this section further takes into account the regional context, spatial scale and demand structure of Bijiang , and summarizes the four core principles of public priority, low-cost intervention, community participation throughout the whole process, and sustainable operation, which provide a value guide for the subsequent development of the design.

Section 2 systematically analyzes the basic connotation, classification and mechanism of Urban Catalyst Theory, and demonstrates the feasibility of old industrial buildings as urban catalysts. The core of catalyst theory lies in the fact that through strategic implantation of spatial elements with stimulating potentials, it acts on the existing elements instead of replacing them, triggering the chain reaction of "element intervention - energy transfer - network formation". --The incremental regeneration process of "element intervention - energy transfer - chain reaction - network formation" is triggered by the strategic implantation of spatial elements with stimulating potentials. In the mechanism of action, the catalyst effect has three typical characteristics: attenuation effect, feedback effect and superposition effect, and goes through three progressive stages: implantation of the original catalyst, shaping of the catalyst medium and formation of the catalyst network. As far as old industrial buildings are concerned, the elasticity of their large-span space for multiple functional conversion, the adhesive effect of industrial memory on community identity, and the economic feasibility of low-cost adaptive reuse for gradual start-up make them structurally compatible with the operating conditions of the catalyst mechanism in terms of spatial attributes, social attributes and economic attributes. On this basis, this section establishes the core link of site system analysis and overall control - catalyst node screening and functional configuration - catalyst effect generation - catalyst network formation. The analytical framework provides an operational methodological path for the site research and design strategy in the subsequent chapters.

The third section analyzes four typical cases, namely Nantou Ancient City, Shenyang Donmaouku Warehouse Complex, Guangzhou Pantang Wuyue and Haizhu Tongchuanghui, and refines eight strategies from the dimensions of spatial design and implementation and operation. At the spatial level, acupuncture-style intervention, opening up closed boundaries, activating memory sites and prioritizing public functions constitute the basic orientation of the design for community-oriented regeneration of old industrial buildings; at the institutional level, taking the village collective as the key actor , stabilizing the expectations of all parties with the long term rental mechanism, parallelizing the dual-track of commercial operation and community self-governance, and breaking the deadlock through events or demonstration projects together constitute the operational framework for the promotion of sustainable implementation of the regeneration. The experiences of the four cases also simultaneously

reveal the limitations of established practices: the commercial-led regeneration path faces the risk of community exclusion, the top-down power structure is difficult to truly realize community as the key actor, and the capital-intensive renovation model is not transferable under the real conditions of Bijiang.

By synthesizing the contents of the three sections, this chapter forms an analytical framework that connects theory and practice: taking community-oriented regeneration as the value goal, Urban Catalyst Theory as the methodological tool, and case experiences as the strategic reference, together they point to a feasible path for the transformation of Bijiang's old industrial buildings from an industrial island to a public place for the community. This framework will be implemented in the following chapters in the problem identification of site research and the specific siting of catalyst nodes, and ultimately guides the formation of regeneration strategies and design solutions.

Chapter 3 Contextual Analysis of Old Industrial Building Regeneration in Bijiang Village

3.1 Regional Overview and Spatial Evolution Background

3.1.1 Location and Historical Background

Bijiang is located in the hinterland of the alluvial plain in the lower reaches of the Xijiang and Beijiang rivers in the Pearl River Delta, and administratively belongs to Beijiao Town in Shunde District, Foshan City, Guangdong Province, located in the northeastern part of the town, about 5.8 kilometers away. Bijiang is at the core of Guangzhou-Foshan co-citizenship, with Chencun Town in the north, Lintou Community in the west and Tanzhou Waterway in the surrounding areas, Bijiang Community in the east, and Taocun Village in the south. From the point of view of regional transportation network, Bijiang has a significant location advantage, about 8 kilometers from Beijiao Town Government (Jihong Road), about 11 kilometers from Shunde District Government, about 15 kilometers from Foshan City Government (Chancheng District), only 20 kilometers from the center of Guangzhou City, the 105 National Highway and Guangzhu West Highway are passed through the territory of Bijiang, the Bijiang Station of the Guangzhu West Highway of commercial speed is constructed in the intersection of the two major roads, Guangzhu Intercity Guangzhou-Zhuhai Intercity Railway Bijiang Station was officially opened in 2012. It is an important frontier node for Shunde to integrate into the Guangzhou-Foshan metropolitan area. The total area of the district is about 8.9 square kilometers, presenting the typical Lingnan water town geographical characteristics of dense water network and low terrain.

From the perspective of geological and geomorphological evolution, the Pearl River Delta region where Bijiang is located used to be a bay island landform in the ancient times. As the Xijiang and Beijiang rivers carried large quantities of sediments and sands for continuous deposition downstream, the region gradually evolved from an ancient coast to a low-lying alluvial plain 3,000 to 4,000 years ago. Archaeological excavations have confirmed the traces of early human activities in the area. The Han Dynasty burials and pottery unearthed in 1985 in Bijiang's Xianggang and Crabgang indicate that as early as the Qin and Han Dynasties, more than 2,000 years ago, the first people settled here and engaged in early agricultural and horticultural production activities, laying an environmental foundation for the formation of the subsequent settlements.

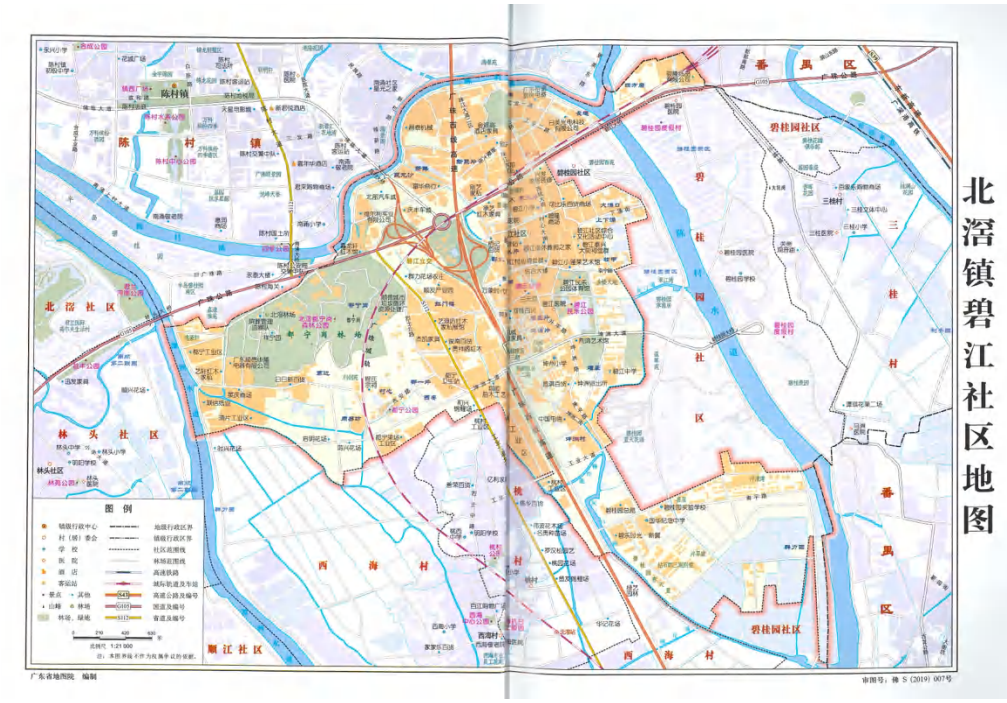


Figure 3-1 Map of Beijiao Town, Beijiao, Shunde, Bijiang Community
(Source: Reference [4])

The history of Bijiang's settlement began in the early years of the Southern Song Dynasty, and it was mainly formed by the settlement of migrants from the southern part of the Central Plains. According to local records and oral histories, the origin of the name "Bijiang" is recorded that there were two earthen posts (Folong Gang) close to each other behind Sanxing Lane in the center of the village, so the name was firstly called "Forced Gang". Later, the name was changed to "Bijiang" (碧江)[68], because "迫" and "碧" sound alike in the Cantonese dialect, and because the village lived near the water and the river was green. The evolution of this place name not only reflects the process of localization of dialect culture, but also records the spatial history of the expansion of the village form from hilly terrace to water network plain.

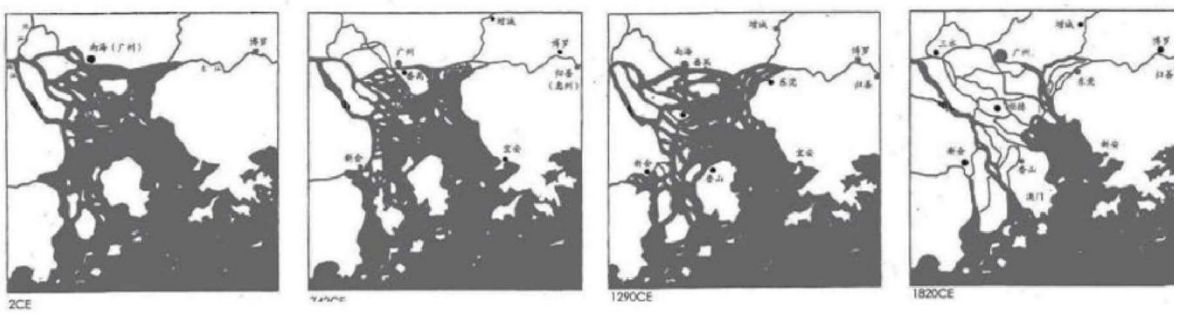


Figure 3-2 Formation of Pearl River Delta
(Source: Reference [69])

After several generations of dyke building and reclamation development in Yuan, Ming and Qing Dynasties, Bijiang gradually developed into a clan village with economic prosperity, culture and education. Historically, Bijiang has been home to many talented people and many eunuchs and merchants, leaving behind a large number of high-specification ancestral halls ,

mansions and schools, forming a traditional architectural texture with Lingnan characteristics. With its deep historical and cultural heritage and well-preserved traditional village style, Bijiang was awarded “Chinese Historic and Cultural Village” by the Ministry of Construction and the State Administration of Cultural Heritage in 2005, and was selected as "Traditional Village of China" in 2013. 2024, the collective economy of Bijiang community will exceed 100 million yuan. In 2024, the collective economy of Bijiang community will exceed 100 million yuan, becoming the first "100 million yuan village" in Beijiao Town. It can be said that Bijiang has an important position both culturally and economically, and how to deal with the relationship between "protection and development" in contemporary urban regeneration also has more stringent requirements.

3.1.2 Industrial Intervention and Spatial Fabric Evolution

At the beginning of the reform and opening-up period, the industrialization process of Shunde rural areas was not simply formed by the market, but relied on the strong promotion of the village collective organization. Shunde villages underwent a process of "re-collectivization", i.e., the collective economic organization transformed from a mere agricultural manager to an operator of land and capital. During this period, in Shunde, where Bijiang is located, the collective organizations at all levels, through institutional innovation, used the collective accumulation of capital or attracted private capital through affiliation to invest in the development of township enterprises. This collective-carrier development path enabled rural industries to rise rapidly in the interstices of agriculture and state-owned industries. By controlling land resources, collective organizations transformed originally closed agricultural communities into open industrial production units, establishing industrialization as the core driving force of rural economic growth and open space expansion.

Accompanied by different stages of policy loosening, Bijiang's industrial spatial pattern has experienced remarkable evolution. In the early development stage from 1983 to 1992, rural industries were mainly relying on the existing stock of assets such as warehouses and halls of village collectives, or utilizing unused vacant land around the village in a "point-like" layout[70]. In the 1990s, with the reform of the property rights system and the promotion of "urban-rural integration", the development pattern of industrial land shifted to an expansion oriented on the axis of the main transportation routes. In this process, village collectives transformed a large amount of agricultural land into non-agricultural construction land by means of innovative land contract models (e.g., 50-year long land lease rights). This low-cost, flexible land supply has

led to the spread of industrial plants along major roads and rivers, and the formation of village-level industrial parks on the periphery.

However, this evolutionary trajectory is not homogeneous - the formation of contiguous industrial parks relies on a more centralized plot size and relatively advantageous location conditions; while those scattered in or on the margins of traditional settlements, limited in scale, with complex property rights relationships of the point and strip industrial space, often outside the vision of integrated development, neither able to be included in the scale transformation of industrial parks. Not be included in the industrial park scale transformation, nor with the natural transformation of industrial upgrading, but with a "seam in the legacy" of the state, continue to be embedded in the settlement fabric of Bijiang. It is this kind of developmental differentiation that finally creates a complex collage pattern of highly intertwined and intertwined industrial production space and villagers' living space.

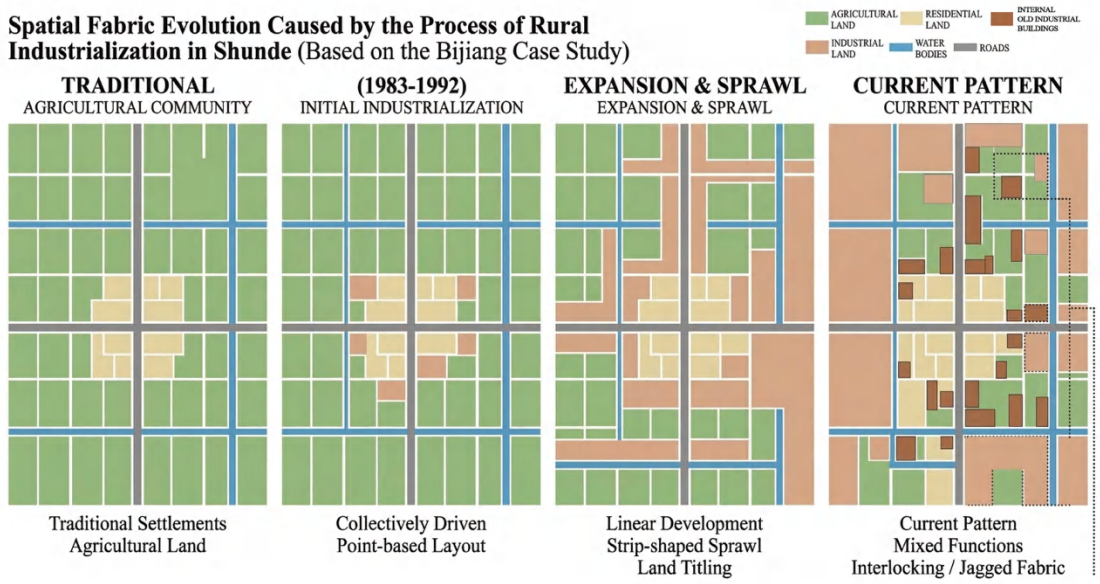


Figure 3-3 Evolution of spatial fabric due to the industrialization process in Shunde villages (Source: Drawn by the author)

Overall, the existing spatial fabric of old industrial buildings in Bijiang is a typical spatial product of institutional change. It does not originate from top-down sophisticated urban planning, but is a bottom-up product of the game of land interests between grassroots collective organizations and market forces. Although this development mode has realized the economic prosperity of "lighting fires in villages and smoke coming out of households" in the short term, it has also led to the rough land use and fragmentation of spatial layout. Industrial factories are embedded in the traditional settlements, farmland and water system in an unorganized manner, which creates mixed functions and environmental pressure, but also objectively leaves a large amount of existing stock space resources for the community.

It is worth noting that the target of regeneration in this paper is not the continuous industrial parks formed in the later integration, but the marginalized part of the above development division - those scattered scale, deeply embedded in the texture of the village, and the old industrial buildings that have been under inefficient use for a long time. These industrial remnants have now become a hard background that cannot be ignored in the spatial structure of the Bijiang community, and the potential and challenges of their regeneration and reuse together constitute the core issue of this study.



Figure 3-4 Bijiang Industrial Zone Distribution
(Source: Drawn by the author)

3.2 Policy Framework and Planning Context

3.2.1 The Policy Framework of the Three Olds Redevelopment in Shunde

The Special Plan for Urban Regeneration ("Three Olds" Redevelopment) of Shunde District (2021-2035) is the deepening and implementation of the policy of "Three Olds Redevelopment" of the Pearl River Delta at the local level, and constitutes the overall policy base for the redevelopment of existing stock space in Shunde District. It constitutes the overall policy base for the redevelopment of Shunde's stock space. The core orientation of the plan is to shift from a single economic value orientation to high-quality urban-rural integrated development, and to form a more systematic institutional arrangement in terms of retention of land revenue, selection of transformation paths and spatial control. For the regeneration practice of Bijiang's old industrial buildings, this policy framework provides both institutional space that can be utilized and delineates a number of rigid constraints.

(1) Core Policy Mechanisms

In terms of the retention and distribution of land revenue, the policy focuses on balancing the long-term interests of all parties in the transformation process. For projects combining the demolition and integration of old villages and old industrial buildings, the policy stipulates that collective economic organizations shall set aside no less than 20% of the compensation for the expropriation of collective property land and agricultural land as funds for remediation and upgrading, to be specifically retained for local use; and it also encourages that priority be given to arranging industrial buildings as compensation for the redevelopment of old villages, so as to increase the proportion of redeveloped industrial properties. The essence of this arrangement is to retain the asset base for the collective economy for continuous value-added under the premise of transferring part of the right to land development, so as to maintain the main position of the village collectives in the process of market-oriented transformation.

In terms of the choice of transformation path, the policy emphasizes "government co-ordination and multi-dimensional synergy", which is to a certain extent a corrective to the previous overly market-driven model - the latter often leads to insufficient allocation of public welfare facilities and damage to the collective interests, etc. For the regeneration of old industrial buildings, the policy encourages the comprehensive use of land acquisition, collective construction land into the market and other means, while explicitly supporting the "enterprise self-transformation" mode, to promote the upgrading and transformation of inefficient industrial land. By guiding a single subject to the integration of scattered land parcels, the policy reserves institutional space for the collective and enterprises to independently explore "regeneration + industrial development", "regeneration + historical and cultural preservation" and other diversified and micro-benefit sustainable model.

(2) Policy dividends of Bijiang's old industrial buildings regeneration

Under the above policy framework, there is a certain degree of institutional flexibility in the regeneration of old industrial buildings in Bijiang at the levels of planning indicators and approval procedures.

In terms of planning indicators, the policy supports the direction of "industrial-to-industrial redevelopment" in old industrial buildings, and allows for a moderate increase in the compatibility ratio of service facilities and the floor ratio (FAR) of industrial land. For projects that provide government reserve land without compensation, over-allocate public service facilities or contribute to historical and cultural preservation in the regeneration process, they will be rewarded with a corresponding floor area ratio (FAR). Of particular concern is the fact that historic buildings can be excluded from floor area ratio (FAR) accounting if they are

revitalized as public welfare facilities, which provides a greater indicator tolerance for the revitalization and utilization of potential historic buildings in Bijiang's old industrial buildings.

In terms of functional mixing and approval process, the policy explores the supply of mixed land with industrial use and other industrial use (except for commercial residential), and only requires that the proportion of industrial floor area be no less than 50%, which provides ample space for the functional conversion of old industrial buildings to introduce new economic activities. For the rational use of the stock of buildings and local use adjustment, the policy explores the simplification of the construction land permit, construction project planning permit and fire inspection and acceptance and other approval links, which to a certain extent reduces the institutional cost of the revitalization of the stock of buildings.

(3) Constraints on the regeneration of old industrial buildings in Bijiang

While granting the above policy flexibility, the plan also delineates a number of rigid constraints for the regeneration of old industrial buildings in order to prevent the erosion of historical features and public interests caused by the disorderly intervention of capital.

In terms of historical, cultural and ecological preservation, the policy lists "bottom line priority" as the first principle, and strictly prohibits the destruction of historical relics and special features. For regeneration projects involving historical revitalization or general urban centers, it is explicitly required that the demolition ratio within the urban regeneration unit or project should not be greater than 20% in principle, the demolition-to-construction ratio should not be greater than 2, and the rate of local resettlement should not be less than 50%. This means that Bijiang old industrial buildings if you take a large-scale demolition and construction, will face a rigorous scale demonstration, progressive micro-remodeling path but more in line with the policy direction.

In the industrial space security and public welfare allocation, the policy strictly implement the control requirements of industrial clusters and industrial land red line, to prevent the "Three Olds Redevelopment" in the name of disguised promotion of real estate development, "industrial to residential" path is clearly restricted. At the same time, the regeneration project shall assume the responsibility of making up for the short board of the city, and improve the allocation standard of public service facilities such as education, medical care, parking, green space, etc. according to the dominant function of the area. This requires the regeneration of old industrial buildings in Bijiang to give up enough public space while promoting industrial upgrading, in order to give back to the overall interests of the rural community[71].

3.2.2 Bijiang's Superior Planning And Overlaying Control Requirements In Shunde And Beijiao

Based on the policy framework described in 3.2.1, the regeneration of Bijiang's old industrial buildings must also respond to more geographically specific superordinate planning requirements, including the overall positioning of Beijiao Town in Shunde District's spatial strategy, the functional orientation of Bijiang's area, and the overlaying control of construction behaviors in the Protection Plan for Historic and Cultural Village.

(1) The overall positioning of Shunde District and the development requirements of Beijiao Area

In the macro spatial pattern of Shunde District, Beijiao Town, where Bijiang is located, assumes the important function of industrial innovation and linkage with the Bay Area. The Shunde District Urban Regeneration ("Three Olds" transformation) Special Plan (2021-2035) establishes a spatial structure of "two cores, two veins, two corridors and multiple nodes", and Beijiao Town, as one of the core of urban development in the north, is positioned as an advanced manufacturing area facing the global market. Beijiao Town, as one of the core of urban development in the north, is positioned as a global advanced manufacturing innovation highland, and bears the responsibility of importing high-quality industries for the northern new town. At the same time, the "Bay Area Development Cooperation and Regeneration Corridor" formed by National Highway 105 links Beijiao with neighboring towns into an open pattern that promotes the clustering of resources and elements and serves the cities on both the east and west coasts [71].

Under the above strategic framework, the Bijiang area is positioned as an advantageous area in the north of Shunde for attracting innovative elements from the Bay Area. This positioning implies that the regeneration of old industrial buildings in Bijiang must abandon low-end manufacturing and shift to advanced industries or supporting service functions that can attract innovative talents and match high-quality urban services.

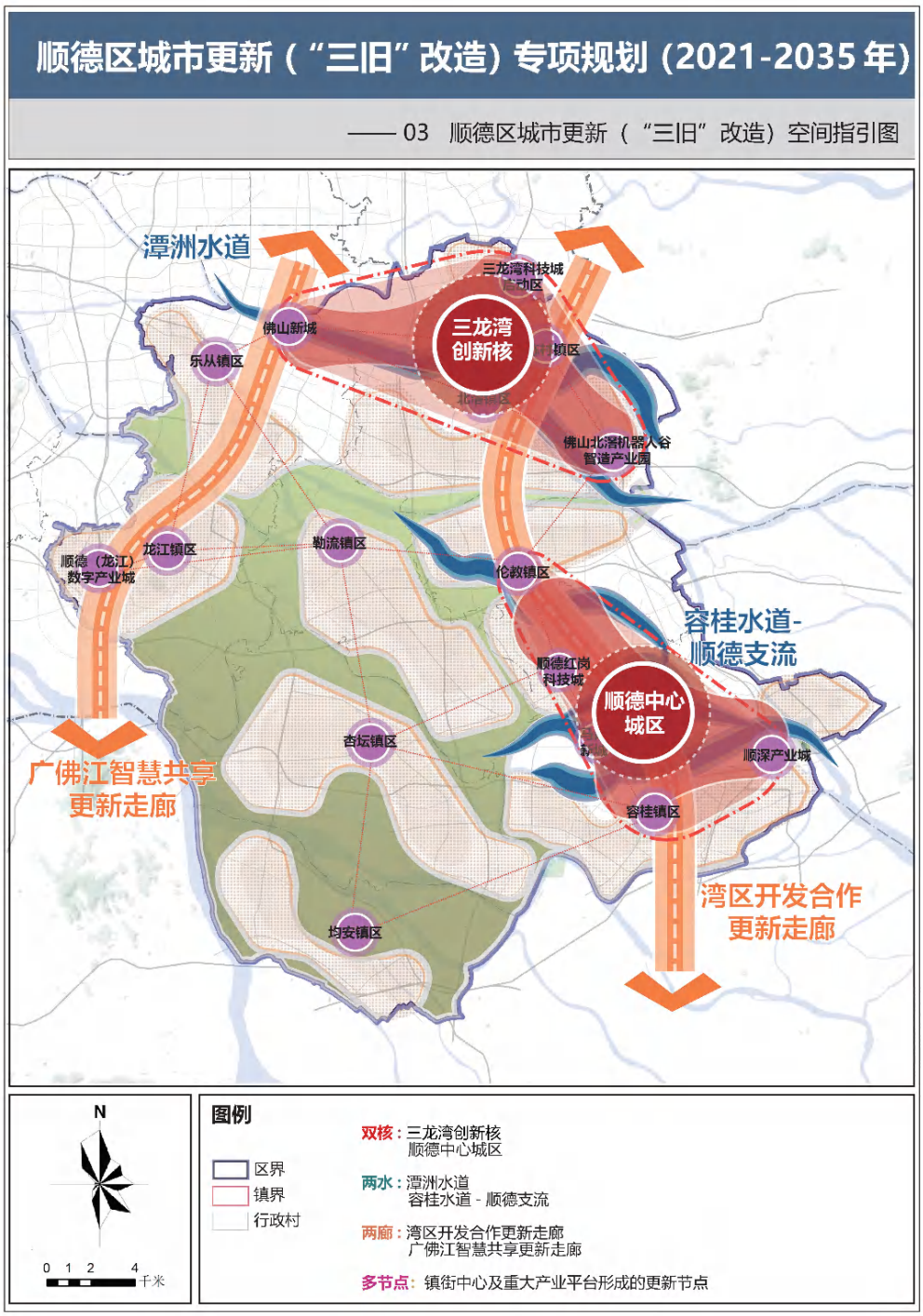


Figure 3-5 Shunde District Urban Regeneration "Three Olds" Transformation Spatial Guideline Map (Source: Shunde District Urban Regeneration ("Three Olds" Transformation) Special Plan (2021-2035))

(2) Functional Orientation and Urban Orientation of Bijiang Area

At the level of functional orientation, " Conservation Plan for the Bijiang Cunxin Street Historic and Cultural District, Shunde District, Foshan City (2020-2035) " clearly puts forward that Bijiang District should be built into a vibrant historic and cultural district integrating Lingnan architectural art tours, folk culture display, and inheritance of the spirit of the revolution, so as to realize the goal of development of livable and touristic. In terms of function allocation, the plan establishes "living and residence, tourism, commercial services and cultural

business" as the main function direction. The above functional orientation is of direct guidance to the regeneration path of old industrial buildings: the spatial revitalization of old industrial buildings should serve the dominant functions of tourism and leisure and cultural creativity of the neighborhood, transforming to the direction of publicity, service and culture, and becoming a functional carrier for carrying cultural tourism experience[72].

(3) Overlapping control requirements of Historic and Cultural Village protection planning

As a Historic and Cultural Village and a "historical revitalization area", the regeneration of Bijiang's old industrial buildings must also meet the multi-dimensional control requirements of the conservation plan, which are mainly reflected in the following four aspects.

First, exit and compatibility guidance for functional conversion. Protection plan in the building compatibility classification control clearly, historical buildings and surrounding buildings "should not be compatible with factories, warehouses, logistics".

Second, the bottom line of micro-regeneration. As mentioned in the previous section, the Shunde District Urban Regeneration Special Plan has clear quantitative restrictions on the demolition ratio and demolition-to-construction ratio of historical revitalization areas. On this basis, the conservation plan further emphasizes the principle of conservation priority, requiring local improvement and internal space reconstruction under the premise of preserving the main body of the building, which excludes the possibility of large-scale demolition and construction of old industrial buildings.

Third, the strict control of building height. Conservation planning for the neighborhood building height zoning control, heritage and historical buildings to implement the "original height control", new or altered buildings must be controlled within the height limit of 12 to 14 meters, the height of local adjacent building groups must even be lowered to 9 meters or 12 meters. Old industrial buildings shall strictly abide by the upper height limit in addition or renovation, so as to protect the original visual corridors and the contour of the neighborhood.

Fourth, the building style and texture of the coordination requirements. The planning of new buildings and reconstruction of the building style control put forward clear guiding principles: materials prohibit the use of large glass curtain wall, stainless steel and other modern exterior materials, giving priority to the use of traditional materials; color to green, gray tones are dominant; building volume and detailing shall be coordinated with the traditional style, and to maintain the height-to-width ratio of the traditional street. The façade renovation of old industrial buildings shall follow the above wind appearance constraints, so as to visually integrate into the traditional texture of Lingnan Water Town.

To summarize, the above mentioned superior plan from the regional strategy, the function of the area and the heritage protection three levels together framed the Bijiang old industrial buildings regeneration of the possible space and the bottom line boundary: the function of the transition to supporting, the form of micro-remodeling to intervene, and the landscape into the traditional Lingnan spatial fabric.

3.3 Background of Regeneration Implementation and Operation Mode

3.3.1 Background of Bijiang Community Building Program and Operation

In recent years, Shunde District has proposed to strengthen grass-roots governance, promote rural revitalization, achieve the goal of "Harmonious Shunde", and put forward the requirements of the Shunde District Community Building Programme. In addition, Bijiang also proposed to give full play to its own advantages and characteristics as a national Historic and Cultural Village. At present, Bijiang has accumulated long-term and solid results in the physical environment, such as the protection of historical space, preservation of traditional villages, and the harmonization of village styles, which have been invested in the past in accordance with the guidelines of the higher authorities.

Table 3-1 List of Completed Projects in Bijiang

Project Type	Time	Name
Area Planning	2003	Declaration of Chinese Historic and Cultural Village
	2003	Research Report on Bijiang Jinlou (Gold House) Historical Architectural Complex and Countermeasures for Protection and Development
	2003-present	Mapping and research on traditional buildings in Bijiang
	2011	Conceptual Design of Bijiang Ancestral Hall Museum
	2012	Declaration of Traditional Village of China
	2017	Study on Style Guidelines for Private Residences in Bijiang Famous Villages
	2018	Bijiang Community Eco-museum Cluster Concept Plan
	2019	Bijiang Ancient Village Display System Planning and Signage System Planning and Design
	2020	Landscape Enhancement Design for Historic Streets and Alleys in Bijiang (Taixing Street - Fine Temple Lane)
	2021-present	Conservation Planning of Bijiang Village, Shunde District, China Historic and Cultural Village
	2022-present	Design, Public Engagement and Cultural Heritage Impact Assessment for the Uncovering and Rehabilitation of Historic Water System in Cunxin Waterway, Bijiang Village

Architectural monoliths	2003-2011	Restoration Design of Bik Kong Zunming Su Ancestral Hall, Cliff Rock Su Ancestral Hall, Ho Koo Su Ancestral Hall, Yat Yun Ancestral Hall, Litang Zhao Ancestral Hall, etc.
	2018	Design of Bijiang Folk House Renovation Demonstration (Zongdeshe, Hanbidong)
	2020	Renovation design of Niangniang Temple in Bijiang
	2020	Bijiang Zhenxiang Building Environment Enhancement and Remodeling Design
Exhibition	2019	Planning and display of the retrospective exhibition of "Bixiang Star Flame" at the Bijiang site of Guangya Middle School
	2020	Planning and exhibition of Shouqingya Independent Women's Exhibition
	2020	Curating and organizing the exhibition on the life of Su Bo-Shao at Bo-Shao Medical Center.
	2021-2023	Planning and organizing the "Bijiang Old Formation" historical and cultural exhibition hall (Bijiang Village History Center).
	2022 to present	Planning and organizing the personal retrospective exhibition of Zhao Baize.
Community Building	2019-2020	Community building and participatory space design in Bijiang (Phase I)
	2020	Bijiang Well Cover Design Competition
	2021～2022	Bijiang Community Building and Participatory Space Design (Phase II)
	2022～2023	Bijiang Community Identity and Participatory Construction of Historical Space

(Source: Drawn by the author)

Table 3-2 Bijiang Community Building Program Types and Implementation and Operation Statistics

		Type								Whether or not Protect Object	Subject of implementation				Source of funding		Restoration and regeneration Post-use
Year	Project Name	Protection Restoration	Re-communization Rezoning	Spatial reuse	Functional conversion	Cluster Revitalization	Open Space	Water System Restoration of Light	Conversion of Own Houses		Government	Commercial	Residents	Organizations	Government	Individuals /Agency	
2001	Preliminary Restoration of Golden Mansion and Ancient Building Complex	✓								✓	✓				✓		Scenic spots
About 2001	Deyun Bridge Relocation	✓								✓	✓				✓		-
2003	Restoration of	✓								✓	✓				✓		Su Clan Association

	Craggy Rock Soo Ancestral Hall														
2004	Zunming Su Ancestral Hall Restoration	✓							✓	✓				✓	Cultural Facilities
2009	Renovation of Yi Yun Su Ancestral Hall, Ho Koo Su Ancestral Hall, and Zhao Clan Ancestral Hall	✓							✓	✓				✓	-
2010	Utilization of Yidang Su Ancestral Hall	✓	✓						✓	✓			✓	✓	Retired Teachers' Home
2012-present	Tokunju Restaurant (Converted Residence)			✓	✓	✓	✓		-		✓			✓	Dining
2013	Little Penglai Art Gallery			✓	✓	✓			✓				✓	✓	
2015	Penglai Study Hall (Congl an Ancestral Hall, Chengbi Ancestral Hall, etc.)				✓				✓				✓	✓	Private Cultural Facilities
2016	Jinlou Scenic Area Enhancement (Zongdeshe)		✓						✓	✓				✓	AAA Grade Scenic Spot
2018	Pilot public housing renovation		✓						-	✓				✓	Cultural Facilities
2019	Zhenxiang Building Displa		✓						✓	✓				✓	Display

	y Project										
	Jinlou Scenic Area Signage System Enhancement		✓				✓	✓			✓	National AAA Scenic Spot
	Bershao Medical Center clearing and displaying		✓				○	✓			✓	Show case
2020	Taixing Street - Fine Temple Lane Improvement, Jiwu Garden Restoration				✓		✓	✓			✓	Public Space
	Restoration of Bijiang Nyonya Temple	✓					○	✓			✓	Traditional Festivals
	Restoration of the Zhenxiang Building pagoda	✓ ✓ ✓ ✓					○	✓			✓	Show case
2021 to present	Residential remodeling within the historic and cultural district					✓	-		✓		✓	Residents' Own Homes
2022	Bijiang Village History Center (Makodang Su Gongzhi)		✓				✓	✓			✓	Show case
	Nearby Stalls			✓			-			✓	✓	Community building organizations

	Three Meow Coffee		✓			-		✓			✓	
2023	Boundless Coffee		✓			-		✓			✓	
2024	Heavenly Favor Study Hall (Heguo Su Ancestral Hall)		✓			✓		✓			✓	Dining
	Ancient Mansion Chicken Man Restaurant		✓			-		✓			✓	
2023～2025	Rehabilitation of Cunxin Waterway and Water Environment Improvement in Ting Chung			✓	✓	○	✓			✓		Public Space
2025	Zhao Zhaizhe Memorial Hall	✓		✓		○	✓			✓		Showcase
	Study Hall	✓				-		✓	✓		✓	Private Cultural Facilities
	Obsession Café Bijiang (Huangjiazhi)		✓			✓		✓			✓	Dining
	Biansu ShuiFu Stall		✓			-		✓			✓	
	Piaoju Coffee		✓			-		✓			✓	
	Deyunju Baiyifang		✓			-		✓			✓	Private Cultural Facilities
	Read Folk Art Bookstore		✓			-		✓	✓		✓	
2026	Four Seasons Summer Culture Space		✓			-		✓			✓	

Yellow Emperor Attached Tavern	✓	-	✓	✓	Dining

Note: The restoration objects marked with "○" are not included in the statutory conservation list, but are given constructive conservation measures in terms of implementation plans, etc. in the conservation plan.

(Source: Xiangcheng Architecture)

Bijiang's existing stock-based urban regeneration did not start with the policy push in recent years, but has been gradually formed in the past twenty years or so through the spontaneous participation of multiple actors and the continuous accumulation of locality practices.

After combing through the various types of regeneration projects completed so far in Bijiang, the following significant features can be summarized.

I. Diversified regeneration objects, covering a variety of existing stock-based urban regeneration space types

Bijiang's existing regeneration practice involves four main types of objects: ancestral halls, public houses, private houses and community public spaces. Ancestral halls are mainly protected and repaired, and some of them have been transformed into community cultural exhibition spaces or places for residents' self-governance activities; the regeneration of public houses is led by neighborhood committees or village collectives, and is mostly used for cultural facilities and community services; the regeneration of private houses presents a relatively rich diversity of businesses, with villagers' self-occupation improving and private investment in catering, coffee and other business operations, such as Dewunju, Sanmao Coffee, Obsession Coffee, etc.; the renovation of community public spaces covers a wide range of stock space types. The improvement and upgrading of the public space of the community takes the improvement of the street environment and the restoration of the water system as the main content.

II. parallel function-oriented, re-communityization and commercialization paths coexist.

From the perspective of functional conversion, Bijiang's existing regeneration practice shows two parallel paths of community-oriented regeneration and commercialization. The re-communization path is led by public welfare, and typical examples include the Bijiang Old Formation Historical and Cultural Exhibition Hall, the "Retired Teachers' Home" in Yidang Su Ancestral Hall, and the Zhenxiang Building Exhibition Project, which aim to provide residents with a spatial carrier for cultural identity and daily interaction. The commercialization path, on the other hand, is driven by private capital. Driven by the cultural and tourism atmosphere of the historic district, restaurants, bookstores, cafes and other businesses have moved in one after

another, injecting economic vitality into the community. The two paths coexist in parallel, constituting the overall pattern of Bijiang's existing stock space revitalization.

III. Multi-body Collaboration, Forming a Stable On-site Regeneration Network

The main actors involved in Bijiang's regeneration practice show a clear division of labor structure. Research Centre for Architectural History and Culture, South China University of Technology and Fanwuqi Community Development Centre focus on community building and participatory planning, undertaking community research, resident mobilization and organizing participatory workshops. Individual villagers and local private enterprises are involved in the regeneration of commercial businesses through self-investment, while social welfare organizations such as the Guangdong Desheng Community Charity Foundation provide financial support for community building projects. The above parties have formed a long-term and stable collaborative relationship, constituting the core support of Bijiang's on-site regeneration network.

IV. The depth of community participation has continued to increase, and residents have changed from bystanders to leaders.

Since the Fanwuqi Community Development Centre was stationed in Bijiang in 2019, community participation in Bijiang has experienced a remarkable evolution from shallow mobilization to deep co-construction. In the first phase of community building (2019-2020), oral history restoration was used as an entry point, and the public exhibition "Bijiang Memory and Community Vision" was used to build consensus among residents, and to successfully promote multi-party consultation on traffic issues in front of the Bijiang Primary School, and ultimately to realize the implementation of a one-way street plan through participatory decision-making. The second phase (2021-2022) focuses on the restoration of Cunxin Waterway as the core issue, and systematically collects residents' opinions and forms a participatory conceptual design plan through household surveys, residents' workshops and street exhibitions to broaden participation; the community consensus and design basis formed in this phase lay an important foundation for the smooth progress of the restoration project in 2023. In the third phase (2022-2023), Bijiang Old Formation Historical and Cultural Exhibition Hall was built as the starting point, mobilizing more than 20 organizations and more than 100 residents to participate in the planning of the exhibition, collection of objects and joint exhibitions, thus truly realizing the goal of participatory co-construction in which the residents are the audience of the exhibition and the protagonists of the creation of the exhibition.

The above four aspects together show that Bijiang has accumulated a relatively deep soil for community-oriented regeneration. The regeneration here is never imposed by a single key

actor as the top-down will, but rather a collaborative network formed spontaneously by village collectives, residents, professional teams and social capitals in long-term interactions; the residents' willingness to participate and their community identity are the endogenous driving force that promotes the continual advancement of the regeneration of Bijiang. It is this soil that constitutes the important practical premise for this study to take the community as the key actor of regeneration and to promote the community-oriented regeneration of old industrial buildings.

3.3.2 Selection of Operation Models for the Regeneration of Bijiang's Old Industrial Buildings

Based on 3.3.1's compilation of Bijiang's existing regeneration practices, combined with the Pearl River Delta village-level industrial park renovation regional experience, Bijiang's existing stock-based urban regeneration has presented four operation modes, each with its own applicable conditions and limitations, which have a direct reference value for the regeneration operation of old industrial buildings.

I. Village Collective-led

It is led by the Bijiang Community Council or village collective economic organisations, and funded mainly by special government grants and social welfare funds, and applies to cultural facilities and community service spaces with strong public welfare attributes. The Bijiang Old Formation Historical and Cultural Exhibition Center and the "Home for Retired Teachers" at the Yitang Su Ancestral Hall belong to this category. The advantage of this model is that it can ensure the public nature of the space and low-threshold accessibility, and fully protect the rights and interests of the residents; the limitation is that the long-term operation depends on the input of external funds, and its own self-sustaining commercial node capacity is limited, and its sustainability is yet to be guaranteed by the system.

II. Private self-management type

Individual villagers or local private enterprises invest and operate on their own, which is applicable to the spontaneous regeneration of commercial business. Bijiang historical district in succession stationed in the De Yunju, three meow coffee, obsessive coffee, read the folk bookstore, etc., are villagers or local enterprises in the cultural tourism atmosphere driven by the independent investment behavior. The advantages of this model are flexible market response, no external financial support, and the ability to inject sustained commercial vitality into the community; the limitations lie in the fact that the business orientation is centered on commercial interests, with limited contribution to the community's communal space, and there is a risk of unstable business after the cultural tourism fervor subsides.

III. Multi-party collaboration

Village collectives provide space carriers, professional teams provide planning and design support, and public welfare funds provide start-up funds, so that multiple parties can jointly promote regeneration projects with public welfare attributes. The series of community building projects in Bijiang is a typical practice of this model: Guangdong Desheng Community Charity Foundation provides financial support, Fanwuqi Community Development Centre and Xiangcheng Architecture provide professional technology, Bijiang Neighborhood Committee is responsible for the organization and coordination, and the residents participate in the whole process of community building. The advantage of this model is that it can truly include the residents in the regeneration decision-making process, taking into account both public welfare and professionalism; the limitation is that it is highly dependent on external public welfare funds, and the continuous operation mechanism after the end of the project cycle needs to be further institutionalized.

IV. the whole lease entrusted type

The village collective retains the land ownership and leases the whole property use right to an external enterprise, which is responsible for the investment and transformation and subsequent operation, and the village collective obtains a stable long-term rental income according to the lease agreement. Haizhu Tongchuanghui adopts this model - the village collective transfers the right to use the property to Haizhu Tongchuanghui with a 20-year long-term lease contract, realizing the stable preservation and appreciation of collective assets. The advantage of this model is that the village collectives do not need to bear the pressure of upfront renovation funds, and can quickly start the large-scale renovation; the limitation is that the operation dominance is completely transferred to an external enterprise, and the community residents and the village collectives have limited influence on the content of the renovation and the direction of the function, and there is the intrinsic risk of the function orientation deviating from the community's demand, and the excessive erosion of the community's public nature by the commercialization.

Comprehensive comparison of the above four models, combined with the specific conditions of Bijiang old industrial buildings - most of the property rights belong to the village collectives, adjacent to the core of the residence, the service object to the neighboring residents - can be judged, the overall lease entrusted to the type of transformation can be started quickly, but its commercial Although the overall leasing and commissioning type can quickly start the transformation, its commercial-oriented logic is difficult to guarantee the continuous supply of public space in the community, and it is not suitable to be the leading path for the operation of

old industrial buildings in Bijiang. The private self-management type can be a useful supplement to the commercial business, but it cannot be the main operator of public space.

Therefore, this study suggests to take multi-party collaboration type as the core framework, in the collective land with clear property rights, the village collective coordinates the daily operation and space management of the core nodes, and introduces a professional team to provide planning and design support, and at the same time, makes clear the proportion of the guarantee of the community's public space at the level of the agreement; for the ancillary space with a certain amount of commercial potential, private self-management can be introduced in an appropriate manner, so as to subsidize the long-term costs of the public welfare operation with the commercial revenue, and form a public welfare and commercial function. Long-term costs, the formation of public welfare and commercial functions complementary composite operating structure. This model not only continues the locality practice of multi-party collaboration in Bijiang's existing community building practice, but also provides institutional guarantee for the sustainable operation of old industrial buildings after renovation.

Summary of the Chapter

In this chapter, the background conditions for the community-oriented regeneration of old industrial buildings in Bijiang are systematically sorted out from the three levels of regional background, policy framework and operation practice, which establishes a cognitive foundation for the subsequent site research and design strategy.

The first section starts from the location characteristics and historical evolution, revealing the dual attributes of Bijiang as a Pearl River Delta water village settlement: on the one hand, Bijiang is an important frontier node in the core zone of Guangzhou-Foshan co-citizenship, with superior transportation location and a strong collective economic base; on the other hand, as a national Historic and Cultural Village, its settlement fabric settlement consists of a superposition of traditional clan fabric and industrialization intervention, which makes the tension between conservation and development particularly prominent. On the other hand, as a national historical and cultural village, its settlement space is formed by the superposition of traditional clan texture and industrialization intervention. The formation of industrial space is not a product of planning will, but a result of the bottom-up growth of collective organizations and market forces in the game of land interests since the reform and opening up. With the differentiation of industrial development, the continuous industrial parks can be included in the scale of transformation, while those scattered scale, deeply embedded in the traditional settlement fabric of the old industrial buildings in points and bands, with the remains of the

state of the seams continue to embedded so far, the formation of industrial space and the villagers' living space highly intertwined with the complex pattern. This spatial attribute is not only the core challenge of community-oriented regeneration of old industrial buildings in Bijiang, but also constitutes a potential condition for it to serve as a catalyst anchor.

Section 2 summarizes the multi-level policy and planning framework from Shunde District to Bijiang District. The Shunde “Three Olds Redevelopment” special plan provides institutional flexibility for the regeneration of old industrial buildings in terms of retention of land revenue, guidance for functional compatibility, and simplification of approvals, while at the same time setting rigid constraints in terms of the bottom line of micro-regeneration, the red line of industrial land, and the requirement of public allocation of buildings. On this basis, the historic and cultural district protection plan further superimposed functional exit guidance, building height zoning control and style coordination requirements, establishing the basic direction of industrial function exit from the regulatory level, and excluding the path of large-scale demolition and construction. The superposition of the above multi-level policies together frames the possible space and bottom line boundaries for the regeneration of Bijiang's old industrial buildings: functionally, they must be transformed into public, service and cultural directions; morphologically, they must be intervened in the form of micro-remodeling; and geometrically, they must be integrated into the traditional spatial fabric of Lingnan. These three dimensions of constraints are highly compatible with the principles of regeneration refined in Chapter 2, further confirming the necessity and legitimacy of incremental regeneration and low-cost intervention.

Section 3 reveals the soil of locality urban regeneration that has been formed in Bijiang by combing the existing stock space regeneration practices of the past twenty years. Existing regeneration projects cover four categories of objects: ancestral halls, public houses, private homes and public spaces, showing two parallel paths of re-community-oriented regeneration and commercialization, and forming a multi-party collaborative network centered on village collectives, professional teams, social welfare agencies and individual villagers. In particular, the continuous promotion of the three phases of the community building program since 2019 has gradually transformed residents from bystanders to active participants in the regeneration, accumulating solid experience in participatory co-construction. In the comparative analysis of operation modes, this section analyzes the conditions and limitations of the four modes, namely, village collective-led, private self-operated, multi-party collaborative, and overall leasing and commissioning, and comes up with the following judgments: combining the specific conditions of Bijiang's old industrial buildings, which belong to the village collective, are adjacent to the

core of the residential area, and the service targets are mainly the residents in the surrounding area, the multi-party collaborative mode should be the core operation framework, supplemented with the private self-operated mode, forming the mutual benefit and commercial function of public welfare. supplemented by private self-operated businesses, forming a composite structure with complementary public welfare and commercial functions, in order to guarantee the community publicity and long-term sustainability of the regeneration results.

Taking the three sections together, this chapter makes a systematic judgment on the feasible path for community-oriented regeneration of old industrial buildings in Bijiang in terms of spatial evolution, policy constraints and operational conditions. These judgments will directly guide the site research in the next chapter: in the selection of research objects, we will focus on those old industrial buildings with limited scale and embedded in traditional settlement fabric; in the design of research content, we will focus on identifying the spatial boundaries of old industrial buildings, property rights conditions and the degree of community connection, in order to provide empirical evidence for the screening of catalyst nodes.

Chapter 4 Existing Conditions and Key Issues of Old Industrial Buildings in Bijiang Village

4.1 Analysis of the Spatial System

In this section, the current status of the spatial system within the study area of Bijiang is systematically sorted out from the four dimensions of public service facility allocation, pedestrian and cycling network, blue-green infrastructure and open space, and the existing value element system, focusing on the correlation between each system and the concentrated area of the old industrial buildings, in order to identify the structural barriers that constrain the integration of the old industrial buildings into the community's daily life network, and to provide empirical evidence for the formulation of the subsequent regeneration strategy. The basis for the formulation of the subsequent regeneration strategy is provided.

4.1.1 Status of Public Service Facilities Rationing

This section takes stock of and examines the public service facilities rationing status of Bijiang Village Center and the communities around the old industrial buildings based on the assessment system of living area support established by the Standard for Urban Residential Area Planning and Design (GB 50180-2018). With Bijiang Village center as the core corresponding to the 15-minute living circle, and with the northwestern area where the old industrial buildings are located as the core of the proximity supporting assessment - the measured service radius of this area is about 390 meters, between the five-minute living circle (300 meters) and the ten-minute living circle (500 meters), this paper takes the standard of five-minute living circle as the reference base. This paper uses the five-minute living circle standard as a reference benchmark to assess the configuration levels of various types of facilities within the two circles respectively.

In terms of the 15-minute living circle in the center of Bijiang Village, the rationing of basic facilities such as administration, health care, catering and commerce, postal and telecommunication is relatively complete, and the basic needs of residents' daily life are generally guaranteed. In terms of commercial business, the catering service business has the largest number and widest distribution, constituting the main driving force for the daily vitality of the neighborhood; the hotel and lodging business already has a scattered distribution, showing the initial development of cultural and tourism functions.

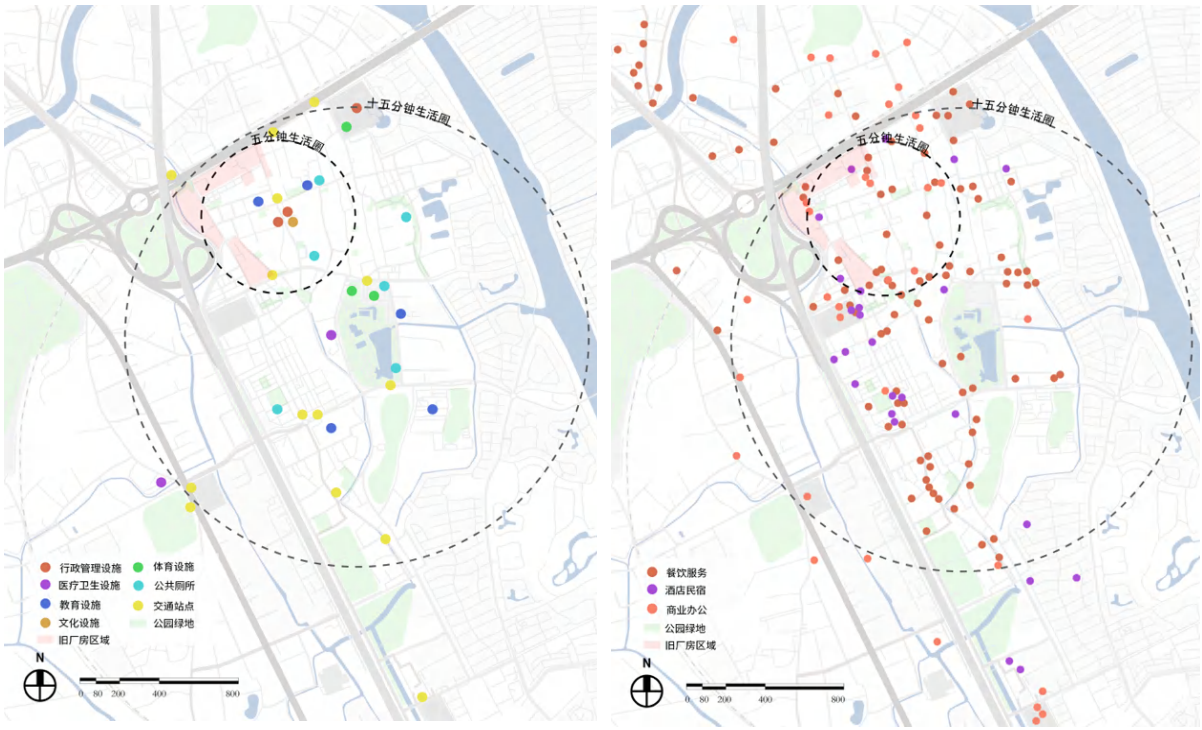
However, a category-by-category assessment of the facilities against the standards reveals that there are significant gaps in Bijiang's all-ages public activity space: there are still geriatric care homes and nursing homes for the elderly; youth activity centers are not independently configured; and the quality of medium-sized multi-purpose sports venues varies, with existing facilities struggling to meet the demand for their use. This gap indicates that the current public service provision structure in Bijiang is skewed towards commercial consumption rather than public interaction, and that there is a serious shortage of shared spaces with substantive activities.

Table 4-1 List of various types of land area specifications for the living circle

Category	Subdivision	15-minute living circle Land area	15-minute living circle floor area	5-minute living circle land area	5-minute living circle floor area
Total	Total	1600～2910	1450～1830	1710～2210	1070～1820
Of which (square meters/thousand people)	Public administration and public service facilities (Class A)	1250～2360	1130～1380	-	-
	Commercial service facilities (Category B)	350 to 550	320～450	-	-
	Community service facilities (R12, R22, R32)	-	-	1710～2210	1070～1820

(Source: Drawn by the author based on reference[73])

Focusing on the northwest area where old industrial buildings are concentrated, the above structural problems are even more prominent when measured by the five-minute living circle standard. Checking against the specification requirements one by one, the infrastructure of community service stations, catering and commercial outlets in this area has already been configured, but there is a lack of cultural activity stations (including activity stations for young people and the elderly), day-care centers for the elderly, community health service stations, small multi-functional sports venues and comprehensive outdoor fitness venues, which are precisely the type of facilities that are most closely related to the residents' daily public interactions and healthy life. In terms of commercial services, the density of restaurants and businesses in the northwest area is much lower than that in the south and east sides of the village, forming a clear pattern of "dense in the south and sparse in the north". The area where the old industrial buildings are located lacks both functional space for daily public interaction and commercial attraction for spontaneous gathering of people.



a) Public Service Facilities b) Commercial Facilities

Figure 4-1 Distribution of Public Service Facilities in Bijiang Village Center Area (Source: Drawn by the author)

This distribution pattern reveals that the section of old industrial buildings is geographically close to the residential core of Bijiang Village, but functionally detached from the villagers' daily life circle, and is neither included in the service provision network nor constitutes an active destination for residents. This state of high accessibility but lack of function is the basic problematic situation for old industrial buildings to be activated and reintegrated into the daily life network through regeneration.

Table 4-2 Configuration of Public Service Facilities in Bijiang Village Living Area

Category	Project	15-minute living circle configuration standard	5-minute living circle configuration standard	Remarks	Bijiang Village Center (15-minute living circle)	Factory side Zhangyi Precinct (5-minute living circle)
Public administration and public service facilities	Junior High School	▲	-	Should occupy an area independently	1	-
	Elementary school	-	-Primary school	Should be self-contained	0	-
	Gymnasium (field) or national fitness center	▲	-	Can be built jointly	1	-
	Large multi-purpose sports ground	▲	-	Suitable for independent occupation	1	-
	Health Service Center	▲	-▲	Suitable for independent	1	-

	(Community Hospital)			occupation of land		
	Outpatient clinic	▲	-	Can be built jointly	1	-
	Nursing Home	▲	-▲	Suitable for independent occupation	0	-
	Care and Attention Home for the Elderly	▲	-▲	Suitable for independent occupation	0	-
	Cultural activity centers (including youth and senior activity centers)	▲	-	Can be built jointly	0.5 (without youth activity center)	-
	Community Service Center (street level)	▲	-	Can be built jointly	1	-
	Neighborhood Offices	▲	-	Can be built jointly	1	-
	Judicial office	▲	-	Can be built jointly	0	-
	Police Station	△	-	Suitable for independent occupation	0	Community service facilities
Community Service Facilities	Community Service Station	-	▲	Can be built jointly	-	1
	Cultural activity station (including youth and senior citizen activity station)	-	▲	Can be built jointly	-▲	0
	Elderly Day Care Centers (Nursing Homes)	-	▲	May be built jointly	-	0
	Community Health Service Station	-	△	May be jointly constructed	-	0
	Small multi-purpose sports (ball) courts	-	▲	Suitable for stand-alone site	-▲	0
	Comprehensive outdoor fitness space (including	-	▲	Suitable for separate occupancy	-▲	0

	senior outdoor activity space)					
	Kindergarten	-	▲	Suitable for independent acreage	- -	1
Commercial Service Facilities	Shopping malls	▲	-	Can be built jointly	1	-
	Vegetable market or fresh food supermarket	-	-	Can be built jointly	1	1
	Gymnasium	△	-Gym	Can be built jointly	0	0
	Dining Facilities	▲	-	Can be built jointly	1	1
	Bank outlets	▲	-	Can be built jointly	1	1
	Telecommunication outlets	▲	-▲	Can be built jointly	1	1
	Postal business premises	▲	-▲	Can be built jointly	1	1
	Community commercial outlets (supermarkets, pharmacies, etc.)	-	▲	Can be built jointly	-	1
Transportation Stations	Bus Station	▲	▲	Suitable for independent installation	1	1
	Railway station	△	△ -	Can be built jointly	Bijiang Station (currently not in operation)	-

(Source: Drawn by the author based on reference [73]and Bijiang Village research)

4.1.2 Pedestrian and Cycling Networks and Transportation Accessibility

The road network system in the center of Bijiang Village is dense with many transportation stops. In addition to the main roads shown in the figure, there are also a large number of paths ranging from 2-4 meters in width within the village composed of architectural texture and generated by villagers' spontaneous walking, most of which are only able to pass pedestrians and non-motorized vehicles. Transportation stops are evenly distributed within the village. Parking lots are only arranged around large public spaces such as commercial centers and parks, with a great imbalance between supply and demand.

In terms of the pedestrian and cycling network, it can be divided into four categories based on the mode of access: pedestrian-vehicle divided roads, pedestrian-vehicle mixed-use roads, purely vehicular roads, and purely pedestrian paths. The main road of pedestrian-vehicle branch extends horizontally along the western boundary of the village, which is the main channel connecting the external regional traffic and the road network in the village; the mixed pedestrian-vehicle road network covers most of the village area, which constitutes the basic skeleton for the daily travel of the residents; and the pedestrian path with Cunxin Waterway as the axis runs through the central part of the village, which is the main touring line of the historic district and the linear space with the most concentration of the daily pedestrian and cycling activities.

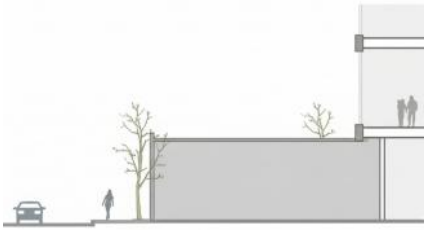
From the overall pattern, the coverage density of the pedestrian and cycling network shows obvious spatial differentiation: the central and southern parts of the village area have a more detailed road network, better pedestrian experience, high accessibility to important nodes, and high quality of pedestrian paths; while the northwestern part of the area where the old industrial buildings are concentrated has an almost missing internal road network, and the pedestrian permeability is extremely limited. The west side of the old industrial buildings is adjacent to the pedestrian-vehicle separated arterial road, which can be connected to the north in the direction of Fo Chen Road, with better accessibility to external vehicular traffic; the east and south sides of the old industrial buildings are distributed by a mixed pedestrian network, which can be connected to public nodes such as Zhenxiang Building, Bijiang Community Council, Bijiang Primary School, etc. in the walking direction, and can be extended to the historical and cultural core area of Bijiang Jinlou (Gold House) through the pedestrian circulation of Cunxin Waterway. However, the advantages of the above external connections are interrupted at the boundary of the old industrial buildings site. Several old industrial buildings within the site are closed, with no internal public thoroughfares, and there is a lack of pedestrian thoroughfares between the site and the surrounding residential fabric.

From the perspective of the overall logic of road network organization, the existing traffic organization of the northwest area of Bijiang Village Center, where the old industrial buildings are located, has wide road width, few entrances and exits, and closed boundaries, which is the logic of freight transportation that serves the transportation of industrial production rather than the logic of life that serves the daily walk. The continuation of this logic makes the old industrial buildings an island in the village's pedestrian and cycling network. The old industrial buildings are neither on any of the naturally occurring pedestrian circuits, nor do they serve as an attractive end point for pedestrian circulation. The structural lack of accessibility constitutes the

primary spatial barrier to the integration of old industrial buildings into the community's daily life network, and points to the core operational direction of opening up boundaries and rebuilding pedestrian connections in regeneration interventions.

In addition, this study comprehensively evaluates pedestrian paths in the district from four dimensions: interface activity, shade continuity, degree of pedestrian-vehicle conflict, and visual reference richness. Paths with active interfaces, good shading conditions, separation of pedestrian and vehicular traffic or few conflicts, and historical or natural landscape references along the route are judged to be high-quality pedestrian paths; on the contrary, paths dominated by continuous fences or solid walls, lacking in shade, with mixed pedestrian and vehicular traffic and frequent conflicts, and with monotonous visual environments, are judged to be low-quality pedestrian and cycling path. Paths in between are labeled in the middle color on the map.

Table 4-3 Slow Pedestrian Path Quality

Pedestrian and Cycling Network Path Quality	Description	Typical Profile Schematic	Example of current photo
High Quality Paths	Paths with active interfaces, good shade, low pedestrian/vehicle separation or conflicts, and historical or natural landscape references along the route.		
Low Quality Paths	Paths with continuous or solid walls, lack of shade, mixed pedestrian and vehicle traffic with frequent conflicts, and monotonous visual environment.		

(Source: drawn by the author)

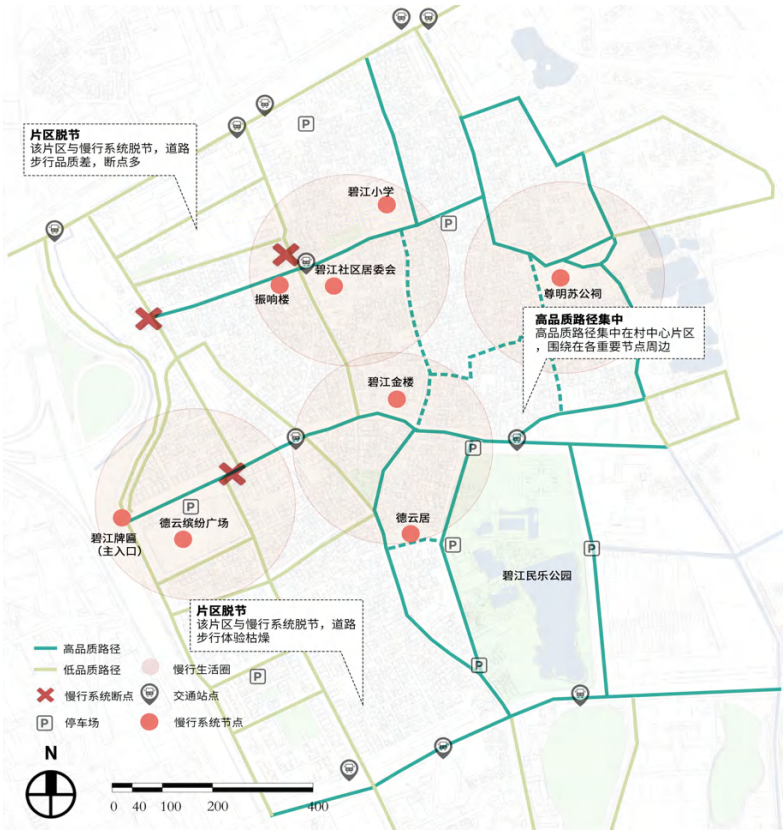


Figure 4-2 Map of existing pedestrian and cycling network
(Source: drawn by the author)

4.1.3 Blue-Green Infrastructure And Open Space

The overall distribution of open space (including squares, parks and courtyards of public nature) in the center of Bijiang Village shows a clear pattern of azimuthal imbalance. Taking the historic and cultural district of Cunxin Waterway as the central reference, there are more significant open space nodes in the northeast, southeast and southwest directions of the village: there is the Bile Time Commercial Center in the northeast; Bijiang Minle Park in the south is the largest centralized green space in the village; hard open spaces such as Deyun Colorful Plaza and Bijiang Plaque Main Entrance Plaza in the southwest corner are the main distribution nodes for foreign visitors entering the village; the surrounding area of Zunming Su Ancestral Hall The hard open spaces such as Deyun Colorful Square in the southwest corner and Bijiang Jinlou (Gold House) Main Entrance Square are the main distribution nodes for foreign visitors to the village; the historical courtyard spaces around Zunming Su Ancestral Hall and Bijiang Jinlou (Gold House) constitute the most public and cultural open spaces in the village. However, surrounded by the above three directions of open space nodes, the northwestern direction shows a remarkable gap - there are only scattered green spaces distributed around Bijiang Resident Committee and Zhenxiang Building in the central west of the village area, while the northwestern corner where old industrial buildings are concentrated is almost devoid of any

public open space, which forms the most prominent structural Gap. There is neither park green space nor any labeled plaza or public node in this area. It is noteworthy that this blind area is spatially adjacent to the Zhenxiang Building, one of the few historic building nodes in the village that is located outside of the core of the historic district, and is also the most walkable cultural venue for the residents of the Northwest Area. The current open space around the Zhenxiang Building is extremely limited, making it difficult to form an effective place for public presence and activities, and its potential public attraction has not yet been effectively supported.

From a comprehensive point of view, Bixi North old industrial buildings area faces two interrelated spatial problems at the same time: one is the lack of public open interfaces in the old industrial buildings; the other is the overall lack of open space for residents to stay and interact with each other on a daily basis in the area . The superposition of the two implies that the regeneration and renovation of old industrial buildings not only has the value of revitalizing its own buildings, but also has the systematic potential to fill the gap of open space in the area and improve the overall public environment of the district at the same time.

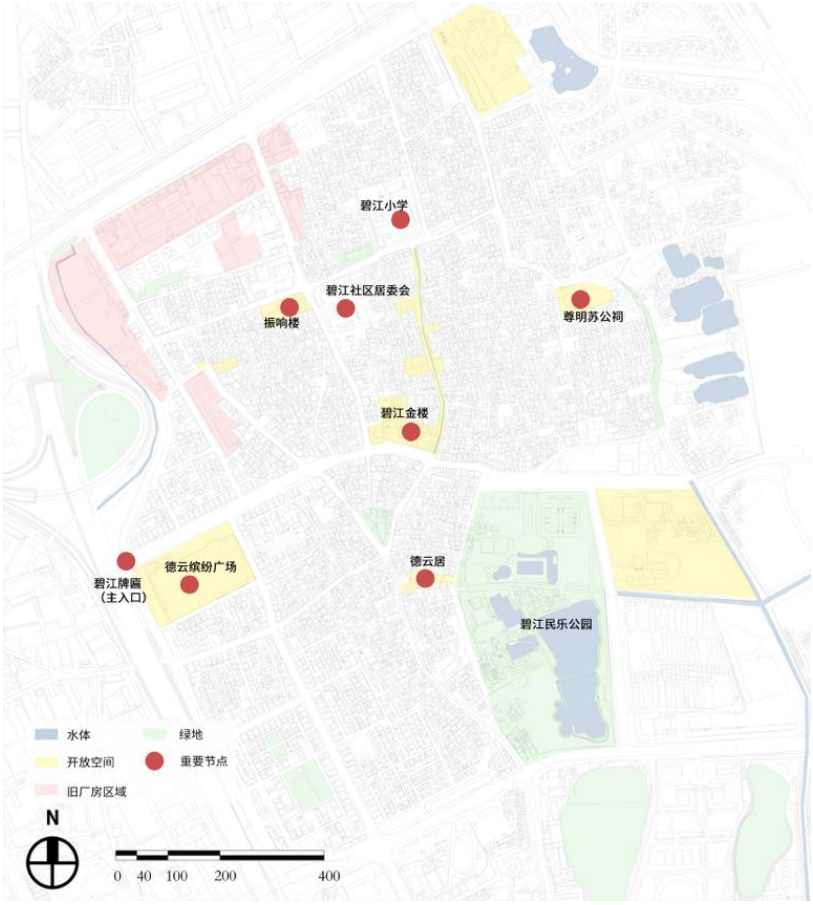


Figure 4-3 Blue-green infrastructure and open space analysis map
(Source: Drawn by the author)

4.1.4 Existing Value Elements System

Bijiang Village is rich in historical and cultural elements, with a clear hierarchy. Provincial-level cultural relics protection units, with Bijiang Jinlou (Gold House) and its architectural complex as the core, are concentrated in the historic and cultural district in the heart of the village; municipal-level cultural relics protection units, represented by the Zunming Su Ancestral Hall, are distributed on the east side of the district; and other traditional buildings (including various types of Su Ancestral Halls) are widely distributed in the central and eastern part of the village, which together constitute the spatial skeleton of the Bijiang clan's cultural relics. On the whole, the center of gravity of the distribution of historical and cultural elements is in the south of the central part of the village, and the historic and cultural district is also concentrated in this area. In terms of the spatial distribution of the existing value elements, the existing historical and cultural dynamic line of Bijiang Jinlou (Gold House) is centered on Bijiang Jinlou (Gold House) and extends in all directions along the Cunxin Waterway and the core of the historic and cultural district. Zhenxiang Building is the natural end point of this dynamic line extending to the northwest, while the old industrial buildings are located in the immediate outside of Zhenxiang Building, constituting the end white space of this cultural dynamic line in the material space.

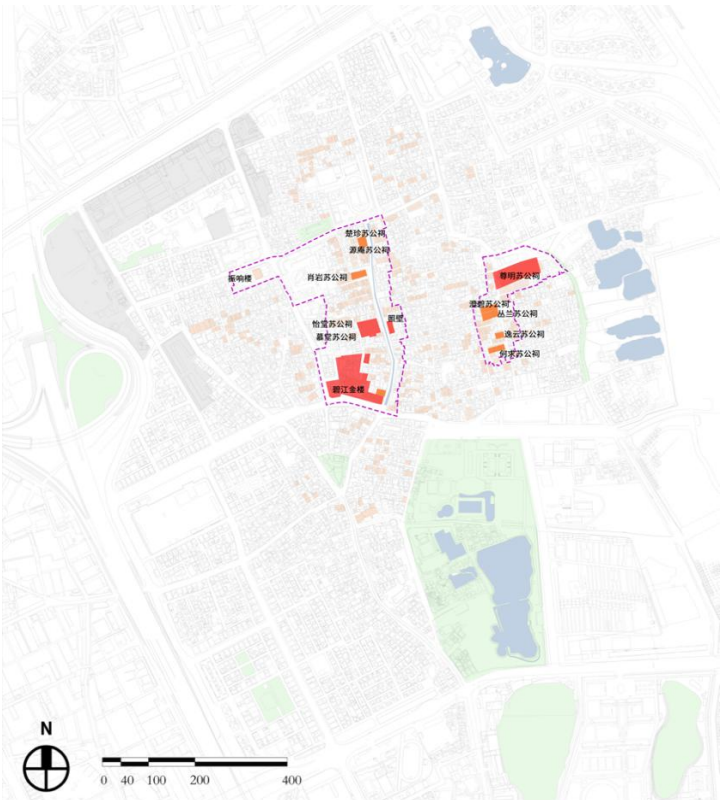
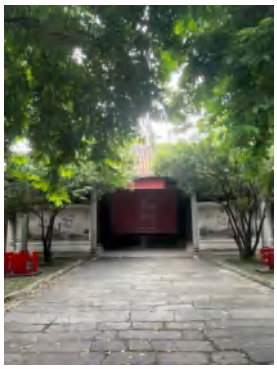


Figure 4-4 Existing Value Elements Analysis Map
(Source: Drawn by the author)

The section of old industrial buildings is located in the northwest edge of the scope of the historic and cultural district, and there is a certain spatial distance between the high-grade cultural relics protection units, and there is no direct physical adjacency. There is only one "Litang Zhao Ancestral Hall" in the south of the old industrial buildings. This ancestral hall is currently used as a venue for the Bijiang Calligraphy Association and children's calligraphy training, and is not connected to the surrounding factory buildings. On the other hand, Zhenxiang Building, as one of the few historic buildings in the village that are located outside the core of the historic and cultural district, is the closest in spatial proximity to the old industrial buildings and constitutes the most important spatial contact point between the old industrial buildings and the system of historic and cultural elements.



a) Bijiang Jinlou (Gold House)



b) Zhenxiang Building



c) Wumang Ancestral Hall (Zunming Su Ancestral Hall)

Figure 4-5 Current Situation of Major Historical Architectural Resources in Bijiang
(Source: photo by the author)

The above analysis shows that there is an obvious spatial broken chain in the distribution pattern of the existing historical and cultural value elements in Bijiang - the rich cultural resources are concentrated in the southern part of the village center, while the northwestern section of old industrial buildings is in the periphery of cultural significance, which lacks its own cultural identity and fails to form effective spatial linkage and functional interactions with the neighboring historical elements This situation means that the old factory building section is in the periphery of cultural significance. This situation implies that the old industrial buildings have a clear opportunity to intervene in the cultural activation level: through the renovation of the old industrial buildings to fill the cultural chain in the material space, and extending the community network to the north-west of the old industrial buildings, it will help to form a wider

coverage and richer level of cultural experience network. From the perspective of Urban Catalyst Theory, the old industrial buildings are located at the intersection of the radiation edge of historical and cultural resources and the daily life space of the community, and have the spatial conditions to be activated as a catalyst node, which will lead to the revival of public vitality in the surrounding area.

4.2 Population Composition and Public Life in Bijiang

4.2.1 Characteristics Of Community And Population Structure

Bijiang Community has a total area of 8.9 square kilometers, with 12 residential groups, 4,589 households, 37,634 permanent residents, 16,227 household residents and 21,407 floating residents. Bijiang community has three economic associations and three service associations. It is worth noting that Bijiang is Shunde's "billion-dollar village", the village annual collective income of more than 100 million yuan.

The demographic composition of the community around Bijiang's old industrial buildings is not a homogeneous single group of residents, but a composite structure of three groups of people, namely, original residents, industrial office workers, and migratory visitors, coexisting and overlapping with each other over a long period of time. This pattern is closely related to the historical accumulation of Bijiang described in Section 3.1: the original residents and the blue-collar labor base accumulated in the early industrialization stage still constitute the key actor of the community as the community as the community as the key actor , and with the spontaneous turnover of the spatial function, the tertiary industry practitioners with certain professional skills have also gradually integrated into the community, forming a complex geo-ecology where the separation of occupations and residences and the local mix coexist.

Under this general structure, quantitative data further reveals the population aggregation characteristics of the district. According to the crowd distribution data of the big data platform and the public data of the National Bureau of Statistics, in terms of the total population, the residential population of the Area is about 11,378, and the office population is about 5,596, showing a clear tendency to dominate the residential function. In terms of age structure, the core workforce aged 25 to 34 accounted for 30.49% and 31.41% of the residential and office groups respectively, with significant youthful characteristics. It is worth noting that comparing the site data with Beijiao Town's data from Shunde's Seventh National Population Census (2020) reveals a number of structural differences: about 6% of the site's population is 55 years old and above, which is lower than Beijiao Town's average of those aged 60 and above, and the degree of aging is relatively light; at the same time, the proportion of minors under the age of 18 is also

lower than that in Beijiao Town. This comparison shows that the population structure of Bijiang old industrial buildings area shows some structural differences with Beijiao Town as a whole: the high concentration of working-age population constitutes the main characteristic of the area, and at the same time, the long term settlement of original residents makes the practical needs of the elderly population not to be ignored. The reality of the composition of young adults and the coexistence of the elderly and minors implies that the spatial regeneration of this area needs to respond not to the demands of a single group of people, but rather to the composite demands across different age levels, taking into account both mobility and locality.

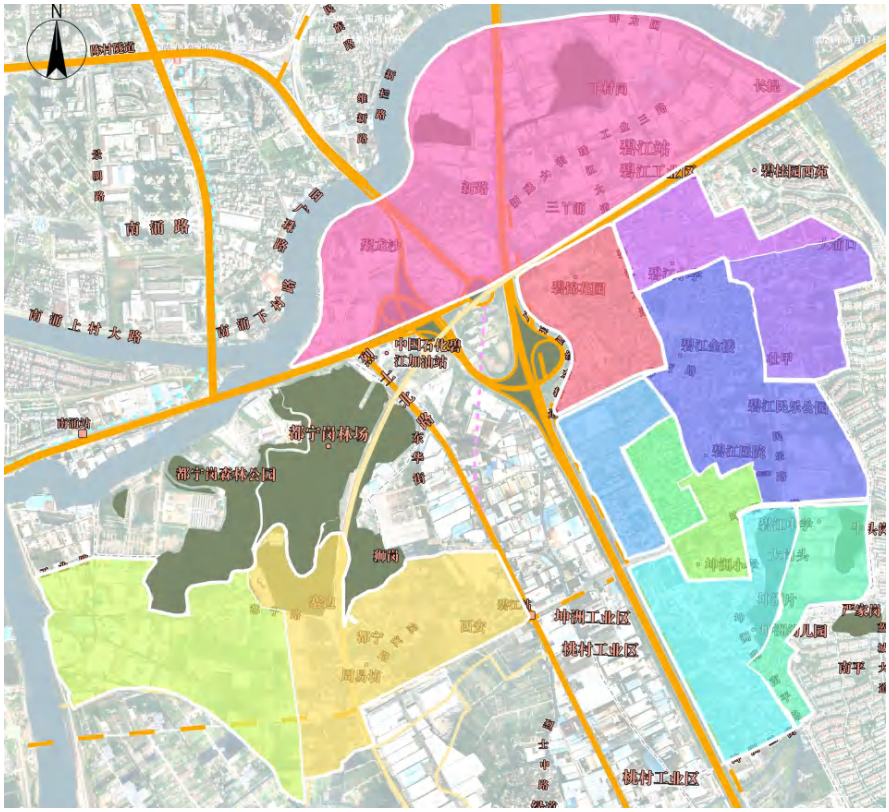


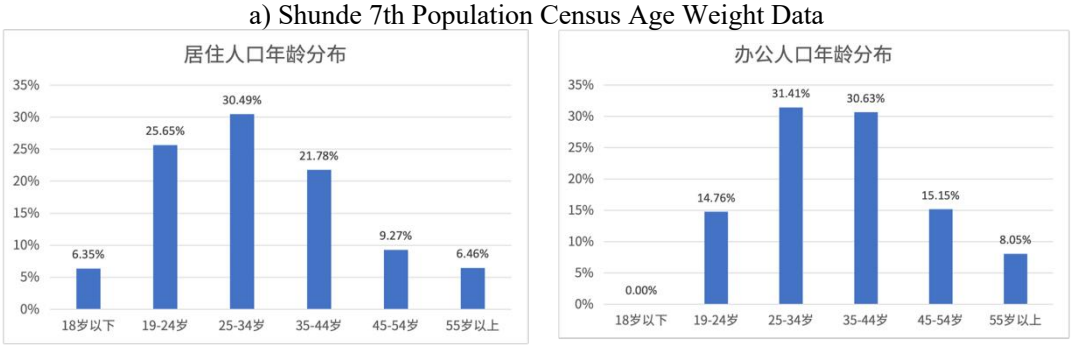
Figure 4-6 Distribution Map of Bijiang Community Area
(Source: Bijiang Community Council)

In terms of occupational composition, the resident population is dominated by manufacturing workers, with monthly income concentrated in the range of RMB 3,000 to 8,000, which is a typical grassroots labor group; while the educational structure of the office population is significantly higher, with 59.09% of the office population having college education or above, and the industry distribution is dominated by the wholesale and retail trade, manufacturing industry, and the construction industry. The data of the two groups of people outline a regional demographic portrait with low-educated blue-collar workers as the base and mid-range business and office attributes superimposed.

单位：%

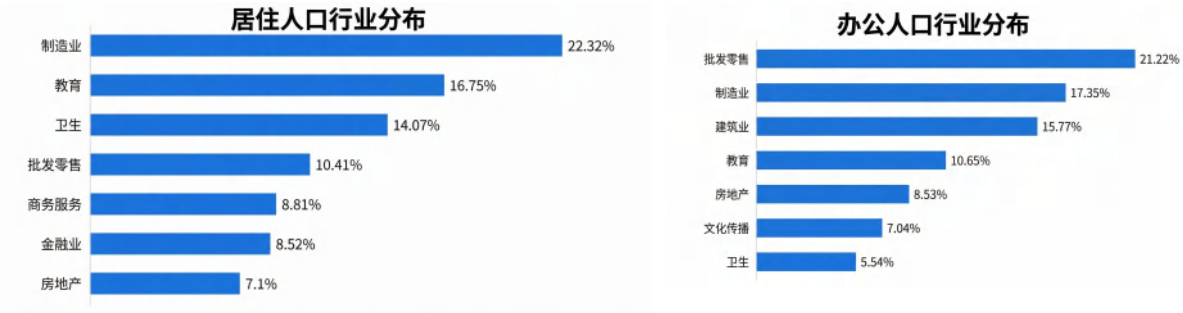
地　区	占总人口比重			
	0-14 岁	15-59 岁	60 岁及以上	其中：65 岁及以上
全 区	**15.01**	**75.09**	**9.90**	**6.87**
伦教街道	17.25	72.66	10.09	6.94
勒流街道	12.71	77.46	9.83	6.92
大良街道	16.05	73.20	10.75	7.58
容桂街道	15.31	75.53	9.16	6.31
陈村镇	15.56	72.98	11.46	8.05
北滘镇	13.84	77.98	8.18	5.50
乐从镇	15.43	75.92	8.65	5.81
龙江镇	13.85	77.74	8.41	5.82
杏坛镇	15.76	70.26	13.98	9.99
均安镇	14.07	73.60	12.33	8.74

a) Shunde 7th Population Census Age Weight Data



b) Age distribution of residential population　　c) Age distribution of office population

Figure 4-7 Bijiang Village Population Age Distribution
(Source: Shunde 7th Population Census, drawn by the author)



a) Industry distribution of residential population　　b) Sectoral distribution of office population

Figure 4-8 Bijiang Village Population Industry Distribution
(Source: Drawn by the author)

In addition, for the foreign visitors in the community around the old industrial buildings, young people aged 25-34 and middle-aged people aged 35-44 constituted the key actor s, while the group under the age of 18 also occupied a significant proportion of 15.11%. This all-age distribution indicates that with the gradual implantation of Bijiang's cultural and tourism industry, the foreign population in this area is no longer limited to a single purpose of industrial exchanges or freight transportation and logistics, but rather shows the early characteristics of

transitioning to leisure and cultural and tourism orientation, such as family tours and micro-vacations.

In summary, the community around Bijiang old industrial buildings presents a composite demographic structure with a young and strong labor force as the key actor , original residents' old age groups and minors co-existing, and the composition of foreign visitors becoming more and more diversified, reflecting the age and demand boundaries of the potential user groups in the area. This demographic pattern provides a clear message for the regeneration planning of old industrial buildings: the spatial strategy should not only respond to the rigid demand of the existing residents for low-cost and highly accessible daily life services, but also provide warm local support for the original residents and the elderly, and at the same time, take into account the expectations of the office population for a quality environment and the demand of the cultural and tourism visiting population for an open public space. For the community-oriented regeneration of Bijiang old industrial buildings, it is not appropriate to dominate the spatial transformation with a single functional position, but should take inclusiveness and flexibility as the basic principle, and build a composite public space system that can carry multiple groups of people, and bridge the tension between mobility and locality.

4.2.2 Observation of Public Space Use Behavior

This section conducts systematic observation of the use behavior of the existing public space around the old industrial buildings in Bijiang through field surveys, on-site interviews and questionnaires, focusing on the activity patterns, space preferences and use satisfaction of different groups of people, in order to identify the structural gap between the existing supply of public space and the residents' actual demand for its use.

From the observation of on-site research, the main users of the existing public space around old industrial buildings show obvious time and crowd differentiation characteristics. In terms of the activity pattern of different groups of people, the local elderly residents are the most stable key actor s in the daily use of public space, and their activity places are concentrated in the village parks, under the shade of large trees, commercial centers and ancestral halls and other nodes with good conditions for shading and avoiding the summer heat, and they are mainly engaged in low-intensity social activities, such as chatting, chess and other social activities; the Bijiang community as the key actor in the Party Service Center is also an important place for the elderly to gather, and it is regularly carrying out book reading, table tennis, planting, vegetarianism, dance practice, and birthday party, The Bijiang Community Party Service Center is also an important gathering place for the elderly, with regular organized

community activities such as book reading, table tennis, planting, vegetarianism, dance practice and birthday parties. The activities of teenagers and middle-aged groups are mainly concentrated in areas with high commercial density, including the area around the Bijiang Village pagoda, Deyun Colorful Plaza and the surrounding roads, with strong consumption and leisure attributes. The activity scope of foreign tourists is relatively fixed, with Bijiang Jinlou (Gold House), the historic and cultural district of Village Heart Street, Deyunju and other cultural and tourism nodes as the main focus, which is basically geographically isolated from the daily activity space of local residents, and various types of people do not overlap with each other and form their own system.

From the point of view of the usage characteristics of activity spaces, public green areas, commercial centers and ancestral halls are the three types of spaces that carry the most concentrated daily public life. Among them, the usage pattern of the ancestral hall is particularly noteworthy: it is open to the public as a cultural tourism node during holidays, and returns to the function of villagers' deliberation and daily activities during non-holidays, carrying community activities such as calligraphy, painting, and sports, with the dual attributes of cultural display and daily services. In addition, the village regularly organizes collective activities such as bazaars and wine-drinking ceremonies, which inject more concentrated popularity into the public space at certain times of the year.

Overall, the use of existing public spaces in Bijiang is scattered in terms of time distribution, with relatively obvious activity peaks on weekends; in terms of spatial distribution, it is highly dependent on a few nodes, such as public green areas and ancestral halls, and most of the spaces in the area, especially in the northwestern part of the area where old industrial buildings are concentrated, have been in a state of low or even unused for a long period of time.



a) Bijiang Community Party Service Center



b) Ancestral hall for teaching calligraphy and painting



c) Outdoor public space



d) Ancestral hall for community activities



e) Social space for young people



f) Gathering of young people in front of the ancestral hall

Figure 4-9 Current situation of public space in Bijiang community
(Source: photo by the author)

4.2.3 Community Identity and Collective Memory

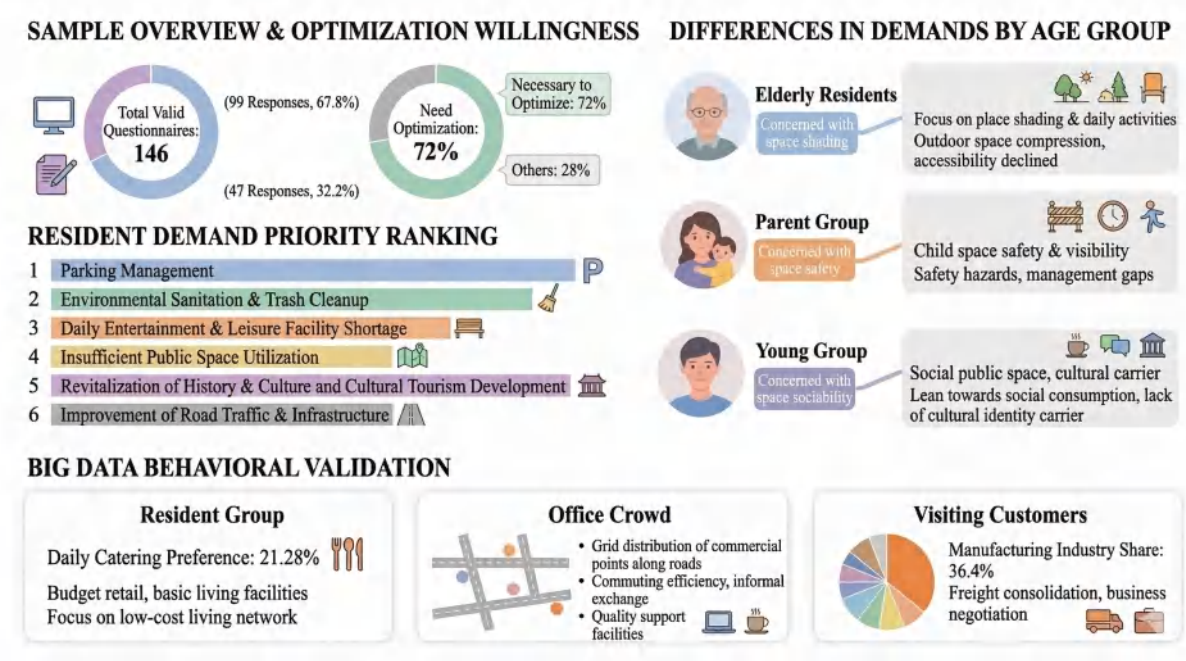


Figure 4-10 Community Identity Willingness and Needs Analysis Chart
(Source: Drawn by the author)

In order to further understand the residents' evaluation of the use of the existing public space and expectations for regeneration, this study conducted a questionnaire survey on the

residents of the communities around the old industrial buildings (see Appendix for details of the questionnaire), and a total of 146 valid questionnaires were collected, including 99 online questionnaires and 47 offline questionnaires. The survey results show that the overall satisfaction of the surveyed residents with the existing public space is fair, but 72% of the respondents believe that there is still a need for further optimization of the existing public space. In terms of demand priorities, the most concentrated issues reflected by residents are, in order, parking management, environmental hygiene and garbage removal, insufficient daily entertainment and recreational facilities, insufficient utilization of public space, historical and cultural revitalization and cultural tourism development, and road traffic and infrastructure improvement. This ranking shows that residents' demands are not limited to a single functional need, but span multiple dimensions such as quality of daily life, public space and cultural identity.

From the point of view of the differences in the needs of different age groups, the spatial demands of various groups of people show obvious differences. Elderly residents are most concerned about shade and rest conditions and whether daily activities can be carried out properly: existing activity spaces are mainly concentrated in indoor spaces such as the Party Service Center of the Bijiang Community, while some of the original outdoor activity facilities have been occupied by vehicles, which has reduced accessibility and safety, and further compressed outdoor activity space for the elderly. The research also found that the old industrial buildings are adjacent to an ancestral hall, where children's interest trainings such as martial arts and calligraphy are conducted. However, children spontaneously run into the open space adjacent to the old industrial buildings to play, which poses a certain safety hazard, reflecting the lack of safe and manageable children's activity spaces in the area, which shows that the parental group attaches great importance to the safety and visibility of children's activity spaces. The young group, on the other hand, has strong expectations for social public spaces, and tends to prefer composite places that can take into account informal exchanges and daily consumption. It is worth noting that this group shows strong willingness to identify with the community culture of Bijiang, but generally believes that there is a lack of spatial carriers that can carry this identity and allow it to be physically expressed.

Comparing the results of the questionnaire with the crowd behavior data from the big data platform can further confirm the above demand structure. The consumption preference of the residential group shows a strong pragmatic and rigid demand orientation, with a high reliance on daily food and beverage (with a preference of 21.28%), affordable retail and basic amenities, and spatial demand focusing on the accessibility and stability of a low-cost living network; the

behavioral trajectory of the office group is dispersed along the main roads and commercial nodes, with high expectations of commuting efficiency, informal communication space and quality support services; the visitor population has a high expectation of commuting efficiency, informal communication space and quality support services; and the visitor population has a high expectation of the quality and efficiency of the office network. The behavioral trajectory of the office population is scattered along major roads and commercial nodes, with high expectations for commuting efficiency, informal communication space and quality support services; the visitor group is highly mobile and purposeful, and its industrial characteristics are highly concentrated in the manufacturing industry (accounting for 36.4% of the total), and its spatial needs are mostly directed to the distribution of goods, short-term business negotiations or convenient docking of specific industrial services.

Comprehensive questionnaire survey and big data analysis results can be judged, Bijiang old industrial buildings around the community demand for residents presents two core features: First, the demand is real: whether it is the elderly are parking crowded outdoor space, children lack of safe activity sites, or young people on the plight of the lack of physical carriers for the community's cultural identity, all show that the district is not without the potential for public life, but a lack of Secondly, the demand is obviously diversified and hierarchical: users of different ages and statuses have different expectations for public space, and a single function-oriented regeneration can hardly respond to this kind of composite demand, but requires a flexible spatial strategy that takes into account daily life and openness, and is able to accommodate the coexistence of diversified groups of people.

The demand of Bijiang residents for public life in the community cannot be understood only from the perspective of the current gap in the allocation of facilities, but also needs to be examined in the context of Bijiang's unique historical and cultural accumulation and collective memory. As a National Historic and Cultural Village, Bijiang's residents' daily life style and tradition of public activities are deeply rooted in the historical soil of traditional Lingnan settlements. This is both the source of community cohesion in Bijiang and an in situ dimension that cannot be ignored in this study to understand the functional needs of the regeneration of old industrial buildings.

During the on-site research process, a number of long-term elderly residents of the Bijiang community were interviewed. The interviews revealed a common narrative theme: public life in Bijiang has traditionally been closely linked to specific local products, seasonal traditions, and collective activities, and these traditions are being continued and revitalized in new forms in recent years.

Among the older residents interviewed, many mentioned that Bijiang was historically known for its orchid cultivation, and that orchids were once important imagery in Bijiang's family gardens and daily interactions. An elderly resident who has long lived in the Village Center area recalled in the interview:

"In the past, every family in Bijiang loved to grow orchids, either to sell them or to keep them in their yards for their own enjoyment. Neighbors would also exchange seedlings and chat with each other about how to raise them."

This tradition of neighborhood interactions mediated by plant growing has continued in recent years in a new form - Bijiang Minle Park regularly hosts orchid expositions, attracting participants from within and outside the community, and becoming one of the most important vectors of expression of Bijiang's local cultural identity.

In addition to orchid culture, residents interviewed generally expressed a deep emotional connection to Bijiang's marketplace tradition. Bijiang has had a tradition of regular bazaars to this day. In recent years, temporary bazaars have been held in the northwest corner of Zhangyi Precinct and the surrounding open spaces, which are also an important form of public activity in which residents gather spontaneously to exchange goods and interact with the community. One resident interviewed said:

"[The bazaar] is not just about buying things, it's a chance for everyone to get together. Nowadays it is held once in a while, and the number of people who come is especially large, old people and children come, it's very lively."

Interviews also revealed that community planting activities have a continuing appeal in the daily lives of Bijiang residents. Some of the elderly residents reflected that they would like to retain functions related to planting and gardening in their daily activity space, which is directly related to their long-established living habits and emotional connection to the land.

The collective memory and living traditions revealed in the above interviews have direct relevance to the functional configuration of this study. Bijiang residents' demand for public space is not an abstract "place for activities," but rather specific types of activities highly related to local culture and traditions-orchid planting and display, regular markets and gatherings, gardening and community farms. This means that if the functional configuration of old industrial buildings can echo the above traditions, it will not only fill the gap of material facilities, but also activate the emotional connection of the residents and establish a real cultural bond between the old and new spaces. Based on this, this study takes community farms, pocket gardens and market places as important functional components in the subsequent functional

configurations, so that the transformed public space of the old industrial buildings becomes a contemporary continuation and regeneration carrier of Bijiang's collective memory.

4.3 Existing Conditions of Old Industrial Buildings

This study focuses on the old industrial buildings in the village, which are mainly concentrated in the northwest part of Bijiang Natural Village, locally known as "Zhangyi Precinct". In terms of texture, the interior of Bijiang Village is dominated by small-scale residential plots, with high building density and a dense lane-and-alley network, which is typical of the texture of traditional villages in Lingnan. The old industrial buildings are embedded in the form of a large volume and a whole piece of land, forming a strong contrast with the surrounding residential texture in terms of scale and density, resulting in a clear texture break in the area. This scale rupture is not only a visual problem, but also directly leads to the spatial disconnection of human flow and activities - villagers tend to bypass the area where the old industrial buildings are located in their daily activities, making it a blind zone in the village public life network.

4.3.1 Formation Mechanism and Ownership Structure of Old Industrial Buildings

The spatial pattern of existing old industrial buildings in Bijiang is not the product of planning will, but the result of the joint action of grassroots collective organizations and market forces under a specific institutional environment. As mentioned above, the promotion of Shunde's rural industrialization relies on the control and management of land resources by village collectives, and this mechanism has left a complex historical accumulation of land ownership while creating a rapid expansion of industrial space.

The formation of Bijiang's old industrial buildings is rooted in the unique collective management land system in Shunde since the reform and opening up. Under this institutional framework, village collective economic organisations (including administrative villages, natural villages and share cooperatives at different levels) are both the nominal owners of land and the actual promoters of industrial development. By converting agricultural land into industrial construction land and granting the right to use it to enterprises or individuals under long-term leases, the collective organizations have formed a basic pattern of collective ownership and decentralized use[74].

However, unlike the uniformly planned industrial parks, the construction process of industrial plants within and on the fringes of Bijiang Villages often lacked systematic land use control. During the development stage when policies were relatively relaxed, some villagers spontaneously erected productive buildings for rent on their own land or house sites; some other

factory buildings were built by the collective and then sublet to foreign enterprises; and a small number of factory buildings were built in a dependency way, whose actual ownership relationship was ambiguous at the beginning of the construction. The parallel construction of these three types of subjects has established the basic pattern of fragmentation of ownership.

From the current situation, the ownership of Bijiang's old industrial buildings shows an obvious mixed state, which can be roughly categorized into the following three types:

First, collective holding type. Uniformly held by village-level share cooperatives or economic associations, with relatively clear property rights, it is the category with the clearest negotiating subject in potential regeneration actions.

Second, individual private construction type. Individually funded by the villagers, built on their own land or around residential sites that have not been strictly approved historically, with property rights belonging to individuals or families, but the nature of the site is often inconsistent with the registration.

Third, the historical legacy of fuzzy type. These include assets left behind by affiliated enterprises whose construction subjects have died out, buildings that have not been registered for a long time, and factory buildings whose right of use and ownership have been seriously separated due to repeated subletting. This type faces the most complex compliance barriers in regeneration operations[75].

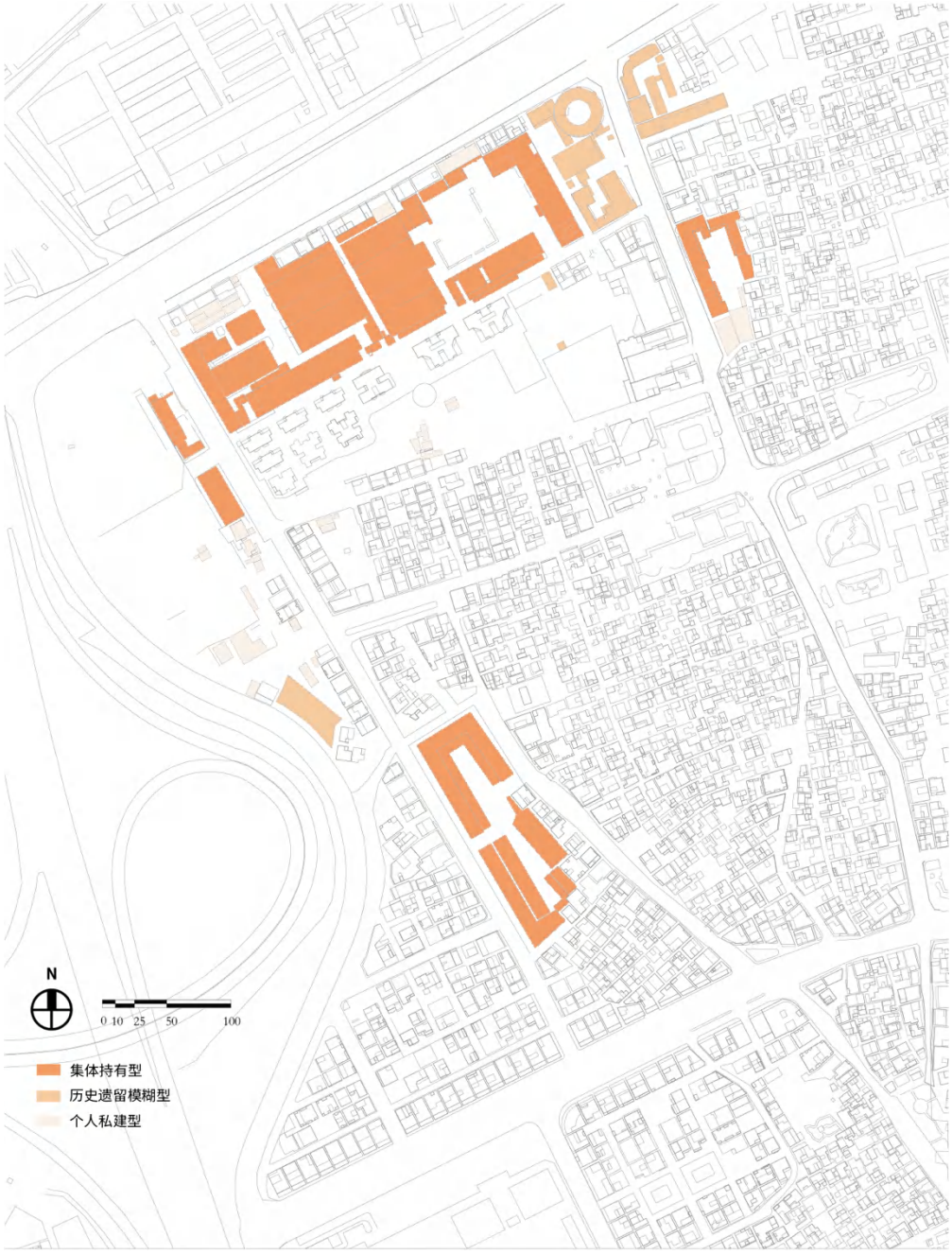


Figure 4-11 The current status of ownership of old industrial buildings within Bijiang Village. (Source: Drawn by the author based on the research)

The above fragmentation of ownership explains why these factory buildings have long been outside the vision of integrated development. Compared with continuous industrial parks with centralized property rights and regular land plots, the scattered factory buildings inside the clusters are difficult to be included in the unified storage and renovation process due to fragmented negotiation subjects, unclear land boundaries, and complicated historical legacy issues, and thus have been left behind in the successive waves of industrial upgrading. However, precisely because these factory buildings have not been removed or replaced on a large scale, they have maintained a long-term spatial coexistence with traditional settlements, lane-and-alley networks, and water patterns, and are deeply embedded in the daily life fabric of the

Bijiang community. This also constitutes an important spatial premise for the catalyst network regeneration strategy discussed in this study - the reconnection of old industrial buildings with the community's daily life network does not have to be established out of thin air, but rather the reactivation of an existing spatial relationship.

4.3.2 Spatial Distribution and Overall Pattern

From the perspective of the Greater Bay Area, Bijiang is located in the middle of the Guangzhou-Foshan metropolitan area, about 20 kilometers and 50 minutes' drive from the central city of Guangzhou, 40 minutes' drive from the central city of Foshan, and 30 minutes' drive from the Panyu District of Guangzhou. This central location enables Bijiang to receive the population and consumption radiation from the twin cities of Guangzhou and Foshan, while avoiding the loss of its own development momentum by being directly adsorbed by the central city, and possessing the external conditions to occupy a place in the regional cultural tourism and creative economy pattern. On the town scale, the site is adjacent to Bijiang Station and is located in the area surrounded by three transportation arteries, namely, Fo Chen Road, Guangzhu Road and Guangfo Jiangzhu Expressway, with remarkable land accessibility. On the east side of the site, there is a large residential area of Bijiang, which has a stable surrounding population base; on the north side, the site is connected to Chencun, and on the west side, the site maintains a close connection with Beijiao Town center.

In the overall spatial pattern of Bijiang Community, Bijiang Industrial Zone, Duning Industrial Zone and Kunzhou Industrial Zone are distributed around the center of Bijiang Village from the north, southwest and south directions respectively. Unlike the large-scale industrial areas mentioned above, the old industrial buildings of interest in this study are small-scale industrial buildings embedded in the traditional settlement of Bijiang Village, mainly concentrated in the northwestern part of the village area, with significant differences in scale, spatial fabric, and property rights, which are the spatial remnants of the penetration of industrialization process into the traditional settlement.

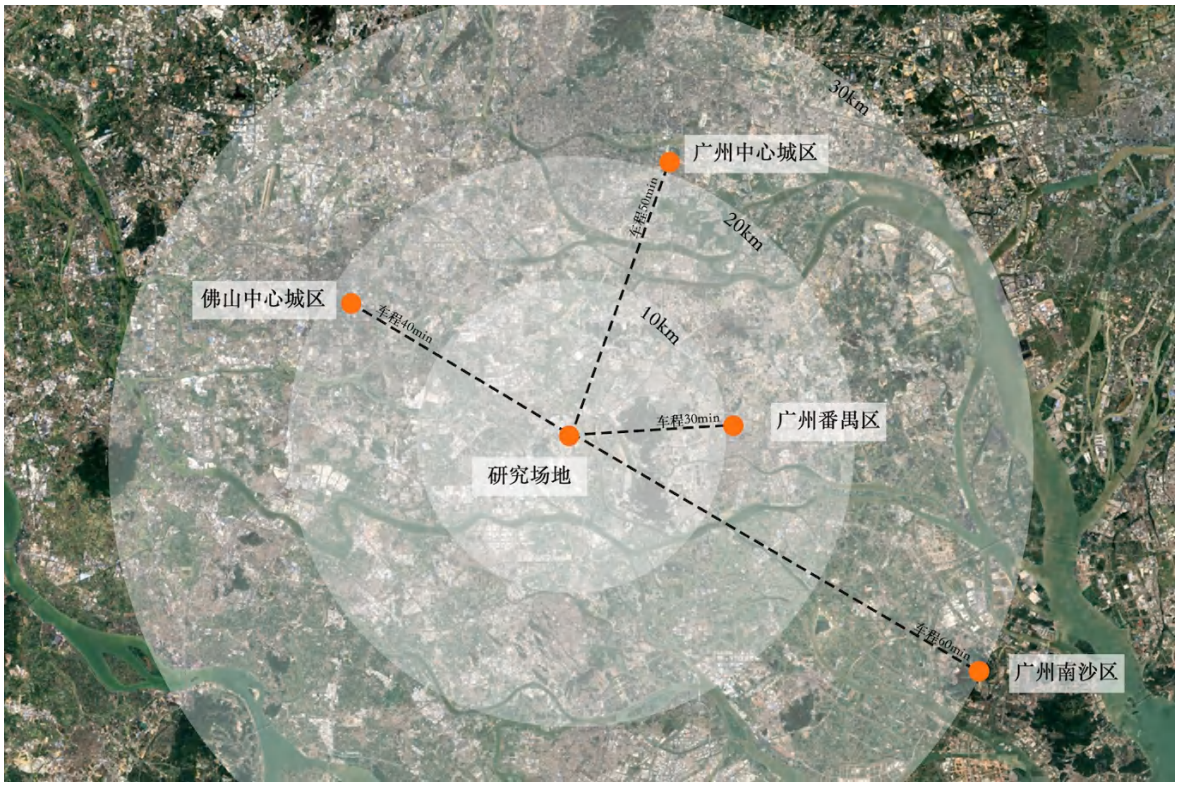


Figure 4-12 Spatial and Temporal Patterns of the Greater Bay Area Scale
(Source: Drawn by the author)

The old industrial buildings in Bijiang are not embedded in a homogeneous urban fabric, but in a composite spatial system composed of traditional settlement fabric and road network. As seen from the satellite map, the historic and cultural district of Bijiang Village Cunxin Waterway in the center of the village and the surrounding area have retained a dense construction fabric, presenting spatial characteristics that are clearly different from those of the surrounding industrial areas. According to the on-site research and drawing analysis, the old industrial buildings in Bijiang Village are mainly concentrated in the northwestern area of the village, adjacent to Zhangyi Road on the western side of the village, forming two to three centralized plots with large volume and a texture clearly differentiated from the surrounding residential buildings. The northern side of this section is adjacent to Guangzhu Road and Bijiang Industrial Zone; the southern side is surrounded by dense settlement fabric, and public nodes such as Zhenxiang Building, Bijiang Community Council, and Bijiang Elementary School are distributed in its proximity to maintain a relatively short spatial distance from the places of daily life.

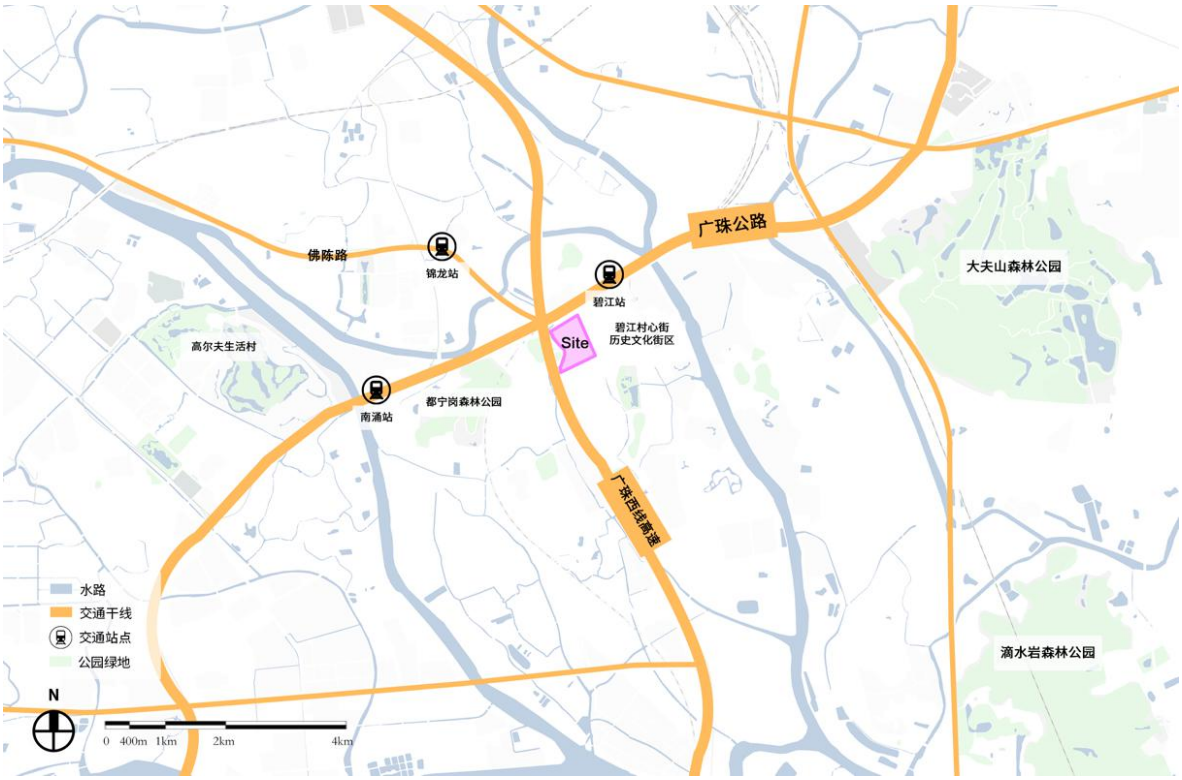


Figure 4-13 Township Scale Location Analysis Map
(Source: Drawn by the author)



Figure 4-14 Village scale zone analysis map
(Source: Drawn by the author)

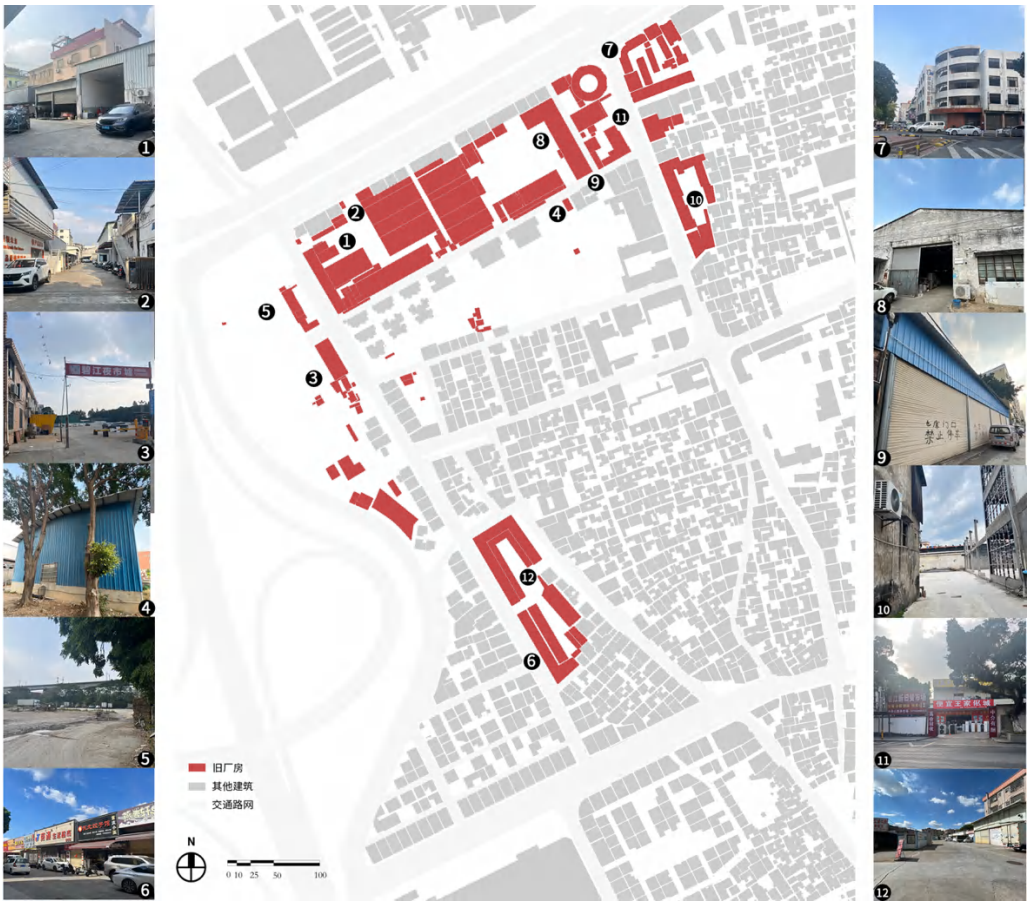


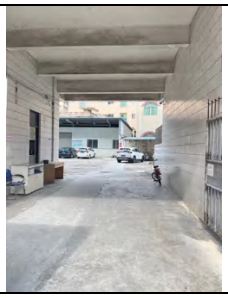
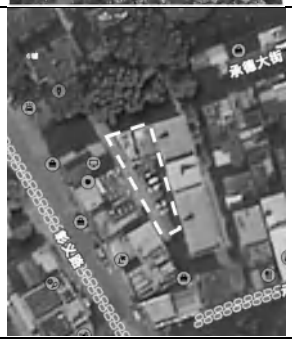
Figure 4-15 Survey and analysis map of the current situation of old industrial buildings
(Source: Drawn by the author)

In terms of macro-location conditions, this section has the location basis to integrate into the daily life activity line of the community; the volume of the plot is relatively concentrated, and it has the scale conditions for holistic regeneration operation. Whether the above conditions can be effectively transformed needs to be further examined in the light of the current status of the old industrial buildings, their spatial quality and ownership. According to the author's organization, the old industrial buildings within Bijiang Village can be divided into 9 areas and 4 clusters. The old industrial buildings are distributed along Guangzhu Road, Zhangyi Road, Bijiang Road and other major traffic roads inside and outside the village, and show obvious spatial differentiation: the north side (Area 2) is the largest volume of continuous industrial buildings group, and the interior is organized as a unit of space with two relatively independent enclosed courtyards; the south side (Area 7) is distributed along the street with a large-scale mixed-use group; the northeast side (Areas 3 and 4) has a number of small-scale stores scattered along the street with the On the northwestern side (Area 1 and 6), a large number of small shops and factories are scattered along the street; on the northwestern side (Area 1 and 6), a large number of outdoor spaces are distributed in a north-south direction along the west side of Zhangyi Road. In addition, there are a number of smaller storage buildings and unused

structures scattered within the village fabric (Area 8 and 9). On the whole, the volume and construction standard of old industrial buildings within the study area are not uniform, the use status varies significantly, and the ownership involves multiple subjects such as village collectives and private owners, and some of the buildings have experienced many times of subletting or informal transfer of property rights, which makes property rights relationship more complicated, and this reality has a direct impact on the timing and implementation path of the subsequent renovation.

Table 4-4 Old industrial buildings status quo area situation list

Area No.	Satellite map	Current photo	Building status	Property Rights	Function
1			Steel-frame corrugated industrial building	Collective land of the village	Stacking building materials on weekdays, market place on holidays
2			Steel-frame corrugated industrial building, frame-structure industrial building, large area	Village collective land + individual private construction	Auto repair industry, furniture rough processing industry
3			Frame-structure industrial building	Ambiguous historical legacy	Idle
4			Steel-frame corrugated industrial building, brick-concrete factory building	Ambiguous historical legacy	Recycling market for used goods

5			Frame-structure industrial building	Village collective land	The ground floor is a commercial building for public services, the upper floor is unused, and the inner yard is a warehouse.
6			Brick-concrete factory building	Individual private construction + ambiguous property rights of historical legacy	Idle and recycling of old things
7			Steel-frame corrugated industrial building	Village collective land	Restaurants along the street, warehouses and logistics in the inner courtyard
8			Brick-concrete factory building	Individual private construction	Unused
9			Steel-frame corrugated industrial building	Historical legacy of ambiguous property rights	Idle

(Source of table: Drawn by the author based on research)

4.3.3 Spatial Status Of Old Industrial Buildings Proper

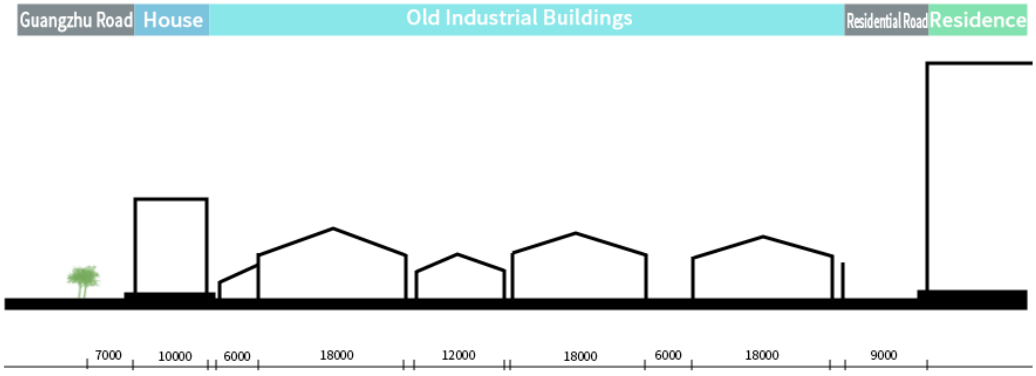
I. North side group



a) Architectural texture



b) Satellite map of the current situation



c) Current section

Figure 4-16 Spatial status analysis of the north side cluster
(Source: Drawn by the author)

The North Side Group is the largest and most concentrated factory buildings area within the study area, and is the above mentioned area.2 The old industrial buildings in this group cover an area of 17970 square meters, and are divided into three relatively independent use units by three enclosed courtyards, and the three inner courtyards are not connected to each other. The cluster has three entrances on Guangzhu Road in the north and Bijiang Road in the west, which lead to the three different inner courtyards. The current business types of the three units from west to east are automobile repair, furniture processing and recycling of used goods, and part of the space is also used as storage. From the point of view of building structure and spatial characteristics, the factory buildings in the cluster are mainly of the large-span high-space type, with a storey height of about 8-10 meters, a large height of the building unit, and open and continuous internal space, which is adapted to the spatial needs of the automobile repair and furniture production for the flow of large-scale equipments and operation of bulky materials. Inside the cluster, there are a number of smaller ancillary structures, including temporary corrugated metal shed or simple metal shed, with lower construction standards and blurred boundaries with the main plant. The villagers' self-built houses on the northern edge of the cluster are closely connected, constituting a layout of "store in front and factory at the back"; the southern side is separated from the Bijin Garden (residential community) by a fence.

From the point of view of the current use, the north side of the cluster is still in use, and activities such as automobile repair, furniture production and recycling of used goods are still going on, so the overall intensity of use is relatively high. However, some of the ancillary spaces have been converted into inefficient warehousing, and the utilization rate is obviously low. In terms of safety, at the structural level, the overall appearance of the large-span industrial building is relatively intact, but there are signs of varying degrees of damage to the ancillary buildings; at the environmental level, the auto repair business involves oil replacement and waste liquid discharge for a long period of time, and there is a risk of soil contamination caused by oil seepage; the furniture production involves paint and dust, and there is a certain amount of environmental residue in the production area, so it is necessary to commission a professional organization to carry out soil and groundwater testing.

II. South Side Cluster

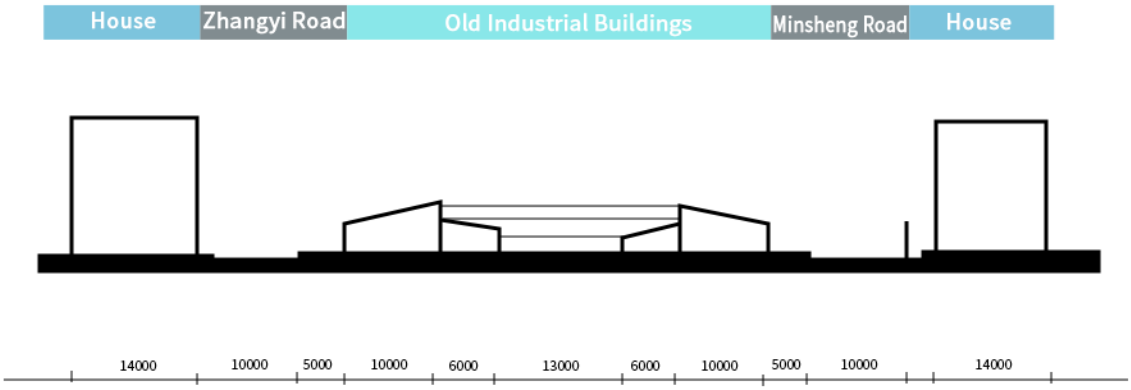
The south side cluster is laid out along the street, with large volume and obvious internal and external functional zoning for the above area.7 The old industrial buildings of this cluster cover an area of 4854 square meters. The street-facing frontage is currently occupied by various types of restaurants and fast-food stores, with active functional interaction with the street; the interior of the cluster mainly carries the functions of logistics and storage of goods, with a relatively sloppy use of space, with two entrances on Zhangyi Road in the west and on Minsheng Road in the east, respectively. From the viewpoint of building structure and spatial characteristics, the floor heights of the factories along the street are about 5-6 meters, all of which are temporary factories with tin roofs and brick walls, while the internal logistics and storage space is more open. From the point of view of the current use status, the catering and commercial part along the street is currently operating normally and the use status is more active; the utilization intensity of the internal warehousing part is on the low side, and the spatial potential has not been fully released. From the safety point of view, the environmental pollution risk of catering and logistics storage is relatively low.



a) Architectural texture



b) Existing satellite map



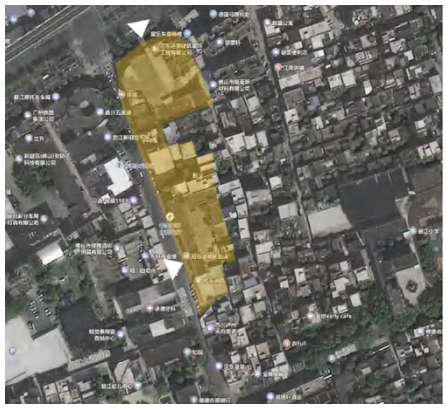
c) Existing profile
Figure 4-17 South Side Cluster Spatial Status Analysis Map
(Source: Drawn by the author)

III. Northeast Cluster

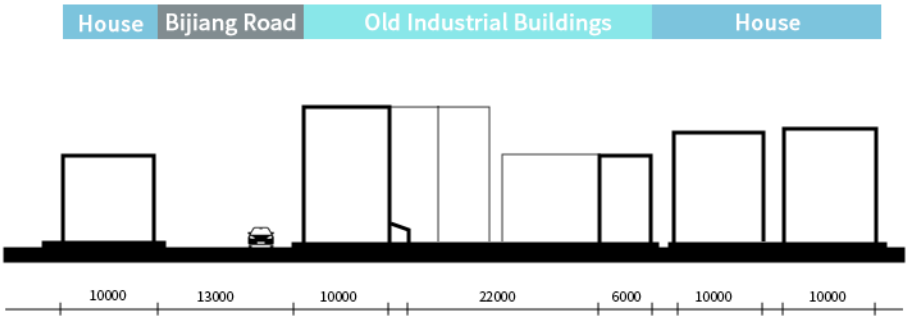
The Northeast Cluster has a number of multi-story factory buildings scattered along Bijiang Road. The stores along the street are still in operation, while the upper floor space is basically unused. The old industrial buildings of this cluster cover an area of 4725 square meters, which is 3 and 4 in the above area. From the viewpoint of building structure and spatial characteristics, the volume of industrial buildings in this area is moderate, and the northernmost detached factory building was formerly known as Huabao Capacitor Factory, with 5 floors, equipped with an independent inner courtyard, and there are a large number of temporary buildings in the inner courtyard; the other industrial buildings along the street are mainly 4-6 floors in height, and the southernmost side of the factory building is a temporary tin factory building of a height of 3 meters or so. From the point of view of the current use, the stores along the street on the ground floor are mainly used for residential and commercial purposes, and the space on the upper floors is largely unused, with a low overall use efficiency, which is a typical state of inefficient utilization. In terms of safety, at the structural level, some of the buildings are multi-storey frame structure buildings, the overall structure is well-preserved, but there are obvious signs of aging in the appearance; at the environmental level, the capacitor factory business may involve the use of heavy metals or chemicals, and there is a certain amount of minor pollution potential, and the subsequent need to carry out pollution isolation.



a) Architectural texture



b) Existing satellite map



c) Existing profile

Figure 4-18 Spatial status analysis of the northeast cluster
(Source: Drawn by the author)

IV. Northwest Side Cluster

The Northwest Side Cluster is surrounded by Bijou Boulevard, Zhangyi Road and Guangzhu Road, with a green urban road on the west side and a small stream inside; on the east side, there are a number of small-scale factory buildings and stores scattered along Zhangyi Road. The old industrial buildings in this cluster cover an area of 3,232 square meters for the above area 1, 6. From the viewpoint of building structure and spatial characteristics, there are both frame-structure building of about 3 floors and temporary tin factory buildings in the area, with a lot of unused vacant land inside the site, and the entrance is only one, which is located on the side of Zhangyi Road; the current business of the factory buildings along the street is mainly food and beverage, and the internal vacant space is used as the storage of building materials, rough processing of building materials, parking, and is used for the function on holidays as a place for the storage of building materials. The current business of the factory building along the street is mainly restaurants, and the internal open space is used for building materials storage, rough processing of building materials, parking, and as a venue for the Bijiang Village market during holidays. In terms of safety, the overall structure of the multi-storey frame-structure industrial building is well-preserved, while the appearance of the

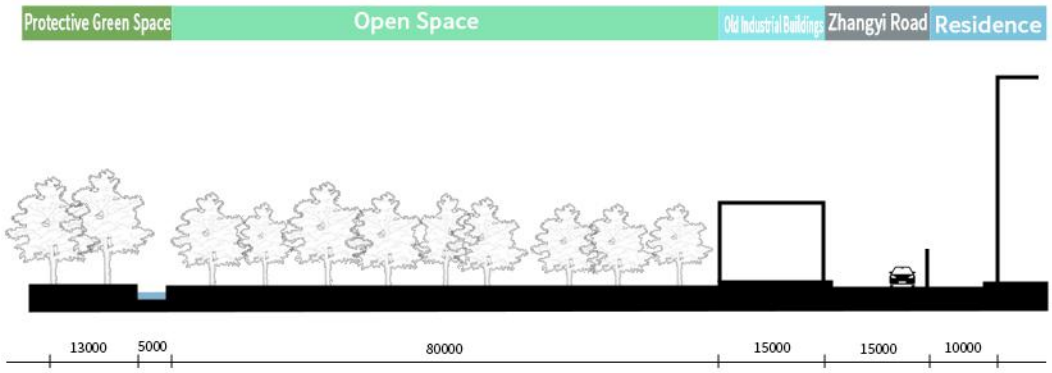
temporary tin factory building is obviously aging, and the structural condition is extremely poor; on the environmental level, the catering business is less polluting, while the rough processing and storage of furniture generates a large amount of dust, which needs to be reduced and dealt with subsequently.



a) Building Texture



b) Existing Satellite Map



c) Existing condition profile

Figure 4-19 Spatial status analysis of the northwest side cluster
(Source: Drawn by the author)

In addition to the above three relatively concentrated clusters, there are also a number of smaller storage buildings and unused structures scattered within the study area, embedded in the residential texture of the village, for the above areas 8 and 9. These structures are small in size and low in construction standard, all of them are temporary, and the boundary with the neighboring residential buildings is blurred, with a total land area of 452 square meters. They are mainly in storage or completely unused, and their interference with the daily life of the neighbors is low, but their scattered distribution aggravates the fragmentation of the area texture to a certain extent. Such structures often occupy the original relatively open open space or potential public space within the village, directly compressing the outdoor activity space available to the neighboring residents and eroding the public space resources.

4.3.4 Status of External Space of Old Industrial Buildings

In addition to focusing on the body of the old industrial buildings and their internal courtyards in the village, this study also focuses on their external spatial environment. The external spatial environment of the old industrial buildings is the most direct spatial dimension of the relationship between the factory building site and the surrounding villages, and it is also the centralized manifestation of the current quality of the public nature of the area. This section analyzes both the street frontage and the experience of the pedestrian and cycling network.

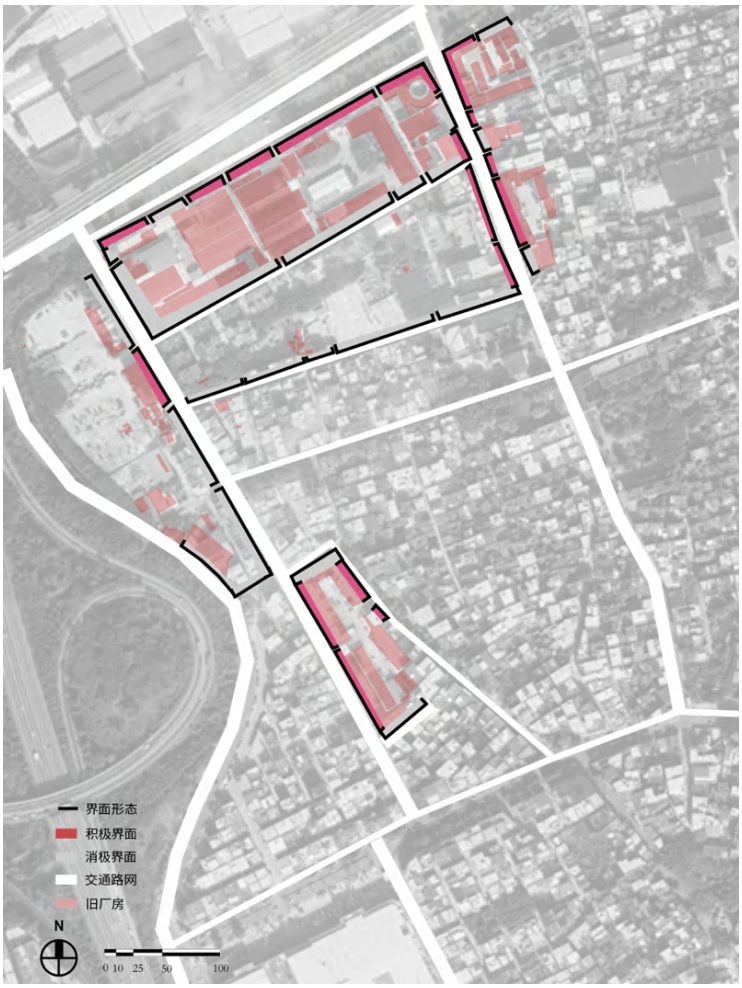
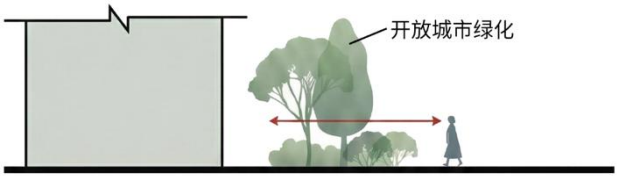
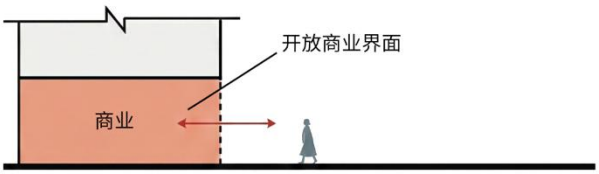
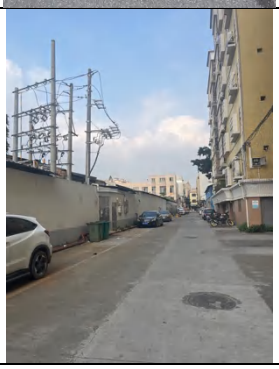


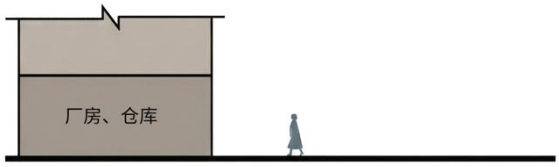
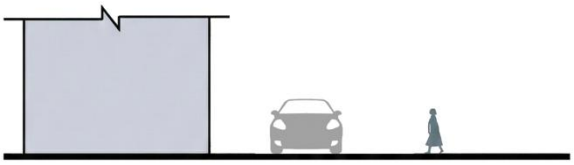
Figure 4-20 Street frontage status analysis map
(Source: Drawn by the author)

The street frontage condition of the old industrial buildings within the study area varies from group to group. After the research, the street frontage of the old industrial buildings within the study area is categorized into two types: active and negative. The street frontage of the northern cluster is dominated by continuous walls, with deep building setbacks and a lack of effective transition space between the walls and the street, making the interface closed and monotonous, and generating an obvious sense of exclusion for pedestrians. The stores along the street-facing frontage of the southern cluster form a localized and relatively active frontage, which is the most concentrated location of active interface elements within the study area, but

the level of industry is low and the quality of the interface is limited. The stores along the street-facing frontage on the northeast side are scattered, with rudimentary forms of openings and unused upper floors leading to a clear vertical break in the active interface. On the whole, inactive frontages are continuously distributed over a large area, especially the walled sections of the factory buildings, warehouses and parking, creating an obvious sense of exclusion for pedestrians, making the walking experience along the street-facing frontage monotonous and depressing, making it difficult to support the natural occurrence of daily public life; while active frontages are extremely limited, only appearing occasionally in a few street-facing frontage openings of the external-service-oriented factories, and are in a simple form, making it difficult to form active frontages in a continuous manner.

Table 4-5 Spatial Analysis of Street Frontages

Interface type	**Schematic diagram of interface profile**	**Photographs of the current situation**
Active frontage		
		
Negative frontage		

Negative frontage		
		

(Source of table: Drawn by the author)

The large size of the old industrial buildings and their continuous closed boundaries form a significant spatial barrier to the pedestrian and cycling network within the village. The north side of the cluster is the largest, and its closed boundary is particularly obvious in blocking the north-south pedestrian connection, and pedestrians have to make a longer detour to cross the area; the lack of spatial nodes for pedestrians to stay, poor shading conditions, and a lack of visual references throughout the entire area have led to the long-term marginalization of the area in the daily pedestrian and cycling activities. At the same time, the street frontage along the pedestrian path is extremely mixed in terms of style - the plain concrete facade of the industrial factory building, the tile veneer of the villagers' own house and the historical buildings such as the ancestral hall are placed in the same interface, the architectural language is contradictory to each other, and the spatial ambience lacks coherence, which further weakened the quality of the walking experience.

In summary, the core problems of the external spatial environment of the old industrial buildings can be summarized as follows: strong closure, weak publicity, and poor walkability. These three points together constitute the spatial structural reason why the northwest area has long been outside the daily public life of Bijiang, and also directly point to the core task of the subsequent renovation design in terms of boundary treatment, interface activation and scale weaving.



Figure 4-21 Existing Landscape Issues
(Source: Drawn by the author)

4.4 Problem Diagnosis and Regeneration Direction

Synthesizing the investigation and research on the three dimensions of the current status of Bijiang spatial system, crowd composition and public life, and old industrial buildings, the regeneration dilemma of Bijiang's old industrial buildings area is not a single problem of material decay. Compared with the ongoing restoration of old ancestral halls, revitalization of public housing and renovation of private homes in Bijiang Village, the regeneration of old industrial buildings faces a very different set of spatial logics and implementation barriers that need to be examined separately.

4.4.1 Core Issues in the Regeneration of Old Industrial Buildings in Bijiang: Dual Challenges of Spatial Relationships and Operational Paths

1. The relationship between old industrial buildings and community life is disjointed rather than fractured.

The old industrial buildings in Bijiang are different from the old ancestral halls and public houses in the village, which are continuously promoted for regeneration. The latter two, no matter how decayed their status is, have always occupied a clear position in the memory of residents' daily life and the community identity system. Ancestral halls carry clan rituals and collective memory, and public housing used to carry out community service functions, to which residents have spontaneous emotional connections and expectations of use. The situation of old industrial buildings is different: from the very beginning of their construction, they were

production-oriented and bounded by walls, and never really integrated into the daily life network of the community.

This fundamental difference determines that the regeneration of old industrial buildings cannot simply apply the logic of ancestral hall restoration or public housing revitalization - the latter is centered on repairing existing relationships, while the old industrial buildings are centered on establishing new ones. How to make a space type that has never had a real connection with the community life, through the intervention of regeneration to really integrate into the daily activities of the residents is the fundamental proposition of the regeneration of the old industrial buildings in Bijiang.

The old industrial buildings are embedded in the residential texture in the form of enclosed courtyards with continuous closed walls and single entrances, forming a significant structural barrier to the village pedestrian and cycling network. Residents generally choose to walk around rather than through this area, making the old industrial buildings a blind spot in the village's public life network.

A more prominent problem is the existence of a large number of fenced-off open spaces within the old industrial buildings, which have been left unused or informally occupied for a long period of time. The volume of these open spaces is not small, the central strip of open space and the west side of the open space along the water together have a considerable area, but they are completely inaccessible to the residents in the neighborhood, and neither form any form of public open space, nor assume any community service functions. At the same time, the research analysis shows that, within 5-minute living circle around the old industrial buildings area, cultural activities station, small multi-functional sports ground, outdoor comprehensive fitness ground and other basic community service facilities are missing, between the large amount of idle vacant land enclosed by the wall and the serious facilities adjacent to the core of the living gap, forming a very distinctive spatial mismatch of resources.

2. The complexity of the property rights structure restricts the implementation of the operation route

From the perspective of property rights, unlike old industrial buildings, the property rights of old ancestral halls in Bijiang Village are usually attributed to clan organizations or village collectives, the property rights of public houses are attributed to village collectives or neighborhood committees, and the property rights of private houses are attributed to individual villagers. The property rights of these three types of objects are relatively clear, and the willingness to remodel and the path of implementation are also relatively clear. The property right structure of old industrial buildings is more complicated: mainly held by the village

collective, but some plots involve private owners, and a few plots have ambiguous property rights left over from history; the term and terms of the existing leases are different, and some of the existing enterprises using the factory buildings are still in the operation state, and there is a greater cost of time and uncertainty in the negotiation of vacating the buildings.

The complexity of this ownership structure makes the regeneration of old industrial buildings face difficulties in the implementation of ancestral hall repair and revitalization of public buildings: it is difficult to quickly form a consensus on the willingness to renovate among multiple ownerships, the compensation mechanism for the existing tenants to vacate is unclear, and the coordination of the timing between the overall planning and the implementation of the overall planning and the implementation of the project in batches requires a more detailed institutional arrangement. This also explains why Bijiang's old industrial buildings have always been on the periphery of successive regeneration practices, failing to be included in the vision of systematic renovation like ancestral halls and public buildings.

From the operation point of view, unlike old industrial buildings, the operation of old ancestral buildings usually relies on the spontaneous maintenance of clan organizations, and the operation of public buildings relies on the administrative management system of village collectives or neighborhood committees, both of which are supported by relatively stable subjects. The operation of old industrial buildings after renovation faces greater uncertainty: the cost of renovation is higher than that of general public housing revitalization, and the recovery cycle is longer; if it is positioned as a purely public welfare function, it is difficult to guarantee the source of funds for long-term operation; and if it is introduced into the commercial sector in order to balance the revenues, it faces the risk of the erosion of the community's public nature by the logic of commerce. How to find a balance between public welfare and sustainability is the core problem that distinguishes the operation of old industrial buildings from other types of stock. At the same time, the division of power and responsibility between the main user and the main manager of the old industrial buildings after renovation is not yet clear. The existing community building programs in Bijiang are mainly promoted by public welfare funds and volunteers, and the continuous operation of the programs after the completion is often faced with the problem of insufficient motivation.

Combining the above two levels, the core issues of Bijiang's old industrial buildings regeneration can be summarized as follows: how to transform the former closed production space into open space, and how to sustainably operate the old industrial buildings with complex property rights and as the key actor of the community.

4.4.2 Direction of Regeneration of Old Industrial Buildings in Bijiang: Releasing Space, Phased Intervention, Community Operation

Based on the summarization of the above core issues, this study makes the following judgments on the regeneration direction of old industrial buildings in Bijiang.

(1) Prioritize the release of open space rather than a complete renovation of the building

The root cause of the lack of relationship between old industrial buildings and community life is the closure of space, not the decay of buildings. Therefore, the first task of regeneration is not to carry out a comprehensive remodeling of the building itself, but to open up the walls and release the stock-based urban regeneration space that has been enclosed for a long time. This judgment has a direct constraint on the choice of the design scope: the volume of the large continuous factory buildings on the north side far exceeds the actual demand for public services in the community, and the existing lease relationship is complicated, so it is neither realistic nor necessary to force it into the scope of comprehensive renovation. In contrast, a number of large areas of open space in the area that are enclosed by walls, the transformation of which is based on the demolition of walls, the entire land, planting greenery, low-cost, quick results, and after the transformation to immediately serve the needs of the surrounding residents in their daily activities, is the most feasible object of intervention in the near future.

(2) Taking community service nodes as the anchor point to establish a sustainable operation foundation

Simple remediation of open space can improve spatial accessibility, but it is difficult to form a sustainable and stable community vitality. For this reason, on the basis of the establishment of the open space network, this program implants community service nodes with clear functions in plots with relatively clear property rights and good location conditions, as the anchor point of public vitality in the area. The community activity center on the south side takes the public welfare activities led by the neighborhood committee as the basic function, supplemented by community-oriented commercial forms such as market and flash sale, forming a composite operation structure in which public welfare and commerce support each other, and providing stable funds for the daily maintenance of public welfare space with commercial proceeds.

(3) Take the village collective as the core of property rights coordination, and resolve property rights constraints in stages

In view of the complexity of the property rights structure of old industrial buildings, the overall transformation of the reality of resistance, the program to take the village collective as the core of the main body, the implementation of phased promotion strategy. In the first phase,

priority is given to the promotion of clear property rights belonging to the collective land, with the removal of fences and open space remediation as the main action to reduce the threshold of the start; in the first phase of the spatial value of the area to enhance the updating of the program has been preliminarily verified, and then based on the promotion of property rights of the more complex parcels of negotiation and integration, and gradually expanding the scope of the transformation.

(4) Continuing the tradition of community building in Bijiang with the institutional guarantee of community participation mechanism.

The implementation of the above spatial strategies and operation modes needs to be guaranteed by the community participation mechanism to prevent the regeneration from deviating from the basic community-oriented regeneration stance in the process. The existing practice of participatory community building in Bijiang has proved that residents have the willingness and ability to participate in the regeneration decision-making process; the renovation of old industrial buildings should introduce the mechanism of residents' participation in the stages of planning, design, construction and operation, and extend the tradition of community building to the field of regeneration of old industrial buildings, so as to make the residents become the key actor s of the regeneration instead of the passive bearers of the wills of the planner or the developer.

4.4.3 Analysis of the Effectiveness of Interventions Based on the Urban Catalyst Theory

The reason the Urban Catalyst Theory is applicable to addressing the aforementioned issues and regeneration directions lies in the direct correspondence between its core mechanisms and these two aspects. Regarding the issue of spatial isolation, the Catalyst Theory emphasizes strategic catalyst nodes to break down existing spatial patterns; by opening public thoroughfares and removing barriers, it reestablishes pedestrian connections between old industrial buildings and surrounding communities—which is precisely the spatial prerequisite for the catalyst effect to spread outward; Regarding the shortage of public services, the catalyst theory centers its interventions on catalyst nodes with public functions, emphasizing that a catalyst must possess genuine public appeal to trigger a chain reaction. This aligns closely with the goals of community-oriented regeneration, which are to fill facility gaps in the area and address residents’ genuine needs through low-threshold facilities; Regarding the issue of fragmented property rights, catalyst theory advocates prioritizing catalyst intervention on plots where conditions are ripe to drive spontaneous follow-up by surrounding plots, replacing one-time comprehensive development with incremental phased approaches. This naturally aligns

with the practical constraints of the Bijiang old industrial buildings area, where complex property rights make unified advancement difficult.

Consequently, the site selection logic for catalyst nodes in this study can be derived from the following three dimensions.

First, using property rights feasibility as a baseline threshold. Collective land with clearly defined ownership should be prioritized as the first-phase catalyst nodes, while intervention in plots with ambiguous ownership or complex private property rights should be deferred. Once the catalyst effect of the first phase is established, these plots can be gradually incorporated into subsequent regeneration phases by leveraging the increased land value.

Second, functional orientation based on gaps in public services. According to the facility allocation assessment in Section 4.1.1 of Chapter 4, facilities such as cultural activity centers, small multi-purpose sports fields, and outdoor comprehensive fitness areas are all lacking within the district's 5-minute living circle. Only when functional configurations truly align with residents' usage needs can catalyst nodes establish a sustainable and stable foundation of foot traffic, thereby generating outward-radiating catalyst effects.

Third, prioritize pedestrian and bicycle accessibility as a spatial condition. The location of catalyst nodes must fall within the extendable range of existing pedestrian circulation or occupy key positions at current pedestrian and bicycle bottlenecks, ensuring that once integrated, they naturally blend into residents' daily walking paths rather than becoming isolated functional enclaves. Based on the analysis of the pedestrian and cycling network in Section 4.1.2 of Chapter 4, the southern and eastern sides of the old industrial buildings have the most direct connection with the residential fabric of the village, offering better walkability than the northern side. Therefore, community service nodes are prioritized on the southern side, while the northern plot focuses on opening up boundaries and improving street frontage as the primary near-term intervention measures, reserving interfaces for future spontaneous regeneration.

The integration of these three dimensions collectively forms the basis for the derivation of catalyst node siting and functional configuration in Chapter 5, ensuring that design decisions are grounded in a systematic response to existing contradictions.

Summary of the Chapter

In this chapter, through the systematic research on the three dimensions of the current situation of Bijiang spatial system, the composition of the crowd and public life, and the ontology of the old industrial buildings, we have completed the transformation from the

background cognition to the identification of the problems, and on the basis of which we have proposed the basic direction judgment of the regeneration of the old industrial buildings.

In the first section, the spatial system analysis is carried out from four subsystems: public service facilities, pedestrian and cycling network, blue-green open space and historical and cultural elements, which reveals the special situation of the northwestern area where old industrial buildings are concentrated in the overall spatial structure of Bijiang. At the level of public service allocation, measured by the 5-minute living circle standard, the area lacks facilities that are most closely related to local residents' daily public interactions and healthy life, such as cultural activity stations, small multi-functional sports venues, and outdoor fitness venues. At the level of pedestrian and cycling network, the old industrial buildings organize traffic by industrial production logic, with closed boundaries and single entrances and exits, which makes the Northwest Area become an island in the village's pedestrian and cycling network, and the residents walk around rather than through in their daily life. At the level of open space, the northwest area is the most prominent gap in the village's open space system, with a large amount of unused open space circled within the walls of old industrial buildings, creating a stark mismatch of resources with the shortage of amenities immediately adjacent to the residential core. At the level of historical and cultural elements, the old industrial buildings are at the end of the white space extending from Zhenxiang Building to the northwest of Bijiang, constituting the intersection of the edge of cultural resources radiation and the community's daily life space. The analysis of the four subsystems points to the same conclusion: the old industrial buildings have the location basis to integrate into the daily life of the community, but the closed spatial form systematically blocks the possibility of this integration.

Section 2 reveals the real needs that old industrial buildings need to respond to in terms of demographic structure and public life behavior. The district presents a composite demographic structure in which the young and strong labor force is the main body, the original residents' old age group and minors coexist, and the composition of foreign visitors is becoming more and more diversified. Behavioral observations show that the existing public activities are highly dependent on a few nodes, and the Northwest old industrial buildings area has been in a state of low or even no use for a long time. The questionnaire survey further reveals that the lack of daily recreational and leisure facilities and the underutilization of public space are the most concentrated demands of the residents, with different age groups focusing on their spatial needs. In addition, the oral interviews revealed local collective memory traditions such as orchid cultivation, regular marketplaces, and community gardening, suggesting that functional configurations that echo these traditions will help to establish authentic cultural ties between

old and new spaces. The abovementioned diversity of needs and locality together indicate that the regeneration of old industrial buildings should not lead the spatial transformation with a single functional positioning, but rather build a resilient public space system capable of accommodating a diverse group of people.

Section 3 conducts a systematic investigation of the property rights structure, spatial distribution and ontological status of old industrial buildings. At the property right level, the old industrial buildings in Bijiang show a mixed state of collective holding, individual private construction and historical legacy of ambiguous coexistence of the three categories, this fragmentation pattern is the systemic root of the old industrial buildings have long been outside the vision of the integration and development, but it also means that the village collectives as the core of the coordination, prioritizing the start of the clear property rights of the land in the phased approach to promote the path of practical feasibility. At the level of spatial distribution, the old industrial buildings are divided into four groups in the north, south, northeast and northwest, distributed in Zhangyi Precinct, which are significantly different from each other in terms of building conditions, usage status and property rights structure, and have the spatial conditions for differentiated and phased intervention. At the level of ontological status, there are three common problems: the continuous distribution of a large area of closed interfaces, the inefficient idleness of internal open spaces, and the poor permeability of pedestrian and cycling network, which together constitute the spatial structural reasons for the area's long-term isolation from daily public life.

Section 4 summarizes the core issues and basic directions for the regeneration of old industrial buildings in Bijiang on the basis of the findings of the above three dimensions. The essence of the key actor is the double challenge of spatial relations and operation paths: old industrial buildings have never been truly integrated into the daily life network of the community, and the fundamental task of their regeneration is not to repair the existing relations, but to establish new ones. The complexity of the property rights structure makes the formation of willingness to renovate and the establishment of the main body of the operation to face additional institutional obstacles. Accordingly, this section proposes four directions of regeneration: the release of open space as the priority action, community service nodes as the anchor point of vitality, the village collectives as the core of property rights coordination to promote in phases, and community participation mechanisms as the institutional guarantee, which establishes a clear problem orientation and methodological prerequisites for the selection of the location of catalyst nodes and the formulation of programs in the subsequent design chapters.

Chapter 5 Community-oriented Regeneration Strategy and Design of Bijiang Old Industrial Buildings Based on Urban Catalyst Theory

5.1 Design Positioning and General Framework

I. Positioning of regeneration subject: community as the key actor

This program takes the community as the key actor of regeneration, fully referring to the conclusions of the questionnaire survey and residents' demand judgment in Chapter 4 in the design stage, aiming at serving the 5-minute living circle around the factory, providing sufficient material conditions for reshaping the community living network, so as to ensure that the functional configuration is an effective response to the real community needs; in the operation stage, taking the village collective as the key actor , establishing the operation and management framework of multi-party collaboration.

II. Functional Positioning: Prioritizing Public Open Space

The functional positioning of this program prioritizes the supply of public open space as the target, and the implantation of community service function nodes as the auxiliary. Beijiao Town has a strong economic foundation, and commercial service facilities already have a certain foundation. What the district really lacks is the public space directly related to residents' daily public interaction, all-age activities and healthy life, rather than commercial consumption space.

III. Catalyst Positioning: Community-level Catalyst as the Core

According to the framework of Urban Catalyst Theory, the positioning of catalysts in this project is based on community-level catalysts. The priority of catalyst intervention is based on the feasibility of property rights, the urgency of community demand and the catalyst effect, and the initial catalyst nodes are established in the ripe parcels, so as to drive the large-scale factory clusters in the north to enter into the spontaneous regeneration process when the conditions are ripe through the gradual diffusion of the catalyst effect.

5.1.1 Design Framework: Multi-core Resonance Community Living Network

The design scope of this program focuses on the spatial objects with priority intervention conditions in the area, and renews them into parks, green spaces, public activity spaces and open spaces, without carrying out a full-coverage transformation of the entire old industrial buildings site. The rationale for this choice is: the core problem of the old industrial buildings

is the closure of the existing stock space rather than the total decay of the buildings; releasing the enclosed open space with minimal intervention cost is more effective than large-scale building renovation to create perceptible changes in community vitality in a short period of time.

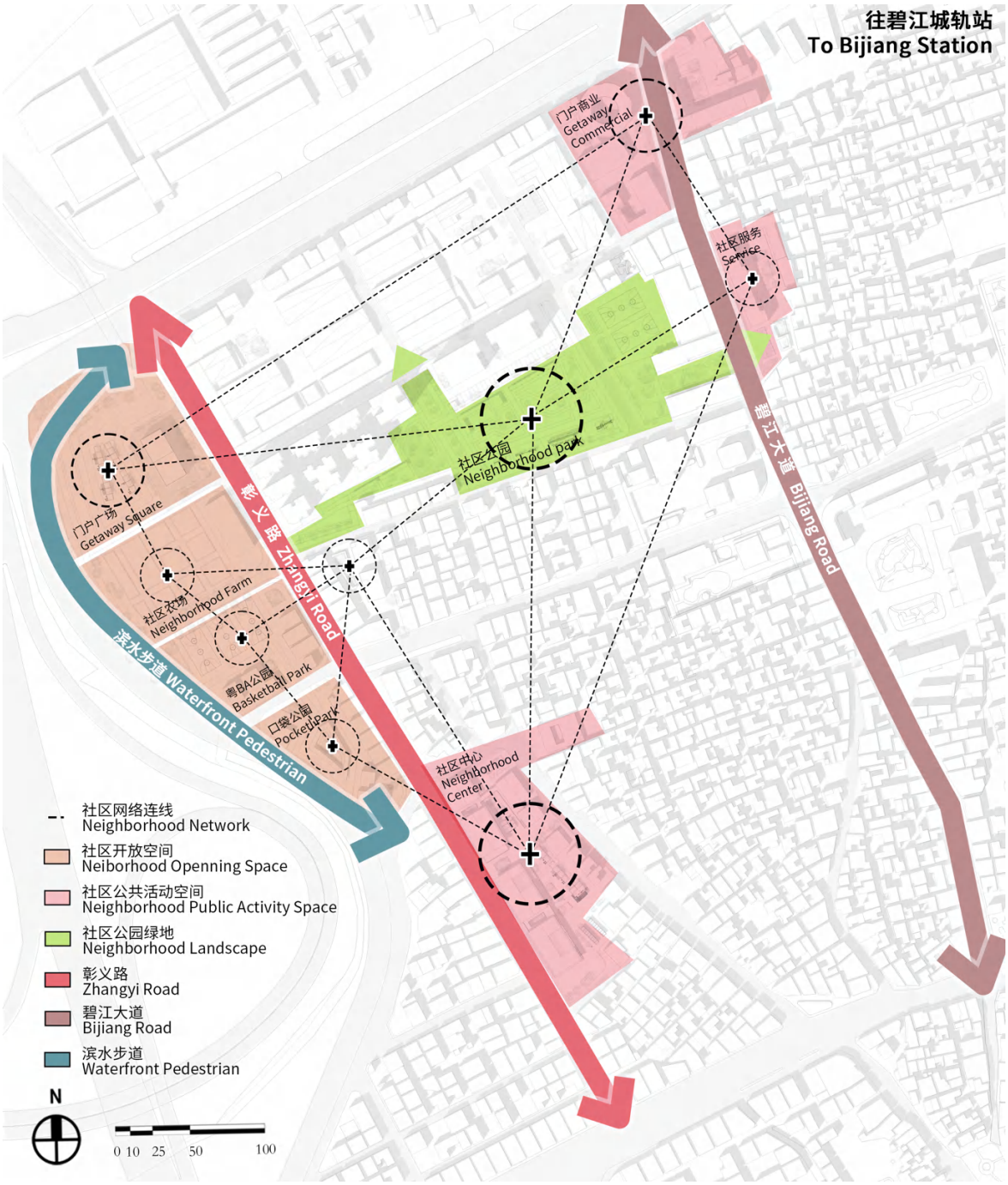


Figure 5-1 Overall framework of community network
(Source: Drawn by the author)

The number of large-scale continuous factory groups on the north side far exceeds the actual demand for public services in the community, and the cost of building renovation is high and the coordination of property rights is complicated, so this plan includes them in the follow-up scope of long-term spontaneous regeneration, and in the near future, it only opens up the

interface of the fence along Zhangyi Road moderately, in order to improve the experience of pedestrian and cycling network on the street and reserve the interface for subsequent regeneration.

This plan takes Zhangyi Road as the longitudinal main axis of the area, the central park on the south side of Bijin Garden (residential community) as the transverse axis, and the waterfront walkway on the west side as the landscape boundary, to construct the basic skeleton of the public space of the area. Zhangyi Road serves as the main pedestrian corridor connecting the nodes in the north-south direction, assuming the functions of guiding the flow of people and connecting the nodes; the west waterfront walkway serves as the linear open space on the west side of the area, integrating the open space along the water into a continuous green recreational belt, and forming a framework of public space together with Zhangyi Road to cover the northwestern corner, where the vitality of the area is the weakest.

On the basis of the above spatial skeleton, this plan sets up four types of catalyst nodes to form a clear hierarchical and multi-core resonance community life network:

The community park node is located in the middle of the area in the east-west direction, which is the largest centralized green space intervention point in the area. In response to the conclusion of the research that "there is a lack of space for daily activities", it is planned to focus on the functions of greening, leisure and daily interaction of the residents, so as to serve the needs of the surrounding residents of all ages for their daily outdoor activities.

The node of the waterfront function zone is located in the open space along the water in a north-south direction on the west side of the site, taking into account the large depth of the site. Taking into account the results of the research in Chapter 4, the site conditions and the collective memory of the Bijiang community, the Gateway Plaza, Community Parking Building, Community Farm, Basketball Court and Pocket Park are arranged in segments to meet the needs of villagers' festivals, planting, Cantonese BA and other needs of locality, and to form a multi-faceted community space that takes into account the needs of static and dynamic activities.

The Community Activity Center node is located in the south side, which is the core anchor point with the highest functional density of this plan, and carries the composite functions of neighborhood service, cultural activities and daily business in a group together with the surrounding ancestral halls and green areas, and is based on public welfare activities led by the community committee, supplemented by moderate community commercial business to support the operation of sustainable.

The gateway commercial node is located in the direction of the northeastern entrance. In the near future, the removal of the fence and site remediation will be the main means of

intervention to open up the spatial connection between the northeastern side of the area and the direction of Guangzhu Road and the Bijiang City Railway Station, so as to reserve an interface for the spontaneous regeneration of the factory buildings on the northern side in the long term.

In terms of their catalytic role, the four types of catalyst nodes mentioned above all fall within the category of community-level catalysts. Their primary objective is to serve the daily lives of local residents; they do not incorporate large-scale cultural, tourism, or commercial functions primarily aimed at external visitors. Although the gateway commercial nodes are located at the district's external entrances, their functional positioning focuses primarily on meeting the convenience needs of commuters and fostering industrial incubation within neighboring communities, rather than serving as urban-level cultural and tourism hubs. This positioning aligns with the core principle of "community-oriented regeneration" in this study and is consistent with the regulatory constraints on large-scale commercial development outlined in the Bijiang Historic and Cultural Village Protection Plan.

5.1.2 Framework of Incremental Regeneration: Catalyst Diffusion Path in Phased Advancement

This program adopts the incremental regeneration path of promoting in two phases, with the maturity of the implementation conditions as the core judgment criterion for the phasing basis.

In the first phase, the release of open space and the launching of the community center are the main contents: priority is given to the demolition of fences, the removal of low-quality temporary buildings, and the inclusion of the central community park, the west waterfront functional zone and the south community activity center into the scope of implementation in the first phase; low-cost site improvement and community building are the main means of establishing the basic pattern of the district's public space quickly, so that the residents can actually perceive the spatial changes.

The second phase focuses on function placement and system improvement: on the basis of the stable use of the open space in the first phase and the improvement of the community's recognition of the area, according to the feedback from the actual use of the residents, public toilets, small libraries, community exhibition rooms and other specific functional facilities will be placed in a number of small frame-structure industrial buildings around the open space; at the same time, it will push forward the interface remediation of the gateway nodes in the north side, and gradually form the overall public space system of the area. Public Space System.

The criteria for determining whether to proceed with Phase II are based on a comprehensive evaluation across two dimensions. The first is the property rights coordination

dimension: for plots with complex existing property rights, such as those in Zones 2 and 3, a survey of property rights and negotiations will be conducted concurrently during the implementation of Phase I. Once the ownership of key plots is clarified and a basic consensus on the relocation and compensation plan has been reached, the institutional prerequisites for Phase II will be deemed met. Second is the usage effectiveness verification dimension: within six months to one year after the completion of Phase I open spaces, the community residents' committee will organize follow-up surveys on usage patterns, focusing on the daily usage frequency of the community activity center and the central park, the demographic coverage of users, and changes in residents' perceptions of the area. If the follow-up results indicate that both locations have established a relatively stable daily user base, and that spontaneous resident activities (such as markets, morning exercises, and children's play) are occurring regularly within the spaces, this is deemed to indicate the preliminary formation of a catalyst effect, and Phase Two may be initiated accordingly. The significance of this dual-dimensional assessment mechanism lies in the following: the ownership dimension ensures the institutional feasibility of Phase II catalyst intervention, while the usage effectiveness dimension translates the "spontaneous diffusion of chain reactions" in catalyst theory into observable empirical evidence. This approach prevents the blind advancement of subsequent investments before the catalyst effect has taken hold, thereby truly realizing the catalyst logic of driving gradual, holistic regeneration through localized activation.

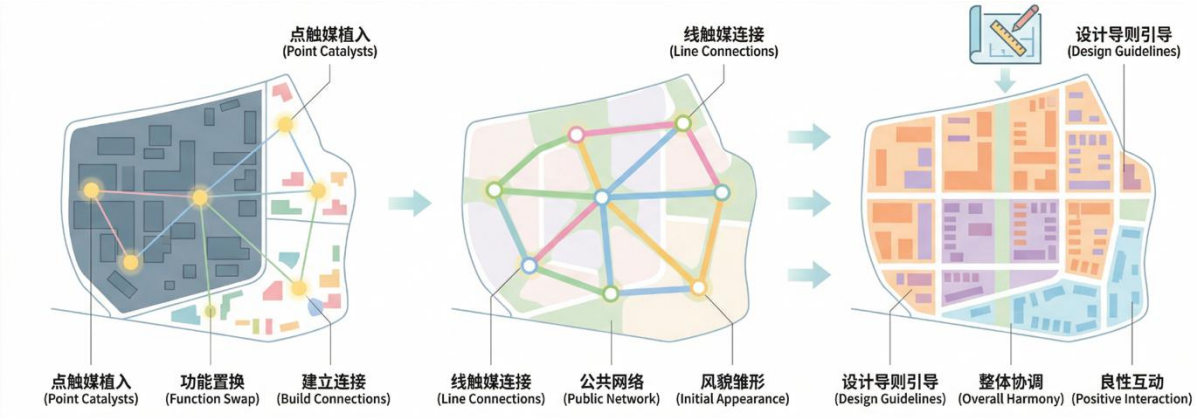


Figure 5-2 Schematic diagram of incremental regeneration
(Source: Drawn by the author)

In summary, the scope of the first phase of the regeneration of this program is the northwestern site (from Guangzhu Road in the north, Zhangyi Road in the east, and Bijin Garden Avenue in the west) and its internal old industrial buildings; the central site of the community (Bijin Garden (residential community) in the north, Bijin River community in the south, Zhangyi Road in the east, and the Chengde Hospital Area in the west) and its internal old industrial buildings; and the southwestern site (from Chengde Area in the north to the

Taining Area in the south. Zhangyi Road to the east and Chengde Avenue to the west) and its internal old industrial buildings. Priority is given to old industrial buildings whose structure, area, environmental safety and other conditions are suitable for community-oriented regeneration, and the rest of the temporary tin factory buildings will be demolished. The reason for choosing these sites in the first phase of the regeneration is that there is a large area of vacant land inside, the property rights are clear, and there is no longer any industrial production inside the factory buildings, so the cost of regeneration and release is low, and there are various implanted functions, and after placing the catalysts, it can stimulate the vitality of the surrounding community to the maximum extent, so the demand for regeneration is the most urgent.

The scope of the second phase is the two old industrial buildings and their surrounding land at the gateway on the northeast side and the old industrial buildings and their internal courtyards on the east side of Chengde Hospital, in addition to the road dredging and environmental regeneration of a large area of the external space of the factory buildings on the north side. The reason for choosing these sites in the second phase of regeneration is that they are some distance away from the community and their accessibility is general, but the site itself and its internal old industrial buildings structure, space, environmental safety and other conditions also have a certain value for regeneration, which can be used as a supplement to the community functions after the first phase of regeneration. For the large factory building space on the north side, the program does not renew the body of the factory building, but only does the regeneration of the external space, which lays the material foundation for the future spontaneous regeneration of the industry in this area under the operation of the market.

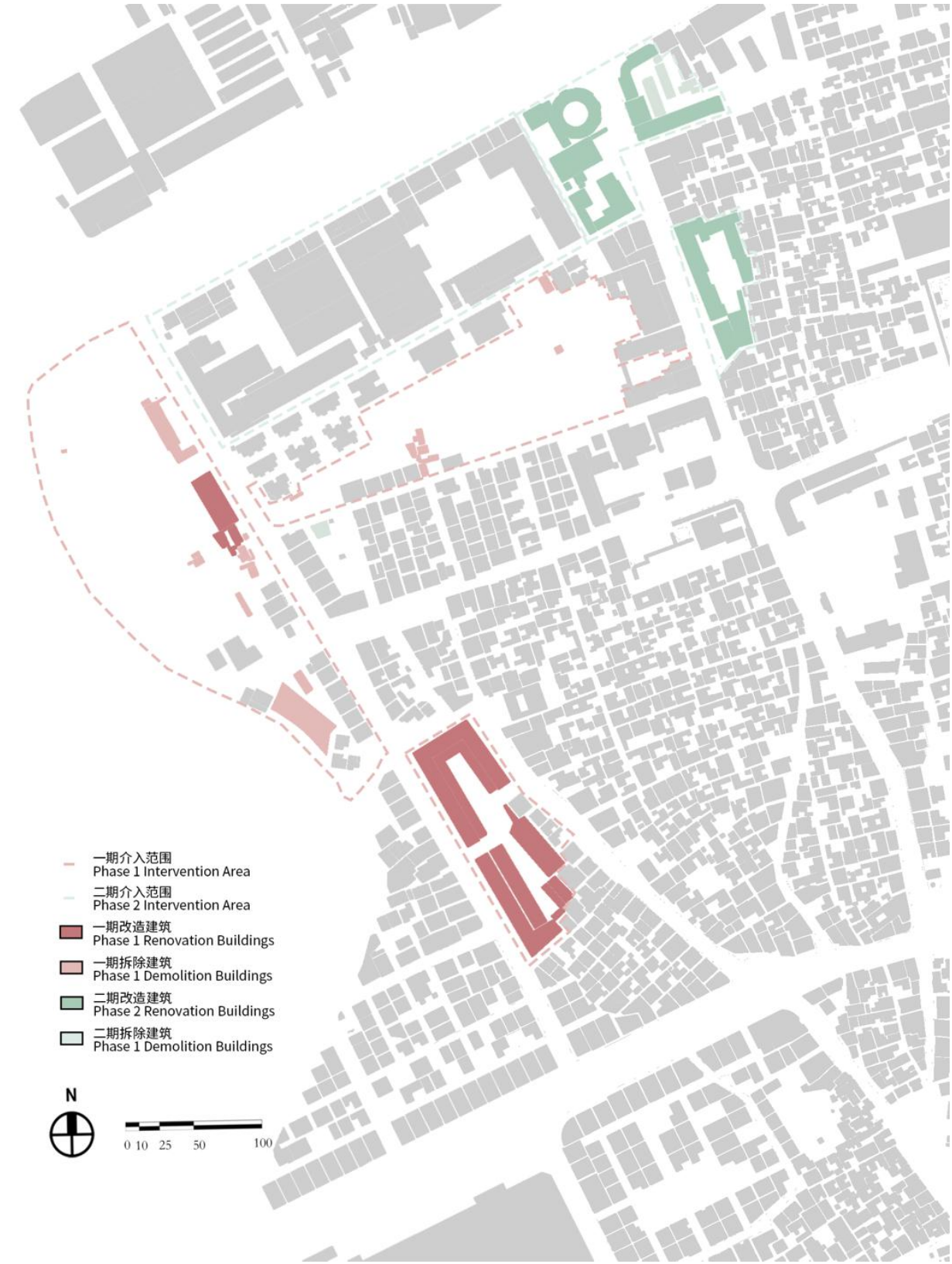


Figure 5-3 Schematic diagram of phased regeneration scope
(Source: Drawn by the author)

5.2 Spatial Design Strategy

The spatial design strategy of this scheme is based directly on the case revelation summarized in 2.3.5, and combined with the local conditions and catalyst theory of Bijiang old industrial buildings area, the following core strategies are refined.

5.2.1 Acupuncture-Style Intervention: Prioritizing the Release of Vacant Stock Land

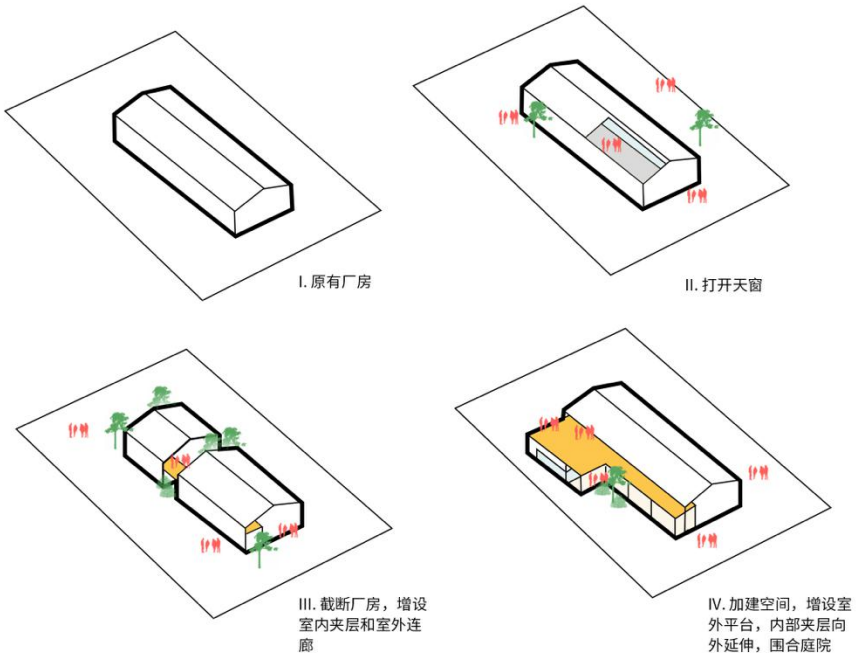


Figure 5-4 Large-span factory building block generation analysis
(Source: Drawn by the author)

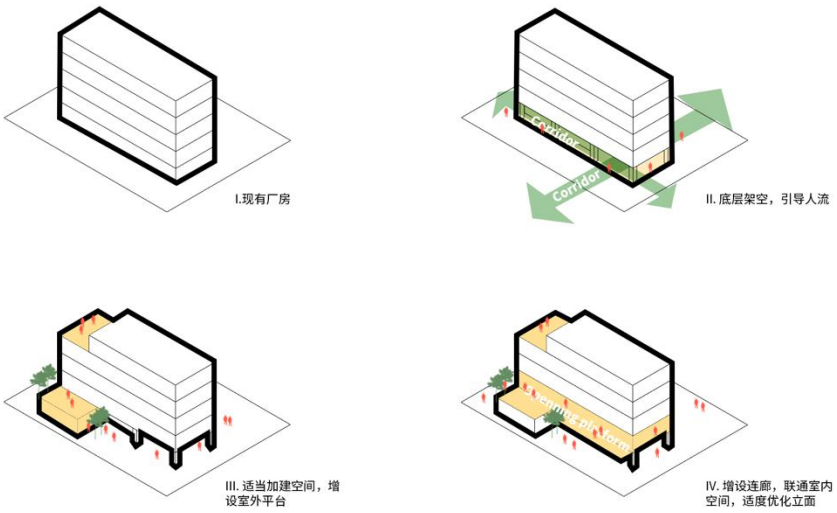


Figure 5-5 Update analysis of multi-storey frame factory building
(Source: Drawn by the author)

This program follows the basic principle of acupuncture-style intervention to achieve the maximum spatial efficiency with the minimum amount of construction and demolition. Specifically, the demolition of low-quality temporary buildings, tin houses and unauthorized structures in the area is the first action, and the released open space is directly transformed into the base for community activities without the need for large-scale new construction. This strategy not only responds to the real constraints of Bijiang's old industrial buildings, which are difficult to be transformed as a whole, but also fits the gradual logic of the catalyst theory, which advocates local activation to drive the whole.

The specific treatment strategies for the three types of existing buildings are as follows: large-span industrial buildings with frame-structure, retaining the main structure, with interface modification and reorganization of the internal space as the main means; multi-storey frame-structure industrial buildings with small-column network, retaining the structural framework, and moderately adding semi-outdoor space and outdoor platforms; and temporary corrugated metal sheds and low-quality unauthorized building works, which will be dismantled in principle, releasing the land to be used as an open space or pedestrian and cycling network. Among them, for the large-span industrial building and multi-story frame-structure industrial building with small column network, the indoor space adopts modular indoor multi-functional modules to meet the needs of community residents for diversified and flexible use.

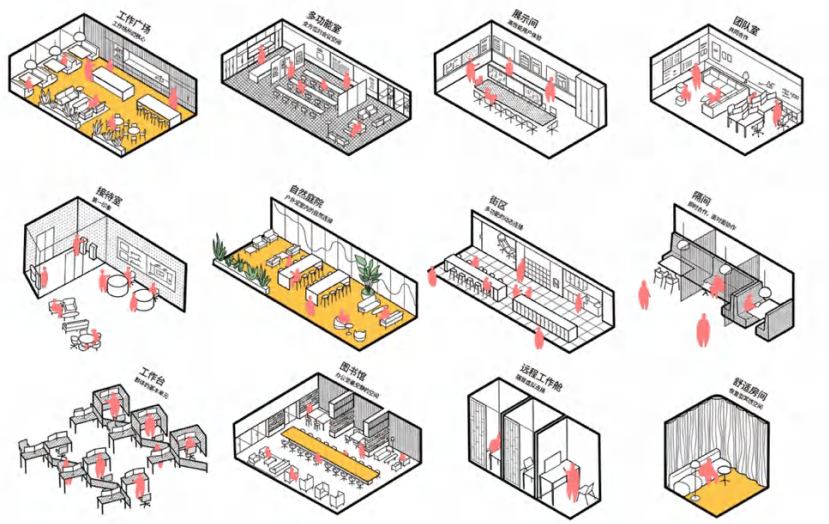


Figure 5-6 Analysis of multi-functional modules of interior space
(Source: redrawn by the author)

5.2.2 Open the Closed Boundary and Rebuild Pedestrian Connectivity

The breaking of the closed boundary is the starting point of all spatial operations in this program. Referring to the case experiences of Pantang Wuyue's removal of boundary walls to realize the interoperability between the village and the park, and Nantou Ancient City's opening up the ground floor of old industrial buildings to form a traversable market, this plan

systematically removes the boundary walls along Zhangyi Road, along the water side and at the junction with the residential area, and directly connects the interior of the area to the surrounding residential texture through the addition of new pedestrian passages.

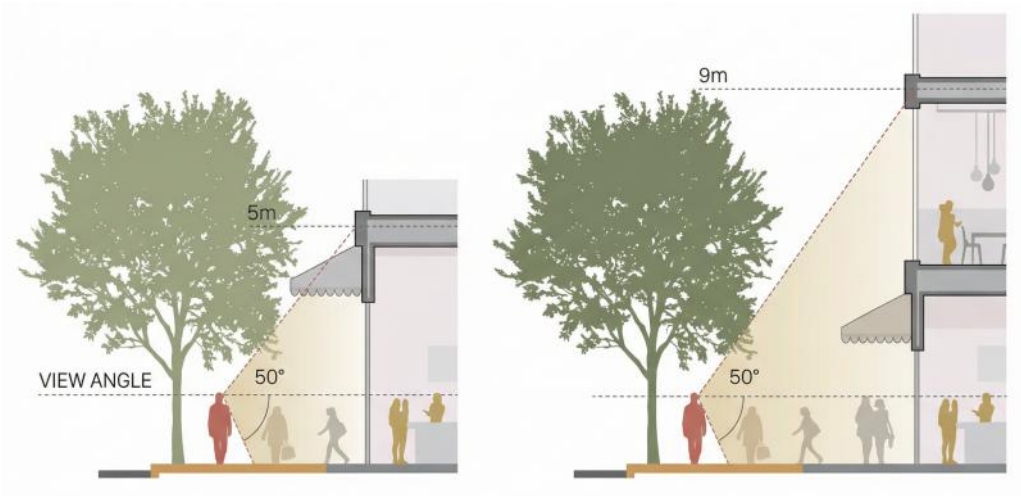


Figure 5-7 Focused design of near-crowd areas
(Source: Drawn by the author)

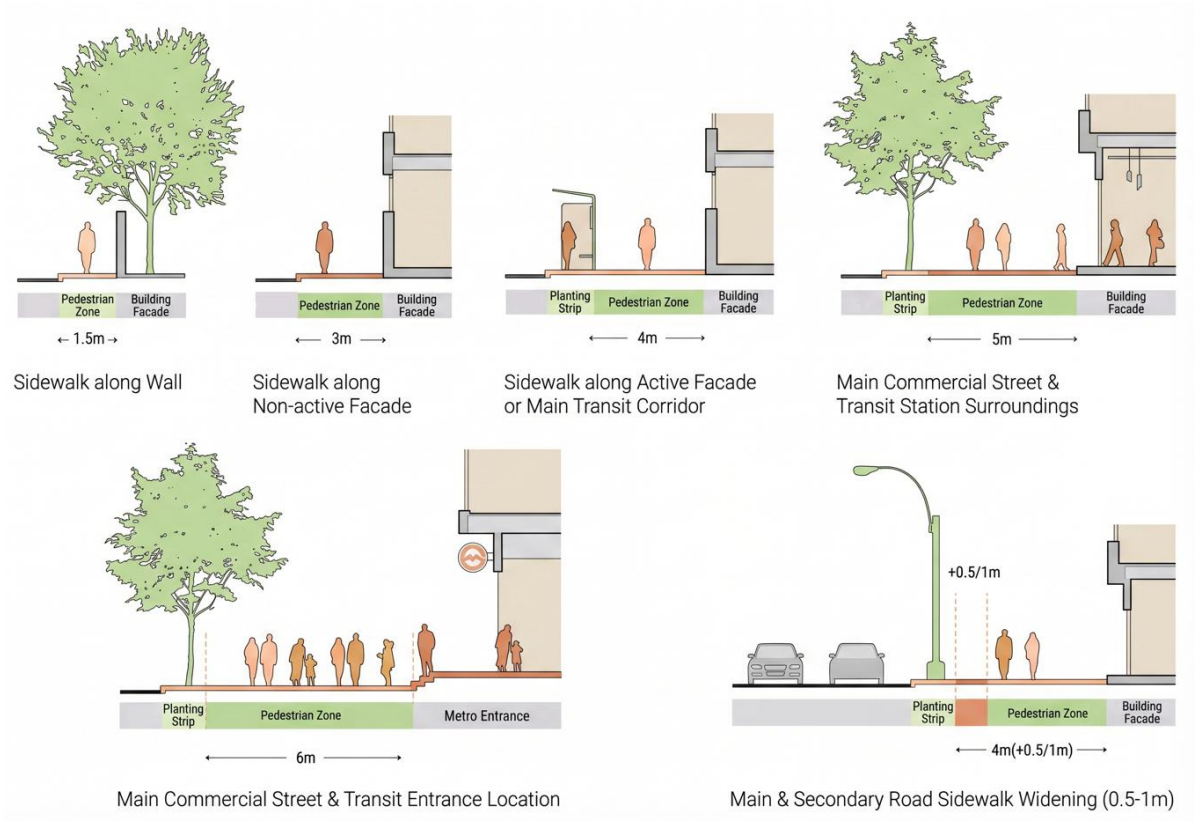


Figure 5-8 Underlying Interface Requirements
(Source: Drawn by the author)

The planning of pedestrian paths is based on the following principles: priority is given to opening up the pedestrian paths interrupted by the walls of the old industrial buildings in the current road network to form a continuous and accessible pedestrian path network; shade nodes are set up along the paths in conjunction with the open space released after the demolition to

ensure the comfort of the walking experience; the interface along Zhangyi Road is transformed from an inactive frontage with solid walls to an active frontage through the placement of the ground floor functions and the reconstruction of the facade; Based on the building height characteristics and daylighting requirements of the traditional villages around the area, the upper limit of the height of the reconstructed buildings is controlled by zoning, and the parcels close to the boundaries of the traditional villages are subject to stricter height limits to maintain the overall continuity of the village skyline. The key requirements of the near-crowd area are determined by combining the street width with the demand for walking space, focusing on guaranteeing the walking comfort along the main public thoroughfares.

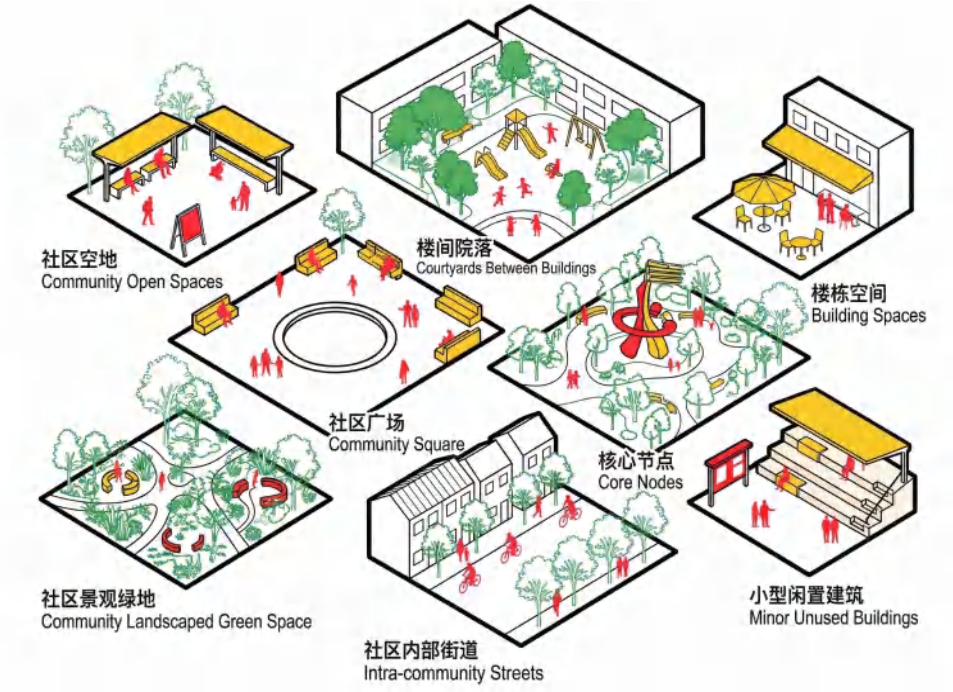


Figure 5-9 Schematic design of outdoor space
(Source: redrawn by the author)

The ground floor interface is the direct source of street frontage vitality. The guideline requires that the ground floor interface of buildings along major public thoroughfares maintain a certain proportion of openness and activity, encourages commercial, exhibition, public service and other functions to be laid out on the ground floor in priority, and restricts the negative impact of large solid walls or closed enclosures on the street frontage.

The systematic design of outdoor space is an important support for catalyst nodes to exert publicity. The outdoor space design of each node follows the following principles: add green space and soft paving to improve the overall environmental quality of the area; combine building setbacks and demolition of vacated space to implant public activity venues with appropriate scales.

5.2.3 Prioritizing Public Functions and Addressing Real Needs through Low-Threshold Facilities

Referring to Donmaouku Warehouse Complex's experience of positioning the core catalyst nodes as libraries and community art spaces, and Pantang Wuyue's practice of responding to the real needs of residents' daily activities with low-threshold public facilities such as martial arts training grounds and pocket squares, the functional configuration of this program takes filling the existing public service gaps as the primary goal.

Specifically, the community park node to children's activities and all-age fitness facilities as the main functional configuration, a direct response to the questionnaire survey reflected the most concentrated lack of security of children's activities venues; waterfront function belt to the elderly outdoor recreation, community farm and sports venues, in response to the elderly outdoor activities space is parking encroachment of the reality of the predicament; community activity centers organized by the Neighborhood Council of the public welfare of the cultural activities as the basic function, supplemented by convenient public services. The community activity center focuses on public welfare cultural activities organized by the neighborhood committee and is supplemented by convenient businesses to ensure low-threshold accessibility of the space to all residents.

In addition, since the questionnaire survey showed that the elderly lacked shaded space, the outdoor space was designed with a covered walkway as a semi-outdoor space; since parents were concerned about the safety of children, the children's activity area was placed in the inner courtyard with open sight lines, and the walls of old industrial buildings and the original ancestral hall were used to form a safe enclosure at the same time. Since this stage is the initial catalyst intervention state, the scale and use of outdoor space is not systematized. Therefore, this study will also configure corresponding movable partitions and containers in the outdoor public space, so that the outdoor public space can be used flexibly by time and people under the management of the village collective and neighborhood committee.

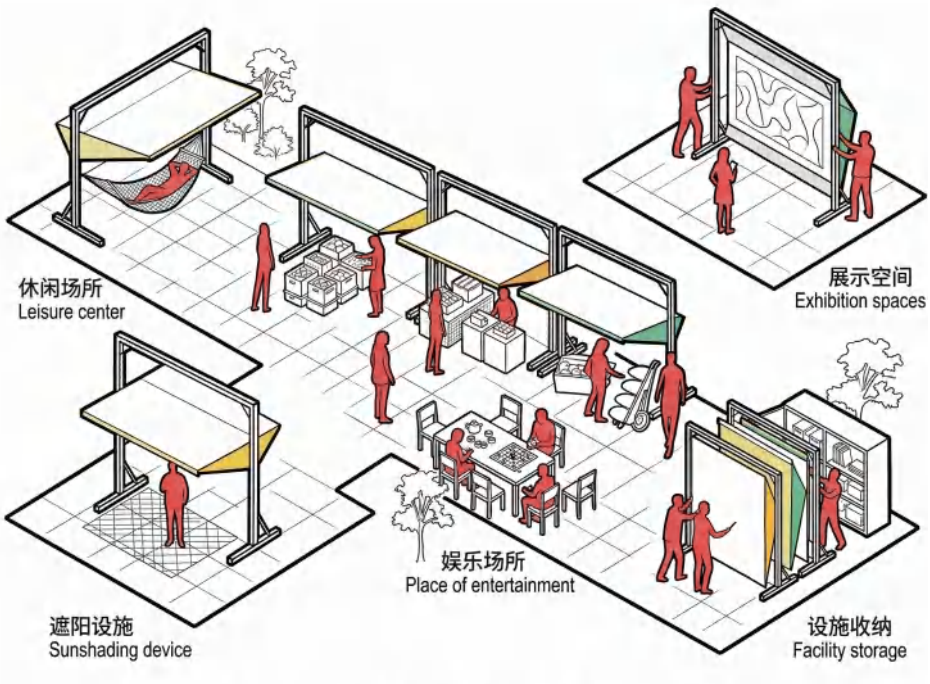


Figure 5-10 Schematic diagram of flexible use of outdoor space
(Source: redrawn by the author)

5.2.4 Reshaping Collective Memory and Strengthening Community Identity with Place Identity

Referring to Donmaouku Warehouse Complex's experience of integrating old and new buildings by preserving the gable wall of warehouses as a theme, and Haizhu Tongchuanghui's experience of preserving the century-old lychee tree and the old dragon boat as a place identity, this proposal selectively preserves a number of recognizable industrial components in the transformation of the community center - including typical concrete columns, gable wall profiles of old industrial buildings, or original equipment foundations - and transforms them into a community identity by using them as a foundation for the community. original equipment foundations - into material carriers of place memory, visually establishing a historical connection between the old and new spaces, and lowering the psychological threshold for residents to enter the renovated space.

The selection of materials is basically oriented to the continuation of the architectural texture of traditional Lingnan villages, encouraging the use of green bricks, grey tiles, timber and other materials that harmonize with the traditional style, and restricting the use of materials that do not harmonize with the historical environment, such as highly-reflective metal panels and large-area glass curtain walls. Color guidelines to gray, beige, brown and other low-saturation color system as the main tone, allowing the moderate introduction of active colors in the local façade as an embellishment, but need to control the proportion.

The greening configuration gives priority to the use of Lingnan native plants, combined with the distribution of the water system in the area to moderately introduce hydrophilic vegetation, to strengthen the overall continuity of the blue-green infrastructure. The paving material is mainly made of materials with good water permeability and coordinated with the traditional village style. The paving of public thoroughfares and the paving within the building setback line are basically consistent in terms of material and color, avoiding fragmentation.

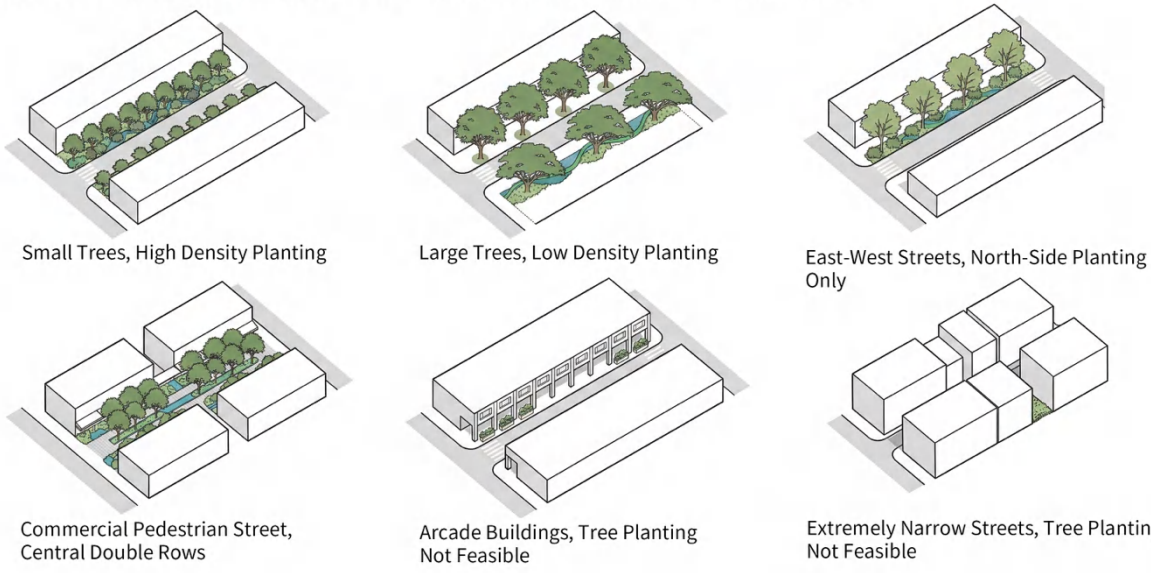


Figure 5-11 Street Greening Planting
(Source: drawn by the author)

5.3 Implementation and Operation Strategy

The community-oriented regeneration of old industrial buildings involves multiple operational levels such as program implementation, post operation and community participation, which requires the establishment of a supporting implementation mechanism in addition to the physical space transformation. The implementation and operation strategy is based on the case study summarized in 2.3.5. Combining the local conditions of Bijiang's old industrial buildings and the catalyst theory, the following core strategies are refined.

5.3.1 Implementation Path: Low-cost Initiation, Phased Advancement

The implementation path of this research program is consistent with the phasing of incremental regeneration. In the first phase, special government grants and village collective self-financing are the main sources of funding, focusing on low-cost intervention elements such as fence removal, site remediation, green planting, and infrastructure support, to avoid the financial pressure of large-scale building renovation. For plots where the conditions for recent renovation are not yet mature, temporary functional interventions - such as using the remediated

open space as a temporary venue for weekend bazaars and community activities - are adopted to activate the use of the space before the formal regeneration is pushed forward.

In the second phase, based on the utilization and capital accumulation of the first phase, social capital will be introduced to participate in the investment and construction of small-volume functional buildings, with long-term lease agreements as the interest-bundling mechanism to ensure a reasonable recovery expectation for the investor. For functional facilities with strong public welfare (e.g. public toilets, small libraries), application can be made for government subsidies for the allocation of public service facilities or support from the Social Welfare Fund.

In the long run, after the implementation of Phase I and II and the enhancement of the land value of the community, the remaining old industrial buildings in the district are expected to be transformed from low-end industrial replacements to high-end industries under the effect of the market. The introduction of the replacement industry follows the following principles: Priority is given to the retention of the relevance of the local industrial base with the direction of the industry, and the original industrial enterprises are encouraged to realize industrial upgrading under the support of the policy, such as guiding the transformation of furniture manufacturing enterprises to the direction of intelligence, customization, or relying on the introduction of Bijiang's local non-heritages and creative handicrafts industry; on the parcels of land which need to be vacated completely, the vacating conditions are clarified through the negotiation mechanism, so as to avoid the impact of mandatory replacement on the established economy of the community. For plots that need to be completely vacated, the conditions of vacating will be clarified through a negotiation mechanism to avoid the destructive impact of mandatory replacement on the established economic relations of the community.

5.3.2 Operational Framework: Village Collective Coordination and Multi-Party Collaboration

Referring to the analysis of the operation mode summarized in 3.3.2 and the case experiences of Pantang Wuyue and Haizhu Tongchuanghui, this proposal suggests the adoption of a multi-party collaborative operation framework centered on the village collectives, with the specific division of labor as follows:

The village collective economic organisation is responsible for coordinating the overall lease management of the collective land in the area, and for the village collective assets, it can adopt the mode of "rent sharing + equity cooperation"; for the historical buildings with unclear property rights, the government platform will take the lead in confirming the rights and incorporating them into the unified operation. Community activity centers and other core nodes

to implement a unified investment promotion, targeted introduction of convenient business close to the needs of the community, and a certain percentage of commercial revenue for the daily maintenance of public space for the public good; for the community center of the market, can be used as a marketplace or daily market site, to attract the villagers to go to the stalls on their own initiative.

Neighborhood committees and community organizations are responsible for planning and organizing public welfare activities, including regular community cultural festivals, residents' deliberation workshops, activities for the elderly, and children's interest courses, etc., making full use of the various types of physical space provided by the design, and continuing the established tradition of community building activities in Bijiang.

Under the framework of unified investment promotion by the village collective, the private commercial tenants will operate independently within the scope of the prescribed business format, and provide continuous financial support for public welfare operation with commercial income.

Considering the immature conditions for the transformation of some nodes in the first phase and the inherent requirement of incremental regeneration itself for the natural succession of functions, this program adopts the strategy of combining temporary intervention and flexible management for the functional configuration of some nodes.

5.3.3 Community Participation: From Demand Research to Operation and Co-Governance

This program establishes a community participation mechanism throughout the implementation, changing community residents from passive beneficiaries of the regeneration results to the key actor s of the regeneration process, which is specifically reflected in three stages:

In the planning stage, based on the findings of the questionnaire survey and resident interviews in this study, a residents' tea party is held before the design scheme is finalized to solicit residents' opinions on the functional configuration of the nodes and the design scheme of the site, so as to ensure that the design decisions respond effectively to the real needs.

During the construction phase, the village collective will coordinate the construction process, and residents will be encouraged to participate in the form of voluntary work for low-tech tasks such as fence removal, site improvement and greening, so as to enhance the community's sense of ownership of the renovation project.

In the operation phase, the institutional framework of the Pantang Wuyue joint development committee is used as a reference to establish a consultation platform involving

resident representatives, the village community, the neighborhood committee and the professional operation team, which regularly conducts multi-party consultations on the rules of site use, activity arrangements and facility maintenance, so that the community operation mechanism tends to mature and stabilize over time.

For sites with basic space availability, priority is given to temporary functions that serve the public interest of the community, such as villagers' gatherings, flexible parking, and other low-threshold uses, and the management of the site is granted to the village community, which is responsible for the daily maintenance and use of the organization. This arrangement not only responds to the immediate needs of residents, but also reserves space for the gradual implementation of formal functions in the later stages, following the proliferation of the Phase II catalyst effect.

For nodes with uncertain functions, movable modules and mobility devices are introduced into the spatial design to maintain functional flexibility with light intervention, so that the space can be flexibly adjusted according to changes in usage needs without the need for large-scale secondary remodeling.

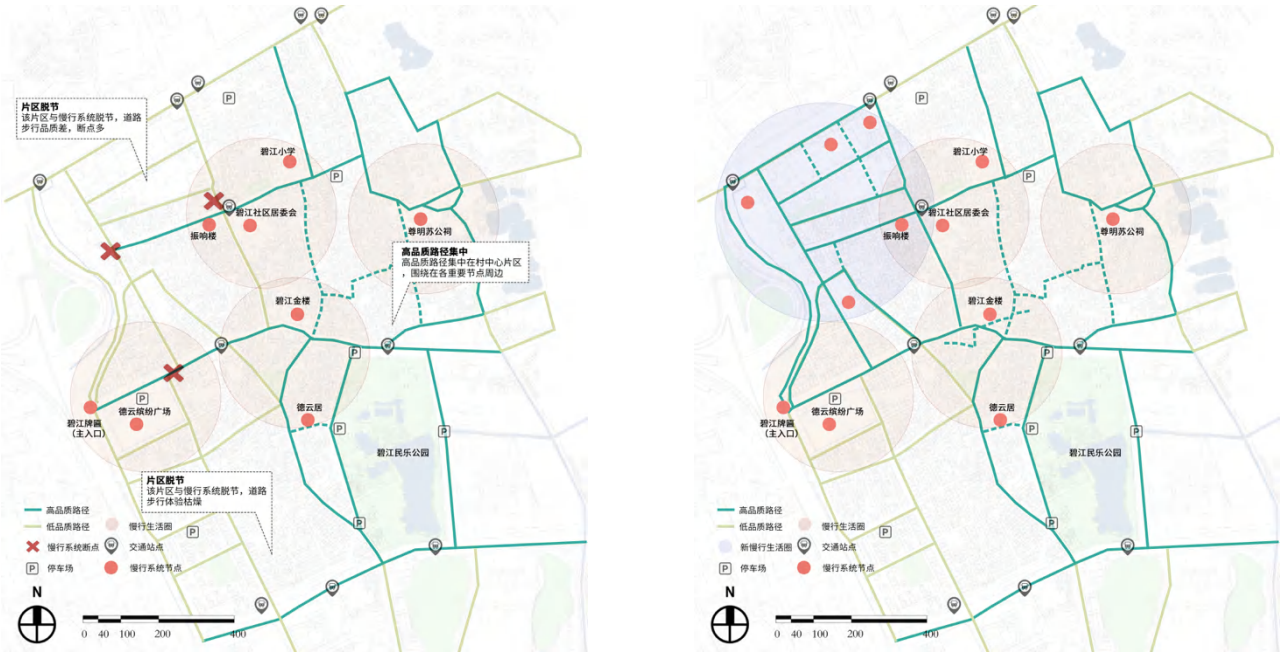
5.4 Design of Phase I Catalyst Nodes

The Phase I regeneration plan realizes the organic integration of infrastructure, ecological landscape and social services through the layout of three zones: Bijiang Vitality Plaza is set up on the west side of the site as the main entrance of the community to enhance the site's recognition; the community parking building is arranged adjacent to the site to alleviate the pressure of parking around the site through the integration of vertical transportation. The central space is utilized to accommodate the community farm and Yue BA Park. The former introduces productive landscapes to promote neighborhood collaboration; the latter combines Guangdong's local basketball culture to create a highly participatory street sports venue. The central park serves as the "green core" of the community, and pocket parks are dotted with fragmented corner spaces to build a hierarchical green leisure network and enhance the ecological microcirculation of the area. The community center is centrally located in the south side of the area, carrying public service functions such as community bazaar and cultural activities, and meeting the diversified fitness and social needs of the residents. The overall design realizes the transformation from old industrial buildings to a vibrant community through functional conversion and pathway linkage, and lays a solid material space framework for the subsequent regeneration phase.

To address the severe spatial disconnections and gaps in the pedestrian and cycling network that existed prior to the renovation, the first phase of the design introduces catalysts to establish a continuous and comprehensive pedestrian network. By upgrading all existing low-quality pedestrian paths to solid, high-quality ones and adding key connecting links, the project achieves connectivity within the pedestrian and cycling network. Second, node integration and expansion. Building upon the preservation and integration of existing nodes, multiple new pedestrian nodes and bicycle nodes were added within and around the previously disconnected areas. This significantly enriched the experience for pedestrians and cyclists. By linking these new nodes with existing ones, a system characterized by “one axis with multiple points, connecting internal areas and expanding outward” was formed.



Figure 5-12 Phase I Update Master Plan
(Source: drawn by the author)



a) Existing pedestrian and cycling network b) Pedestrian and cycling network after the regeneration.

Figure 5-13 Comparison of the pedestrian and cycling network before and after the regeneration. (Source: Drawn by the author)

The updated plan realizes the integration and enhancement of the original single node, effectively activating the once forgotten fringe areas through a full-coverage network, and providing a solid pedestrian foundation for the daily commuting and leisure life of the community.

5.4.1 Community Activity Center Node

This site is located in the heart of the Bijiang Old Industrial Buildings Redevelopment Area, bordered by Zhangyi Road to the east and Minsheng Road to the west. It serves as the busiest intersection along the community's regeneration axis. Guided by the core concept of "openness and sharing," the design integrates the most pressing functional needs identified by residents during preliminary research—such as senior wellness, children's activities, a community market, and neighborhood recreation—into the complex of old industrial buildings.

According to the results of the survey, the middle-aged and elderly groups have a continuous demand for chess and cards recreation, recreation and health care, and community markets, while families with school-age children lack training and a safe place for activities. For this reason, the sectional design clearly lays out the functional zoning of the building: the ground-level void (community market) of the west group is set up as an open space, and the upper level is a chess and cards leisure space; the middle section of the building is oriented to the demand for exhibitions, performances and readings, and takes into account the cultural activities of different ages; the east group is dedicated to the provision of elderly recreation and convenient commerce, and is adjacent to the children's training and activity area, forming a

spatial pattern in which the old and the young are looking at each other without interfering with each other, but it is convenient for the accompanying of the parents. The design technique of elevated ground floor is carried out throughout the building. The design technique of elevated ground floors throughout the buildings not only releases valuable public space on the ground, but also echoes the semi-outdoor space lifestyle favored by residents in the hot and humid climate of the south.

In terms of layout, the building clusters are arranged in a staggered manner along the north-south axis, and a continuous inner street is formed between the clusters, which serves as both a pedestrian passageway and a flexible marketplace. The pedestrian path shown by the pink dotted line connects the community activity group, community market group, flash group and non-motorized parking area into a ring, ensuring the natural flow of people within the site without creating dead ends. Scattered trees and green nodes throughout the site provide shade and informal corners for residents to stop and talk.

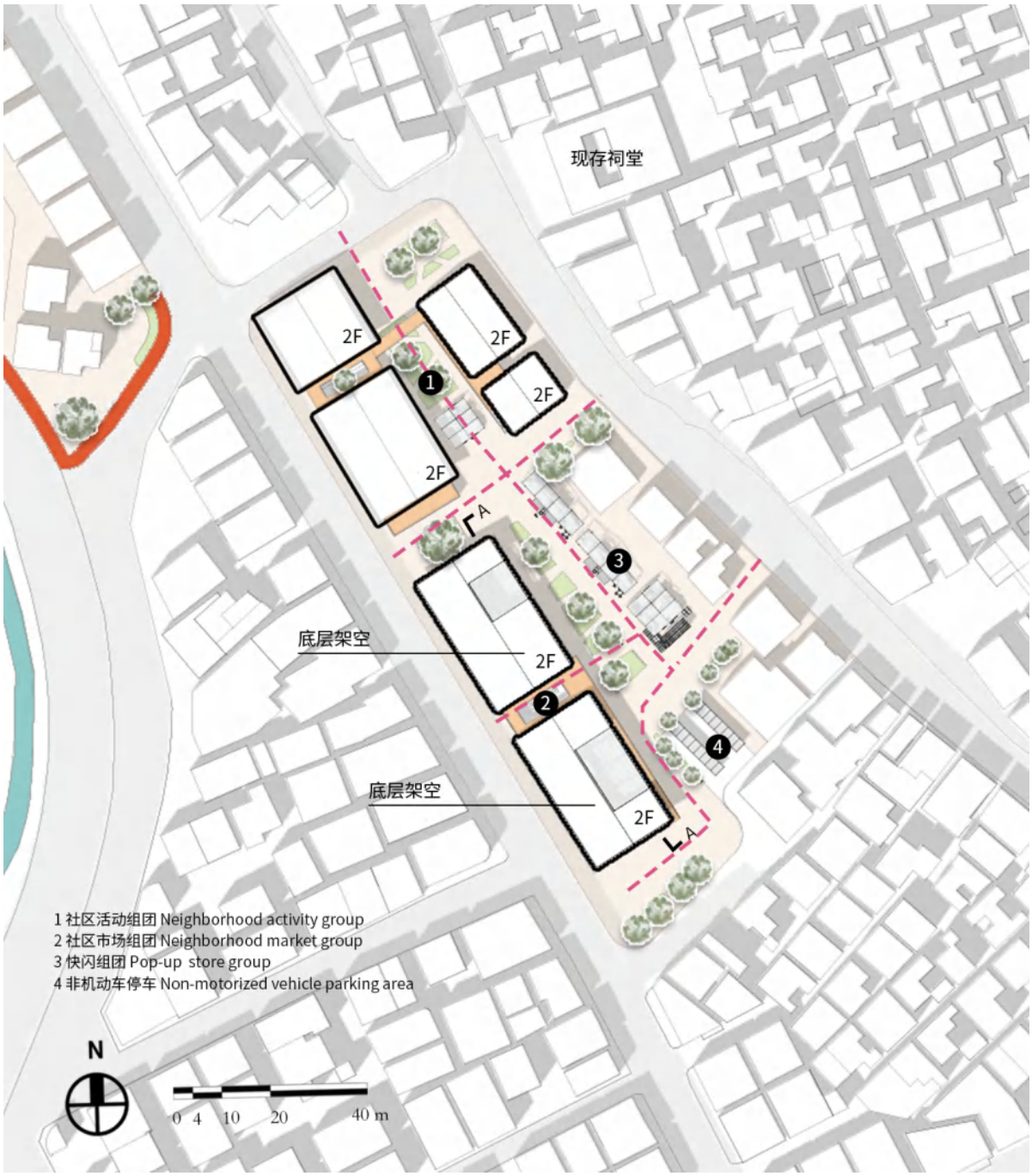
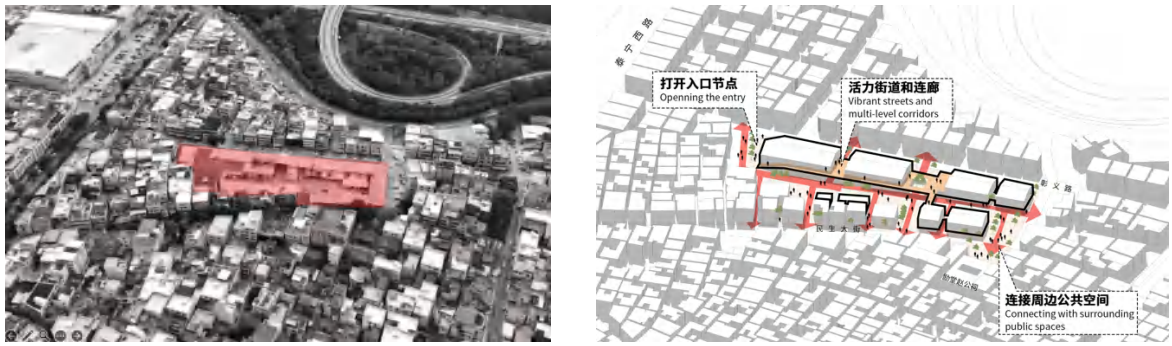


Figure 5-14 Node Plan - Community Center Node
(Source: Drawn by the author)

The existing ancestral hall (Litang Zhao Ancestral Hall) on the north side of the site currently hosts children's calligraphy training and the activities of the Calligraphy Association, and is an important vehicle for community identity. Calligraphy training complements the children's activity area in this node - the former focuses on the teaching and transmission of traditional culture, while the latter provides a more diverse and dynamic venue for activities, and together they form a complete education and activity network for young people in the community. The presence of the ancestral hall as a historical and cultural symbol also gives the

regeneration design a sense of cultural anchoring, so that the modern lightness of the new facilities and the historical thickness of the site form a dialog rather than a separation.



a) Before update b) After update

Figure 5-15 Nodes before and after update - Community Center Node
(Source: Drawn by the author)

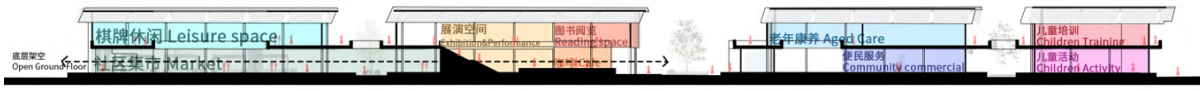


Figure 5-16 Node A-A Section - Community Center Node
(Source: Drawn by the author)



Figure 5-17 Aerial View of Node - Community Center Node
(Source: Drawn by the author)


a) Low point perspective view


b) People view

Figure 5-18 Node Rendering - Community Center Node
(Source: Drawn by the author)

This node is intended to break the logic of the closed boundary of the old factory area, open up to Minsheng Road and Zhangyi Road in both directions, and guide the flow of people to the interior of the site with the help of several horizontal passages. At the same time, the elevated connections between buildings and the second floor corridors give the entire node a three-dimensional roaming experience, making this community center a real public living room for the daily life of Bijiang residents.

5.4.2 Central Community Park Node

This node is located in the important transition zone of Bijin old industrial buildings renovation section, leaning on Bijin Garden (residential community buildings) in the north, neighboring Bijin Kindergarten in the south, and Chengde Hospital in the east, and it is a key urban living room that stitches together different communities and public service facilities in the surrounding area. The design aims to transform the lack of public activity space and poor daily infrastructure exposed in the preliminary research into concrete and micro spatial solutions, reshaping the originally unused or negative site into an all-age friendly ribbon community park.

Combined with the results of the preliminary research, from west to east, the site is arranged with street corner steps, children's activity area, community drying area, sports and fitness corridor, and community basketball court. Among them, the special setting of "community drying site" solves the pain point of insufficient drying space in the community; at the same time, the drying area is arranged adjacent to the children's activity site and fitness corridor, which conforms to the daily life trajectory of the elders who take care of their grandchildren while undertaking household chores, and realizes the intertwining of sight lines and scenes of composite functions. In addition, a garbage collection station and a new parking lot are planned at the edge of on the north side of the site, which fills in the shortcomings of the

original community infrastructure and solves the problems of parking difficulties and hygienic dead ends.

In terms of plan composition, the design takes a highly recognizable linear walkway as the main spatial ridge, linking the irregular and fragmented functional patches into a continuous and dynamic pedestrian and cycling network. Different attributes of the space are defined through the conversion of paving materials and the enclosure of landscape plants, which ensures the relative independence of each functional area while maintaining the overall visual permeability. The plant configuration takes into account the climate characteristics of the south and provides the necessary shade shelter, creating a microclimate environment that is pleasant to stay in and conducive to neighborhood interaction.

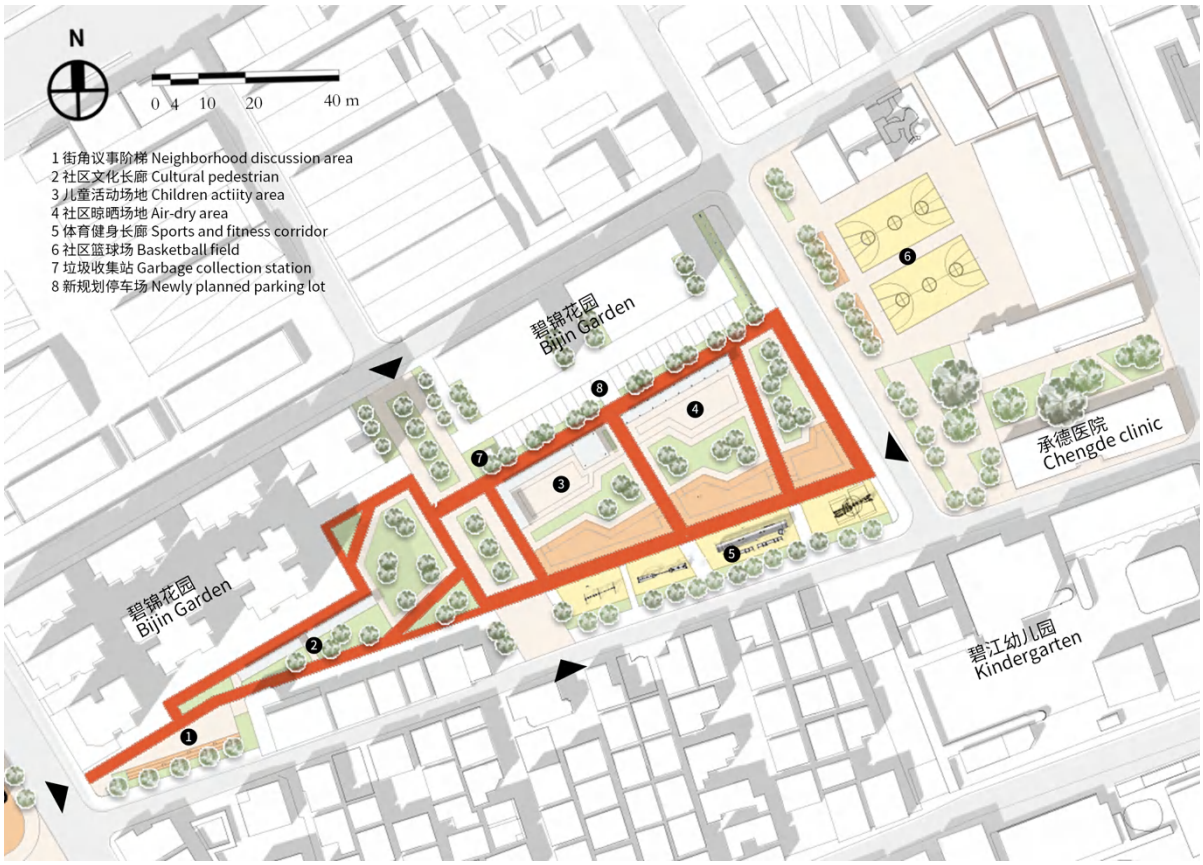


Figure 5-19 Node Plan - Community Park Node
(Source: Drawn by the author)



Figure 5-20 Node Aerial View - Community Park Node
(Source: Drawn by the author)



a) People view b) People view

Figure 5-21 Node Rendering - Community Center Node
(Source: Drawn by the author)

The spatial boundary treatment of the site highly emphasizes the interaction and functional complementarity with the existing facilities in the surrounding area. The south side is adjacent to Bijin Kindergarten, where the children's activity site and the setup of the ladder form an extension of the educational function, providing a safe buffer space for parents and children to wait and play after school; the east side is adjacent to Chengde Hospital, where the intervention of the sports and fitness promenade and the green landscape provides an outdoor place with a sense of tranquility and therapeutic properties for the people who visit the hospital and the medical staff; and Bijin Garden (residential community) on the north side has a centralized parking lot and a standardized community center node. The centralized construction and standardized management of the parking lot directly improves the traffic micro-circulation and

clutter at the edge of the residential area, and straightens out the originally blurred boundary relationship.

The strip-like community park breaks the closed logic of the old factory or unused land, and turns into a multi-directional open green corridor. It not only intercepts and serves the pedestrian flow from the surrounding main roads, but also connects to the old streets and alleys through multi-directional capillary paths, transforming the park node into a highly shared catalyst node of community vitality that eliminates boundaries.

5.4.3 West Waterfront Space Node

This node is located in the western waterfront boundary of Bijiang old industrial buildings renovation section, which is the key transition zone connecting the dense village texture on the east side and the open water landscape on the west side. The design transforms the local culture traditions in the preliminary research into a concrete public space, creating a waterfront ribbon park with both fireworks and ecological vitality.

Based on memory characteristics such as “local produce, seasonal traditions, and community activities” identified through interviews and research, the site features a sequential functional layout from north to south, responding to the needs of different groups. The northern section houses the Bijiang Vitality Plaza, which incorporates a pop-up space, providing a flexible venue for regular markets, commodity exchange, and spontaneous intergenerational gatherings; The central core area consists of a “Community Farm” and “Farm Workshop,” fulfilling the elderly community’s strong desire for daily gardening and sharing experiences in orchid care; the southern section features the “YueBA Basketball Park.” Additionally, the inclusion of a mechanical parking garage at the northern end of the site effectively alleviates Bijiang’s current parking pressure.

In terms of layout, the design relies on the boundary of the water system on the west side to create a continuous waterfront slow-moving recreational belt, linking the juxtaposed functional modules such as plazas, farms, and ball fields, which provide suitable shade shelters and informal socializing corners for rest after the market and casual conversations between farm work.

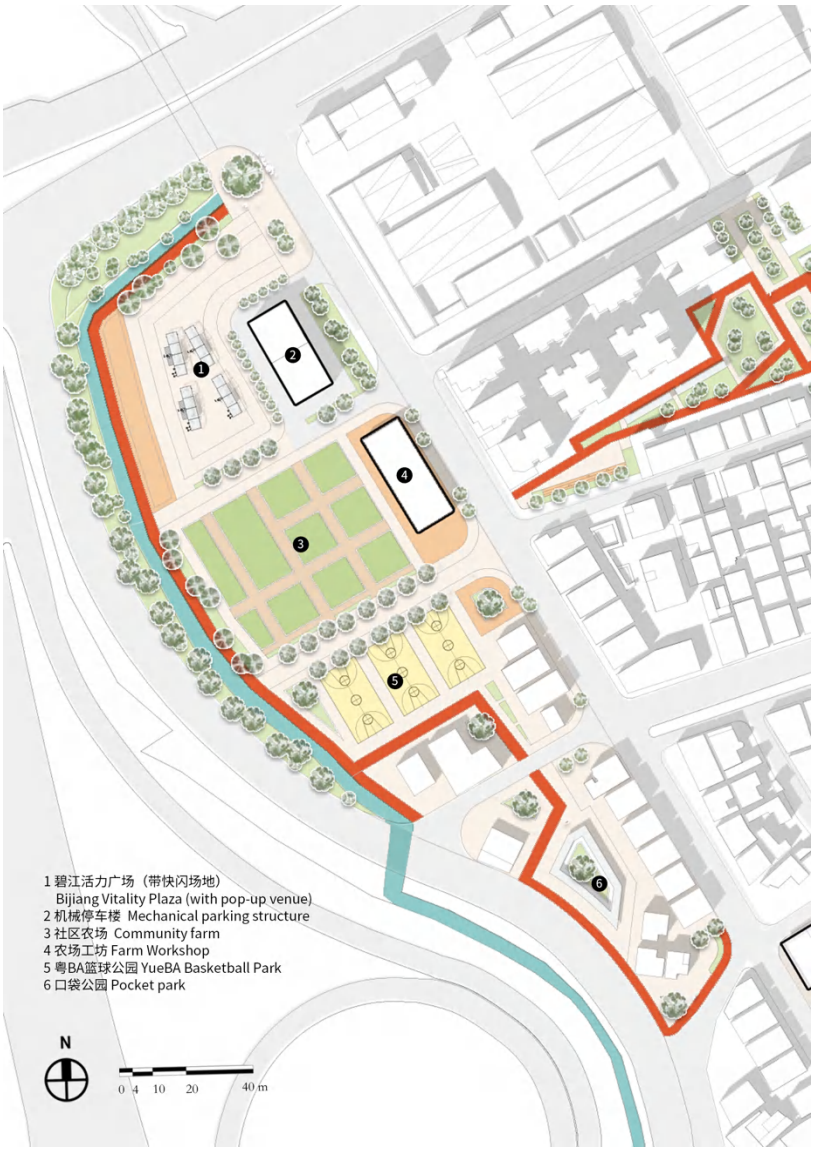


Figure 5-22 Node Plan - Waterfront Node
(Source: Drawn by the author)

This node is adjacent to the dense residential area on the east side, and the pocket park in the southeast corner serves as a spatial entry point to guide the internal pedestrian flow of the village to gently transition to the waterfront area. The design changes the closed and negative state of the original factory waterfront, and implements a strategy of comprehensively opening up the waterfront in both directions to the interior of the community and the waterfront. A number of east-west horizontal landscape side streets penetrate the site and are closely connected to the original village lane-and-alley network, so that the waterfront space is no longer a deserted edge of the area, but a destination for residents' daily strolls. The pedestrian and cycling network penetrates the site, effectively integrating this waterfront node into the entire Bijiang slow life circle, making it truly a vibrant waterfront living room that stitches together the old city texture and carries and stimulates the collective memory of the community.



Figure 5-23 Aerial View of Node - Waterfront Node
(Source: Drawn by the author)



a) Farm People view



b) Waterfront Path People view

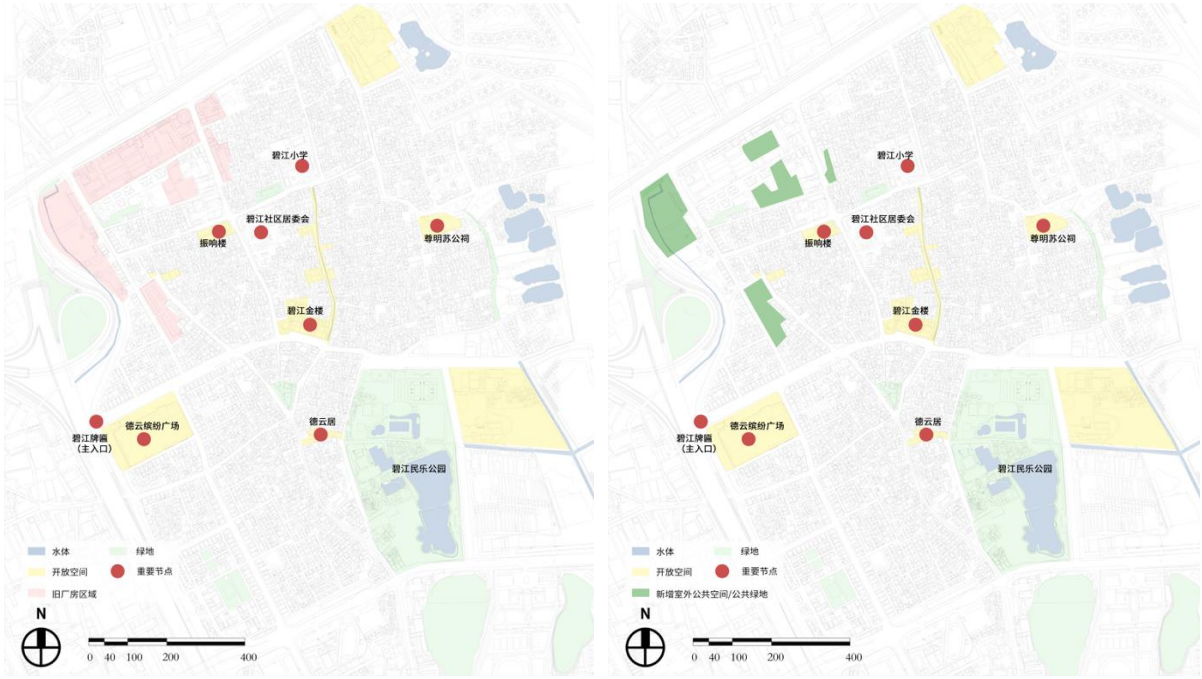
Figure 5-24 Node rendering - Community Center Node
(Source: Drawn by the author)

5.5 Design of Phase II Catalyst Nodes

As an extension and deepening of the Phase I program, the focus of the Phase II regeneration is shifted from the construction of public nodes to the texture of the site, through the local intervention of the existing factory buildings and paths, and the placement of linear walkways and composite courtyards, to sew up the sense of rupture between the Phase I project and the surrounding traditional houses, and to construct an organic whole with the in-depth symbiosis of industrial offices, commercial services and community life.

The industrial courtyard improves the spatial quality by releasing the internal space and reorganizing the courtyards of the large-volume factory buildings, providing material

conditions for the industrial regeneration in the long term. The gateway commercial facilities on the northeast side and the community service facilities on the east side together form an urban functional interface facing Bijiang Road, enhancing the economic vitality of the area while providing convenient administrative and living security for the neighboring residents. The pocket park with more scattered layout utilizes the negative corner space of the site for green infill, providing the necessary ecological respiratory outlets and rest stops for the high-density old industrial buildings area. The overall design further optimizes the pedestrian and cycling network of the area and the work-life balance through this organic intervention from point to line, completing the transformation from a single factory to a multi-functional complex community.



a) Existing open space and blue-green space b) Updated open space and blue-green space

Figure 5-25 Comparison of open space and blue-green space before and after regeneration (Source: Drawn by the author)

For the public space and green space system after the two phases of regeneration, as shown, after the vacating of existing stock-based urban regeneration and functional conversion, the area of the old industrial buildings on the northwest side has been replaced by a continuous piece of new outdoor public space, which has fundamentally changed the physical space form of the area, and moreover brought about the systematic optimization of the spatial order of the site. The new green space and outdoor public space effectively suture the fragmented urban fabric, which not only improves the quality of the site at the ecological level, but also provides multiple anchors for public activities for the residents within the 5-minute living circle. The renewed public space boundary reveals and connects important nodes such as Zhenxiang Building and Litang Zhao Ancestral Hall, which were originally bounded by old industrial buildings, and

increases the number of open outdoor interaction places, which significantly improves the spatial accessibility and public attributes of the nodes. In terms of the overall spatial pattern of Bijiang Village, the newly added Bijiang Vibrant Radiance on the northwest side forms an echoing morphology with the existing open spaces such as the Bijiang Pai Fang, the Bijiang Folk Music Park on the southeast, and the Zunming Su Ancestral Hall (Wumang Ancestral Hall) on the east side. The site is transformed from the original localized and fragmented open spots to a multi-core, well-distributed public space system.



Figure 5-26 Phase II Regeneration Master Plan
(Source: Drawn by the author)

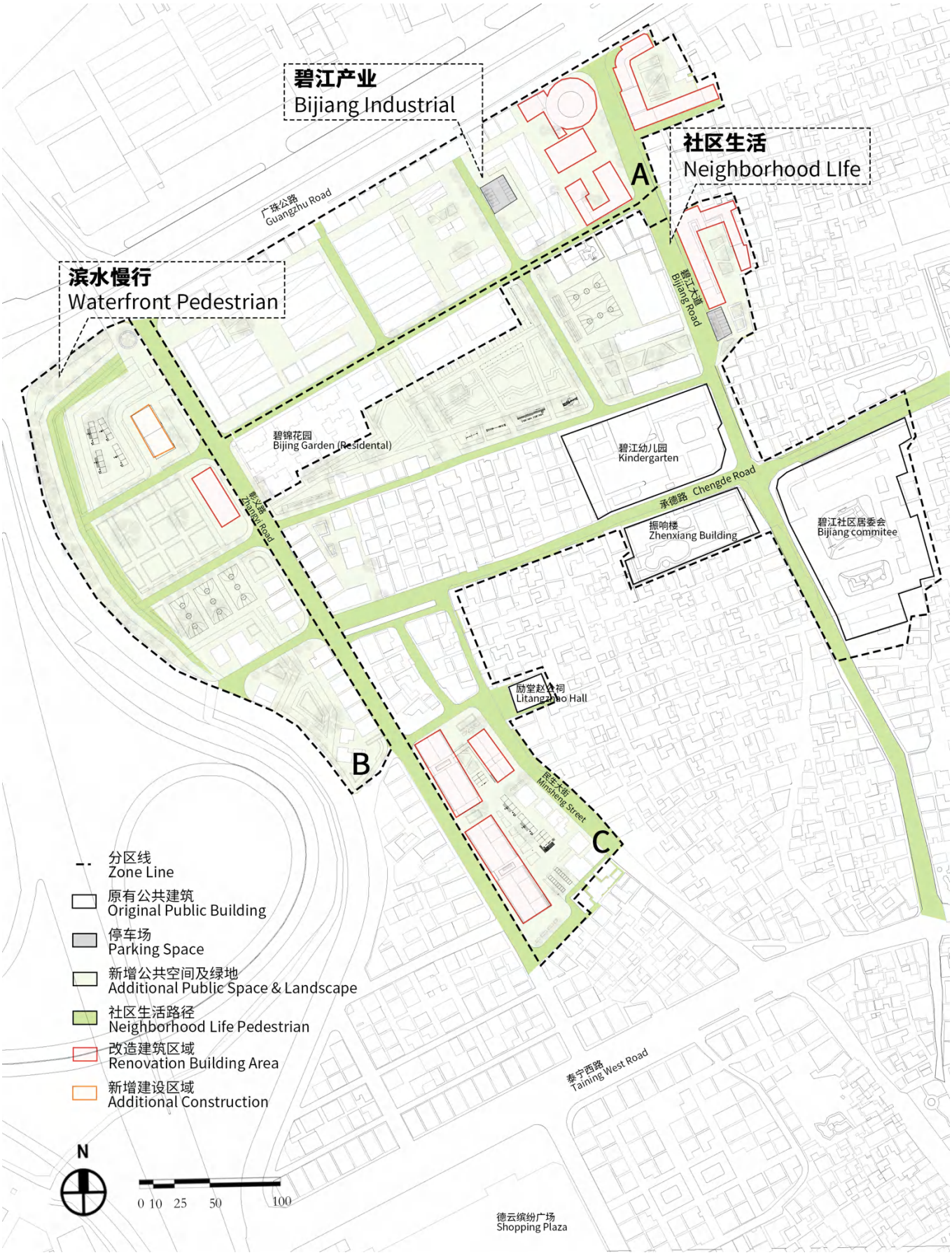


Figure 5-27 General Zoning Map for Phase I and II Updates
(Source: Drawn by the author)

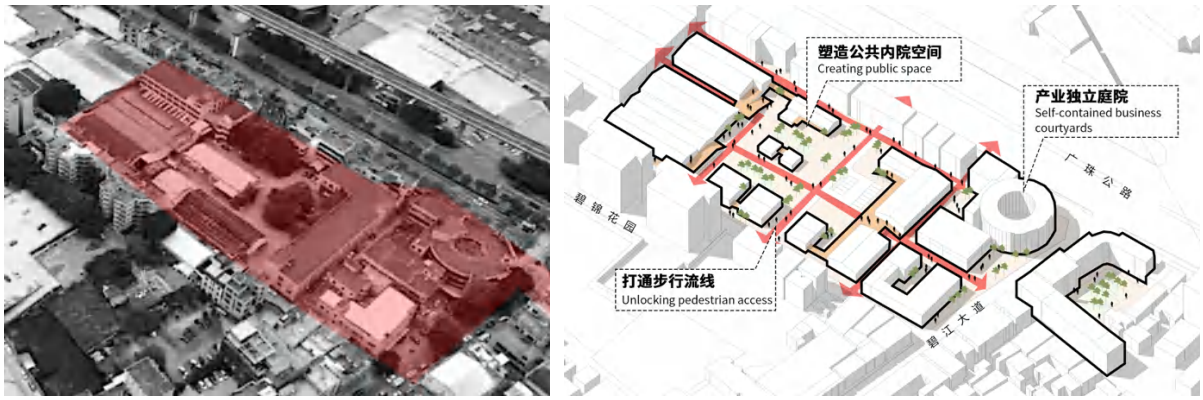
5.5.1 Gateway Commercial Node

This node is located along the street intersection of the community-oriented regeneration of Bijiang old industrial buildings, adjacent to Guangzhu Road and other urban arterial roads, and also a necessary way for people to come to the village from the northeast direction of Bijiang Station. Therefore, this node is the gateway node to show the new face of the community and to attract people from outside. The design is designed to reshape the urban interface of the old factory area through iconic architectural forms and an open block layout.

Based on the preliminary research on the economic vitality and demographic structure of the community, this node is clearly divided into two functional groups: the circular building at the core of the street corner serves as the gateway commercial, adopting a full-glass curtain wall design, and vertically stacking up modern commercial businesses such as furniture, retail, and café, etc., which is based on the commuting flow of Bijiang Station and the daily consumption of the surrounding community, and is the self-sustaining commercial node that feeds the operating cost of the purely public welfare community park of Phase 1. Node. The extended building complex at the back is defined as an industrial independent courtyard, providing relatively quiet and independent office and exhibition space for start-ups or new industries.

At the level of outdoor space, the design focuses on the creation of publicity. On the façade treatment, the commercial ground floor along the street adopts a large number of setbacks and colonnade design, forming a spacious transitional semi-outdoor space, which echoes Shunde's climatic demand for sun and rain protection, and provides a place for cafes to hang out and residents to sit around. The central area between the building clusters is shaped as a public courtyard space, combined with a patchwork of trees and greenery, providing an ecological and social "urban living room" for office workers and residents passing by.

The pedestrian flow is the core planning strategy of this node. As shown in the axonometric plan, the design cuts strongly into the interior of the site with a number of red pedestrian and cycling lanes, completely breaking down the closed walls of the former factory. These frontages bring the pedestrian flow from external streets such as Guangzhu Road into the community hinterland in a natural and dispersed manner. Together with the permeable commercial interface on the ground floor, the gateway is not only a gathering place for consumption and offices, but also a vibrant hub that opens up around the clock and seamlessly connects the city with the internal community of Bijiang.



a) Before Regeneration b) After Regeneration

Figure 5-28 Node Comparison before and after update - Portal Node
(Source: Drawn by the author)

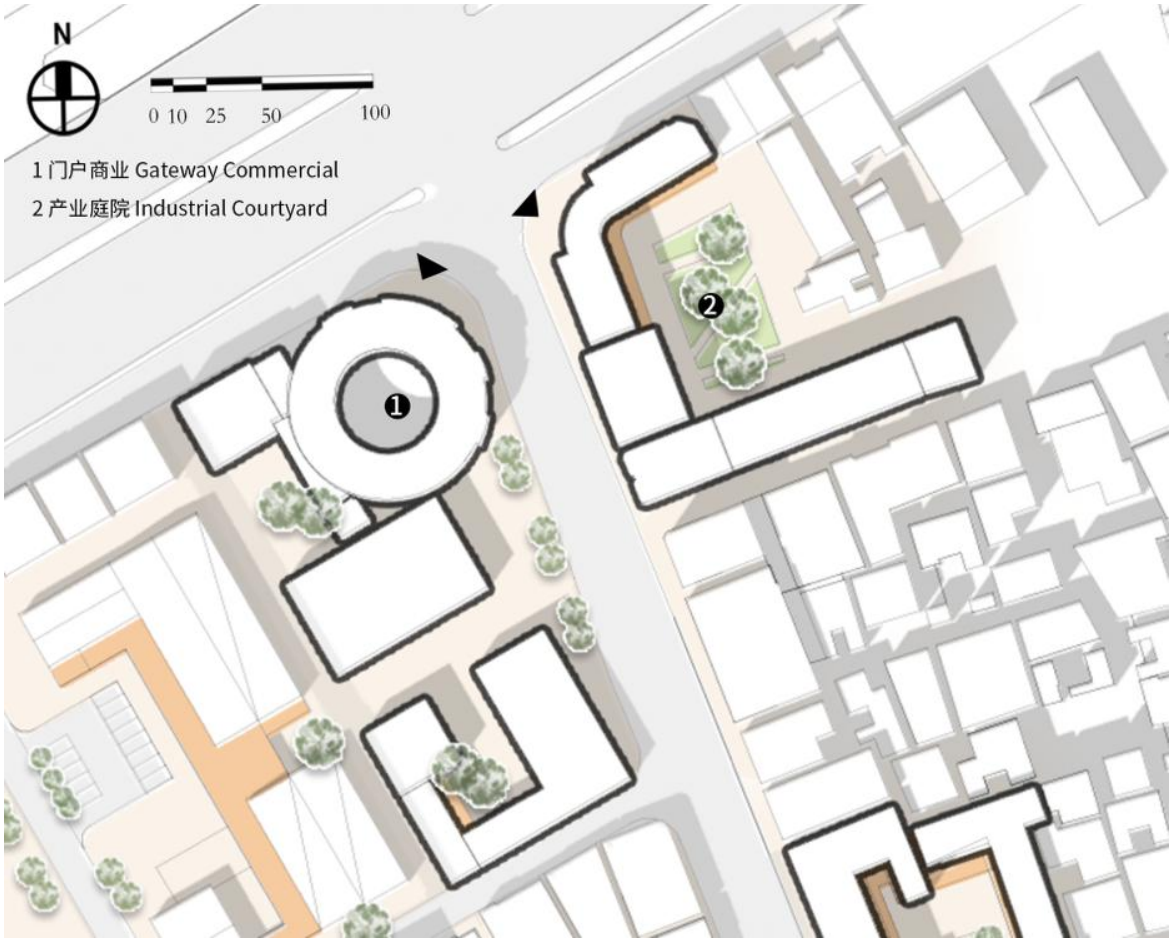


Figure 5-29 Node Plan - Gateway Node
(Source: Drawn by the author)


a) Before Regeneration


b) After Regeneration

Figure 5-30 Node Rendering - Portal Node
(Source: Drawn by the author)

5.5.2 Pocket Park Node

The pocket park nodes are distributed in the corners of the community-oriented regeneration area of Bijiang old industrial buildings in a scattered layout. Based on the preliminary research on the economic vitality of the community and the population activities, a vibrant community pocket park is constructed through the removal of the temporary tin factory buildings and fences on the original site, the creation of landscapes, and the enhancement of over-guidance.

The functional layout of each pocket park varies from site to site, but the internal functional modules are basically similar, consisting of covered corridors, green spaces, and several temporary parking spaces, with additional lighting and safety protection, and softening of the existing old pavement . The pocket park is intended to provide a minimal stopover and gathering place for different residents, to reshape the community interface, and to alleviate the urgent need for parking spaces in the community.


a) Pocket Park 1 Rendering


b) Pocket Park 2 Rendering

Figure 5-31 Node Rendering - Pocket Park
(Source: Drawn by the author)

Summary of the Chapter

This chapter takes community-oriented regeneration as the oriented goal, takes Urban Catalyst Theory and the design strategies extracted from the case study as the core guiding framework, and takes the conclusions of the community research and demand study in Chapter 4 as the direct basis, and then develops a systematic program construction around the overall positioning, spatial strategies, implementation and operation paths, and phased node design of community-oriented regeneration of Bijiang old industrial buildings.

At the level of design positioning and general framework, this chapter clarifies the three-fold positioning logic of taking the community as the key actor of regeneration, taking the provision of public open space as the priority target, and taking community-level catalyst intervention as the core type. On this basis, the spatial skeleton of the community living network is constructed with Zhangyi Road as the vertical axis and the western waterfront walkway as the landscape boundary, and four types of catalyst nodes are set up, namely, community parks, waterfront functional zones, community activity centers, and gateway businesses. The framework of incremental regeneration divides the program into two phases: the first phase focuses on the release of low-cost open space and the activation of the community center; the second phase, based on the initial formation of the catalyst effect, promotes the insertion of functions and systematic improvement, and reserves an interface for the long-term spontaneous regeneration of the large-scale factory complex to the north.

At the level of spatial design strategy, this chapter refines four core strategies: first, acupuncture-style intervention, with the demolition of low-quality temporary buildings as the first action, to release the maximum spatial efficiency with the minimum amount of construction and demolition; second, open the closed boundary, systematically removing fences and opening up pedestrian passages, transforming the closed factory area into a continuous and accessible network of slow walkers; third, prioritize the public thoroughfare function, and respond to community needs by using the children's activity area and the open space for the elderly, Third, public functions are prioritized to respond to community needs with low-threshold facilities such as children's activity venues, senior open space, community farms, etc. Fourth, collective memory is reshaped to strengthen place identity and community identity by preserving industrial components and continuing the Lingnan building materials and color system.

At the level of implementation and operation strategy, this chapter establishes a low-cost start-up and phased implementation path, proposes a multi-party collaborative operation framework centered on the village collectives, and builds a community participation

mechanism covering the three phases of planning, construction, and operation, so as to change the residents from passive beneficiaries of the regeneration results to active participants in the regeneration process.

At the level of node design, the three catalyst nodes in the first phase, namely the community activity center, the central community park and the west waterfront space, respond to the core needs of the district from the dimensions of neighborhood services, all-age activities and local culture; the nodes in the second phase are mainly gateway businesses and pocket parks, which effectively supplement the first phase of the program in terms of spatial fabric and extension of the pedestrian node system. The two phases of regeneration are jointly promoted to realize the transformation of Bijiang's old industrial buildings from a closed and negative existing stock space to an open and diversified community public space system.

Conclusion and Discussion

I. Research Conclusion

(1) This paper demonstrates the feasibility of old industrial buildings as catalysts in the local context of Bijiang through the literature review and theoretical construction of community-oriented regeneration of old industrial buildings and Urban Catalyst Theory, and establishes an analytical framework throughout the whole paper accordingly.

At the theoretical level, the paper clarifies the connotation of core concepts such as "old industrial buildings", "community" and "community-oriented regeneration", and positions the regeneration of Bijiang's old factory buildings as "The positioning of the old factory buildings in Bijiang is clearly defined as a community-oriented regeneration path that benefits people's livelihoods, which is effectively differentiated from neighboring types such as industrial heritage preservation and cultural and creative parks. On this basis, the structural fit between the old factory buildings and the urban catalyst operating conditions is demonstrated from three dimensions: the spatial pattern of large-span industrial buildings and high ceilings provides an elastic basis for diversified functional conversion; as a material carrier of the community's collective memory of production, the old factory buildings have a local emotional adhesion, which is conducive to the infiltration and diffusion of the catalyst effect in the social level; Adaptive reuse instead of demolition and construction can significantly reduce the initial intervention cost, which is highly compatible with the progressive phasing logic advocated by the catalyst theory.

Based on the above arguments, this paper establishes a four-link analysis framework: site and plant system analysis - screening and functional configuration of catalyst nodes - generation of catalyst effect - formation of catalyst network. The analytical framework of this paper is a methodological spine that links the whole process from theoretical construction to site research, to strategy and design. The case study further shows that adhering to the public orientation and taking low-threshold, local residents-oriented functions as the key actor is the fundamental premise of the effectiveness of the catalyst strategy, while taking the village collective as the key actor and the parallelism of commercial operation and community autonomy is the key to the sustainable operation of the community-oriented regeneration of old industrial buildings.

(2) From the three dimensions of regional spatial evolution, policy and institutional framework, and community building practice, this paper systematically combs through the

formation background and regeneration context of Bijiang's old industrial buildings, which provides sufficient local context for subsequent strategy development.

At the institutional level, the Shunde Three Olds Redevelopment Plan and the Protection Plan for Bijiang Historic and Cultural Village jointly define the space and bottom line for the regeneration of old industrial buildings: the former provides floor area ratio (FAR) incentives, mixed land supply and simplified approvals for functional transformation; the latter sets quantitative constraints on demolition ratios, building heights, and material styles. The latter sets quantitative constraints on demolition ratios, building heights, and material styles. The core conclusion of the two superimpositions is that the micro-regeneration as the basic approach, oriented to public and cultural functions, is not only encouraged by the policy, but also practicable under the regulatory constraints.

At the level of spatial evolution, Bijiang's old industrial buildings are not the product of planning will, but the result of bottom-up growth under the collectively operated land system in Shunde since the reform and opening up. This special formation mechanism determines the spatial properties of old industrial buildings deeply embedded in the traditional settlement fabric, which not only constitutes the complex constraints of integration and development, but also provides the spatial premise of weaving them back into the daily life network of the community . The reconnection between old industrial buildings and the community does not have to be created out of thin air, but is a reactivation of an existing spatial relationship.

At the level of operational practice, the multi-party collaborative network formed by Bijiang over the past twenty years, with village collectives, professional teams and social welfare organizations as the core, as well as the experience of participatory co-construction accumulated in the three phases of community building projects since 2019, constitute an important locality soil for the community-oriented regeneration of old industrial buildings.

(3) Through a combination of field surveys, questionnaire surveys, interviews and big data analysis, this paper systematically examines the current situation of Bijiang's old industrial buildings from the three dimensions of spatial system, crowd demand and old industrial buildings ontology, and summarizes the following issues.

First, spatial closure is the primary obstacle. The old industrial buildings are embedded in the residential texture in the form of enclosed courtyards, forming a structural barrier to the village pedestrian and cycling network. Villagers tend to walk around rather than through the old industrial buildings, which makes the old industrial buildings an isolated walking island in the public life network of Bijiang. At the same time, the large amount of existing stock space that has been encircled by the fence for a long time has neither formed any form of public open

space nor assumed any community service function, creating a stark resource mismatch between the serious facility gaps immediately adjacent to the residential core.

Second, there is a structural shortage of public service provision. Measured by the 5-minute living circle standard, the Northwest Area is not equipped with basic community facilities such as cultural activity stations, small multi-functional sports venues, comprehensive outdoor fitness venues, and day-care centers for the elderly, and the structure of the facility supply is skewed towards the commercial consumption end, while the shared space most relevant to residents' daily public interactions and healthy living is seriously insufficient.

Third, the complexity of property rights restricts the path of regeneration. The old industrial buildings in the area present a mixed state of collective holding, individual private construction and historical legacy of ownership ambiguity of the three types of coexistence, it is difficult to incorporate into the unified transformation in a short period of time, objectively requiring the adoption of clear property rights as a priority for the intervention of the gradual phasing path.

On this basis, this paper puts forward four judgments on the direction of regeneration with open space release as the priority action, community service nodes as the anchor point of vitality, village collectives as the core of coordination for phasing, and community participation mechanism as the institutional guarantee, and translates them into the strategic framework and design scheme in Chapter Five.

(4) Supported by the aforementioned theoretical framework and current situation judgment, this paper proposes a systematic regeneration strategy for Bijiang's old industrial buildings, and completes the complete transformation from strategy to program.

In terms of design orientation, this program clearly takes the community as the key actor of regeneration, the supply of public open space as the priority target, and the community-level catalyst intervention as the core type. Taking Zhangyi Road as the vertical main axis and the west waterfront walkway as the landscape boundary, it builds a "multi-core resonance" spatial skeleton of the community life network, and sets up four types of catalyst nodes, namely, the community activity center, the central community park, the west waterfront functional zone and the gateway commercial, forming a hierarchical node system.

In terms of spatial strategy, four core principles have been refined: acupuncture-style intervention: the removal of low-quality temporary buildings is the first action to release the maximum spatial efficiency with the minimum amount of construction; opening the closed boundary: systematically removing the fence, adding new pedestrian access, and transforming the closed factory area into an organic part of the pedestrian and cycling network; prioritizing

public thoroughfare: responding to real community needs with low-threshold facilities such as children's activity venues, open space for the elderly, and community farms; and reshaping the collective community to meet the needs of the community. Reinventing the collective memory: through retaining the typical industrial components and continuing the Lingnan building materials and color system, the place identity and community identity will be strengthened.

On the progressive framework, the program is promoted in two phases: the first phase takes the removal of walls, site improvement and the launch of three core catalyst nodes (community activity center, central community park, west waterfront space) as the main content, and establishes the basic pattern of the district's public space quickly with low-cost intervention; in the second phase, on the basis of the initial formation of the catalyst effect, it promotes the function placement and system improvement with nodes of gateway commerce and pocket parks, while at the same time, it also provides a large-scale factory on the north side of the district for the improvement of the system and for the development of the community. On the basis of the initial formation of the catalyst effect in the second phase, nodes such as gateway commercial and pocket parks will be used to promote function placement and system improvement, while an interface will be reserved for the long-term spontaneous regeneration of the large-scale factory group in the north. In terms of the operation mechanism, an operation framework with the village collective as the core and multi-party collaboration is established to support the long-term operation of the public welfare space with moderate commercial proceeds, and a resident participation mechanism is carried out throughout the three phases of planning, construction, and operation, so as to change the community residents from the passive beneficiaries of the regeneration results to the active participants in the process of regeneration.

Comprehensively, the core conclusion of this paper can be summarized as follows: the community-oriented regeneration of old industrial buildings in Bijiang can neither apply the logic of large-scale industrial land regeneration in the central area of the city, nor copy the mode of revitalization of historical villages dominated by commercial development, but needs a differentiated approach that can simultaneously respond to the requirements for the protection of Historic and Cultural Villages, the demand for micro-scale spatial restoration, and the shortfall of the local community's public life. Instead, it needs a differentiated path that can simultaneously respond to the conservation requirements of historical and cultural villages, the demand for micro-scale spatial restoration and the gap in public life of the local community. Taking the Urban Catalyst Theory as a methodological tool and activating the old industrial buildings in a progressive, low-cost, community as the key actor in a phased manner, it is the concrete presentation of this path that gradually transforms the old industrial buildings area

from a closed industrial island into an important carrier for the public life of the community of Bijiang.

II. Limitations and Future Directions

(1) The institutional analysis of multi-body interest coordination mechanism needs to be deepened. This paper mainly focuses on urban design and spatial strategy, and only describes the game structure and negotiation paths of village collectives, government, enterprises and residents at the strategy level, but fails to analyze the interests of each subject and deduce the institutional paths by combining with the actual tenure relations of the old industrial buildings in Bijiang. This limitation is partly due to the boundaries of the urban design research methodology itself, and partly due to the fact that the research stage has not yet entered the implementation level, which makes it difficult to obtain the relevant first-hand data. Bijiang's old industrial buildings involve a complex pattern of collective property rights, private property rights, and ambiguous historical property rights, and the negotiation costs and interest boundaries of each party in the actual operation are far more complicated than described in this paper's strategy level. This limitation affects the institutional rigor of the regeneration path derivation, and it is necessary to introduce the perspective of public policy analysis or institutional economics in the subsequent research to carry out a more rigorous empirical analysis of the multi-subject collaboration mechanism.

(2) The quantitative assessment of catalyst intervention effect needs to be supplemented. The argumentation of the catalyst effect in this paper mainly relies on the deduction based on theoretical logic and case experience, and lacks the quantitative tracking and verification of the actual use effect after the implantation of the catalyst nodes. Due to the limitations of the research cycle and design research methodology, this paper is unable to make a before-and-after comparison of the indicators such as changes in pedestrian flow, space utilization rate and residents' satisfaction after the completion of the first phase of the catalyst nodes, and the diffusion paths of the catalyst effect still belong to the theoretical level of inference to a large extent, rather than the conclusions of the empirical test. This limitation is a common problem that is difficult to be avoided in urban design research, but it also means that the evaluation framework of catalyst effectiveness constructed in this paper still needs continuous empirical corrections after it is put into practice.

(3) The local adaptability of the design program needs to be jointly verified by local residents. The functional configuration of this paper is based on the demand research of the questionnaire survey and the interviews with local residents, and the local demand has been

included in the program generation stage. However, due to the time constraints of the study, the design solutions presented in this paper have not yet undergone a systematic participatory consensus building process with Bijiang residents. Case studies show that the effectiveness of regeneration practices such as Pantang Wuyue relies to a considerable extent on the mechanism of participatory research and multiple rounds of consultation in the form of resident accompaniment. The program of this paper is inadequate at this level, and the appropriateness of the specific functions in the program still needs to be verified and adjusted through participatory mechanisms such as residents' workshops in the subsequent implementation stage.

In conclusion, this paper explores a feasible path for community-oriented regeneration of old industrial buildings in historical villages based on the local context of Bijiang's old industrial buildings. The significance of this path goes beyond Bijiang itself. In the broader context of existing stock-based urban regeneration in the Pearl River Delta, a large number of small-scale, fragmented old industrial buildings deeply embedded in the traditional settlement fabric face similar institutional constraints and spatial dilemmas as Bijiang. The framework of catalyst-based progressive regeneration proposed in this paper may provide some reference for the research and practice of the same type of problem.

Therefore, subsequent research can be carried out in the following directions: first, after the implementation of the Bijiang old industrial buildings program, a dynamic tracking mechanism for the use of catalyst nodes can be established, and the evaluative framework of catalyst effectiveness can be calibrated and corrected with measured data, so that a complete closed loop can be formed between theoretical deduction and practical feedback; second, the methodological framework of this paper can be extended to other types of historical settlements in the Pearl River Delta region (e.g., traditional villages or clan villages of the waterfront type). Second, the methodological framework of this paper will be extended to other types of historical settlements in the PRD region (e.g., traditional water village or clan village) to verify the adaptability of the catalyst community-oriented regeneration strategy under different local conditions; third, the potential of digital tools in community participation and demand collection will be explored in depth to make up for the limitations of the traditional questionnaire survey in terms of the breadth of coverage and the dynamic tracking of the survey methodology.

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Appendix: Community Needs and Space Utilization Survey Questionnaire for Old Industrial Buildings in Bijiang Village

Questionnaire on the Needs of the Neighboring Communities of Bijiang Old Industrial Buildings

South China University of Technology School of Architecture Shunde Bijiang old industrial buildings community-oriented regeneration study

To the interviewed residents

Greetings! The purpose of this questionnaire is to understand your feelings and expectations about the use of public space around the old industrial buildings in Bijiang, and the results of the survey will directly serve the community-oriented regeneration design study of the area. The questionnaire will take about 8-12 minutes to fill out, and all the information will be used for academic research only, completely anonymous, so please feel free to answer truthfully. Thank you for your support and cooperation!

Note: Questions marked with * are mandatory; multiple choice questions are indicated and the rest are single choice questions.

Part I Basic Information

Q1. What is your age group? *

A. Below 18 years old
B. 18-30 years old
C. 31-45 years old
D. 46-60 years old
E. Above 60 years old

Q2. What is your gender? *□

A. Male
B. Female
C. It is not convenient to disclose

Q3. What is your main role in Bijiang at present? (Multiple choice)

(Multiple choice)

A. Local resident
B. Foreign worker/renter
C. Commuter working here (non-resident)
D. Business operators
E. Out-of-town tourists/businessmen visiting the area
F. Others: _____

Q4. How long have you lived or worked in Bijiang? *□

A. Less than 1 year
B. 1-5 years
C. 5-10 years
D. More than 10 years
E. Do not live/work here, only visit occasionally

Q5. Do you have any of the following members in your household? (Multiple choice allowed)

(Multiple choice, this question helps us to understand the differences in needs of different family structures)

A. Children under 14 years old
B. Elderly people over 60 years old
C. Both of the above

D. None of the above

Part II Usage of Existing Public Space

Q6. Which type of public space around old industrial buildings do you use most often in your daily life? (Multiple choices allowed)

(Multiple choice)

A. Roads along the street (pedestrian passage)

B. Traditional public spaces such as ancestral halls/squares

C. Indoor activity spaces such as community party service centers

D. Open space/parking lot around old industrial buildings

E. Waterfront embankment space

F. Hardly used

G. Others: _____

Q7. Which of these public spaces do you most often engage in? (Check up to 3)

(Check up to 3)

A. Walking, passing through

B. Sitting out and relaxing

C. Fitness, exercise

D. Children's play/companionship

E. Socializing and chatting with neighbors

F. Participate in cultural/festival activities

G. Shopping and consumption

H. Others: _____

Q8. How often do you currently use public space? *

A. Every day

B. 3-5 times per week

C. 1-2 times per week

D. Several times a month

E. Very rarely

Q9. What is your peak time for using public space? (Multiple choices allowed)

(Multiple choice)

A. Morning (6:00-9:00)

B. Morning (9:00-12:00)

C. Afternoon (12:00-17:00)

D. Evening (17:00-20:00)

E. Night (after 20:00)

F. No distinct pattern

Part III Satisfaction Evaluation of Existing Public Space

Q10. Please rate your level of satisfaction with the current situation in the following areas (please tick the corresponding box) * (1=very dissatisfied, 5=not satisfied, 5=not satisfied)

(1=Very dissatisfied, 5=Very satisfied, if this item does not concern you, please tick "Not applicable")

Evaluation Dimension	Very dissatisfied	Dissatisfied	Fair	Satisfactory	Very Satisfied	Not applicable
Continuity and safety of walking space	○	○	○	○	○	○
Shade and open space conditions in public spaces	○	○	○	○	○	○

Safety and Usability of Children's Activity Facilities	○	○	○	○	○	○
Accessibility of space for daily activities for the elderly	○	○	○	○	○	○
Parking management and road order	○	○	○	○	○	○
Environmental sanitation and garbage removal	○	○	○	○	○	○
Historical and cultural atmosphere in public space	○	○	○	○	○	○
Nighttime Lighting and Sense of Security	○	○	○	○	○	○
Overall level of maintenance of public space	○	○	○	○	○	○

Q11. In general, do you think there is a need to further optimize the public space around the old industrial buildings in Bijiang? *○○ ○

A. Very necessary

B. Necessary

C. General, dispensable

D. Not necessary, the status quo is already better

E. Not sure

Part IV Problem Diagnosis and Prioritization of Regeneration Needs

Q12. What do you think are the most prominent problems in the district at present? (Maximum 3 items)

(Maximum 3 items)

A. Parking is chaotic and occupies public space

B. Poor environmental hygiene

C. Lack of recreational facilities for daily use

D. Unused space in old industrial buildings with low utilization rate

E. Lack of display and revitalization of historical and cultural resources

F. Inconvenient road transportation and old infrastructure

G. Lack of safe places for children's activities

H. Occupation of activity spaces for the elderly

I. Lack of space for young people to socialize and express themselves culturally

J. Others: _____

Q13. If old industrial buildings were to be renovated and renewed, which types of functions would you most like to see introduced? (Maximum 3 items)

(Maximum 3 choices)

A. Cultural facilities such as cultural exhibitions, non-heritage experiences, etc.

B. Convenient commerce (catering, retail, daily services)

C. Open community plaza for public activities

D. Safe places for children's activities

E. Fitness and leisure facilities for the elderly

F. Creative office/youth entrepreneurial space

G. Waterfront recreational trails and viewing platforms

H. Parking lots and traffic diversion facilities

I. Others: _____

Q14. Which group of people do you think the renovated old industrial buildings should serve first? *●

A. Focus on the daily needs of local residents (especially the elderly and children)

B. Attracting foreign tourists and commercial consumption as the main focus

C. to be shared by both local residents and foreign visitors

D. with a focus on local youth entrepreneurship and cultural creativity

E. Not sure

Q15. Would you like to participate in the design process of the renovation of old industrial buildings (e.g. residents' opinion collection, co-creation workshop, etc.)? *□

A. Very willing, actively participate

B. Yes, if it is convenient

C. Don't care

D. Not really willing

E. Not at all

Part V Sub-group Specific Questions

(Please fill in the corresponding part according to your own situation, and skip the rest)

If you have children under 14 years old at home, please answer Q16-Q17.

Q16. What do you think is the biggest shortcoming of children's activity places in your district at present? (Multiple answers allowed)

(Multiple answers allowed)

A. Lack of exclusive and safe activity areas

B. safety hazards in existing open space (e.g., traffic, aging buildings)

C. Inadequate interface with supporting facilities such as interest classes

D. Inconvenient supervision due to lack of parental line of sight coverage

E. Others: _____

Q17. What types of functions would you like to see children's activity space combined with? (Multiple choices allowed)

(Multiple choices)

A. Adjacent to a shrine or interest training space for easy pick-up and drop-off

B. With waiting sitting area for parents

C. Incorporate local historical and cultural elements

D. With simple dining or retail

E. Other: _____

If you are 60 years of age or older or have an elderly family member, please answer Q18-Q19

Q18. What are the current limitations on your (or the elderly in your household's) daily outdoor activities? (Multiple answers allowed)

(Multiple answers allowed)

A. Existing activity areas are occupied by vehicles

B. Lack of shade

C. Roads are not level, making it difficult to walk

D. Distance felt too far, poor accessibility

E. Lack of other places where the elderly can gather

F. Others: _____

Q19. What types of facilities would you (or the elderly at home) most like to see added in the community? (Maximum 2 items)

(Maximum 2 choices)

A. Shaded sitting and seating areas

B. Managed and safe activity plaza

C. Exercise equipment

D. Chess/recreation room

E. Elderly Services (medical, assisted living, etc.) Package

F. Others: _____

If you are in the younger age group of 18-40 years old, please answer Q20-Q21

Q20. To what extent do you identify with the culture of the community in Bijiang? Please answer the following questions.**

A. Strong identification, part of my life and identity

B. Some identification, but lack of channels for expression and participation

C. Weak sense of identity, not very relevant to me

D. Don't know, can't tell

Q21. What type of social/cultural space would you like to see in the renovation of old industrial buildings? (Multiple choices allowed)

(Multiple choice)

A. An open space for daily sitting and informal communication

B. Experiential space to showcase Bijiang's history and culture

C. Workshop/office space to support entrepreneurship, design, handicrafts

D. Flexible venues for small-scale performances, bazaars, and exhibitions

E. Cost-effective dining and leisure complexes

F. Others: _____

Part VI Open Views

Q22. What do you think are the most important issues or practices to be avoided in the regeneration of old industrial buildings?

Please fill in here:

Q23. If it is possible to add a public space near the old industrial buildings that you need most, what would you like it to be like? Please describe as much as possible.

Please fill in here:

Q24. What other suggestions or comments do you have for improving the public space in the Bijiang area?

Please fill in here:

--- This concludes the questionnaire, thank you for your participation! ---

This study is conducted by the Research Project Team of Community-oriented Regeneration of Old Industrial Buildings in Bijiang, Shunde, please feel free to contact the researchers if you have any questions.

攻读硕士学位期间取得的研究成果

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

序号	作者（全体作者，按顺序排列）	题　　目	发表或投稿刊物名称、级别	发表的卷期、年月、页码	与学位论文哪一部分（章、节）相关	被索引收录情况
、						

注：在“发表的卷期、年月、页码”栏：
1 如果论文已发表，请填写发表的卷期、年月、页码；
2 如果论文已被接受，填写将要发表的卷期、年月；
3 以上都不是，请据实填写“已投稿”，“拟投稿”。
不够请另加页。

二、与学位内容相关的其它成果（包括专利、著作、获奖项目等）

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感谢我的家人们。感谢你们在攻读研究生期间的理解和支持，为我提供心理和物质上的“双重保障”。感谢爸爸妈妈在我从小到大求学二十年以来的支持和鼓励，是你们的支持让我有勇气继续攻读研究生、有机会到欧洲看更大的世界。感谢我的姐妹吴嫣然，相似的成长环境和求学经历让我们能够理解彼此，互相加油打气，分享生活的喜怒哀乐，衷心祝愿我们都有美好的未来。

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行文至此，我的研究生生活真的要告一段落了。三年前，收到华工录取通知书的我觉得一切都是最好的安排，现在我对这点仍坚信不疑。很幸运有各位老师、家人和朋友的陪伴，祝愿我们都能顺利、平安、幸福。

档案目录序号：3

四、答辩委员会决议书

答辩委员会对学位（毕业）论文的评语（主要内容包括：1.论文选题与综述；2.学术水平与创新性；3.论文综合能力表现；4.学位（毕业）论文答辩情况；5.存在的不足之处和建议等）

论文聚焦传统村落产业转型过程中旧厂房空间的社区化更新问题，选题具有选题具有较强的现实意义与研究价值。论文以顺德碧江村旧厂房为研究对象，围绕村级工业进存与社区生活空间交织并存的现实特征，通过文献研究、实地调研、案例分析、类型归纳等方法，对碧江旧厂房片区的空间系统、人群需求与旧厂房本体条件进行系统调研。在此基础上，论文从城市触媒理论出发，构建了面向旧厂房社区化更新的设计策略，并结合具体地块提出相应的空间更新与功能植入方案，形成了具有一定针对性的设计实践成果，可为历史村落中旧厂房的活化利用与社区公共空间建设提供一定参考。

论文整体研究思路较清晰，资料收集较充分，研究内容较完整，能够较好地结合存量空间更新与社区需求等议题展开分析，具有一定创新性与实践意义。答辩过程中，作者汇报表达清楚，能够围绕研究背景、问题分析与设计策略进行较为完整的阐述，并能够较准确回答答辩委员提出的问题，基本达到建筑学硕士学位论文要求。建议根据答辩委员意见，进一步完善调研资料与设计策略之间的对应关系，并对论文文本及图纸表达进行修改完善。

根据投票结果，答辩委员会一致同意倪嘉恒通过硕士学位论文答辩，同意其毕业，并建议授予建筑学硕士学位。

论文答辩日期：2026 年 5 月 21 日　　答辩委员会委员 5 人

毕业表决票数：通过（5）票；不通过（　）票

学位表决票数：通过（5）票；不通过（　）票

答辩委员会决议（打“√”）：

毕业：通过（√）；不通过（　）

学位：通过（√）；不通过（　）

答辩成员签名	林正宇（主席）　Emanuele Morezzi（陈可代） [illegible]　[illegible]　[illegible]
答辩秘书签名	陈可

学位申请人姓名：倪嘉恒