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专业学位硕士学位论文

Regeneration Design of Nanheng Village in Guangzhou from the Perspective of Urban Morphology

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Abstract

Against the backdrop of rapid urbanization in the Guangdong–Hong Kong–Macao Greater Bay Area, complex and multifaceted relationships have emerged between rural settlements and newly developed urban districts. On the one hand, as urban development continues to expand, the spatial boundaries, productive environments, and social structures of existing villages are under increasing pressure; on the other hand, the historical fabric, local memories, and ecological wisdom embodied by rural settlements provide vital cultural and morphological resources for homogenized urban spaces. For the Waterside Settlements of Lingnan, urbanization has not only transformed the relationship between villages, land, and canals in terms of production and daily life but has also undermined the overall spatial order formed by the interplay of canals, farmland, streets, and buildings. How to avoid simplistic demolition and reconstruction or superficial, symbolic preservation during urban regeneration, and how to sustain spatial values and local characteristics under new urban development conditions, have become urgent issues that the regeneration design of water villages must address.

This paper takes Nanheng Village as its subject of study and explores design methods for the regeneration of Lingnan fishing-villages from the perspective of urban morphology, focusing on the question: “How can we preserve and sustain the unique character of Nanheng Village by redefining the historical and spatial relationships of the fishing-village, thereby creating a water-village community that coexists harmoniously with the surrounding areas?” The study first establishes a conceptual framework linking Lingnan waterside settlements, urban morphology, and assemblage theory through a review of the literature and case studies. Drawing on online data and field research findings, it identifies the core issues of the site. Based on this, the study develops an analytical methodology comprising “multiscale morphological mapping, residents’ memories and perceptions, and morphological resilience analysis,” and translates the findings into design guidelines that are ultimately applied to the design practice of the research subject.

The design process unfolds sequentially across different scales. At the planning level, the

approach centers on a waterfront experience corridor that connects the mountains to the sea, reorganizing the road network, canals, and blue-green infrastructure to strengthen the connections between the canal banks and the city, as well as between the villages and the Nansha Bay research cluster. At the urban design level, centered on Nanheng Canal, three key spatial strategies are proposed: reorganizing the waterfront interface of traditional fishing villages through the integration of production–living–ecological space (PLES); transforming productive spaces through public landscape-making and cultural-tourism translation; and revitalizing local memory through its symbiosis with urban regeneration. Node design runs throughout these strategies, and a “Mountain-Sea Corridor” is created through the organization of visitor routes. Finally, the design practice is guided and regulated through urban design guidelines.

The study indicates that the regeneration design of Nanheng Village should establish a collaborative fabric among morphological preservation, industrial revitalization, functional implantation, the restoration of public life, and the enhancement of ecological resilience. In this way, the traditional fishing village can be transformed within the new urban district into an open, composite, and locally distinctive new water-village community, while also providing methodological reference and design inspiration for the regeneration of similar water-village settlements in the Greater Bay Area.

Keywords: urban morphology; assemblage theory; urban regeneration; Lingnan water towns; fishing-village

Contents

Abstract ..... **I**

Contents ..... **III**

Figure & Table Lists ..... **VII**

Chapter 1 Introduction **1**

1.1 Research Background and Case Selection 1

1.1.1 Existential Challenges Facing Traditional Villages amid Urbanization 1

1.1.2 Historical Discontinuity and Ecological Challenges in Urban–Water Relations 2

1.1.3 Limitations of Conventional Regeneration Approaches 3

1.1.4 Research Object 4

1.2 Research Questions and Significance 7

1.2.1 Research Questions 7

1.2.2 Research Significance 9

1.3 Research Methods 11

1.4 Research Framework 14

Chapter 2 Literature Review **15**

2.1 A Study of Waterside Settlements in the Lingnan Water Towns 15

2.2 Overview of Urban Morphology 19

2.2.1 Urban Morphology and Urban Design 19

2.2.2 The Relevance of Morphological Research to Urban Villages 26

2.2.3 Emerging Tools and Methods in Urban Morphological Research 28

2.2.4 Trends in Urban Morphology Research 31

2.3 Assemblage Theory 36

2.3.1 Origins 36

2.3.2 Development 39

2.4 The Intrinsic Connection Between Morphology and Assemblage Theory 41

2.5 Case Studies 44
2.5.1 Conceptual Design for the Barene di San Giuliano Wetlands in Venice. 46
2.5.2 Redevelopment Plan for the Coloane Village in Macao 50
2.5.3 Renovation of Honggang Village, Nansha 55
2.5.4 The Hague Canal Rehabilitation Project 62
2.5.5 Case Summary 64
2.6 Chapter Summary 67
Chapter 3 Site Analysis 69
3.1 The Historical Background of Nanheng Village 69
3.2 Planning and Policy Context 72
3.2.1 Location Analysis 72
3.2.2 Industrial Positioning and Urban Development 73
3.2.3 Ecological Structure 76
3.3 Existing Conditions Analysis 77
3.3.1 Traffic Analysis 77
3.3.2 Analysis of Surrounding Amenities and POI Distribution 79
3.3.3 Analysis of Rainfall and Flood Conditions 80
3.3.4 Analysis of Natural Factors 83
3.3.5 Building Condition Assessment 84
3.4 Chapter Summary 86
Chapter 4 Morphology Types and Assemblage Analysis 88
4.1 A Multiscale Mapping of the Morphology of Fishing Villages 89
4.1.1 Analysis of Settlement Types 90
4.1.2 Feature Region Analysis 94
4.1.3 Analysis of Distinctive Architectural Complex Types 96
4.2 Identity Morphology Based on Local Memory 99
4.2.1 Survey Participants and Sample Characteristics 99
4.2.2 Questionnaire-Based Assessment of Perceived Morphological Memory

..... 100
4.2.3 Interview-Based Analysis of Morphological Memory 102
4.3 Analysis of Morphological Resilience for Adaptive Regenerations 104
4.3.1 Analysis of Road Network Resilience 105
4.3.2 Analysis of the Resilience of Building Fabric 108
4.4 Chapter Summary 111
Chapter 5 Construction of Design Methods 114
5.1 Design Concept 114
5.2 Defining the Scope of Design and Planning Objectives 120
5.2.1 Determination of the Planning Area 120
5.2.2 Planning, Positioning, and Structure 122
5.3 Adaptive Planning for Road Systems 123
5.4 Building Height and Development Intensity Controls 128
5.5 Translation of Architectural Morphology Characteristics 130
5.6 Chapter Summary 135
Chapter 6 Urban Design Proposal for Nanheng Village and Its Surrounding Area 137
6.1 Overview of the Key Design Area 137
6.2 Development of the Mountain-Sea Corridor Tour Route 141
6.3 Design of Key Nodes 142
6.3.1 Reorganizing the Waterfront Interface of Traditional Fishing Villages through the Integration of PLES 142
6.3.2 Transforming Productive Spaces through Public Landscape-Making and Cultural-Tourism Translation 150
6.3.3 Revitalizing Local Memory through Its Symbiosis with Urban Regeneration 154
6.4 Economic and Technical Indicators 157
6.5 Urban Design Guidelines 160

6.6 Chapter Summary 169
Summary and Outlook 170
Summary of Key Findings 170
Discussion and Summary of Key Innovations 171
Shortcomings and Outlook 172
Bibliography 174
Appendix 182
Appendix 1 Survey Questions 182
Appendix 2 Interview Transcript 183
攻读硕士学位期间取得的研究成果 185
Acknowledgement 186

Figure & Table Lists

Fig.1-1 Map of Nanheng Village..... 5
Fig.1-2 Conceptual Rendering of the Current State of Nanheng Village..... 6
Fig.1-2 Research Framework..... 14
Fig.2-1 Spatial Structures of Three Types of Water Town Settlements..... 16
Fig.2-2 Estuarine-network types landscape structure..... 19
Fig.2-3 Schematic Diagram Illustrating the Close Relationship Between Urban Morphology and Urban Design..... 23
Fig.2-4 The plan of Caltagirone, Italy: seven morphological spheres and 13 typological sectors..... 25
Fig.2-5 The plan of Schio, Italy: the regulation scheme for Block B9..... 26
Fig.2-6 Keyword co-occurrence cluster analysis (left) and overlay year trend analysis (right) of publications related to “urban morphology”..... 33
Fig.2-7 Author-affiliation co-occurrence cluster analysis (left) and overlay year trend analysis (right) of publications related to “urban morphology”..... 33
Fig.2-8 Keyword co-occurrence cluster analysis (left) and overlay year trend analysis (right) of publications related to “urban morphology”..... 34
Fig.2-9 Publication trends of “urban morphology”-related studies over the past two decades..... 36
Fig.2-10 The Difference Between Trees and Rhizomes..... 37
Fig.2-11 The Contribution of Urban Morphology and Assemblage Theory to the Research Question..... 44
Fig.2-12 The Barene di San Giuliano in Venice Project Estuary I..... 48
Fig.2-13 The Barene di San Giuliano in Venice Project Estuary II..... 49
Fig.2-14 The Barene di San Giuliano in Venice Project Estuary III..... 49
Fig.2-15 Location of Coloane Island..... 51
Fig.2-16 Design Guideline Plan for the Stilt Houses in Coloane Village..... 53
Fig.2-17 Existing Conditions of Coloane Island..... 54

Fig.2-18 Location Map of Honggang Village 56
Fig.2-19 Structural Diagram of the “Evening Songs from Fishing Boats” Rural Demonstration Zone 57
Fig.2-20 Spatial Upgrading of Honggang Village 58
Fig.2-21 a: Gender distribution of respondents; b: Age distribution of respondents; c: Household registration distribution of respondents 60
Fig.2-22 a: Respondents' preferences regarding public spaces; b: Respondents' activity preferences; c: Key areas for renovation 60
Fig.2-23 a: Current issues; b: Preservation and maintenance of distinctive features 61
Fig.2-24 Flowline Plan for the Hague Canal 63
Fig.2-25 A comparison of the canal in the past (left) and today (right) 63
Fig.2-26 Types of Canal Cross-Sections 64
Fig.3-1 Current Map of the Guanyin Temple 71
Fig.3-2 Map of the Six Waterways of Guangzhou 71
Fig.3-3 Photos of Nanheng Village in the 1970s and 1980s 72
Fig.3-4 Timeline of the Historical Development of Nanheng Village 72
Fig.3-5 Location of Nanheng Village 73
Fig.3-6 Map of Guangzhou’s Urban-Rural System (left); Schematic of Nansha Science City (right) 74
Fig.3-7 Nanheng Village Control Detailed Plan (top) and Existing Urban Design Plan (bottom) 76
Fig.3-8 Map of the Ecological Space Network in Nansha District 77
Fig.3-9 Current Traffic Analysis Map 79
Fig.3-10 Analysis of Nearby Points of Interest 80
Fig.3-11 Chart of Annual Average Temperature Changes in Nansha District, 2008–2024 81
Fig.3-12 Chart Comparing Monthly Precipitation in Nansha District in 2024 with the 10-Year Average 82

Fig.3-13 Vertical Profile of the Nanheng Canal Estuary 83
Fig.3-14 Analysis of Natural Factors 84
Fig.3-15 Identification of Building Condition Issues and Recommendations for Remediation 86
Fig.4-1 Historical layout of water towns: macro scale (left), meso scale (right) 91
Fig.4-2 Morphological Changes Within the Study Area of Nanheng Village 93
Fig.4-3 Nanheng village morphology feature region 96
Fig.4-4 Analysis of Distinctive Architectural Complex 98
Fig.4-5 Basic Information a: Gender; b: Age Group; c: Housing Type 101
Fig.4-6 Event Requirements 101
Fig.4-7 Need for comprehensive optimization and improvement 102
Fig.4-8 Needs for Canal Rehabilitation 102
Fig.4-9 Analysis of Connectivity (left) and Integration (right) in Nanheng Village and Its Surroundings 107
Fig.4-10 Intelligibility Analysis 107
Fig.4-11 Integration and Overlay Analysis with 2030 Flood Inundation Risk Simulations 108
Fig.4-12 Analysis of Non-Impervious Surfaces Within the Built-Up Area on Both Banks of the Nanheng Canal 111
Fig.5-1 Design Framework 115
Fig.5-2 Master Plan 117
Fig.5-3 Skyline Analysis (left) and Longitudinal Profile Analysis of Nanheng Village (right) 118
Fig.5-4 Rendering of the overall design 119
Fig.5-5 Generation of the Planning Area 122
Fig.5-6 Master Plan Layout Diagram 123
Fig.5-7 Transportation System Optimization Analysis Diagram 127
Fig.5-8 Master Plan of the Road Network 128

Fig.5-9 Before-and-After Comparison of Height Restrictions on the Construction Site130
Fig.5-10 Diagram of Architectural Configuration Analysis 133
Fig.5-11 Analysis of Residential Cluster Layouts 134
Fig.5-12 Analytical diagram showing the evolution of the elevated platform system... 135
Fig.6-1 Master Plan for Urban Design in Key Areas 139
Fig.6-2 Renderings of Key Areas 140
Fig.6-3 Functional Layout Map of Key Areas 140
Fig.6-4 Map of the Mountain-Sea Corridor Tour Route 141
Fig.6-5 Design Drawing of a Section of Canal Water Street 144
Fig.6-6 Cross-Section of Canal Water Street 144
Fig.6-7 Rendering of Canal Water Street 145
Fig.6-8 Design Drawing for the Floodable Water Square Node 146
Fig.6-9 Cross-Section of Floodable Water Square 147
Fig.6-10 Cross-Section of the Urban Waterfront Living Room 148
Fig.6-11 Design Analysis Diagram of the Urban Waterfront Living Room 148
Fig.6-12 Design Analysis Diagram of the Technology Incubation Cluster and Flower Boat Pier 150
Fig.6-13 Design Plan for the Fishing and Farming Wetland Experience 152
Fig.6-14 Design Plans for a Multifunctional Urban Farm 153
Fig.6-15 Design Plans for a Multifunctional Urban Farm 154
Fig.6-16 Design Drawings for Banyan Tree Plaza 156
Fig.6-17 Community Activity Facility Layout Plan 157
Fig.6-18 Schematic Diagram of Demolition, Renovation, and Retention vs. New Construction 159

Table 2-1 Summary of the Characteristics of the Three Major Schools of Morphology . 20
Table 2-2 Six Key Principles of Rhizomatic Structure 37
Table 2-3 Comparability of the Case Study with Nanheng Village and Implications for

Morphological Applications 45
Table 2-4 Summary of the Case Study 64
Table 4-1 Design Analysis Summary 89
Table 4-2 Summary Table of Topics Derived from Interviews 103
Table 4-3 Indicators for Spatial Syntax Analysis 105
Table 4-4 Summary Chart of Resilience Analysis of Building Fabrics 109
Table 4-5 Design Analysis Summary 112
Table 6-1 Economic and Technical Indicators 158
Table 6-2 Summary of Demolition, Renovation, Retention, and New Construction Floor Area 159
Table 6-3 Land Use Balance Sheet 163

Chapter 1 Introduction

1.1 Research Background and Case Selection

1.1.1 Existential Challenges Facing Traditional Villages amid Urbanization

The rapid urbanization of the Guangdong-Hong Kong-Macao Greater Bay Area (GBA) is profoundly altering the living environment and development trajectory of traditional villages within its cities. As one of China's most open and economically dynamic regions, the Greater Bay Area had achieved an urbanization rate of 89% by the end of 2023, 22.8 percentage points higher than the national average during the same period[1]. Urbanization has led to built-up urban areas continuously encroaching on peripheral zones, creating isolated "enclave-like" urban villages. Furthermore, changes in land use have exacerbated this threat. Take Nansha District in Guangzhou as an example: during the first 15 years of the 21st century, urban land use increased by 119%, with farmland being the primary source of this land conversion[2]. The direct consequence has been that villages, which are intrinsically linked to farmland, have become surrounded by heterogeneous spaces such as industrial parks and gated communities. This squeeze effect has not only severed the traditional production networks connecting villages with farmland and water systems but has also fragmented the canal system through a grid-like road system, thereby disrupting the evolutionary logic of the physical form of Lingnan water villages, such as fishing-village communities.

The squeeze on physical space is accompanied by the socioeconomic marginalization of urban villages. For example, the economic activities of many fishing-village communities rely on traditional fishing and agriculture, industries that lack competitiveness within the modern urban system. At the same time, because urban villages are relatively isolated in terms of location and social networks, their economic activities struggle to integrate into the city's core areas, resulting in persistently low income levels for residents. Furthermore, as urbanization progresses, urban villages will continue to lose their social capital[3]and face a process of disintegration and regeneration. The influx of large numbers of migrants intensifies competition for resources within the villages, while the original residents' limited access to education,

vocational training, and healthcare further exacerbates social polarization and erodes their sense of identity as villagers.

1.1.2 Historical Discontinuity and Ecological Challenges in Urban–Water Relations

Following the Industrial Revolution, urban hydrological systems underwent a process of "denaturalization"; many historic waterways were filled in or channelized, and modern infrastructure severed the symbiotic relationship between people and water. Traditional water systems typically served multiple functions, including agricultural irrigation, fisheries, and transportation, but modern urban development often focuses solely on the aesthetic aspects of these systems while neglecting their productive functions. Rivers not only connect the land but also foster trade, culture, and urban growth. Within the Pearl River Delta, traditional villages have always formed in close proximity to water bodies—not merely for sustenance, but also for the experience and interaction with humanity. Many ceremonial spaces have emerged in reliance on water (such as the March 3rd canal procession in Pantang Village, Liwan District, Guangzhou, and the Dragon Mother temples often established at the mouths of canals in Nansha fishing-villages to pray for safe voyages). Due to fluctuations in water levels and the disruption of waterways, these spaces lose their sacredness, severing the connection between hydrological processes and cultural memory.

Even more concerning is that many canals have been incorporated into urban drainage systems, serving as conduits for urban wastewater discharge. This functional distortion not only undermines the ecological value of water bodies but also leads to the occurrence of "river syndrome"—including the decline of aquatic and riparian biota, the degradation of ecosystem services, the accumulation of harmful substances, increased vulnerability to disasters, and changes in river morphology—making villages vulnerable to extreme weather events[4]. This not only compromises the safety of the villages but may also cause harm to wider urban areas. Against this backdrop, how to improve the ecological resilience of traditional villages through design has become an urgent issue for designers to address.

1.1.3 Limitations of Conventional Regeneration Approaches

The 2025 Central Urban Work Conference stated: "...with the theme of promoting high-quality urban development, the main focus on pursuing inward-oriented urban development, and **urban regeneration as a key lever**, we will vigorously advance the optimization of urban structure, the transformation of growth drivers, the enhancement of quality, the transition to green development, **the preservation of cultural heritage**, and the improvement of governance efficiency...," and called for "shifting the drivers of urban development and placing greater emphasis on distinctive development"[5].

However, in the face of the highly complex demands of existing urban spaces today, traditional urban regeneration approaches often rely on static analyses of physical space and emphasize top-down, experience-based design. These approaches still have certain limitations when it comes to coordinating spatial elements across different scales and adapting to complex, nonlinear social spaces[6, 7]. Macro-level planning at the scale of territorial spatial planning focuses on regional economic integration while neglecting the specific elements of micro-scale sites. Conversely, micro-scale architectural design tends to be fragmented and is unable to address the reconfiguration of the relationship between villages and water. Interventions at a single scale cannot fundamentally resolve the spatial and social issues faced in urban regeneration; an integrated multi-scale approach is emerging as a trend. This approach should not only focus on individual historic buildings but also on the relationships between buildings within the city and the role of projects within the urban fabric[8]. In addition, traditional planning approaches place too much emphasis on functional renovations, often adopting a "demolish and rebuild" or "tear down and start over" approach, while neglecting the preservation and continuation of village culture[9]. For example, during the process of redevelopment, many traditional villages have been transformed into single-purpose tourist attractions, with commercial interests encroaching on the living spaces of the local residents, leading to the loss of the villages' historical memory and cultural fabric.

Although new theories and tools have been introduced into urban regeneration practices in recent years[10, 11, 12, 13], the rigidity of the governance system has prevented these approaches

from being fully and effectively implemented. The government-led "invest-demolish-rebuild" model destroys social capital networks, while unorganized community-led self-construction projects are prone to falling into a cycle of low-level repetition due to a lack of technical expertise. Therefore, exploring a governance structure that fosters collaboration among government, communities, and the environment can ensure that new theories and tools are effectively implemented, operate efficiently, and support coordinated governance.

1.1.4 Research Object

This study focuses on Nanheng Village in Nansha Subdistrict (now part of Gangwan Subdistrict [Note 1])of Nansha District, Guangzhou. Nansha Subdistrict is located in the southeastern part of Nansha District, Guangzhou, on the western shore of the Humen Estuary. It serves as the passage through which the Pearl River flows into the sea and connects the cities of the Pearl River Estuary. Nansha Subdistrict has a peninsula-like shape, extending from northwest to southeast. Its territory consists primarily of low hills, terraces, and alluvial plains, with Huangshanlu—the highest peak at 295 meters above sea level—located in the central part.[14]

In terms of its current spatial context, Nanheng Village is situated at the complex interface between mountains, canals, farmland, the coastal shoreline, and new urban development (Fig.1-1). The northern part of the village extends along the slopes of Guanyin Mountain and Dajiao Mountain, retaining a relatively compact rural fabric; the central area centers on the Nanheng Canal, with residences, dining establishments, stilted platforms, and private docks lining both banks—this is the area that most vividly showcases Nanheng Village's spatial character of having emerged from and being sustained by water; on the southern side of the village, productive landscapes such as paddy fields, fish ponds, and fruit orchards are still visible; however, due to lifestyle shifts and spatial compression brought about by urban development, these productive environments have gradually been transformed into residual landscape resources within the urban development context. At the same time, newly constructed urban

[Note 1] Nanheng Village is currently administratively part of Gangwan Subdistrict, but for the sake of convenience in this study, we will continue to use the term "Nansha Subdistrict" as it appears in the *Chronicle of Nansha Subdistrict*.

roads, research institutions, and high-rise buildings on the western and southern sides continue to accentuate the disparity in scale between Nanheng Village and the surrounding urban spaces, resulting in a juxtaposition of traditional settlement patterns and modern urban textures. (Fig.1-2)

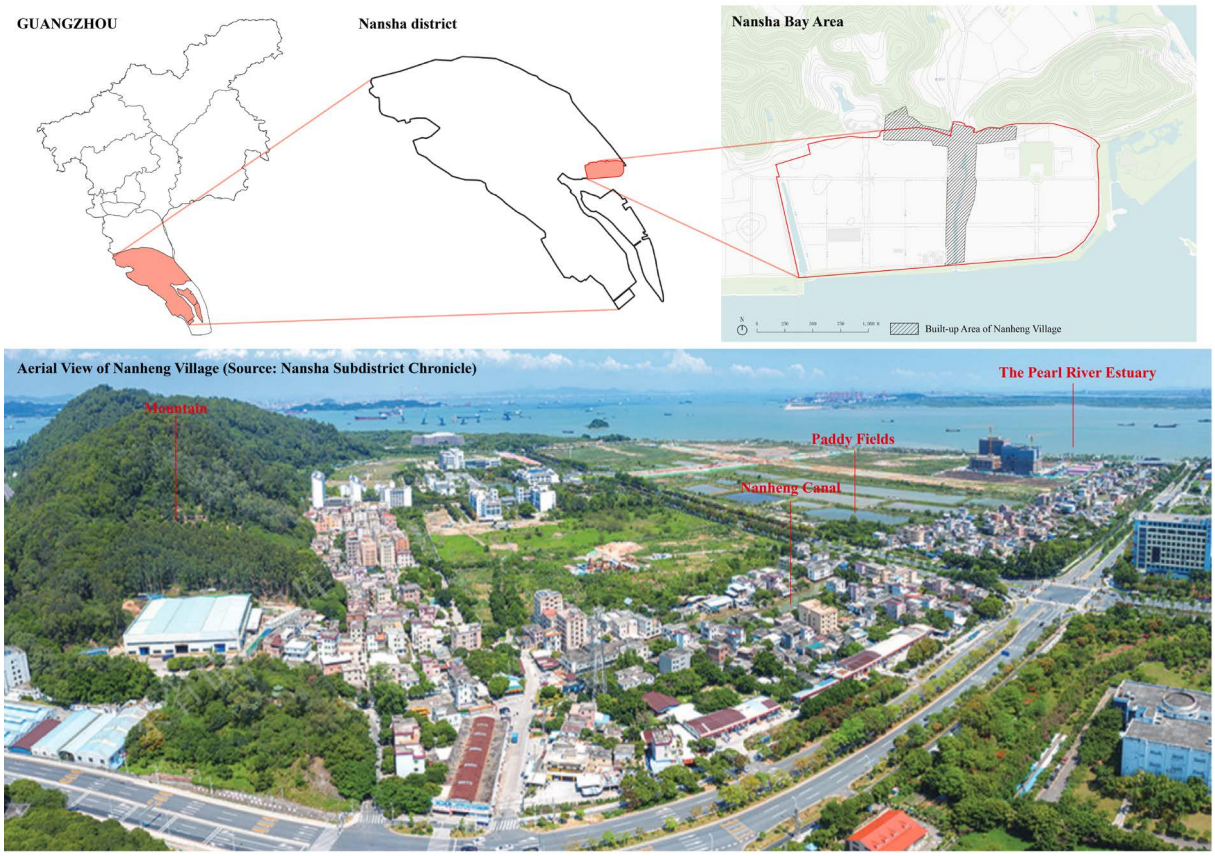


Fig.1-1 Map of Nanheng Village

(Source: Created using map data from QGIS as the base map)

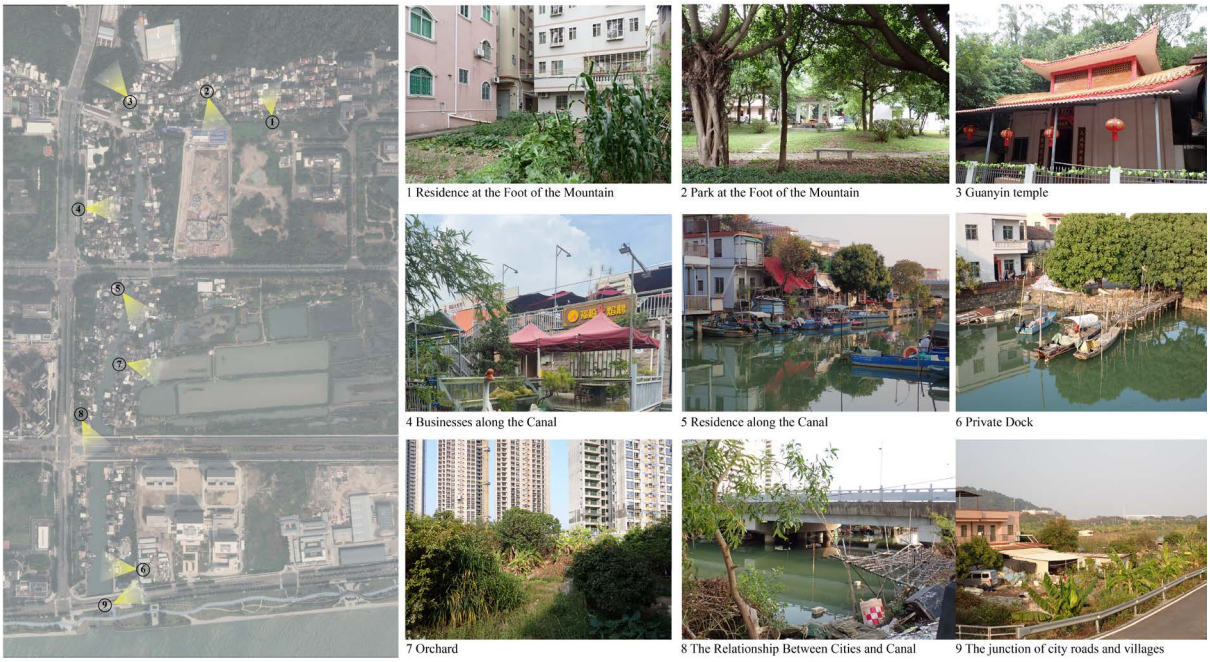


Fig.1-2 Conceptual Rendering of the Current State of Nanheng Village

(Source: Satellite base map from Google Earth; current images taken by the author)

According to the definition in the *Encyclopedia of China*, a fishing-village refers to "a settlement of fishermen whose primary economic activity is fishing or aquaculture; it is a type of natural village"[15]. According to the *Chronicle of Nansha Subdistrict*, Nansha Subdistrict is rich in fishery resources, and from the 1980s to the mid-1990s, fishing and aquaculture were its primary sources of income [14]. Although the economic structure of Nansha Subdistrict has undergone changes with urban development, Nanheng Village within the subdistrict still retains distinct traces of its fishing culture and some fishing-related living spaces. Furthermore, on a sociocultural level, public spaces such as the Dragon Mother Temple continue to embody local beliefs and collective memory. These spatial forms and historical remnants collectively indicate that Nanheng Village can be defined as a traditional fishing-village with the characteristics of Lingnan Waterside Settlements.

As the only remaining model of a Lingnan fishing-village settlement within Nansha Subdistrict, Nanheng Village embodies three key characteristics: morphological distinctiveness—the traditional structure of waterside settlements; concentrated contradictions—the issue of spatial fragmentation caused by urban expansion; and cultural scarcity—it preserves the history of villagers' integrated fishing and farming lifestyles, as well

as tangible cultural assets such as the dragon mother temple. Nanheng Village is currently undergoing urban regeneration, with both its spatial morphology and social structure facing significant transformation. In particular, the area along the southern canal has entered the phase of renovation, redevelopment, and relocation, and some traditional waterfront spaces, riverside buildings, and daily life scenes may undergo significant changes in the future. This context makes Nanheng Village a key case study for observing the regeneration process of traditional waterside settlements. On the one hand, the urban regeneration process provides relatively comprehensive planning documents, current survey data, and regeneration proposals, allowing the research to be grounded in relatively solid empirical data; on the other hand, as the village is at a critical stage of change, the study can promptly document its traditional morphological characteristics, spatial contradictions, and cultural values, thereby providing a basis for subsequent conservation and regeneration strategies. In other words, Nanheng Village is not a static historical relic, but rather a dynamic space that continues to evolve under the pressures of urbanization. Its research value lies precisely in the tension between “traditional morphologies that are still recognizable” and “ongoing pressures for regeneration.” Therefore, it can be regarded as a typical case study for discussing and researching urban regeneration approaches for traditional Lingnan waterside settlements, while also providing valuable references and insights for the integration of other similar traditional villages with new urban districts.

1.2 Research Questions and Significance

1.2.1 Research Questions

Based on the above research context, it can be observed that, on the one hand, due to urban development projects, urban villages are often surrounded by industrial parks and newly constructed high-rise residential buildings. These new urban blocks cut through and disrupt the original village layout, continuously encroaching on the villages’ existing land, thereby threatening their sustainability—specifically, the typical morphology of Shatian settlements[16] found in Nanheng Village, as well as its highly distinctive local ways of life and production, and its unique architectural typology. On the other hand, from a functional and social perspective, there is social segregation between the village and its surrounding areas. Currently,

the village itself is experiencing commercial decline and is unable to provide high-value-added commercial experiences to the surrounding areas.

The problem domain addressed in this thesis consists of three parts. First, villages are being demolished, and their internal structures face the loss of unique urban character, diversity, and local identity. Urban planners are racking their brains to find ways to infuse character into newly built, homogeneous cities, yet they overlook urban villages—elements such as their unique urbanization, history, culture, and spatial experiences that could bring a more diverse texture to the city's future[17]. Second, in urban areas, the historically close connection between rivers and human settlements has gradually been altered. In Nanheng Village, the layout of the villages on both banks of the canal and the waterways was historically closely intertwined. In modern times, however, growing demands for production and daily life have led to the channeling of water flows, and the reduced flow in the waterways has resulted in increased pollution. Even after river restoration projects, the waterways have been repurposed primarily for riverside tourism, leaving visitors with a limited experience of the water. Third, traditional static urban design methods struggle to address the dynamic evolution of villages and to achieve urban design that accounts for different spaces and time scales. Just as our environment constantly changes over time—transforming from a traditional fishing-village into a waterfront community that preserves the local topography and establishes positive connections with the surrounding areas—it is necessary to consider different temporal and spatial scales in order to envision the spatial experiences that future designs will create.

Based on the three issues outlined above, Nanheng Village was selected as the site for this project's research and design, which gives rise to the research questions addressed in this thesis:

How can we preserve and sustain the unique character of Nanheng Village by redefining the historical and spatial relationships of the fishing-village, thereby creating a water-village community that coexists harmoniously with the surrounding areas?

Three sub-research questions can be derived from this research question.

1. Within the "fishing-village–fishbone" layout of Nanheng Village, which morphological fabrics serve as key vehicles for shaping local identity? How can selection criteria and design

strategies for “preservation–restoration–replacement” be established across multiple scales—city, neighborhood, site, and building?

2. How can the local memories and daily rhythms of long-term residents and newcomers be captured and interpreted? How can Nanheng Village be transformed into a water-village community that appeals to both long-term residents and newcomers, as well as on an urban scale, thereby fostering shared cultural continuity and community cohesion?

3. Given the extreme weather conditions, how can the infrastructure system in Nanheng Village be restructured to ensure both safety, accessibility, and rapid recovery while also offering a unique experience?

1.2.2 Research Significance

1. Theoretical Significance

Through a systematic study of Lingnan waterside settlements and an examination of urban morphology and assemblage theory, this paper explores methods for revitalizing traditional fishing-village settlements in the context of urban development and regeneration within the GBA’s extensive water network.

Specifically, this study breaks through the limitations of traditional urban morphology—which tends to emphasize historical qualitative descriptions and static spatial perceptions—by establishing a composite technical approach that integrates multi-scale morphological diagramming —residents’ memory and perception—and morphological resilience analysis. Taking Nanheng Village as the subject of design practice, the study conducts a design translation to explore methods suitable for the morphological research of Lingnan fishing-village villages and their regeneration amid the urbanization process. It also attempts an integrated regeneration approach that unites the city, the village, and the water, revealing the interdependent fabrics between changes in the water system, settlement morphology, and urban-rural life. In this process, urban morphology is transformed from an analytical tool for interpreting villages and their formation into a decision-making method for guiding urban regeneration design.

Second, this study attempts to integrate urban morphology with assemblage theory,

thereby enriching the theoretical perspectives of research on traditional village regeneration and promoting interdisciplinary convergence among studies on Lingnan fishing-village communities, urban village regeneration, and the resilience of waterfront spaces. In this process, Nanheng Village is no longer viewed solely in terms of whether it requires preservation or complete demolition, but is instead understood as a dynamic complex composed of natural fabrics, production and daily life, local memory, and urban functions.

2. Practical Significance

In the course of urban development, villages with distinctive local character are often squeezed out by urban expansion and subsequently blend into the homogeneous urban landscape. While development is inevitable, the ability to preserve regional characteristics—whether cultural or physical—amidst these changes would be an advantage[18]. From a historical perspective, if the fishing-village were to disappear, the Nansha Bay area would lose its only remaining tales of fishermen. From an urban perspective, the existence of Nanheng Village adds character to the uniformity of the urban landscape; its natural presence is like an organic cell embedded within a neat grid, injecting heterogeneity and complexity into the mainstream urban planning dominated by external organizations, and stimulating innovative vitality at both the individual and societal levels.

At the practical level, this study addresses issues commonly found in the revitalization of Nanheng Village and similar Lingnan fishing-villages—such as the fragmentation of water systems, the loss of traditional fabrics, a lack of public spaces, and the fading of local memory—by proposing a revitalization approach based on the identification of morphological values. It emphasizes the need to identify, prior to revitalization, the spatial structures, daily life scenarios, and cultural carriers within the village that possess enduring value, and to use this as a basis for determining which spatial elements should be preserved, restored, renovated, or newly constructed, thereby providing a more concrete design framework for the revitalization of traditional fishing-villages. This approach helps facilitate the translation of urban morphology research findings into urban design practice, establishing a comprehensive process that integrates theoretical research, site surveys, design analysis, design implementation, and

regulatory oversight.

Finally, this study offers valuable insights for the revitalization of similar traditional fishing villages and urban villages within the GBA. The challenges faced by Nanheng Village are not unique to this community but reflect the common difficulties encountered by many traditional waterside settlements amid the rapid urbanization of the GBA. This study will establish a comparative and transferable framework for urban regeneration analysis and design.

1.3 Research Methods

This paper aims to develop a design methodology for the urban regeneration of Lingnan fishing-village communities by analyzing the current state of development in the Nansha area and the morphological characteristics of the study site itself, progressing from theoretical research to on-site design surveys and analysis. The methodology will be applied to a practical design case using the study site as an example. The following research methods will be employed:

Literature Review and Theoretical Analysis: Conduct a systematic review of the literature and theoretical frameworks to integrate the interconnections and applicability of Lingnan water towns, urban morphology, and assemblage theory. Additionally, perform keyword and author network analysis using databases such as WOS and CNKI to identify domestic and international research hotspots and evolving trends, thereby providing a basis for the selection of indicators and methodologies.

Case Studies: Select typical regeneration and design cases to examine their backgrounds, implementation pathways, and outcomes, summarizing transferable strategies and insights for the current site.

Multi-Source Data Collection and Site Survey: Integrate multi-source data—including historical development, land use, and master plans—to construct a base map and clarify site issues. Verify secondary data through on-site observation, rapid surveying, and photographic documentation to identify key spatial nodes and environmental issues.

Spatial Analysis and Evaluation: Conduct morphological mapping, feature extraction,

and typology identification across the city, neighborhood, and building scales to support typological classification and problem identification.

Social Survey: Questionnaire surveys are conducted among villagers and users to systematically examine their spatial cognition, activity preferences, cultural identity, and demands for regeneration. High-frequency responses are identified to provide clues for subsequent interviews. Interviews are then carried out with residents and relevant stakeholders to extract local memories and preference-based needs, thereby calibrating design objectives and priorities. During the actual interview process, the inquiry should not be strictly confined to the predetermined sequence of questions. Instead, the mode of questioning should be flexibly adjusted according to the interviewees' life experiences, narratives, and communicative context, with follow-up questions posed around significant clues, so as to obtain richer and more specific materials concerning local memory and spatial cognition.

Multi-Indicator Evaluation Method: Establish an indicator system at the scales of road network structure and architectural fabrics to conduct a comprehensive resilience assessment of the site, identify flood risk points, and address the quantitative shortcomings of traditional morphological studies.

Graphical Design Method (Design Research and Prototyping): Drawing on research-by-design and diagrammatic design methods, the study translates the preceding analytical findings into a design process comprising "morphological identification–type extraction–morphological translation–spatial assemblage–rule-based design control." Through the overlay of historical maps and the reconstruction of relationships between the road and water systems, the design identifies the mountain–sea configuration and spatial framework of enduring value, on the basis of which the planning boundary is delineated. The findings of the resilience analysis are subsequently translated into adaptive planning strategies, including road-alignment optimization, traffic redistribution, secondary-street densification, the completion of circulation loops, and the integration of pedestrian and cycling networks. Furthermore, the overall spatial relationships among the mountains, village, canals, farmland, urban fabric, and coastline are translated into control parameters for building height, development intensity, and waterfront

setbacks. Finally, the study extracts a series of morphological characteristics from the traditional building assemblages of Nanheng Village. These include the parallel and perpendicular relationships between buildings and water, comb-like and courtyard-based layouts, dual-level ground-floor interfaces, elevated platforms, small-scale building clusters, and the spatial permeability of streets and alleys. These characteristics are then typologically translated to accommodate contemporary functions such as scientific research, commerce, housing, and public services. On this basis, the design proposals are progressively implemented across multiple levels, encompassing the overall plan, urban design for the key development area, detailed node design, and urban design guidelines. Through this process, urban morphology is extended beyond its role as an analytical method for interpreting the historical spatial structure of Nanheng Village and transformed into an operative design methodology that informs street-network organization, plot subdivision, building configuration, public-space formation, and development control.

1.4 Research Framework

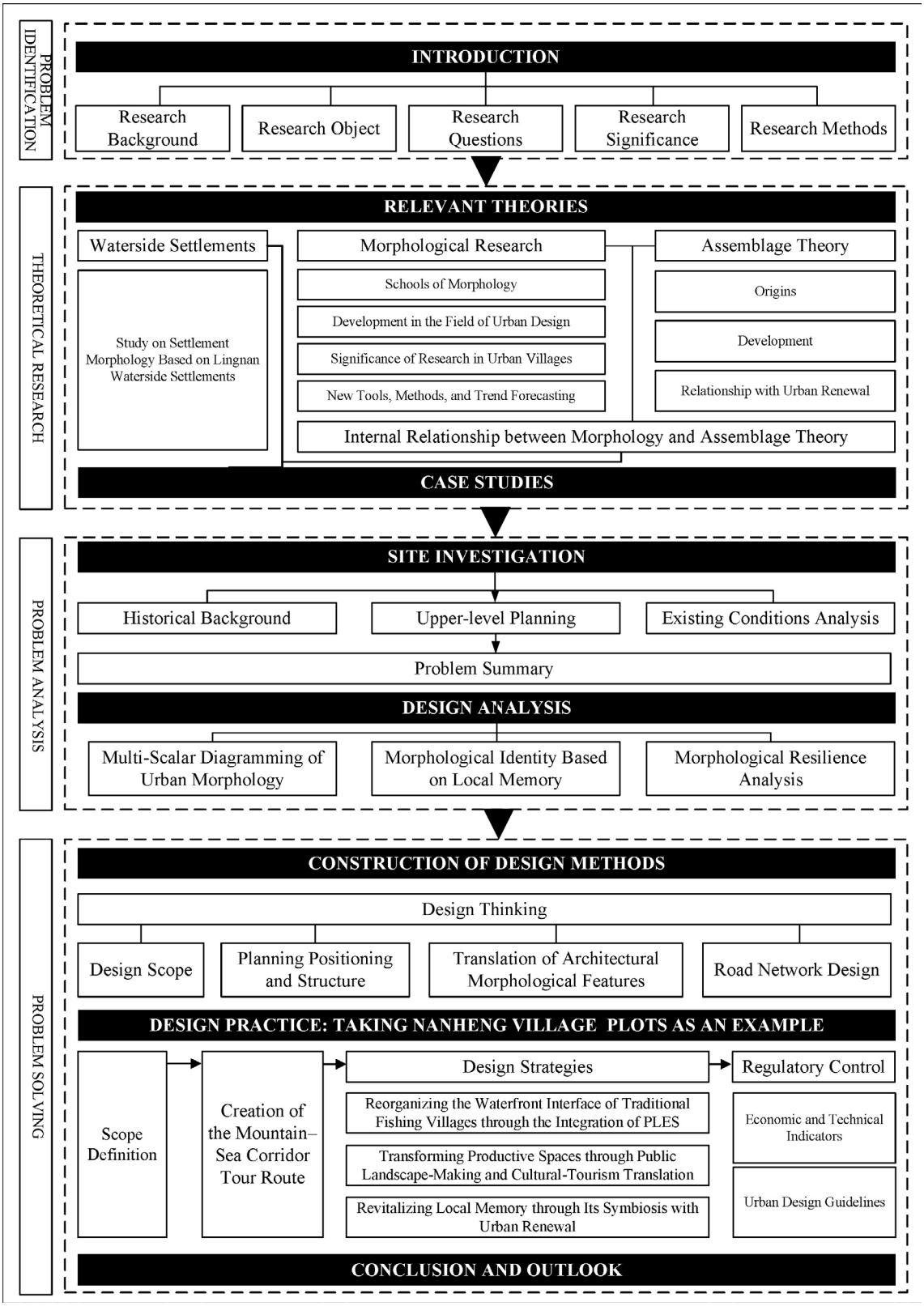


Fig.1-2 Research Framework

（Source: Created by the author）

Chapter 2 Literature Review

2.1 A Study of Waterside Settlements in the Lingnan Water Towns

In a broad sense, "Lingnan" refers to the regions south of the Five Ridges (Dayu Ridge, Qitian Ridge, Dupang Ridge, Mengzhu Ridge, and Yuecheng Ridge), including Guangdong, Guangxi, Hainan, Hong Kong, and Macao. "Lingnan Water Towns" refer to a unique form of settlement and cultural landscape that has developed in response to the natural environment of the Lingnan region[19]. In his book *Lingnan Water Towns*, Zhu Guangwen defines "Lingnan water towns" as a type of Chinese waterside settlement found in the Pearl River Delta region—either historically or currently—characterized by open outdoor spaces formed by contiguous mulberry-fish ponds or commercial orchards and flower farms, and featuring the distinctive architectural style of the Cantonese ethnic group as well as the natural landscape of Lingnan's subtropical climate and vegetation[20]. Lingnan waterside settlements are located in the core area of the GBA, and their morphological characteristics have been shaped by the combined influence of the distinctive natural conditions and socio-cultural context of the Pearl River Delta. Their settlement morphology is closely associated with the dense hydrological network[21], and over time, they have evolved into highly adaptive and multifunctional mixed-use spatial forms, making them an ideal testing ground for studying diverse settlement patterns.

Early studies of Lingnan waterside settlements focused primarily on their geographical characteristics, classifying them based on their relationship with water systems. These studies primarily identified the following types[22, 23]:

1. Linear Water Towns: Waterside settlements are built along waterways or between them, extending along water and land transportation routes, with the alignment of waterways and roads serving as the basis for and boundaries of the towns' development. Buildings are arranged along the waterways, facing major transportation routes at the front and backing onto rural landscapes at the rear, flexibly adapting to changes in the terrain.
2. Block-style water towns: Waterside settlements are typically situated along one side of a canal, surrounded by paddy-pond complexes. They feature a comb-like layout,

with alleys running parallel to the canals, and the riverside often serves as a hub for community activities.

3. Networked Water Towns: Waterside settlements are divided by T- or Y-shaped river networks, which segment the built environment into distinct sections. This design maximizes the contact between residential areas and waterways, facilitating transportation and daily life, while the village periphery is bounded by pond-based irrigation systems.

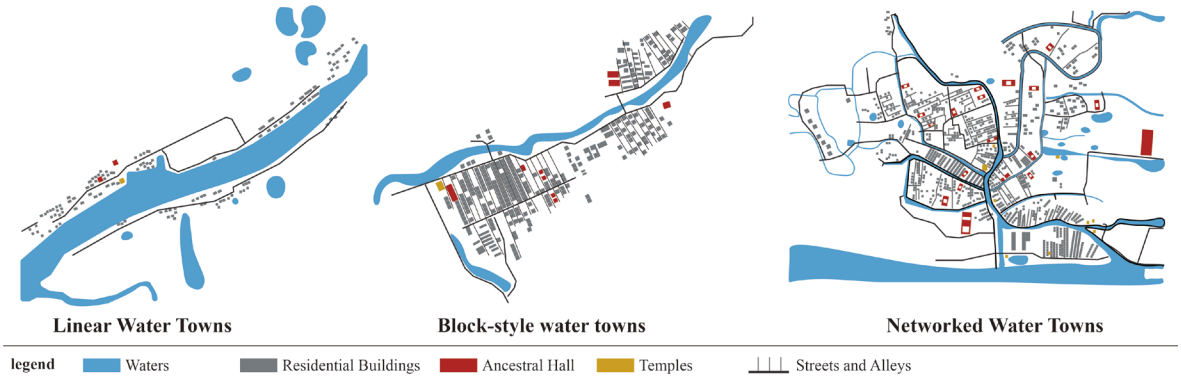


Fig.2-1 Spatial Structures of Three Types of Water Town Settlements

(Source: Adapted from Reference [23])

Although this classification method is intuitive and allows for the rapid identification of external differences in the canals, alleys, and residential fabric of Lingnan waterside settlements, its explanatory power is largely limited to the level of spatial appearances. It pays insufficient attention to the internal social organization, land relations, clan structures, and economic fabrics of these settlements, making it difficult to fully reveal the complexity of their formation and evolution. With the introduction of sociocultural factors, research on Lingnan waterside settlements has gradually shifted toward socio-spatial analysis. For example, based on the correlation between the clan structures of the Guangfu ethnic group and settlement morphology, Zhang Shawei classified Lingnan settlements into traditional villages dominated by Guangfu culture, Hakka-dominated traditional villages, Guangfu-Hakka blended traditional villages, and Shatian-type traditional villages. He further pointed out that these different village types are not merely the result of adaptation to the natural environment, but rather the product of the combined effects of multiple factors, including ethnic group migrations, clan relations, land

development, social defense, and local governance [16]. In the waterside settlements of Lingnan, clan settlements within enclosed paddy fields often organized their village spaces around a clan hall as the central focal point. In contrast, due to later development and a more diverse population composition, the Shatian area—where boat-dwelling people, tenant farmers, and migrant settlers long lacked stable clan organizations—exhibited a linear morphology characterized by settlements built along embankments and situated along waterways, with a relative absence of kinship-based public spaces such as clan halls. Furthermore, a distinct relationship of control and dependence existed between the clan-based communities within the enclosed paddy fields and the non-clan communities in the Shatian area, thereby giving rise to the early traditional urban-rural dichotomy characteristic of the Lingnan water towns [24]. In the contemporary context, the causes of urban–rural differentiation have shifted from issues concerning the relations of production embedded in the land system to factors such as the previously dominant model of "incremental development," planning lag, interest-based negotiations, and governance dilemmas. Nevertheless, the condition in which cities and villages are spatially interwoven in morphological terms yet remain differentiated in terms of place experience continues to persist.

In recent years, researchers have further introduced a dynamic systems perspective and proposed classification studies based on the triadic system of ecology, society, and space. For example, based on the characteristics of the GBA, YANG Xi et al. examined the relationship between villages and water by analyzing the hierarchy of the Pearl River Delta's water system and its connections to village clusters and productive spaces. They expanded the scale of their research from the traditional single-village model to the landscape structural scale, which is jointly constituted by villages, hydrological elements, and the agricultural matrix. Based on multi-temporal image analysis of historical base maps from the late Qing Dynasty to the Republic of China period and contemporary satellite imagery, they identified and extracted landscape elements such as villages, water networks, ponds, farmland, forests, and industrial land. They then classified the water towns in the Pearl River Delta region into three types: tributary network, mainstem network, and estuary network, comparing their synchronic

differences and diachronic evolutionary patterns (Fig.2-2). The findings of this analysis are applied as spatial prototypes in contemporary urban design practice—for example, by using the network structures of different water town patterns as a design foundation, employing their spatial forms and orientations at the macro scale as a reference framework for urban design, or by treating urban infrastructure as active landscape elements that form an integral part of regional character[25]. Furthermore, the application of the Dutch polder system's urban philosophy provides new design references for the conservation, regeneration, and adaptive design of Lingnan waterside settlements. This philosophy emphasizes a shift from an exclusionary "struggle against water" to "coexistence with water" under dynamic hydrological conditions through a combination of human intervention and natural regulation, By reserving floodplain space, restoring wetland ecosystems, establishing resilient water storage areas, organizing tiered drainage systems, and developing community water cycles, the resilience of these settlements is enhanced in the face of extreme rainfall, tidal fluctuations, and sea-level rise. This approach enables continuous spatial adaptation, organically integrating ecological corridors with spaces for human activity to achieve a symbiotic relationship between people and nature[26, 27]. These new classification methods provide a multidimensional, integrated framework for studying the morphology of Lingnan waterside settlements, a dynamic approach to adapting to natural and social relationships, and a global perspective on the future transformation of delta water towns.

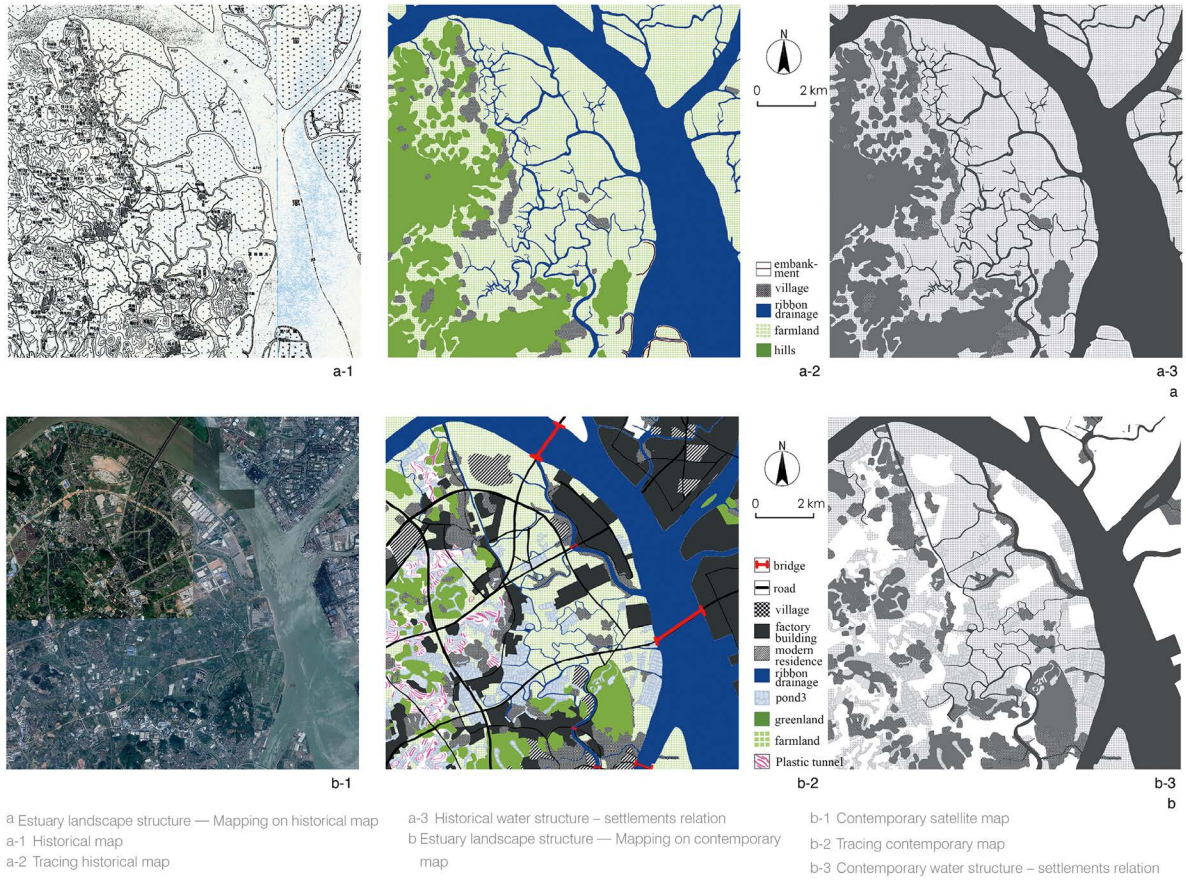


Fig.2-2 Estuarine-network types landscape structure

(Image source: Reference [25])

2.2 Overview of Urban Morphology

2.2.1 Urban Morphology and Urban Design

Morphological studies explain the arrangement and diversity of urban forms by examining the interrelationships between human settlements and sociocultural, economic, and environmental factors[28]. The findings of morphological studies highlight the significance of the built environment and provide opportunities for informing planning processes, as well as for creating and preserving local distinctiveness[29]. The International Seminar on Urban Form (ISUF) has recognized the active contributions of numerous scholars in the field of urban morphology and has categorized the major schools of urban morphological thought into three principal traditions: the British, Italian, and French schools (Table 2-1). Although these three concepts have different focuses, researchers agree that form, resolution, and time constitute the three core components of urban morphology research and are central to all studies in this field.

Form is the most direct object of study in urban morphology, consisting primarily of three types of physical elements: buildings and their associated open spaces, plots or parcels of land, and streets. Resolution emphasizes that urban morphology can be understood at different spatial scales—corresponding to buildings/plots, streets/blocks, the city, and the region. This awareness of scale distinguishes urban morphology from studies focused solely on architectural typology or macro-level urban structure. For example, what Conzen termed "plan units" and the Italian scholars' research on "tessuto" (fabric) represent analytical objects situated precisely between individual buildings and the city as a whole. Furthermore, time is an indispensable historical dimension for understanding urban morphology, as the elements that constitute it undergo continuous transformation and replacement. A given plot may serve different social groups and functions across various historical periods; therefore, urban morphology must be fully understood within the context of historical processes[30]. Form, resolution, and time are not three isolated concepts; together, they constitute the three nested dimensions of the traditional analytical framework of urban morphology. Form addresses the question of "what cities are composed of and how they are organized"; resolution addresses the question of "at what scale cities should be observed and interpreted"; and time addresses the question of "how these forms persist, transform, and are replaced."

Table 2-1 Summary of the Characteristics of the Three Major Schools of Morphology

(Summarized based on References [31, 32, 33, 34])

School	Main Representatives	Research Focus	Characteristics
British School	M. R. G. Conzen; J. W. R. Whitehand	Emphasizes the influence of historical processes on urban form; focuses on the relationships among urban blocks, plots, and buildings.	Highlights the historical layering, continuity, and transformation of urban form; places particular emphasis on historical maps, cadastral maps, and field

School	Main Representatives	Research Focus	Characteristics
			surveys.
Italian School	Saverio Muratori; Gianfranco Caniggia; Aldo Rossi	Emphasizes the continuity and evolution of building types; focuses on architectural typology within urban space.	"Procedural typology" is proposed as an analytical tool. Architectural typologies are viewed as the root of urban morphology. Emphasis is placed on the intrinsic logical relationship between architecture and the city.
French School	Henri Lefebvre; Philippe Panerai	Emphasizes the relationship between social processes and spatial form; focuses on the theory of the production of space.	Adopts a more sociological perspective on space, emphasizing the roles of power, economy, and society in shaping urban form.

In the study of the built fabric of urban form and the processes that shape it [35], urban morphology is a field of research that is closely linked to urban design in theoretical terms. From a broader perspective, urban morphology is not only a description of the process of form but also an interpretation of the intrinsic relationships among various spatial components [30,36,37]. Both fields are dedicated to understanding the complexity of urban form, as well as the people and processes associated with it [38], and use a common language to convey the fundamental elements of an ideal urban morphology. Both emphasize understanding cities from the perspective of historical continuity and making judgments regarding future development space [39] (Fig.2-3). The academic origins of urban morphology can be traced back to the

pioneering work of German geographer Otto Schlüter, whose studies tracing the historical changes in urban form through maps and urban landscapes laid the foundation for long-term research in urban morphology[40]. Saverio Muratori and Gianfranco Caniggia, two key figures in the Italian Design Typology school, further integrated morphology with architecture and urban design. Beginning in the 1950s, Muratori, through in-depth surveys of historic Italian cities, proposed the concept of the city as an organism, emphasizing the city's evolutionary process and its structural logic. In his teaching and research in Venice, he developed a research methodology for urban morphology grounded in history and applied it to the design proposal for the Barene di San Giuliano in Venice in the 1960s (see 2.5.1 for details). Caniggia further researched and developed a series of concepts proposed by Muratori, establishing a process typology approach to transform static morphological classification into dynamic generative processes. Through his studies of Como and Florence, he revealed the fabrics by which architectural types form urban fabric through repetition, variation, and aggregation[41]. This approach expanded morphological research into a planning tool, establishing the disciplinary status of urban morphology in urban design.

The subsequent research primarily draws on the Italian school of typomorphology represented by Saverio Muratori and Gianfranco Caniggia. Within this tradition, architectural form is understood as the sedimentation of spatial organization, building practices, and collective ways of life over a long-term process of historical transformation. Through the notion of "operative history," historical inquiry is translated into a generative basis for design, enabling research findings to inform contemporary design practice [42].

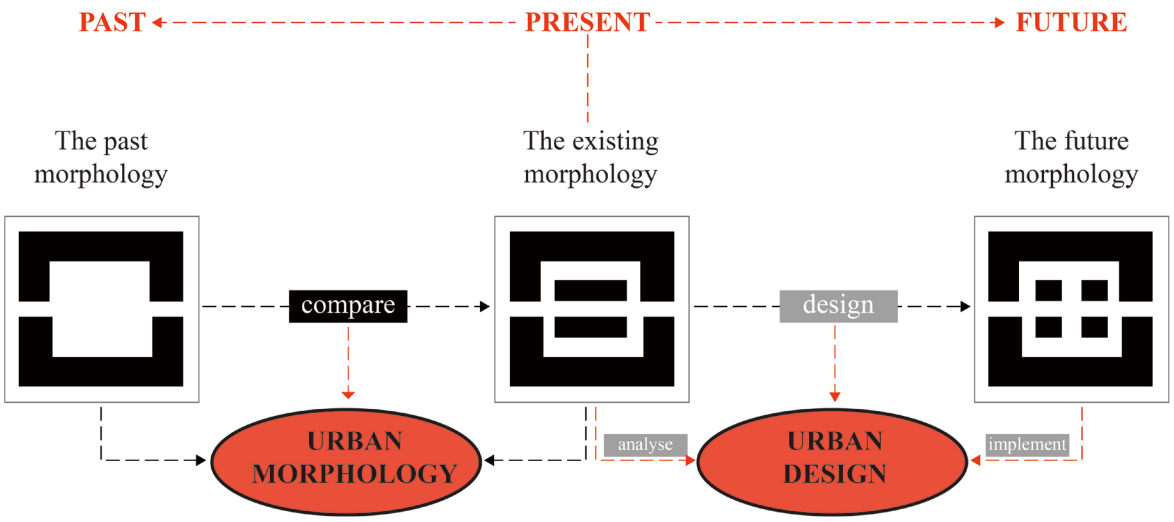


Fig.2-3 Schematic Diagram Illustrating the Close Relationship Between Urban Morphology and Urban Design

(Source: Adapted from Reference [40])

In modern urban design, the application of urban morphology is gradually shifting from a passive interpretation of history to an active design approach. In the 1980s, during the regeneration project of a century-old working-class neighborhood in Caltagirone, Italy, the morphological approach was no longer limited to describing the historical urban morphology but was transformed into a distinctly operational planning and design tool. The plan first focused on the morphological homogeneity among different building clusters, street structures, and public spaces within the urban fabric, conducting a detailed morphological analysis of the historic district and dividing the city into seven morphological spheres. At the same time, a typological analysis was conducted at the residential block level, further subdividing residential blocks into thirteen typological zones (Fig.2-4), and corresponding planning strategies and regulatory guidelines were proposed based on the architectural typologies, street fabric, and spatial organization characteristics of each zone. Based on the homogeneous typological characteristics of history, culture, and architecture, the entire district was divided into five intervention categories, and a detailed guidance manual was developed[43]. Similarly, around 1990, the worker housing regeneration project in Schio, Italy, served as another typical example of how the morphological approach shifted from historical interpretation to design regulation. Unlike traditional historic centers, the Schio project—a worker housing community with a

history of only about a century—derives its value not from individual landmark buildings, but from the continuous fabric of the neighborhood, the relationships between building complexes, and the spaces of daily life. Based on the historical and cultural value of the buildings and blocks, as well as their architectural integrity, the design team divided the neighborhood into five categories of intervention—A through E—and compiled an operational manual for owners, tenants, and the public to guide residents in adhering to unified yet flexible morphological rules during routine maintenance, additions, and renovations [44](Fig.2-5). Maretto's research indicates that morphological approaches can provide decision-making support for the revitalization of historic districts. In the urban regeneration project in Chioggia, Italy, the design team used the historic form as a foundation while incorporating modern functional requirements, seeking a balance between preservation and development. By examining the lagoon area's unique land-water relationships, production systems, street-courtyard structures, canal-alley relationships, and the evolution of building typologies. They identified the productive logic underlying the urban morphology and reorganized these elements into urban design proposals—such as reestablishing the district's public center through the "Market Island" concept and continuing the typological characteristics of Chioggia's historic public spaces via arcaded squares. At the same time, they introduced new functions—including residential, market, and port office spaces—along with environmental control and material strategies adapted to contemporary living[45]. This process—from morphological perception to design generation—is also reflected in the integration of morphology and landscape design. Neglia's research extends the discussion of urban morphology beyond the built-up area to the boundary zones between the city and the region, and between the city and nature. She points out that, against the backdrop of contemporary urban sprawl and metropolitan expansion, unbuilt spaces, agricultural lands, rivers, coastlines, wetlands, and topographic boundaries should no longer be regarded as "gaps" or "residual spaces" within the urban form, but rather understood as integral components that shape the urban structure. Using case studies of Rome, Boston, and Bari, she explores how hydrological topography influences the direction, boundaries, and spatial structure of urban expansion, and proposes that landscape design can re-establish connections

between urban, rural, and natural morphologies by reorganizing agricultural patterns, hydrological corridors, coastal forms, and ecological spaces[46].

It is evident, therefore, that the role of morphology in modern urban design has undergone a transformation. On the one hand, by revealing the formation fabrics of historic neighborhoods and built-up urban areas, morphology provides a basis for regeneration designs that carry forward local context; on the other hand, it transforms neighborhood fabric, building typologies, open spaces, hydrological topography, and landscape structures into forward-looking design tools, thereby establishing a more continuous and adaptive design path that bridges historical preservation, urban regeneration, the creation of public spaces, and ecological restoration. Compared to typology-driven planning techniques, which focus on isolated interventions and the management of historical urban fabrics, morphology-driven planning techniques place greater emphasis on building complexes, the overall environment, and the urban landscape, and appear better equipped to address issues related to heterogeneous, stratified, and interconnected urban structures and design[47].

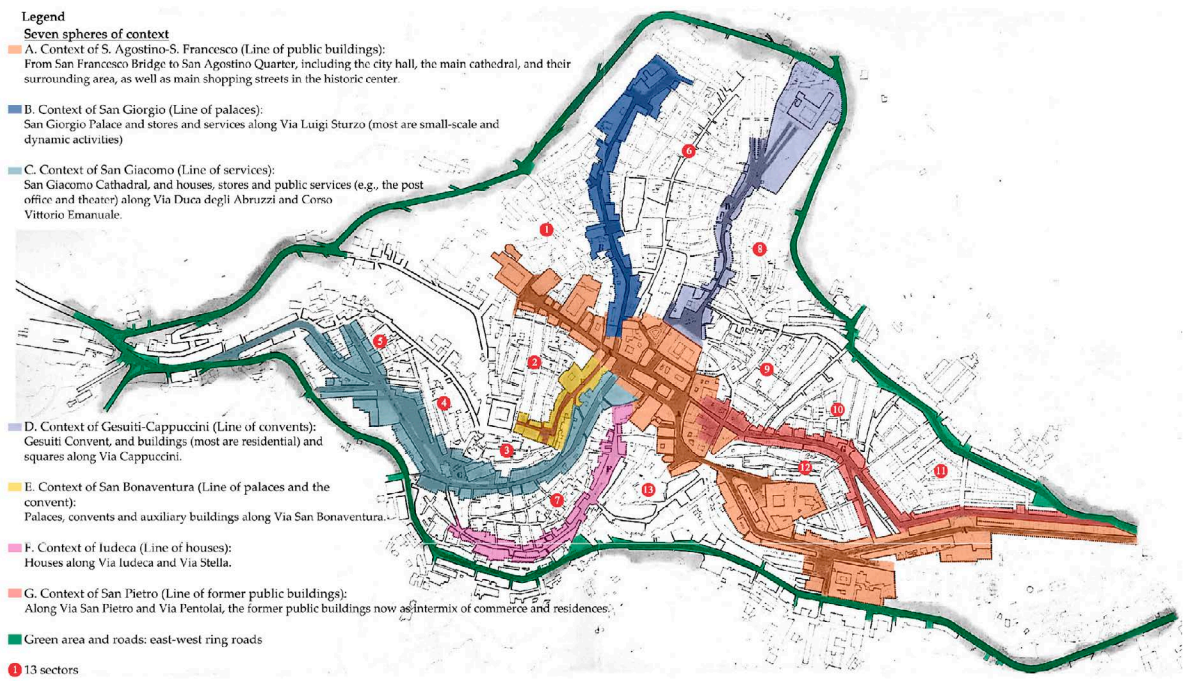
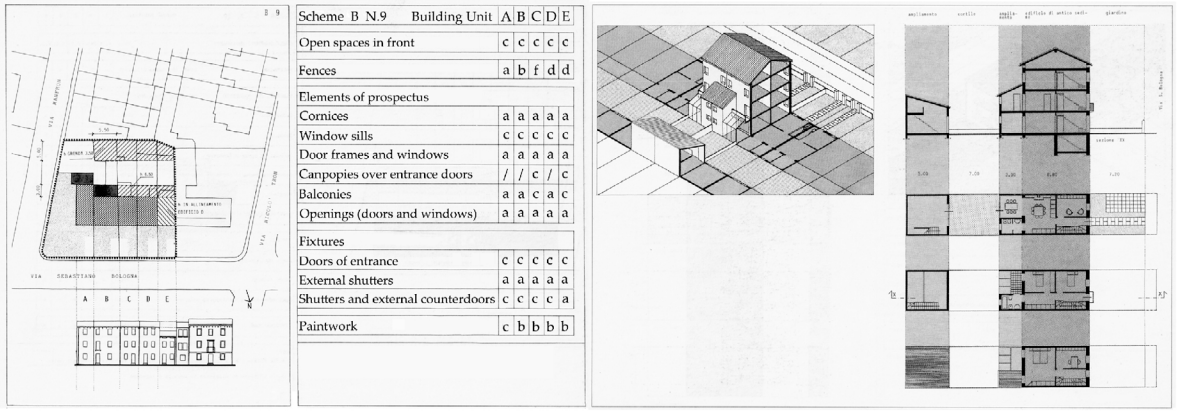


Fig.2-4 The plan of Caltagirone, Italy: seven morphological spheres and 13 typological sectors

(Image source: References [48])



Scheme B N.9 Building Unit	A	B	C	D	E
Open spaces in front	c	c	c	c	c
Fences	a	b	f	d	d
Elements of prospectus					
Cornices	a	a	a	a	a
Window sills	c	c	c	c	c
Door frames and windows	a	a	a	a	a
Canpopies over entrance doors	/	/	c	/	c
Balconies	a	a	c	a	c
Openings (doors and windows)	a	a	a	a	a
Fixtures					
Doors of entrance	c	c	c	c	c
External shutters	a	a	a	a	a
Shutters and external counterdoors	c	c	c	c	a
Paintwork	c	b	b	b	b

Fig.2-5 The plan of Schio, Italy: the regulation scheme for Block B9

(Image source: References [48])

2.2.2 The Relevance of Morphological Research to Urban Villages

Morphological studies are not limited to urban areas; they also apply to smaller settlements, such as villages, traditional settlements, and areas with mixed-use development in new cities undergoing rapid urbanization (such as “villages within cities”)[49]. Because these areas have played a crucial role in urban expansion, many villages have been incorporated into the urban fabric during this process, becoming key human settlements for spatial growth, land conversion, social reorganization, and cultural continuity. Therefore, conducting morphological studies of urban villages or traditional villages not only helps explain the logic behind the formation of their spatial forms but also aids in recognizing their comprehensive value as historical heritage, social networks, and local living systems.

Taking Thinh and Gao’s study of urban villages in Hanoi as an example, although urban villages are often criticized for their “informality,” “self-organization,” and “substandard living conditions,” and are subject to demolition pressures under current policies; their morphology is not entirely disordered. The road networks, public-private interfaces, and incremental regeneration within these villages all exhibit recognizable morphological patterns. This morphology possesses a unique historical logic and adaptive characteristics; understanding these existing forms is a prerequisite for formulating strategies for in-situ, incremental improvement [28]. In addition, natural conditions such as water resources have played a key role in shaping village forms. A study by Mosharraf and Correia of three traditional villages in

central Iran shows that the type, distribution, and management of water resources directly influence village site selection, road alignment, public nodes, and spatial hierarchy. For example, the village of Abyaneh in Iran developed around mountain springs; its main thoroughfare runs along the watercourse, and the canal not only provides water supply and irrigation but also shapes high-quality public spaces and visual landscapes [49]. Morphological studies can link settlement patterns to hydrological conditions, topographical features, resource management, and social organization. Village morphology is not an isolated physical arrangement, but rather the result of long-term coupling between the natural ecosystem and social institutions. Particularly against the backdrop of climate change, water scarcity, and mounting pressures to preserve rural heritage, analyzing how traditional settlements utilize, allocate, and manage water resources offers important insights for modern village regeneration and resilience planning. Another example is Zhang Zhiming's study of the traditional Lingnan waterside settlements of Sangyuanwei in the Pearl River Delta, in which he argues that the threat of flooding not only shaped the morphology of the waterside settlements but also gave rise to fabrics of rural self-governance. Located in the area where the Xi River and Bei River converge, Sangyuanwei has long faced the threat of flooding. Dikes, sluice gates, canals, fish ponds, and pond-based agriculture collectively form the infrastructure system essential to the settlement's survival. It was precisely through the ongoing processes of water management, flood control, and dike maintenance that the villages within the enclosure gradually developed a collaborative fabric centered on the "bao" (fortified settlements), "ji" (landowners), and clan organizations; survival and development became key drivers of rural self-governance and water management.[50]. In this process, morphological research not only explains the historical evolution of settlement patterns but also provides strategic guidance for addressing challenges such as climate change and social isolation.

Therefore, conducting morphological research in urban villages and traditional villages holds multiple significance. First, it can explain the generative logic behind seemingly chaotic spaces and identify the intrinsic relationships among roads, water systems, land parcels, building types, and public nodes, thereby helping to understand how villages adapt to new urban

conditions through self-organization, incremental expansion, and mixed-use development during rapid urbanization. Furthermore, it links spatial morphology to local social structures, water management, and the ecological environment, providing a more nuanced basis for the preservation of urban and rural historical and cultural heritage and the shaping of ecological landscapes, thereby facilitating the reintegration of urban villages into the city's overall structure. Finally, it can provide criteria for design decision-making in urban design: which morphological relationships should be preserved, which interfaces should be repaired, which buildings or plots may be replaced, and which traditional types can be transformed into new public spaces, spaces for economic activities, or resilient infrastructure. Consequently, urban villages should not be regarded as anomalous spaces to be eliminated in the process of urbanization. Instead, when examined through an urban morphological approach, they can serve as important cases for understanding urban–rural transformation, local adaptability, and fabrics of informal growth.

2.2.3 Emerging Tools and Methods in Urban Morphological Research

In recent years, with the deepening of morphological research and the development of geographic information, spatial analysis, and computer modeling technologies, the introduction of quantitative analysis tools has become an important methodological complement to urban morphology research. The adoption of tools such as GIS and spatial syntax has facilitated the structured analysis of urban space. Combined with computer modeling and big data technologies, these advancements have enhanced the level of quantification and precision in morphological research, further driving the shift from empirical data to data-driven approaches. Through multiscale and multidimensional quantitative measurements of elements such as urban spatial structure, building form, road networks, land use, functional distribution, and environmental effects, researchers are able to more accurately interpret the spatial logic, social fabrics, and environmental impacts underlying urban morphology, thereby enhancing the explanatory power and practical value of urban morphological research.

In terms of morphological measurement, the integration of open-source data and computational tools has significantly enhanced the ability to identify, compare, and visualize

complex urban morphologies. Venerandi et al. used the MOMEPY tool in combination with open-source data (such as OpenStreetMap) to conduct a comparison of morphology between Makoko, an informal waterfront settlement in Lagos, Nigeria, and the historic urban center of Venice, Italy. By comparing nine morphological indicators—such as building footprint area, building footprint diversity, building corner irregularity, alignment of buildings with streets/waterways, building extent, building coverage ratio, average street/waterway width, street/waterway width deviation, and street/waterway boundary permeability—the study revealed similarities between the two sites across five morphological indicators, and this similarity is more pronounced in the more mature and stable areas of Makoko[51]. This study not only demonstrates the effectiveness of morphometric tools in comparing urban spaces across different regions and types—providing technical support for the processing and visualization of complex morphological data—but also suggests that researchers should reevaluate the value of spatial order, adaptability, and human-scale features within informal settlements.

In studies of the morphology of rural and suburban spaces, spatial syntax provides an effective method for quantifying street network structures, spatial accessibility, and spatial perception relationships. Li Rand et al. used spatial syntax theory as a foundation and employed Depthmap software to conduct a quantitative analysis of the spatial morphology of suburban villages in central Jilin Province. Through an axis analysis method, they quantified the villages' integration and intelligibility. By selecting eight village case studies for comparison, they identified the relationship between the spatial core and the plan structure of the villages and further demonstrated a correlation between spatial characteristics and industrial structure—villages dominated by the secondary and tertiary sectors tend to have more complete street networks and higher spatial intelligibility [52]. This study demonstrates that spatial syntax can not only reveal the spatial organizational characteristics of a village's alleyway system but also serve as a quantitative basis for the spatial reconstruction of villages, the optimization of industrial layout, and the formulation of strategies for rural cultural tourism development.

The integration of spatial syntax and urban morphology has further driven the shift in

urban design from empirical judgment toward an analytical, evidence-based design process. Karimi discusses the role of urban morphology and spatial syntax in analytical and evidence-based urban design from a theoretical perspective. He argues that urban morphology research must simultaneously focus on both the built form and the "living spaces" between built forms. He proposes a design methodology that integrates social, economic, and cultural factors with the city's physical structure, and illustrates—through the case study of Jilin City's public transportation system and the regeneration of its central business district—how spatial syntax models can be embedded throughout the entire urban design process. This case study progresses from the evaluation of public transit routes and station site selection to the regeneration of urban squares, the architectural design of transit stations, strategies for public spaces in the central business district, and revisions to the city's master plan, demonstrating the comprehensive value of spatial morphology analysis in multi-scale urban design and planning decision-making[53].

New tools and methods in the field of morphology provide a more precise and multidimensional perspective on the evolutionary patterns of urban spatial forms. The integration of these tools, their applicability in diverse urban contexts, and the integrated analysis of socioeconomic factors will be key areas of focus in providing more comprehensive decision-making support for sustainable urban development in the future. Furthermore, against the backdrop of rapid global urbanization, environmental challenges—such as the urban heat island effect, extreme heat, and urban flooding—have imposed new adaptive requirements on urban spatial form, necessitating more effective morphological analysis methods to address the complex relationships among spatial structure, land use, building form, and environmental impacts[54]. At the same time, the need for urban regeneration—which balances historical preservation with development—has created a conflict between modernizing the urban morphology and preserving its historical character[55]. Future research on urban morphology should continue to deepen in areas such as methodological integration, cross-context applicability, socio-economic linkages, environmental adaptation, and historical preservation, in order to support more refined, sustainable, and culturally sensitive urban and rural spatial governance.

2.2.4 Trends in Urban Morphology Research

This section employs bibliometric methods to conduct a systematic analysis of the development status, knowledge structure, and evolutionary trends in the field of urban morphology research. Bibliometrics is an integral part of systematic evaluation and allows for an objective assessment of scientific and technological progress. It primarily involves the quantitative analysis of published research and the use of quantitative indicators to examine the state of an entire discipline. In this section, VOSviewer is used to conduct network analysis of authors' national origins and keywords, generating co-occurrence maps and trend charts overlaid with year data.

Data Preparation. The English-language literature was retrieved from core journals indexed in the Web of Science. Using "urban morphology" as the topic search term, publications from the past five years were selected. After filtering by research area, documents with relatively low relevance were manually excluded. The top 1000 records, ranked by relevance, were ultimately selected for analysis. Within these 1000 records, the five most represented disciplinary categories were Environmental Sciences, Construction and Building Technology, Environmental Studies, Green and Sustainable Science and Technology, and Urban Studies. Correspondingly, the Chinese-language literature was obtained from the China National Knowledge Infrastructure (CNKI). A total of 289 articles from CSSCI-indexed journals were selected for analysis, with their disciplinary distribution mainly covering Urban Economics, Urban and Rural Planning and Municipal Administration, Environment, History, and Architectural Science.

Based on the visualization results of Web of Science literature on "urban morphology" and CNKI literature on "城市形态" (urban morphology), both international and Chinese research have been shifting from morphological measurement toward climate- and carbon-oriented morphological governance.

The WOS keyword network reveals three major clusters: First, the thermal environment–remote sensing cluster, centered on "heat island," "urban heat island," "land surface temperature," and "local climate zones"; second, the morphological measurement and urban

expansion analysis cluster, centered on “form,” “morphology,” “density,” and “urbanization,” where machine learning and remote sensing are applied to morphological recognition and indicator extraction; Third, the microclimate–thermal comfort–simulation evaluation cluster, centered on climate, microclimate, thermal comfort, buildings, ventilation, and simulation (Fig.2-6 Left). The trend over time shows that since 2023, nodes such as land-surface temperature, local climate zones, machine learning, and simulation have become lighter in color and have been discussed more frequently, indicating that research continues to focus on quantifiable assessment and modeling (Fig.2-6 Right). Within the global collaboration network, China has emerged as the largest hub for output and collaboration, forming strong connections with the Netherlands, Singapore, the United States, the United Kingdom, Germany, and Australia. The fact that China has been a frequent topic of discussion over the past two years indicates that its growth rate and catalytic role in this field are significant (Fig.2-7).

The CNKI-based analysis indicates that research on “urban form” is more deeply embedded in the discourse of planning and governance. Terms such as urban spatial form, urban design, and territorial spatial planning constitute central nodes, extending further to topics including urban regeneration, urban agglomerations, urban expansion, and spatial regulation. In the time-overlay visualization, terms such as floor area ratio, carbon rights, and local climate zones appear as relatively recent keywords, suggesting that domestic research agendas are shifting from macro-scale spatial structure and governance frameworks toward more implementable instruments centered on development intensity control, carbon objectives, and microclimatic regulation (Fig.2-8).

Overall, international research tends to emphasize a quantitative and model-based paradigm, whereas Chinese research has been accelerating the integration of climate and carbon objectives into planning institutions, design guidelines, and urban governance frameworks. Nevertheless, both strands of research are converging toward a common direction: enhancing resilience through the optimization of spatial form and promoting the sustainable development of urban and rural spaces.

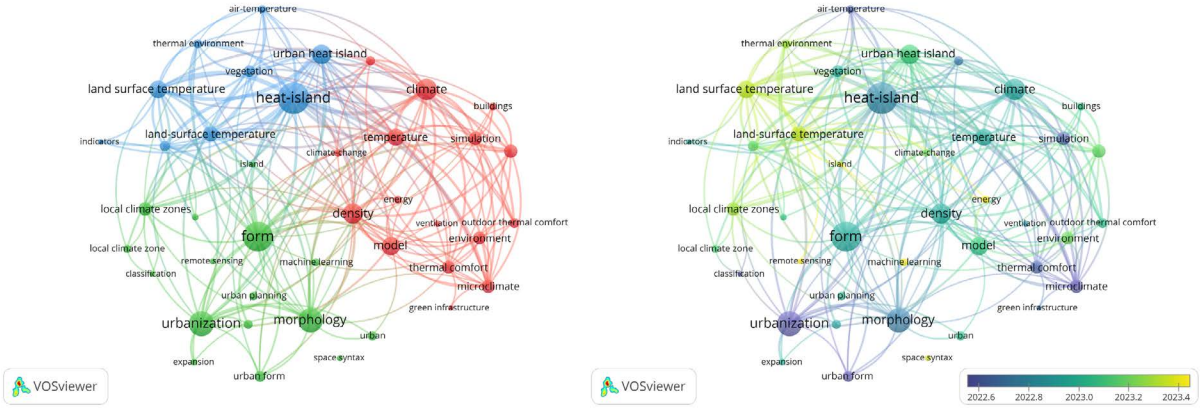


Fig.2-6 Keyword co-occurrence cluster analysis (left) and overlay year trend analysis (right) of publications related to "urban morphology"

（Prepared by the author based on Web of Science data）

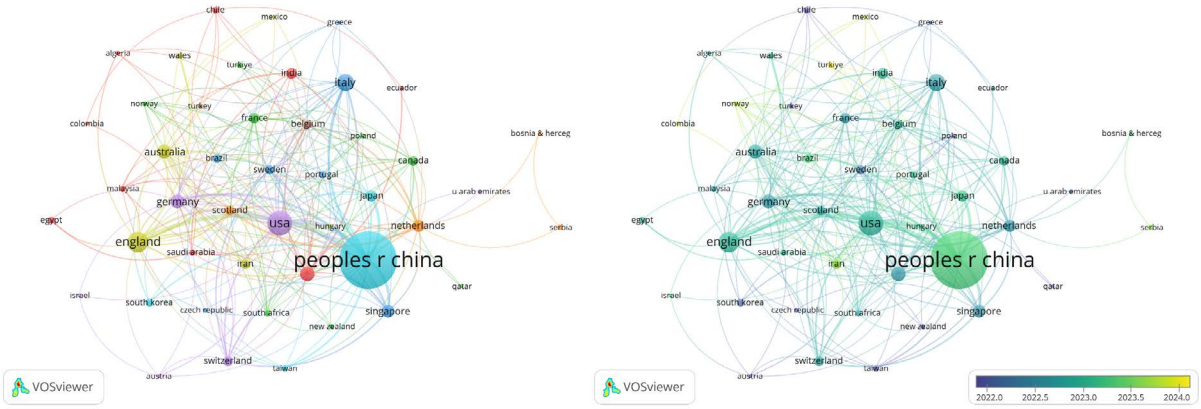


Fig.2-7 Author-affiliation co-occurrence cluster analysis (left) and overlay year trend analysis (right) of publications related to "urban morphology"

（Prepared by the author based on Web of Science data）

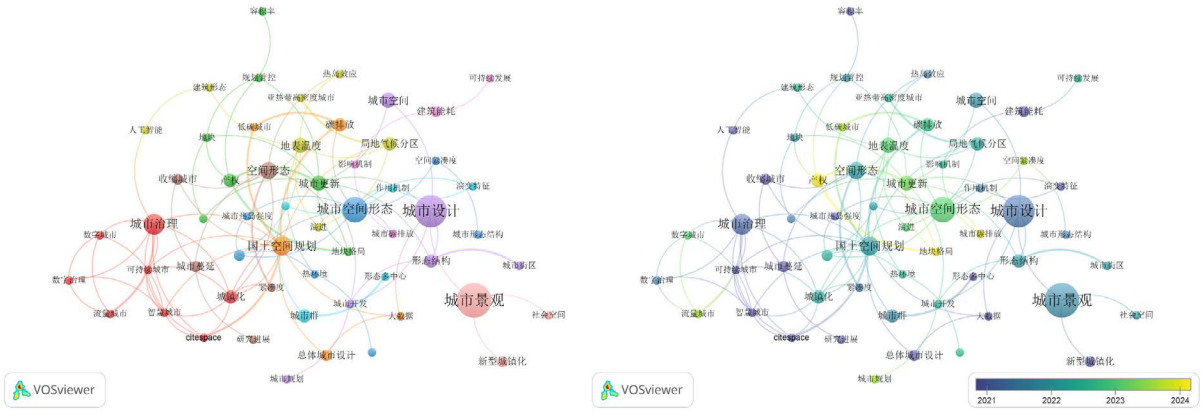


Fig.2-8 Keyword co-occurrence cluster analysis (left) and overlay year trend analysis (right) of publications related to "urban morphology"

（Prepared by the author based on CNKI data）

Although the analysis of keyword co-occurrence and annual trends reveals many areas of convergence, gaps still exist. Looking at the publication trends related to urban morphology over the past two decades (Fig.2-9), the number of publications in this field showed a relatively marked upward trend between 2005 and 2019. However, after 2019, although the number of journal articles related to urban morphology remained at a high level, the growth trend began to level off, indicating that research in urban morphology has entered a relatively stable phase of development. There may be various reasons for this shift in trend. On the one hand, since urban morphology has a long history, it has accumulated a relatively mature theoretical foundation and analytical framework in areas such as land parcels, streets, blocks, urban fabric, building types, and urban spatial structures. The discipline has entered a mature phase, with methods centered on morphological measurement now well-established and applied in a vast body of research, and related indicators and technical approaches gradually stabilizing. On the other hand, the integration of urban morphology with new methods and tools is still in its exploratory phase, and a unified theoretical paradigm or mature methodological system has yet to emerge. Consequently, certain research weaknesses have become apparent. First, current research in urban morphology still lacks a unified indicator system and model framework capable of spanning multi-scale spatial units, resulting in insufficient systematic connections between urban morphology research and complex issues such as urban resilience, climate

adaptation, disaster risk, public health, and social equity. Second, data standards are inconsistent and not sufficiently open, and indicator weightings vary widely, making it difficult to reproduce results or conduct cross-regional comparative studies. There are significant differences in data accuracy, regeneration frequency, classification standards, and openness among different urban areas, regions, and platforms. At the same time, many comprehensive evaluation studies still rely heavily on subjective judgment when setting indicator weights. Some studies use expert scoring, the Analytic Hierarchy Process (AHP), or the entropy weighting method for weighting, but results obtained using different methods may vary significantly. This makes it difficult for other researchers to replicate and verify the findings, and also hinders cross-urban comparisons. Third, most studies remain at the data analysis stage, lacking empirical research on implemented projects. While many studies can identify issues in urban morphology—such as high density with insufficient open space, inadequate road network connectivity, imbalanced land-use mix, poor accessibility to green spaces, or high thermal environmental risks—they generally fall short in proposing feasible spatial intervention strategies.

In summary, although research on urban morphology has established a relatively robust theoretical foundation and accumulated a wealth of methodologies, there is still significant room for improvement in areas such as the integration of multiscale indicators, the standardization of data, the reproducibility of model results, cross-regional comparisons, the integration of resilience-related issues, and the translation of findings into planning practice. These issues are precisely the areas that subsequent research in this paper needs to address and avoid.

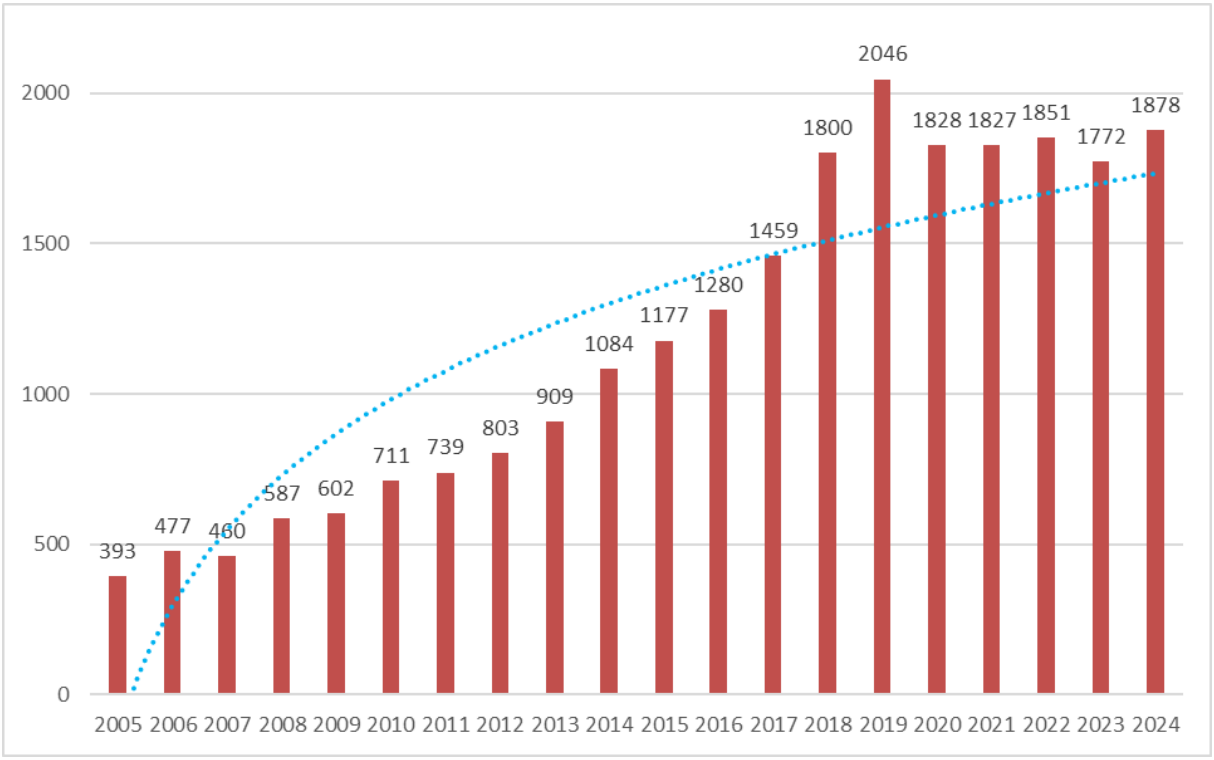


Fig.2-9 Publication trends of "urban morphology"-related studies over the past two decades

(Data source: Web of Science)

2.3 Assemblage Theory

2.3.1 Origins

Assemblage theory originates from the rhizome theory proposed by Deleuze and Guattari in their 1987 book *A Thousand Plateaus*. The rhizome is not an ecological concept in the strict sense, but rather a philosophical model derived from the characteristics of underground stems—their spread, growth, and regeneration. In this book, Deleuze and Guattari identify six key principles that help explain rhizomatic structures (Table 2-2 is a summary adapted from [56]), emphasizing the nonlinear and decentralized characteristics of knowledge, space, and social practices.

In 2008, drawing on Rhizome Theory, Richard Coyne critically reflected on the characteristics of networks and rhizomes in heritage design. He argued that networks are typically described as a technical feature characterized by idealized and hierarchical authority; in contrast, the rhizome rejects uniformity, focusing instead on "discontinuity" and "separation," advocating for the interweaving of heterogeneous elements, and embodying a decentralized

philosophy[57] (Fig.2-10). In 2011, Jin Guangjun et al., in their study on the aesthetic of ecological urban forms based on Deleuze's Rhizome Theory, proposed that the "rhizome" aesthetic schema can be divided into three logical stages of construction: the "stem" state, the "cluster" state, and the "network" state. They analyzed that these stages possess a high degree of ecological quality in terms of spatial adaptability, morphological integration, and environmental contextuality[58].

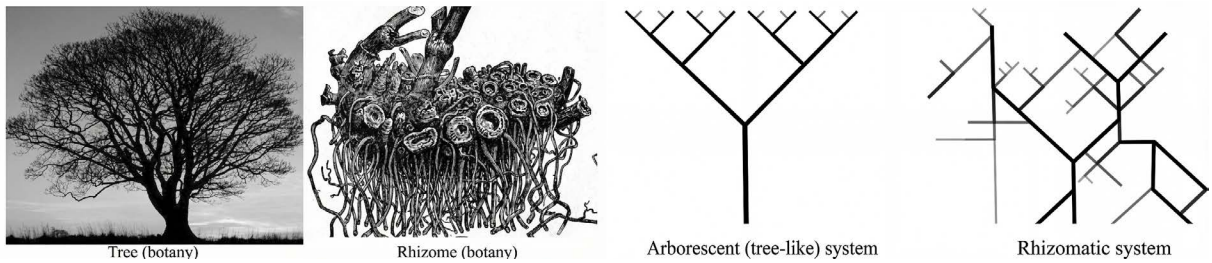


Fig.2-10 The Difference Between Trees and Rhizomes

(Image source: Reference [59])

Table 2-2 Six Key Principles of Rhizomatic Structure

Principle	Meaning
The principle of Connectivity and Heterogeneity	In a rhizome, any point can be connected to any other point, and such points must be mutually connected. The rhizome is characterized not by linearity or hierarchy, but by the establishment of innumerable connections through multiple possible pathways. This connectivity also underscores heterogeneity: different components within the structure may originate from entirely distinct domains or possess different properties, yet they can still become interwoven and interrelated in various ways.
Principle of Multiplicity	The emergence of any unity, or "the One," must be achieved through the production of multiplicity. In other words, unity does not reside in the essence of things; rather, it is generated through the dynamic relationships and interactions among multiple elements. This principle rejects any attempt to reduce complexity to a single structure or a

Principle	Meaning
	singular narrative.
Principle of A-signifying Rupture	This principle suggests that the rhizomatic structure does not fear rupture or fragmentation, because even when a rupture occurs at a particular point, the structure can rapidly initiate processes of self-repair and regeneration. For example, one part of a rhizome may be damaged, but the integrity and functionality of the overall structure are not entirely lost. This principle opposes excessive segmentation or fragmentation and instead emphasizes adaptability and regenerative capacity.
Principle of Cartography and Decalcomania	The rhizome does not depend on any fixed structure or generative system, nor does it assign privileged importance to an original axis, namely a conventional center or point of origin. Cartography indicates that the rhizome is a dynamic map of networked relations rather than a linear or hierarchical model. Decalcomania refers to the generation of new forms through superimposition, transfer, and replication, rather than through the simple reproduction of existing structures.

The principles outlined in the table above provide a relational framework for understanding and organizing complex urban spaces in the field of urban design. First, connectivity and heterogeneity imply that different areas, functions, or groups within a city can be interconnected in dynamic and diverse ways, without the need for strict hierarchies or fixed logic. At various spatial nodes throughout the city, connections should be established through multiple pathways—such as creating side streets within enclosed technology parks, pedestrian walkways, and waterfront greenways—to form a variety of access routes. Second, in social or urban research, the principle of diversity helps designers understand how complex systems—such as urban networks and community relationships—achieve wholeness through diversity and difference. It frames the city as a composite system co-generated by multiple themes, activities, and relationships. Design should therefore preserve the potential for diverse uses and

future changes—for example, by converting village residences into creative office spaces while retaining certain residential characteristics and nearby community service facilities. Furthermore, the principle of non-semantic discontinuity can be applied to the understanding of urban regeneration or post-disaster reconstruction. That is, the disruption of an area can give rise to new growth patterns through spontaneous repair and reconnection. For example, the design of urban greenways should not be interrupted by the crossing of motor vehicle lanes; alternative routes can be established through spaces under bridges, elevated walkways, or temporary passageways to maintain the continuity of the network. Finally, the principle of mapping and tracing suggests that urban design should shift from the expression of static outcomes to the organization of dynamic processes. In urban design, this principle implies that design should not be confined to traditional logic of spatial organization but should allow new relationships and morphologies to emerge through dynamic generation. For example, prior to urban regeneration, spatial nodes and morphologies that carry residents' memories should be mapped based on research; the locations and morphologies of public space renovations should be determined accordingly, and adjustments should continue after implementation. When drawing inspiration from exemplary cases, these must be adapted to the specific site conditions to align with local culture and regional climate.

2.3.2 Development

One of the foundations of "assemblage urbanism" is the Rhizome Theory[60]， , which not only describes the convergence of heterogeneous elements within institutions, places, architectural structures, or artistic forms but also emphasizes a focus on multiple materialities, including socio-natural relationships[61]. In 2012, Dovey argued that the term "assemblage" implies both a dynamic process and a diagrammatic spatiality, offering a useful way to rethink "place" theory from the perspectives of process, identity formation, and production. He proposed that a key dimension of assemblage thinking is the territorialization/deterritorialization axis, which describes how social and spatial boundaries are drawn and erased, as well as how identities are formed, expressed, and transformed; At the same time, Dovey argues in the article that, since assemblage theory is essentially a

philosophical framework, it should be linked to theories such as complex adaptability and resilience in urban studies to facilitate a better understanding[62]. In 2023, Guttormsen et al. explored the potential value of assemblage theory as a conceptual framework for understanding the role of heritage in socially sustainable urban places. They conceptualized urban placemaking as a dynamic and complex social assemblage. Through three case studies of urban regeneration in Norway, they revealed the coexisting forces of "assembly"—which co-creates places—and "disassembly"—which destabilizes them (the latter being, in fact, a process of reassembling placemaking). Drawing inspiration from urban assemblage theory, they integrated heritage value with social sustainability strategies in urban transformation. Heritage was utilized in diverse ways and incorporated into new planning and architecture, thereby achieving regeneration [60]. In 2024, Mohammed et al. applied the concept of assemblage theory to a study on the redevelopment of low-income communities in Ethiopia. From the perspective of assemblage theory, the authors viewed slums as parasitic structures that grow organically over time through the expansion of their network of nodes. The goal was to integrate these structures with surrounding buildings, alleviating the social and spatial separation between old and new structures. This spatial solution and morphogenesis fabric transformed the simple juxtaposition of the two urban systems, shifting from a negative juxtaposition that resulted in more low-income spaces to an organic generative model of mutual nesting between urban areas[63]. In 2025, Yang Chao proposed an "open framework" for urban design that integrates self-assembly and hetero-assembly. He summarized case studies of design practices applying this open framework at the urban, neighborhood, site, architectural, and micro-scales[64], attempting to explore new models and methods for applying assemblage theory in urban design. It is worth noting that when the aforementioned authors applied assemblage theory to analyze and design organic spatial growth, they did not deny the role of orderly planning. Guiding spatial combination and organic nesting under the premise of established rules is precisely the advantage of using assemblage theory that is sought in the processes of urban design and urban regeneration.

Urban regeneration is a systematic process; traditional linear, hierarchical planning

methods often struggle to address the uncertainties inherent in complex urban environments. In contrast, assemblage theory emphasizes continuous “decomposition” and “recombination,” fostering a dynamically adaptive urban socio-ecological system. The “fracture-repair-regeneration” fabric not only enhances the city’s adaptability but also strengthens its resilience in the face of external shocks, making it particularly well-suited for the GBA, where climatic conditions are highly variable.

At the same time, urban regeneration is not merely about reshaping buildings and spaces; it is also about reconstructing social relationships. By integrating new and existing buildings with public spaces, the assemblage theory can alleviate social segregation, transforming the urban villages commonly found in urban regeneration projects into “community villages,” thereby achieving spatial inclusivity.

Furthermore, the decentralized nature of the assemblage theory can bring greater flexibility and innovation to urban regeneration, promoting bottom-up, participatory design and thereby achieving spatial regeneration that is more dynamic and responsive to the needs of the public.

2.4 The Intrinsic Connection Between Morphology and Assemblage Theory

Urban form can be viewed as the result of the combination of several basic units across multiple scales. Therefore, introducing assemblage theory into urban morphology research at the urban design scale helps transform what was originally descriptive morphological analysis into an understanding of the rules governing the selection, arrangement, and connection of morphological units in the urban design process, thereby providing a systematic approach to the construction of urban space(Fig.2-11). Specifically, the intrinsic connection between the two is primarily reflected at three levels: the objects of study, modes of interpretation, and design applications. Urban morphology provides urban assemblages with spatial units that can be identified, classified, and compared; assemblage theory, in turn, further explains how these units relate to social activities, ecological processes, local culture, institutional rules, and other factors, and how—through continuous combination, decomposition, and reorganization—they form urban places characterized by phased stability and dynamic adaptability to change.

Urban morphology posits that urban form can be analyzed through the identification and combination of basic elements across different scales; time is a crucial aspect of urban morphological research, and studies of urban form can only be fully understood when situated within a historical context. Assemblage theory, on the other hand, conceives of the urban area as a dynamic assemblage formed by heterogeneous elements and their interactions. The elements possess independence from one another and can acquire new functional capacities through different combinations; this relationship was summarized by Manuel DeLanda as "relations of exteriority" [65]. Therefore, research in urban morphology on material elements, multiscale structures, and historical transformations can be linked to assemblage theory's concepts of heterogeneity, relationality, and dynamic generation. In this process, the typological approach of urban morphology can be used to analyze the morphological types of assemblages. As demonstrated by the research of Caniggia and Maffei, the focus of typological studies includes analyzing the generative relationships among buildings, blocks, streets, and the urban fabric[42], Consequently, typomorphology can transform the relatively abstract "constituent elements" of assemblage theory into mappable morphological units, convert "combination relationships" into identifiable spatial structures, and explain the variation and reorganization of assemblages through typological evolution and typological translation.

Based on the above understanding, urban morphology and assemblage theory can form the following interconnected stages of analysis and design:

1. Identification and Classification of Morphological Units

Using historical maps, cadastral data, remote sensing imagery, and field surveys, identify basic elements such as buildings, parcels, streets and alleys, waterways, docks, shorelines, farmland, fish ponds, and public spaces, and establish morphological atlases according to scales such as building–parcel, street–block, and village–region. Buildings, parcels, streets and alleys, and waterfront interfaces are classified into types based on spatial location, geometric characteristics, functional use, and relationships among elements. Type classification examines not only the shape of individual elements but also focuses on relational structures such as "building–parcel–street and alley," "residential–dock–canal," and "public space–

transportation–activity," to identify the patterns of combination among different types.

2. Typological Process Tracking

By superimposing morphological data from different historical periods, we compare the continuity, variation, replacement, and disappearance of typologies, and analyze how industrial changes, road construction, water conservancy projects, and land systems influence spatial morphology. The typological continuity and typological abrupt change revealed by urban morphology correspond, respectively, to the processes of stabilization and destabilization of relationships in assemblage theory.

3. Determining Assembly Relationships:

Building on an analysis of morphological types, this study incorporates social actors, usage activities, ecological processes, cultural memory, and governance systems into the analysis to identify key elements that maintain the integrity of settlements. It assesses their roles in facilitating public activities, neighborhood interactions, cultural expression, and transportation, thereby distinguishing between core relationships that need to be sustained, fractured relationships that require repair, and weak ties that can be reorganized.

4. Typological Translation and Design Assembly

Transforming morphological analysis into a design process of "type—translation—assembly." First, identify foundational typologies representative of the local context; second, develop typological translations based on new environmental and functional contexts; and finally, form new assemblages through the reconfiguration of streets, alleys, waterfronts, public nodes, and infrastructure, while adopting strategies of preservation, completion, renovation, and integration based on actual conditions. In this way, urban design no longer directly replicates traditional forms but instead carries forward the logic of scale, interfaces, connections, and use underlying traditional morphologies.

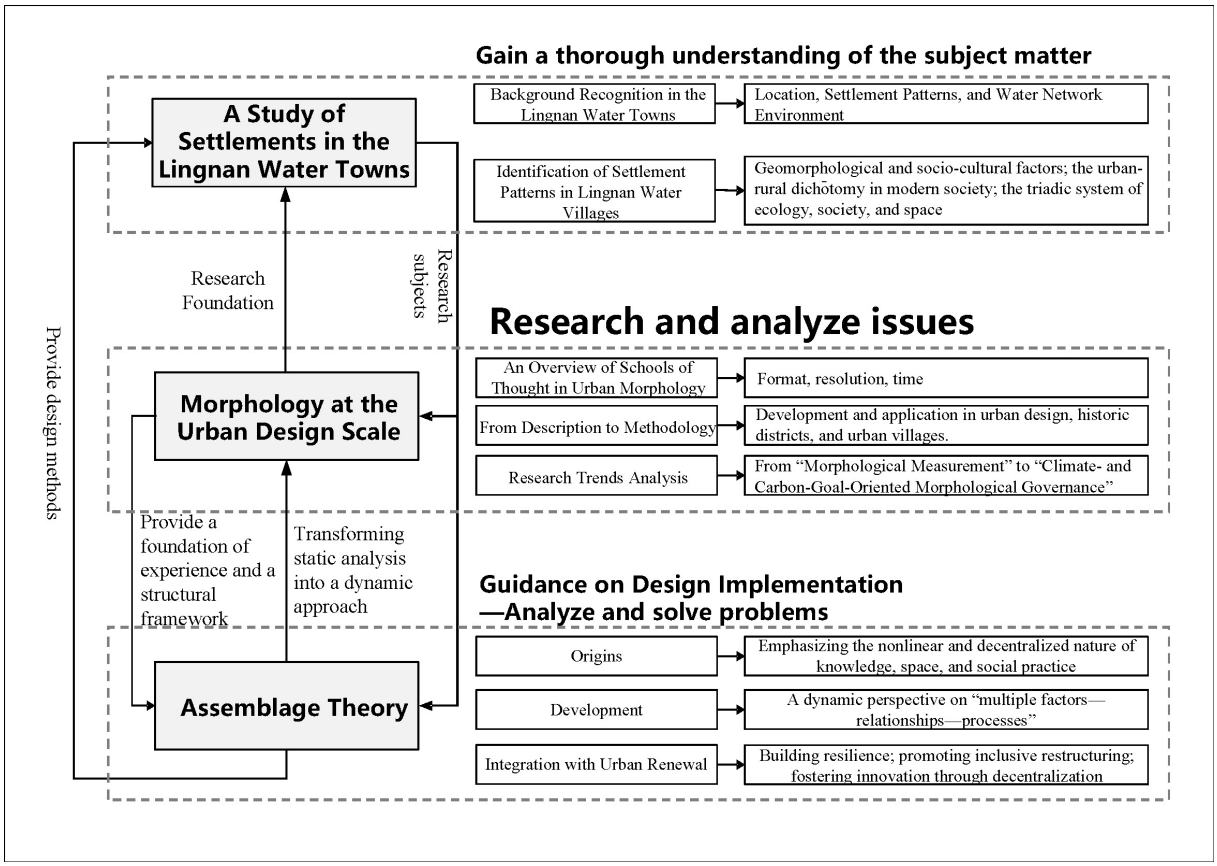


Fig.2-11 The Contribution of Urban Morphology and Assemblage Theory to the Research Question

(Source: Created by the author)

2.5 Case Studies

The case-study section examines four cases with clear methodological relevance: a classic competition project in the history of urban morphological research—the San Giuliano Wetlands in Venice—and three implemented projects—the Coloane Fishing Village in Macao, Honggang Village in Nansha, and the canal revitalization project in The Hague. By examining these cases, the study extracts operational lessons applicable to the regeneration design of Nanheng Village and identifies their implications for the application of urban morphological research. The San Giuliano Wetlands project features a comprehensive process of historical morphological analysis and design exploration. The restructuring plan for Coloane Fishing Village addresses the conservation of a coastal fishing village, the improvement of community life, and the introduction of tourism functions. The regeneration of Honggang Village in Nansha shares geographical, cultural, and settlement-typological similarities with Nanheng Village. The canal revitalization project in The Hague, meanwhile, involves the restoration of a historic water

system and the organization of multifunctional public spaces. Table 2-3 details the comparability of these cases with Nanheng Village and their methodological implications for the application of urban morphology.

Table 2-3 Comparability of the Case Study with Nanheng Village and Implications for Morphological Applications

Case	Comparability with Nanheng Village	Implications for the Application of Morphological Research
Design Proposal for the San Giuliano Wetlands, Venice	Both involve the use of water systems as a spatial framework and the transformation of historically water-oriented morphological structures into contemporary urban design.	It demonstrates how morphological research can move from historical interpretation towards design generation, and from the study of individual building types towards the investigation of multiscale spatial relationships.
Restructuring Plan for Coloane Fishing Village, Macao	Both are situated in the context of coastal fishing villages in South China, characterised by fishing-related memories, stilt houses, and piers, while also facing the challenges of tourism-oriented transformation.	It extends morphological research from the physical environment to ways of life, community relationships, and incremental forms of operation and management.
Regeneration of Honggang Village, Nansha	Both Honggang Village and Nanheng Village are fishing settlements located in the Nansha water-town region. They share a linear layout structured by waterways, fishing-related memories, and a similar context of regeneration and transformation.	It expands morphological identification from individual buildings to an integrated system encompassing waterways, piers, and spaces of production and everyday life. It also provides a questionnaire-based approach to investigating local collective memory.

Case	Comparability with Nanheng Village	Implications for the Application of Morphological Research
Canal Revitalization Project in The Hague	Both involve the reactivation of water systems that have been weakened or disrupted by urban development.	It extends morphological research to the revitalization of blue-green infrastructure and the development of dynamic networks of public activities.

2.5.1 Conceptual Design for the Barene di San Giuliano Wetlands in Venice

1. Project Background

The San Giuliano Wetlands Project was an urban design proposal submitted by Muratori in 1959 for a planning competition for the Barene di San Giuliano area in Venice. Located between the Venetian Lagoon and the mainland, near the key transition zone between Mestre and the island of Venice, this area serves as a vital interface connecting the “City of Water” with the mainland.

2. Planning and Design

Based on an understanding of Venice’s historical evolution, Muratori proposed three schemes, each corresponding to the typical spatial structures of different historical periods in Venice, representing a classic example of “morphological design deduction.” Muratori first summarized three typical textural systems in Venice’s urban development:

(1) Type 1 refers to an island cluster organized around a central square. This type represents Venice in the tenth to eleventh centuries, when the city functioned as an archipelagic urban system composed of island-based parishes, with waterways clearly prevailing over land routes.

(2) Type 2 is characterized by a comb-like layout, in which the principal waterborne and terrestrial routes are arranged along parallel axes, while secondary structures are inserted perpendicularly, including alleys, communal courtyards, and large family residences. This type corresponds to Gothic Venice, in which a relative balance was

achieved between waterways and land routes.

(3) Type 3 is arranged along a foundation strip flanked by canals on both sides, with houses aligned along the foundation or distributed around courtyards and alleys perpendicular to it. This type is characteristic of Renaissance and modern Venice, during which land routes gradually came to assume a dominant role.[66]

Based on these three historical prototypes, Muratori proposed three corresponding contemporary schemes:

(1) Estuary I envisions the new district as a lagoon city composed of multiple island-type residential units. These islands are connected to one another by bridges and are organized around central squares that accommodate housing, public services, and community life. The district is also linked to the mainland and unfolds along both banks of the San Giuliano estuary. The proposed building types include apartment buildings with workshop spaces on the ground floor, courtyard apartments, and terraced houses. Vehicular traffic and infrastructure are arranged within the peripheral green belt, while pedestrian movement and waterborne transport dominate within the islands. Except on the mainland-facing side, docks and berths are provided along the waterside edges of the islands. Water is thus not merely part of the urban blue-green network but also functions as an urban street, reflecting the spatial logic of historic Venice. This scheme most explicitly embodies the idea of "constructing the city through water," integrating canals, islands, bridges, and squares into a coherent urban structure. (Fig.2-12)

(2) Estuary II conceptualizes the new district as a city composed of multiple peninsula-type blocks. Vehicular roads and canals are arranged in parallel, forming a typical comb-like structure. The peninsulas converge toward the lagoon basin, with each peninsula constituting a self-sufficient urban unit for approximately 10,000 residents. The housing is mainly composed of three-story buildings with arcades, whose ground floors accommodate circulation, workshops, and storage functions. The peninsulas are connected through a canal network, while motor vehicles are restricted to the

inland-facing green buffer zone. Enclosed by the water system and green belts, the scheme creates a series of neighborhood spaces with independent public spaces and everyday service facilities. (Fig.2-13)

(3) Estuary III develops along both sides of the estuary as a double-strip urban structure, while longitudinal and transverse canal systems generate a continuous chain of islands and urban blocks. Terraced houses and parks are arranged on the landward side, whereas apartment buildings facing the Venetian landscape are located on the lagoon side. The urban center is designed as a linear street–square space. This scheme particularly emphasizes the significance of urban space: streets, courtyards, and similar spaces are regarded as places where everyday life and history unfold, while blue-green spaces become containers of place memory. (Fig.2-14)

Scheme III synthesizes the strengths of Schemes I and II and represents Muratori's most mature attempt to translate the historical types of Venice into a modern urban structure.

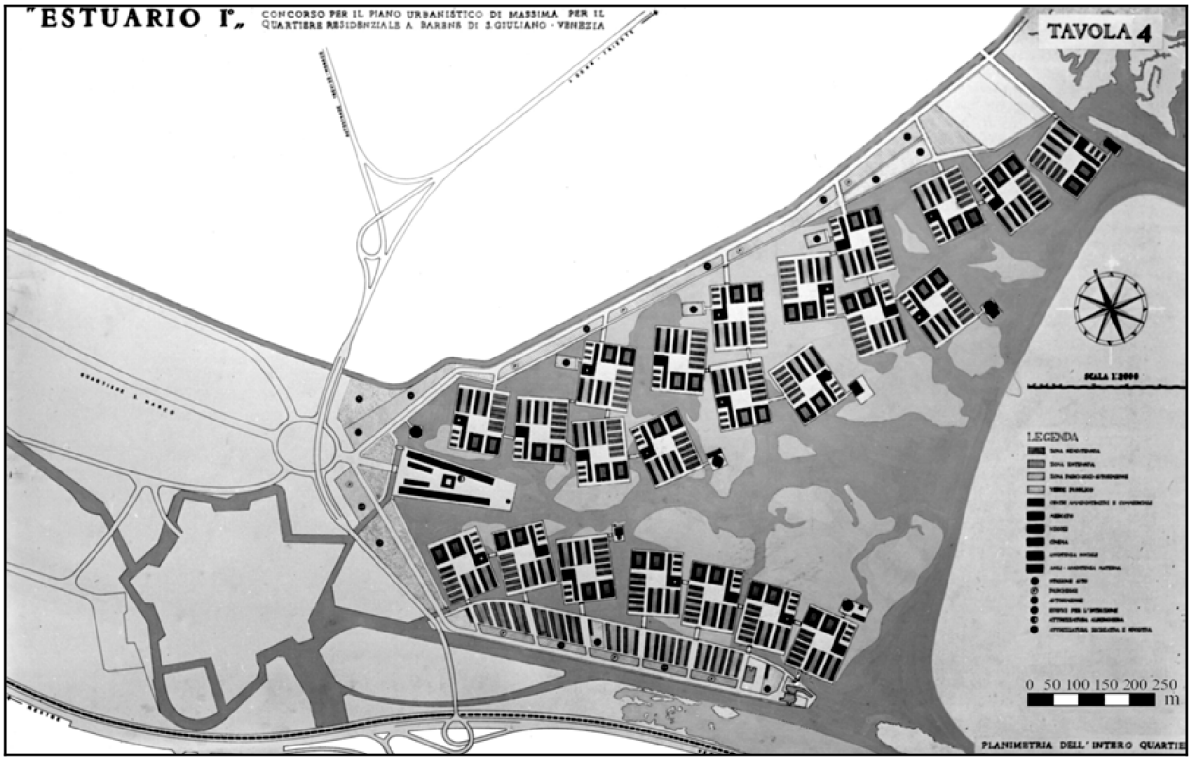


Fig.2-12 The Barene di San Giuliano in Venice Project Estuary I.

(Image source: Reference [66])



Fig.2-13 The Barene di San Giuliano in Venice Project Estuary II.

(Image source: Reference [66])



Fig.2-14 The Barene di San Giuliano in Venice Project Estuary III.

(Image source: Reference [66])

3. Lessons from the Case

From the perspective of water-settlement design, water in Muratori's schemes performs at least four roles: spatial division, traffic organization, the shaping of public space, and the construction of local identity. Whereas conventional modernist urban design often relies on large open spaces and a singular center, Muratori's water-city proposal emphasizes the formation of a multi-level, networked public-space system through water bodies at multiple scales.

The San Giuliano wetland scheme was not merely a competition proposal; rather, it can be understood as a critical experiment through which Muratori tested his theory of urban morphology by means of design. Its core objective was not to simply "replicate the form of Venice," but to extract structural logics, generative fabrics, and typological rules from the historical evolution of Venice and translate them into methods for modern urban design. Urban design grounded in an in-depth reading of local historical forms can prevent design practice from becoming an abstract planning exercise detached from context. At the same time, in the San Giuliano scheme, a clear scalar relationship can be observed from dwellings, courtyards, streets and alleys, neighborhoods, and districts to the entire new town. These scales are organized not as a linear sequence, but through mutual nesting: types respond to history, combinations respond to nature and society, and structures respond to forms of public life.

2.5.2 Redevelopment Plan for the Coloane Village in Macao

1. Project Background

Coloane Village is located on one of Macao's two islands, in the southern part of the city, facing the Hengqin New Area of Zhuhai across the water. Its economic development has been relatively slow; however, fisheries were once well developed and constituted a pillar industry of the village, while shipbuilding also played an important role in its local economy. As a century-old fishing village, Coloane Village is known for its tranquil seaside village atmosphere and attractive natural landscape. Nevertheless, with the rapid development of modern industries, its distinctive characteristics and cultural identity have been gradually eroded. The traditional fishing economy has increasingly been replaced by tourism and other emerging industries,

placing the village's traditional features at risk of disappearance[67].

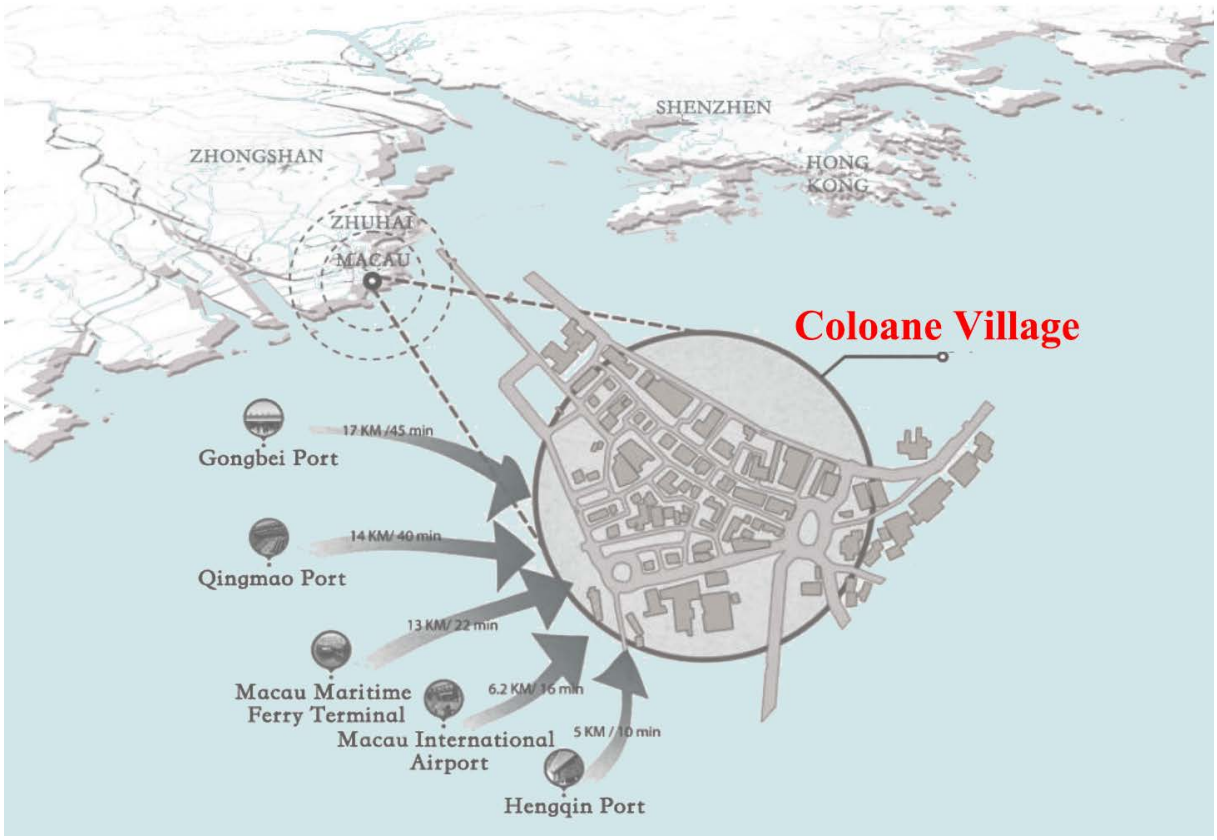


Fig.2-15 Location of Coloane Island

(Redrawn based on Reference [67])

In 2008, Typhoon Hagupit damaged both the external appearance and structural integrity of the stilt-house cluster along Rua dos Navegantes in the fishing village of Coloane Island, which was the last remaining group of stilt houses in Macao, thereby posing potential safety risks to residents. In addition, the area around the stilt houses suffered from poor sanitary conditions due to the accumulation of a large amount of waste.

In 2009, the Macao government conducted the *Feasibility Study on the Optimization of the Old Urban Area of Coloane*, which proposed a development direction that emphasized both development and conservation. In alignment with Macao's positioning as a "World Centre of Tourism and Leisure," the study sought to explore and preserve tourism resources with distinctive local characteristics. To more comprehensively conserve the historical landscape of Macao's fishing villages and to inherit the distinctive features of the small fishing village along Rua dos Navegantes and its related industries, the Macao government further carried out a

planning and design study for the redevelopment of the western side of Rua dos Navegantes in Coloane[68].

2. Planning and Design

The stilt-house area covered by the planning study is located along the western waterfront of the urban area of Coloane Island, extending from Largo do Cais in the north to the former slaughterhouse site in the south, with a total area of approximately 4,932 m².

The planning objectives are as follows: (1) to improve the living environment of local residents; (2) to introduce cultural and commercial elements and improve the relationship between business operators and residents; (3) to preserve and highlight the historical landscape of the fishing village; (4) to enhance the relationship between the waterfront landscape, local residents, and tourism; and (5) to identify an appropriate implementation fabric for the project.

The key design strategies include: (1) maintaining the architectural style of the stilt houses, largely preserving their existing functional attributes while introducing creative and cultural industries; (2) constructing timber boardwalks to improve public and tourist access to the waterfront; (3) retaining Coloane Pier to preserve the fishing-village character of Coloane; (4) setting both the indoor floor level of newly constructed buildings and the elevation of the timber boardwalks at 3 m above sea level, to mitigate the risk of inundation during ordinary spring tides; and (5) at the current stage, using part of the existing pedestrian paths as temporary parking spaces, while removing these parking spaces when future conditions permit, converting the carriageway into pedestrian paths and cycle tracks, and allowing access only for special-purpose vehicles, with the aim of realizing a genuine leisure and tourism center.

At the architectural level, the planning and design study also formulated design guidelines for the stilt-house area, providing graphic guidance on the design principles for newly built stilt houses, the structure of the community environment, the proportions of streets and open spaces, and architectural forms. (Fig.2-16)

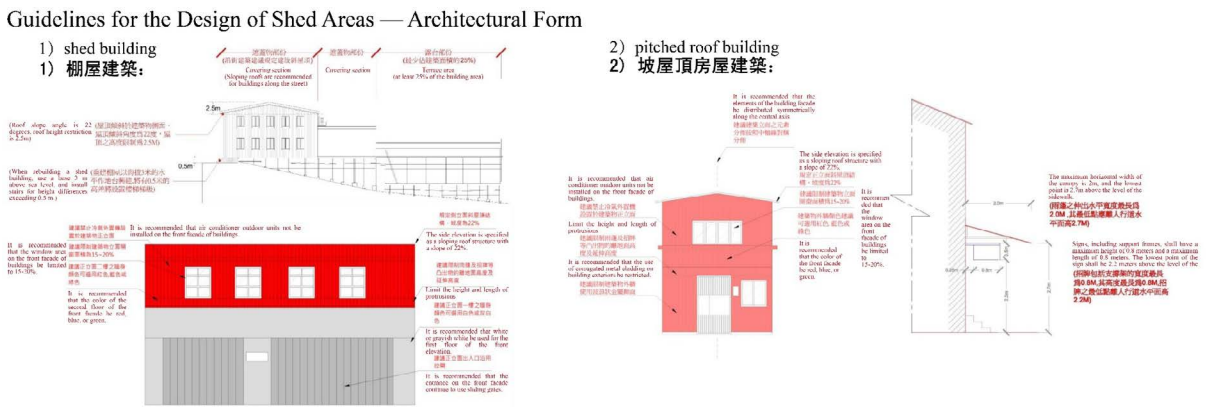


Fig.2-16 Design Guideline Plan for the Stilt Houses in Coloane Village

(Source: Planning Study for the Redevelopment of the Western Side of Rua dos Navegantes in the Old Urban Area of Coloane)

During project implementation, a tenancy agreement system and an evaluation committee fabric were established to introduce local creative-cultural and commercial activities in Macao in an orderly manner, while ensuring that tenants would use the stilt houses appropriately and maintain their architectural characteristics. With regard to tenancy arrangements, the principles of "in-situ rehousing" and "priority leasing for original users" were advocated. The evaluation committee emphasized pluralistic participation, with the Cultural Affairs Bureau serving as the lead department, other relevant departments acting as supporting agencies, and a certain number of representatives from the cultural sector and Coloane residents included in the process. At the same time, in the subsequent design of specific areas and facilities—such as waterfront seating, mailboxes, bus stops [67], and tourism route design[69] and so on—various local associations and university groups also participated. Through this process, opinions and suggestions from residents and business operators regarding the environment and public facilities were collected, thereby supporting the continuous environmental improvement and area-based revitalization of Coloane Island. (Fig.2-17)



Fig.2-17 Existing Conditions of Coloane Island

(Source: left—Liaison Office of the Central People's Government in the Macao SAR; middle and right—photographs by the author)

3. Lessons from the Case

Today, Coloane Fishing Village has become one of the "New Eight Scenic Spots of Macao," attracting large numbers of visitors for leisure and sightseeing, and serving as an important window through which Macao presents its natural and cultural appeal.

The transformation of Coloane Fishing Village places particular emphasis on the preservation and revitalization of traditional fishing-village culture. By retaining fishery-related buildings, public spaces, and symbolic elements of the fishing village, the project enables both visitors and residents to experience an authentic traditional way of life. In the regeneration process, the spatial linkage between key nodes representing fishing-village culture and other street spaces reflects the logic of compositional theory. In the regeneration design of the areas surrounding Nanheng Village, historical memory may likewise serve as a point of departure, through which core cultural symbols of traditional fishing villages can be extracted and integrated into everyday street and alley spaces, thereby creating a distinctive spirit of place.

At the same time, the insertion of multifunctional commercial spaces has been a key factor in enhancing the attractiveness of Coloane Fishing Village. In this process, an appropriate amount of commercial space was introduced while existing community functions were retained, enabling the integration of the tourism economy with community life without fully transforming the area into a "tourist-oriented" commercial district. How to regulate and balance commercial and residential functions constitutes an important issue in urban regeneration.

Spatial regeneration and transformation should adopt an incremental design approach and emphasize the participation of residents and future users. Such an approach should take into account both current transitional functions and the realization of future design objectives, rather than pursuing immediate completion. During the transformation process and subsequent maintenance, the expectations and demands of users should be continuously understood. Fabrics such as evaluation, follow-up visits, and feedback-based assessment may be adopted to support the dynamic adjustment of regulations and institutional arrangements, so as to prevent the disorderly expansion of commercial activities.

2.5.3 Renovation of Honggang Village, Nansha

1. Project Background

Honggang Village is located in the western part of the southern cluster of Guangzhou's Nansha New Area and falls under the jurisdiction of Wanqingsha Town (Fig.2-18). The village covers a total area of 12.28 hectares. Built along the Nansha 14th Canal, the village extends linearly along the canal, with each household having its own dock—a characteristic that gives rise to a unique Tanka culture and the spatial logic of water towns [70].

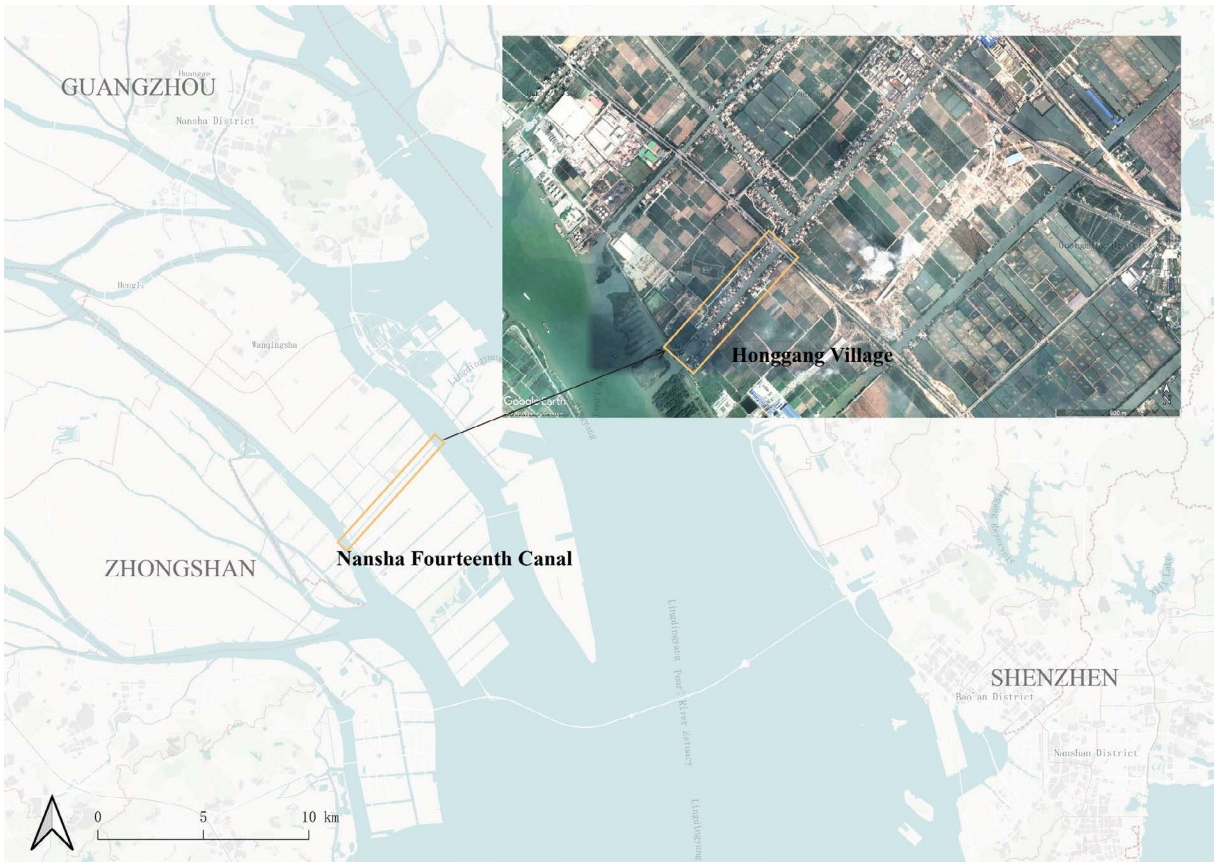


Fig.2-18 Location Map of Honggang Village

(Source: redrawn based on Google Maps)

Economically, Honggang Village has relied on fishing for many years. However, due to the decline in marine fish stocks in recent years, income from traditional fishing has become insufficient to support modern living standards, prompting the village to explore new avenues for transformation. In fact, as early as the 1990s, a small number of fishermen along the canals began operating recreational fishing boats, giving rise to experiential tourism activities that took visitors out to sea for fishing experiences [71].

In 2022, Honggang Village was designated as a core node in Phase I of Nansha District's "Evening Songs from Fishing Boats" New Rural Construction Belt. It has become a key vehicle for Nansha District's implementation of the "Bai-Qian-Wan Project [Note 2]" aiming to drive industrial and cultural revitalization through spatial regeneration[72]. (Fig.2-19)

[Note 2] The High-Quality Development Project for Hundreds of Counties, Thousands of Towns, and Tens of Thousands of Villages, commonly known as the "Bai-Qian-Wan Project," is the top-priority initiative for advancing high-quality development in Guangdong Province.



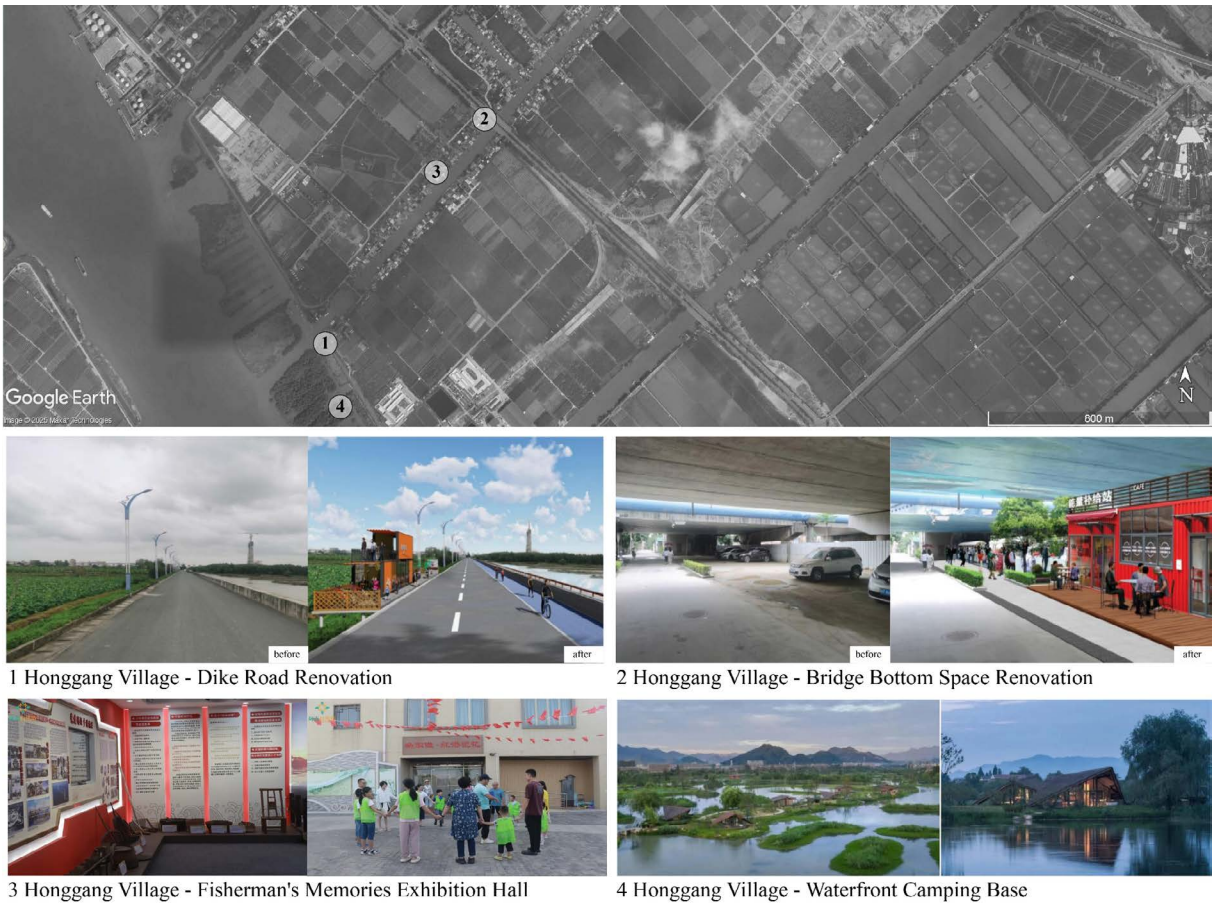
Fig.2-19 Structural Diagram of the "Evening Songs from Fishing Boats" Rural Demonstration Zone

(Adapted from portions of the feasibility study report for the "Evening Songs from Fishing Boats" New Rural Demonstration Zone Construction Project)

2. Innovative Core Node Design

The project enhances the quality of the space through four levels of spatial interventions (Fig.2-20). First, the embankment road is renovated to widen the roadway and designate separate lanes for vehicles and pedestrians, thereby improving accessibility and safety. Second, abandoned water treatment plants and the spaces beneath bridges are repurposed into shops, guesthouses, and guesthouse complexes; for example, the space under the Wanhuang West Road Bridge has been converted into shops, providing visitors with rest areas and dining services. Third, cultural symbols are reinforced through the construction of the "Fisherman's Pride · Memories of Honggang" exhibition hall, which showcases fishing culture through text, images, artifacts, and multimedia; fourth, a vegetated buffer zone is established along the banks of the 14th Canal, utilizing native plant combinations and landscape design to restore the

shoreline [73, 74].



1 Honggang Village - Dike Road Renovation

2 Honggang Village - Bridge Bottom Space Renovation

3 Honggang Village - Fisherman's Memories Exhibition Hall

4 Honggang Village - Waterfront Camping Base

Fig.2-20 Spatial Upgrading of Honggang Village

(Source: redrawn from Guangzhou Urban Planning Survey & Design Research Institute Co., Ltd. (GZPI))

3. Extraction of Local Memory

To address the challenges of balancing flood-control safety and waterfront landscape coherence, Nansha District launched a design competition in 2024 to solicit modular design proposals for fishermen's courtyard gardens from the public. Before the competition, consultations with residents were conducted, and the findings were compiled into a survey report[75]. Given the similar historical backgrounds and settlement morphologies shared by Honggang Village and the study site examined in this research, the findings derived from this highly comparable context can serve as a form of a priori evidence, providing empirical support for community regeneration initiatives and waterfront redevelopment strategies in Nanheng Village. Furthermore, both Honggang Village and Nanheng Village exhibit comparable

morphological “motifs,” including waterway-driven linear settlement patterns and relatively informal building layouts. Consequently, the user preferences and redevelopment demands identified through the Honggang Village survey possess a high degree of referential value and can offer meaningful insights for the planning and design interventions proposed for Nanheng Village.

The following summarizes the key findings of the survey conducted in Honggang Village. Among the respondents, 68% were male, and 32% were female. In terms of age distribution, middle-aged residents between 30 and 45 years old constituted the largest group (42%), followed by residents aged 45 to 65, who accounted for 41%. Regarding household registration status, residents represented the overwhelming majority at 87%, while non-local residents accounted for 13% (Fig.2-21). Concerning activity preferences, parks and public squares were the most favored spaces (32.61%), followed by waterfront areas (21%), streetside green spaces (19%), and sports facilities (19%) (Fig.2-22 a). The most common activities reported were socializing and chatting (32%), morning exercise (29%), and tea drinking (16%) (Fig.2-22 b). With respect to existing problems, the lack of public facilities along the waterfront (26%) and the shortage of public open spaces (23%) were identified as the most pressing concerns (Fig.2-23 a). In terms of redevelopment priorities, the combination of integrating cultural characteristics and improving public amenities was considered the most desirable intervention strategy, receiving support from 52% of respondents (Fig.2-22 c). Regarding heritage conservation, respondents expressed a preference for prioritizing the preservation of collective memory spaces (30%), distinctive buildings (30%), and historic trees (26%) (Fig.2-23 b).

Overall, the survey results reveal a strong community demand for a waterfront regeneration strategy that emphasizes practicality, visual coherence, and cultural expression. Residents expect redevelopment efforts to focus on embedding local cultural identity and enhancing public amenities while simultaneously improving the continuity of public spaces and the quality of supporting infrastructure.

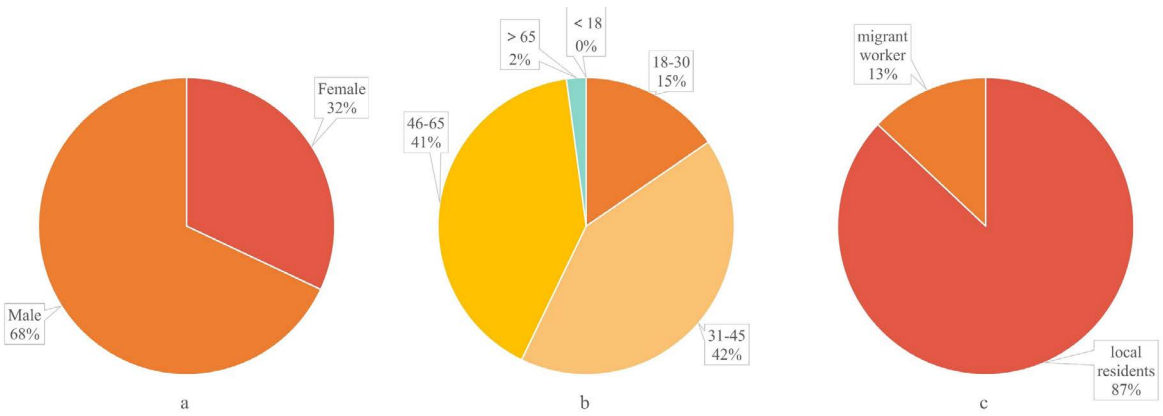


Fig.2-21 a: Gender distribution of respondents; b: Age distribution of respondents; c: Household registration distribution of respondents

(Data source: GZPI)

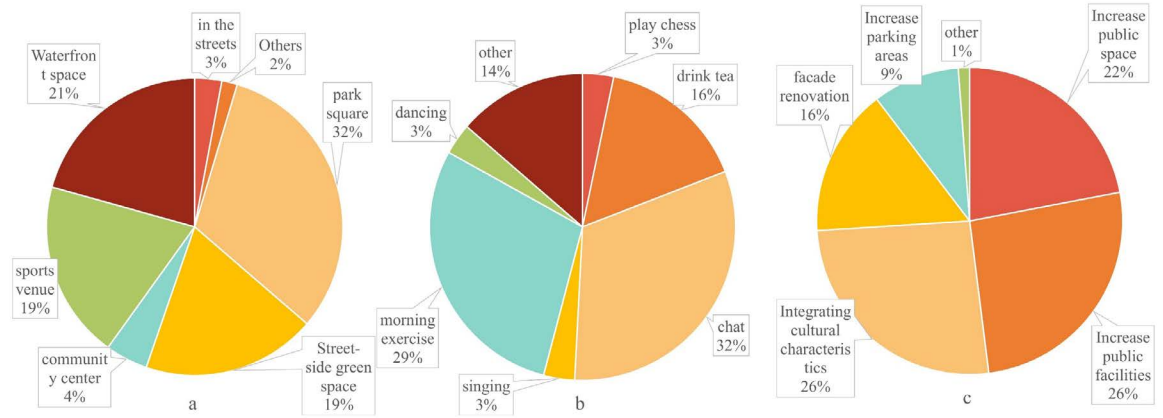


Fig.2-22 a: Respondents' preferences regarding public spaces; b: Respondents' activity preferences; c: Key areas for renovation

(Data source: GZPI)

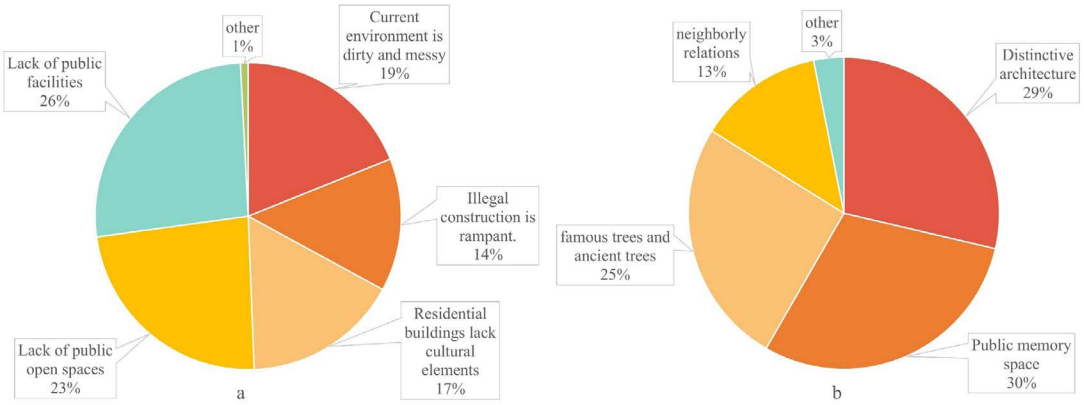


Fig.2-23 a: Current issues; b: Preservation and maintenance of distinctive features

(Data source: GZPI)

4. Lessons from the Case

The regeneration practice of Honggang Village provides an important reference model for the transformation of traditional coastal settlements. Its significance lies not only in the optimization of the physical environment but also in its innovative approach to addressing deeper structural relationships. Rather than focusing solely on the village itself, the regeneration process was grounded in a broader regional perspective, positioning the village's development within a framework of interconnections with surrounding areas. The project was embedded within a multi-scalar policy system, thereby establishing a coordinated structure of regional linkage: at the macro level, the overall urban design strategy for Nansha identified the area as a "Natural Agricultural Landscape Zone"; at the meso level, the "Evening Songs from Fishing Boats" Demonstration Belt Special Plan provided thematic guidance; and at the micro level, the Fishermen's Courtyard Design Guidelines offered specific design controls and implementation standards.

From the perspective of urban morphology, the regeneration of Honggang Village demonstrates a process of reciprocal evolution between natural and cultural forms. The continuity of the natural landscape framework was maintained, while settlement spaces were distilled into a series of standardized design modules during the redevelopment process. This approach preserved the original functional logic of the village—such as docking piers and waterside access steps—while encouraging the reinterpretation of traditional spatial elements through the application of contemporary materials and construction techniques.

2.5.4 The Hague Canal Rehabilitation Project

1. Project Background

The Hague, Netherlands, was originally established as a government center. Many of the city's original canals were filled in between 1910 and 1970 to make way for urban development, and the city's historical character was subsequently lost. In 2019, MVRDV and local community organizations jointly developed a plan aimed at reopening The Hague's 17th-century canals to improve sustainability, the economy, transportation, and water management in the area

2. Design Proposal

According to a study of the historic canals conducted by the local Hague-based architectural firm BAU, MVRDV's design primarily focuses on restoring the main canal and planning other tributaries and culverts. The canal routes are interwoven with urban green spaces, creative districts, shopping areas, dining venues, and sports routes, enabling the project to serve as an "urban activator" (Fig.2-24). The design proposal includes a swimming canal, a koi canal, and a surfing canal, among others. These thematic designs align with The Hague's overarching master plan to establish the city as a sports hub (Fig.2-25). The project pays particular attention to the challenges of constructing tram lines and other infrastructure within the existing canal area, and has designed various types of canal cross-sections to address the complex built environment (Fig.2-26).

The Hague Canal Restoration Project is a prime example of a neighborhood-driven initiative. Resident Shireen Poyck brought together various community initiatives and stakeholders to launch the "Grachten Open" initiative and invited MVRDV partner Jan Knikker to participate. The vision for opening the canals was jointly drafted by residents and businesses and received support from the community, local businesses, the SOS Den Haag Foundation, and two major property owners in the area. In 2020, the Hague City Council voted unanimously to proceed with a feasibility study for opening the canals.



Fig.2-24 Flowline Plan for the Hague Canal

(Source: https://mvrdv.com/projects/407/the-hague-canals)



Fig.2-25 A comparison of the canal in the past (left) and today (right)

(Source: https://mvrdv.com/projects/407/the-hague-canals)

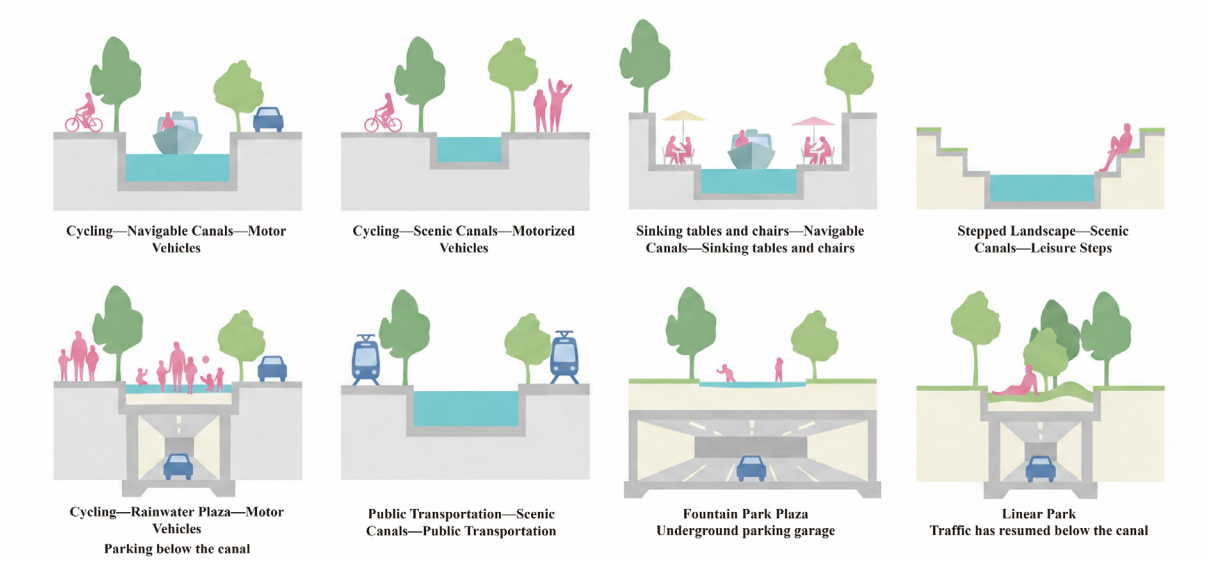


Fig.2-26 Types of Canal Cross-Sections

(Source: Redrawn based on https://mvrdv.com/projects/407/the-hague-canals)

3. Lessons from the Case

First, the project combines ecological functions with diverse spatial uses, enhancing the overall value of the area. By designing multifunctional canal spaces, it revitalizes the charm of the historic canal; this mixed-use design effectively revitalizes neglected urban areas.

Second, the design process should closely integrate the project with the city's positioning, aligning the design vision with the city's vision so that it becomes an integral part of the everyday environment rather than an isolated entity within the urban landscape and urban planning.

Finally, the Hague Canal Restoration Project demonstrates the importance of community participation in urban regeneration. By focusing on the broader interests of the city and engaging residents and their communities, the designers have created personalized urban public spaces.

2.5.5 Case Summary

Table 2-4 Summary of the Case Study

Objective	**Method**	**Objective**
Extract historical	Identify and synthesize representative urban tissue types from different historical periods	Urban structure

Objective	Method	Objective
spatial	through urban morphological analysis.	
archetypes and translate them into contemporary design frameworks	Employ a "type–variant–scheme" approach to design development and spatial transformation	Urban blocks
Establish urban spatial organization adapted to water environments	Utilize waterways as the primary structural framework for spatial subdivision and urban form generation	Canals, estuaries, waterfronts, islands, bridges
	Organize a hierarchical transportation system integrating pedestrian, waterborne, and vehicular circulation	Water transport routes, pedestrian networks, and road systems
	Create a multi-level public space network through the structuring role of water bodies	Central plazas, linear street–plaza systems, neighborhood public spaces
Preserve and continue local historical character and cultural memory	Retain the original architectural character and functional attributes	Stilt houses, piers, and fisheries-related buildings
	Extract local cultural symbols and embed them within interpretive and exhibition spaces	Fisherfolk cultural exhibition centers, collective memory spaces
	Formulate design guidelines to regulate building forms and spatial proportions	Building forms, street frontages, open spaces, and community spatial

Objective	Method	Objective
		structure
Stimulate the local economy and promote the integration of production, living, and tourism functions	Introduce cultural, creative, and commercial activities while retaining existing community functions	Stilt houses, retail spaces, homestays, cultural and commercial venues
	Integrate spatial regeneration strategies with tourism development objectives	Waterfront spaces, consumption, and activity nodes
Enhance ecological resilience and environmental quality	Coordinate water resource management with urban regeneration initiatives	Drainage systems, waterfront spaces
	Restore waterfront ecosystems through the use of native vegetation and ecological landscape design	Ecological interfaces
	Resolve conflicts between water bodies and existing infrastructure through differentiated cross-sectional design strategies	Canal cross-sections, waterfront urban interfaces

Taken together, the research value of these four cases lies not only in the specific design strategies they provide, but also in their demonstration of the expanding scope of urban morphological research. The San Giuliano Wetlands proposal illustrates how historical morphological analysis can be translated into new rules of spatial generation. The case of Coloane Fishing Village demonstrates that morphological conservation must be integrated with community life and operational fabrics. The Honggang Village case indicates that the morphology of water-town settlements should be understood through the interrelationships among production, everyday life, water management, and local culture. The canal revitalization project in The Hague provides empirical evidence that water systems and blue-green infrastructure can be incorporated into urban morphological research and employed as

structural elements for reorganizing urban public life. Collectively, these cases demonstrate that, in contemporary urban regeneration, urban morphology has gradually evolved into an integrated approach that connects historical identification, morphological abstraction, social use, ecological adaptation, spatial generation, and regulatory control.

2.6 Chapter Summary

This chapter is structured around two main threads: theoretical foundations and case studies. The first half reviews relevant research on Lingnan waterside settlements, urban morphology, and assemblage theory, providing a theoretical foundation for subsequent analysis and design. The second half draws on four case studies—the Barene di San Giuliano Wetlands, the renovation of the Coloane fishing-village, the regeneration of Honggang Village in Nansha, and the revitalization of the canals in The Hague——to analyze the practical pathways through which theory transitions from history to design.

In the theoretical section, first, the spatial value of Lingnan waterside settlements should be identified within the context of their holistic relationships. The formation of these settlements is closely linked not only to architectural character and the fabric of streets and alleys but also to the role of canals, farmland, fish ponds, and daily life. Therefore, the subsequent analysis of Nanheng Village incorporates architecture, streets and alleys, waterfront spaces, canals, the landscape of farmland, and public life into the scope of the study, providing a basis for the continuation of the village's character in the subsequent New Water Village project.

Second, research in urban morphology suggests that future urban design around Nanheng Village should be grounded in the historical logic, social relationships, and environmental adaptation of the existing spatial form. It is recommended to utilize quantitative tools for precise identification, translating analytical results into implementable design strategies.

Furthermore, assemblage theory offers a framework for dynamic reconfiguration in the regeneration of Nanheng Village. Subsequent designs should consider the interconnections, openness, and adaptability of various elements under different temporal and spatial conditions, exploring the connection between traditional fishing-village forms and contemporary urban functions.

In the case study section, this chapter validates the aforementioned theories at the practical level through four case studies. The Barene di San Giuliano Wetlands project in Venice demonstrates how urban morphology can be used for prototype refinement and design simulation; the case of Coloane Fishing Village in Macao offers insights into the preservation of fishing-village character, the design and renovation of village houses, and the experience of incremental commercial integration and multi-stakeholder participation; the regeneration of Honggang Village in Nansha, Guangzhou, demonstrates the potential for Lingnan waterside settlements to sustain local memory and spatial texture in the context of urbanization; and the revitalization of The Hague's canals illustrates how the reopening of historic urban waterways and the organization of diverse routes can revitalize urban public life.

Based on the above understanding, the next chapter will conduct a systematic site survey of Nanheng Village. It will examine the site's basic characteristics and core issues from the perspectives of historical development, overarching plans, transportation conditions, public services, stormwater management, natural elements, and the current state of buildings. The chapter will clarify the actual relationships between Nanheng Village and the surrounding urban, ecological, and industrial systems, thereby providing a foundation for subsequent research and design.

Chapter 3 Site Analysis

3.1 The Historical Background of Nanheng Village

Nanheng Village is located in Nansha Subdistrict, Nansha District, Guangzhou. Nansha Subdistrict originally belonged to Dongguan County but was transferred to the jurisdiction of Panyu County in 1959; Nanheng was then administered by a village management committee under Panyu County. In 1987, Nansha Town was established, and Nanheng became one of its village committees. In 1990, the Nansha Economic Management Committee was established, designating Nansha as a key development zone within the open-door policy area. In 2005, the Nansha Subdistrict of the Nansha District was established.

During the Guangxu reign of the Qing Dynasty (1875–1908), Nanheng Village began as a gathering place for fishermen coming ashore; subsequently, farmers from other regions came to reclaim land and settle here, forming a village. This transition from a nomadic life on the water to a settled life on land laid an important foundation for the development of Nanheng Village's social organization and settlement pattern. At the foot of Guanyin Mountain within Nanheng Village stands a massive rock known as "Guanyin Stone." The villagers built a temple inside the rock, named "Guanyin Temple," which was rebuilt in 2000. To this day, villagers still visit the temple during festivals to pay their respects and pray for divine protection. Guanyin Temple plays a vital role in maintaining the villagers' sense of local identity and community cohesion. (Fig.3-1)

As shown in the 1908 Map of the Six Waterways of Guangzhou (Fig.3-2), Nanheng Village is located between the Humen and Jiaomen waterways, making it a waterfront settlement situated at the "gateway to the river and the sea" of Guangzhou. This unique location endowed Nanheng Village with the inherent potential to serve multiple functions—including estuarine transportation, fisheries production, tidal flat reclamation, and external exchanges—which became the crucial foundation for the village's water-based modes of production, daily life, and social interaction.

The residents of Nanheng Village live primarily at the foot of Dajiao Mountain and along the banks of the Nanheng Canal, in seven residential areas: Shuiqiao Street, Qing'er Street,

Houyu Street, Houlen Street, Shixia Street, Zhujiang East Road, and Lianxi Street. Traditionally, the local economy has been primarily agricultural, including offshore fishing, aquaculture, rice and vegetable cultivation, and livestock farming (Fig.3-3). In the 1990s, Nanheng Village established several seafood restaurants along both banks of the Nanheng Canal, becoming renowned near and far for its seafood cuisine. The stilt houses and private docks lining both banks of the canal create a unique "waterfront community" experience.

In 1989, the Fok Ying Tung Foundation proposed the objective of "establishing a foothold in Nansha, developing Panyu, connecting with Hong Kong, and supporting economic development in the Pearl River Delta and Guangdong," and actively invested in development and construction projects in eastern Nansha [14]. This brought new opportunities for the development of Nansha Subdistrict, where Nanheng Village is located. In 2012, Nansha was approved as a national-level new area. In 2024, with the promulgation of the "Guangzhou Regulations on the Renovation of Urban Villages," Nanheng Village began the process of urban regeneration. Nanheng Village has undergone a transition from a traditional county-level administrative unit to a new urban district with its own urban governance system. This process signifies the elevated status of the Nansha area within Guangzhou's urban development framework, and it also marks Nanheng Village's transformation from a relatively independent rural production unit into an urban-rural transition zone influenced by regional industrial planning, land development, and urban governance. (Fig.3-4)



Fig.3-1 Current Map of the Guanyin Temple

(Source: Nansha Cultural Associations)

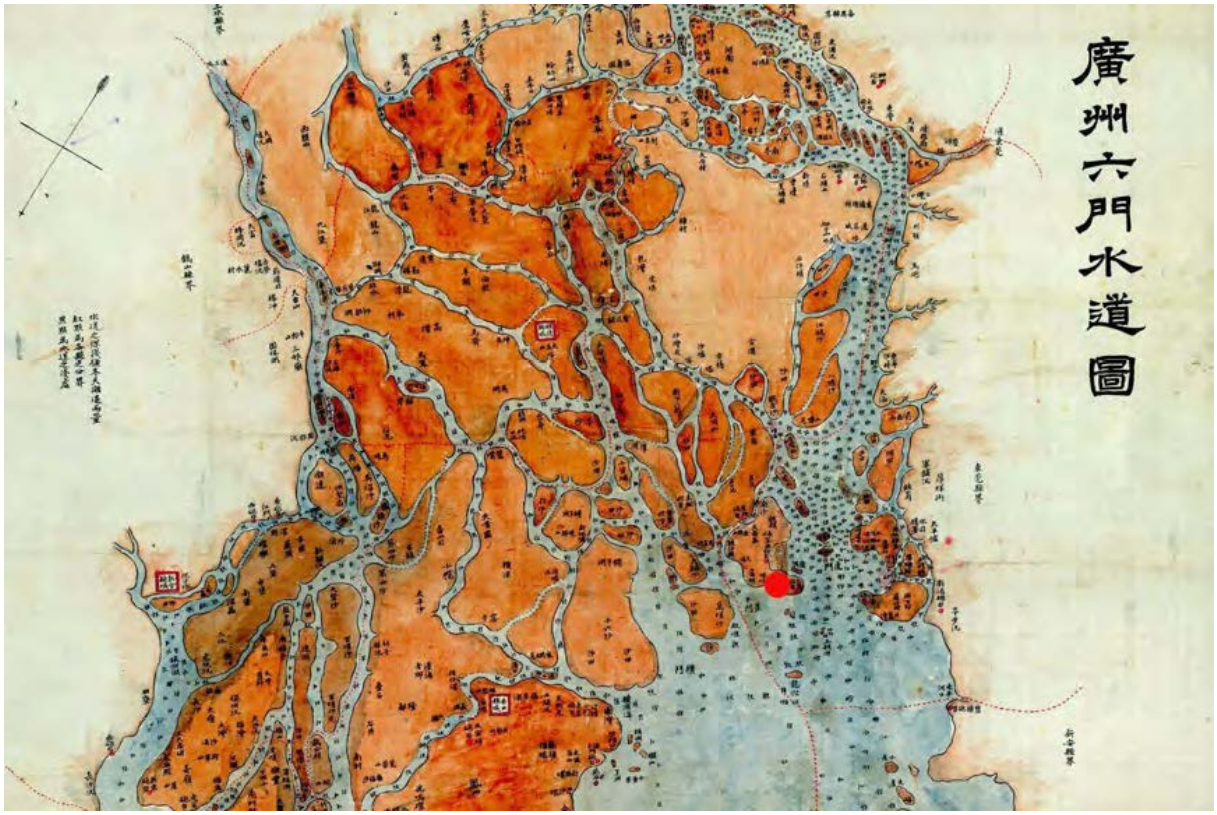


Fig.3-2 Map of the Six Waterways of Guangzhou

(The red dot marks Nanheng Village; map source: http://www.infonht.cn/ViewMessage.aspx?MessageID=9122)



Fig.3-3 Photos of Nanheng Village in the 1970s and 1980s

(Source: Nansha Cultural Associations)

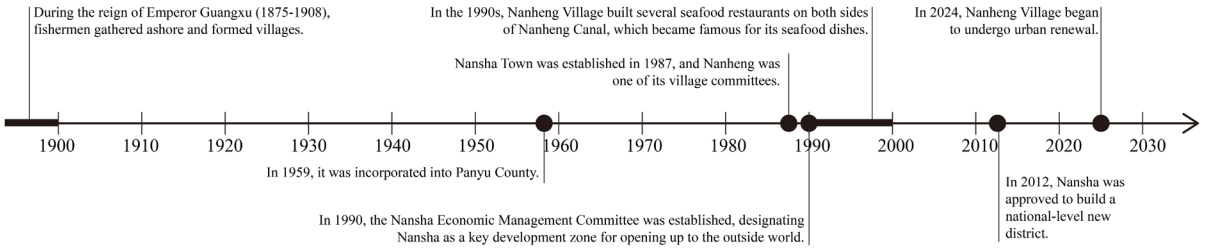


Fig.3-4 Timeline of the Historical Development of Nanheng Village

(Source: Created by the author)

3.2 Planning and Policy Context

3.2.1 Location Analysis

Nanheng Village is located at the southeastern tip of Nansha Subdistrict, bordering the Pearl River estuary to the east, the Fuzhou Waterway to the south, the Sanxingwei natural village of Dalingjie Village to the west, and Lujing Village to the north. The village covers an area of 4.2 square kilometers, all of which lies within the urban development boundary. The built-up area within the current village boundaries is approximately 0.42 square kilometers (the gray-hatched area in Fig.3-5). The village is named Nanheng because it is situated at the

southeastern tip of Nansha Subdistrict and features an east-west seawall running across the village entrance.

Nanheng Village is located approximately 9 km (as the crow flies) from the central urban area of Nansha, south of the Nansha Bay Comprehensive Service Center, and lies within the coordinated development zone spanning both sides of the Golden Inner Bay. Leveraging Nansha District's central location within the Bay Area, the area surrounding Nanheng Village enjoys a unique geographical advantage. (Fig.3-5)



Fig.3-5 Location of Nanheng Village

(Image source: Adapted from the *Guangzhou Nansha New Area Master Plan for Territorial Space (2021–2035)*)

3.2.2 Industrial Positioning and Urban Development

At the level of the city's master plan, the design site is located on the outskirts of the Nansha New Area in Guangzhou's central urban district, situated between Nansha Science City and Nansha Bay—two key nodes of the city's Vitality and Innovation Axis. The overarching plan calls for the establishment of major scientific and technological infrastructure and key research institutions in this area to create an open platform for collaboration in basic research

and cutting-edge technology, with the goal of transforming Nansha Science City into China's center for marine science and technology innovation[76]. (Fig.3-6 left)

In the Nansha New Area Master Plan, the project site is located within the Nansha Bay Research and Development Cluster, designated as a marine science and technology R&D industrial park [77]. Its unique geographical location at the mouth of the Pearl River makes the Nansha Bay area a key driver for Guangzhou's maritime development and a model for creating a vibrant global waterfront district. (Fig.3-6 right)

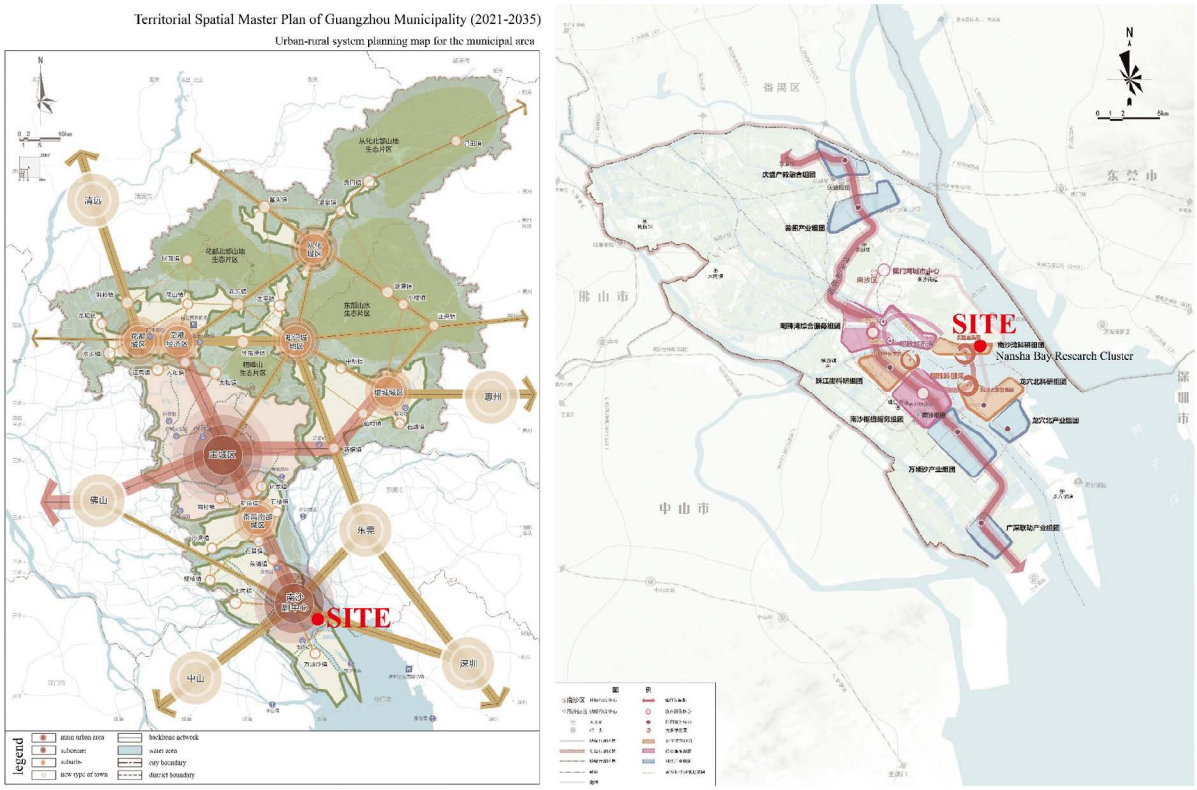


Fig.3-6 Map of Guangzhou's Urban-Rural System (left); Schematic of Nansha Science City (right)

(Image source: Adapted from the *Guangzhou Nansha New Area Master Plan for Territorial Space (2021–2035)*)

Driven by the industrial system and key platforms, Nansha's industrial development is promoting the expansion of urban functions, forming an urban-rural interface where production, daily life, and ecology intertwine. Villages such as Nanheng Village, situated within this interface, serve as key sites where industrial spillover interacts with ecological conservation, and historical character blends with modern services. The *Guangzhou Nansha New Area Rural Construction Plan (2018–2035)* outlines the overarching approach to rural construction in Nansha Subdistrict as "urban-rural integration, revitalization through urban regeneration, and

innovative development," aiming to achieve high-standard, integrated urban-rural development. In terms of landscape planning, this falls under the category of new rural community zones[78] promoting the transition of "villages to residential communities" to transform villagers into new urban residents.

According to the current zoning plan and urban design layout for the area surrounding Nanheng Village (Fig.3-7), the zones along both banks of the canal are designated for commercial and service functions. As indicated in the current urban design, the area near the canal is planned as a waterfront cultural and tourism center. However, in terms of land use and form control, the regeneration model primarily involves large-scale demolition and comprehensive reconstruction. It lacks provisions for the preservation and restoration of existing fishing-village architecture and the village's structural fabric, and does not include a preservation inventory or control lines for traditional alleyways, wharf systems, or stilt-house spaces.

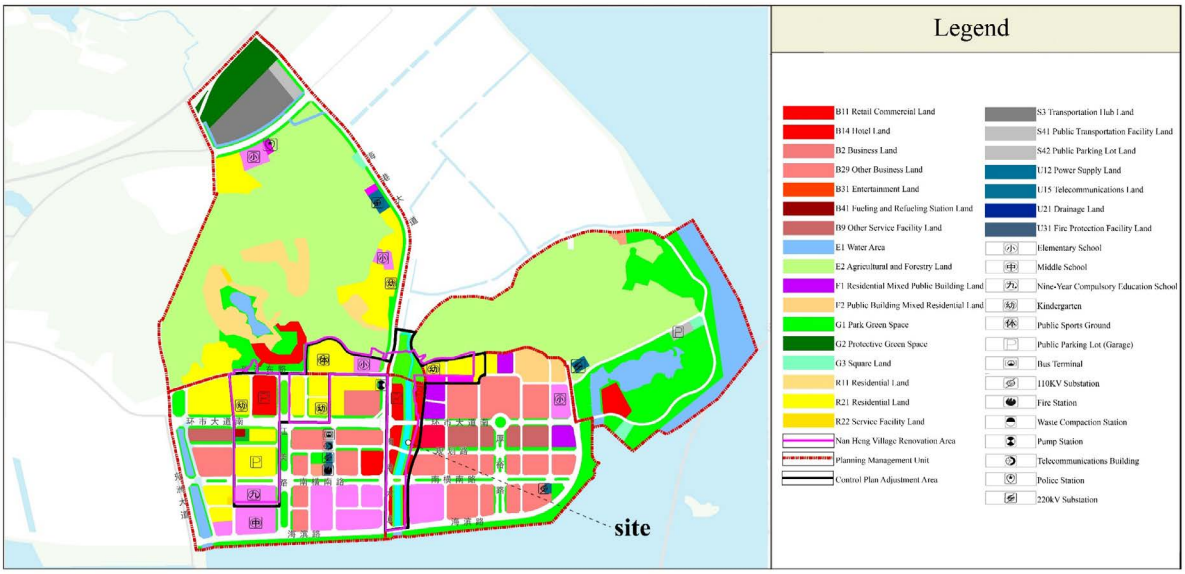




Fig.3-7 Nanheng Village Control Detailed Plan (top) and Existing Urban Design Plan (bottom)

(Image source: Planning and Natural Resources Bureau of Guangzhou Nansha Economic and Technological Development Zone)

3.2.3 Ecological Structure

The site is traversed by the Nanheng Canal, which connects to the Pearl River estuary via a sluice gate. Municipal ecological corridors run along its eastern and western sides, with the Hengli-Fuzhou Waterway Ecological Corridor passing through the site. To the north lies the Huangshanlu Ecological Green Core. The design site is situated at a critical interface where the "river-sea, river, and urban" systems converge, forming a junction point for a multi-source ecological network comprising "green cores, corridors, and water systems." It possesses

significant value for ecological connectivity and landscape potential. (Fig.3-8)

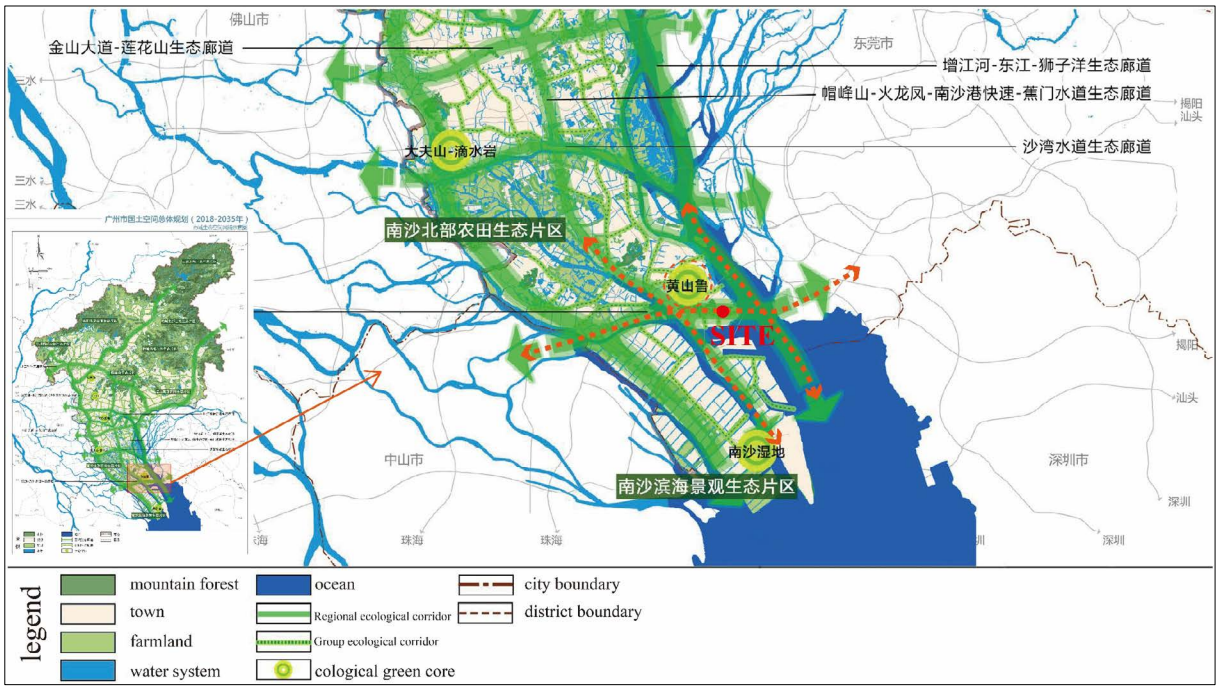


Fig.3-8 Map of the Ecological Space Network in Nansha District

(Image source: Adapted from the *Territorial Spatial Master Plan of Guangzhou Municipality (2021-2035)*)

3.3 Existing Conditions Analysis

3.3.1 Traffic Analysis

As shown in Fig.3-9, the transportation network surrounding the design site consists of a system of one east-west and one north-south arterial road. Due to the presence of Dajiao Mountain to the north, the entire Nansha Subdistrict is divided into northern and southern sections by the mountain, resulting in relatively weak north-south transportation links. South Ring Road serves as the site's primary passenger transport artery, extending eastward toward Nansha Coastal Park and northward toward Nansha Passenger Port. Fu Zhou Avenue functions as the main freight corridor, connecting southward to Longxue Island Freight Port; it largely bypasses the front of the site, facilitating the separation of passenger and freight traffic.

Only one subway line runs near the site; the "Nanheng Station" is located on South Ring Road, approximately 700 meters from the western side of the site. There are multiple bus stops along South Ring Road, spaced approximately 400–600 meters apart. However, the walking

distance from the site to the nearest bus stop is relatively long and requires crossing a city road. Bus coverage along the coastal area is limited, and connectivity needs to be improved. Within the site, only a side road on the north side allows motor vehicle access. The elevation of the urban roads crossing the site is higher than the building ground level within the site, making direct entry impossible; the remaining roads are alleys that permit only electric scooters and bicycles. Additionally, the canal within the site is divided into three sections by the urban road, with only the southern ends connected to the ocean. Numerous private docks line both sides of the canal, providing a certain foundation for waterborne transportation; however, this has not yet been integrated into the urban public transportation system.

The large-scale grid road network resulting from new urban development contrasts sharply with the existing alleyway system in Nanheng Village. As urban density and the density of transportation infrastructure increase, this disparity will lead to congestion at the urban-rural interface, necessitating further hierarchical subdivision of the road network. At the same time, this paper will also explore whether this “radical” grid-based approach is appropriate for traditional villages. When urban development and regeneration occur simultaneously, is there a better solution for managing this urban-rural transition interface?

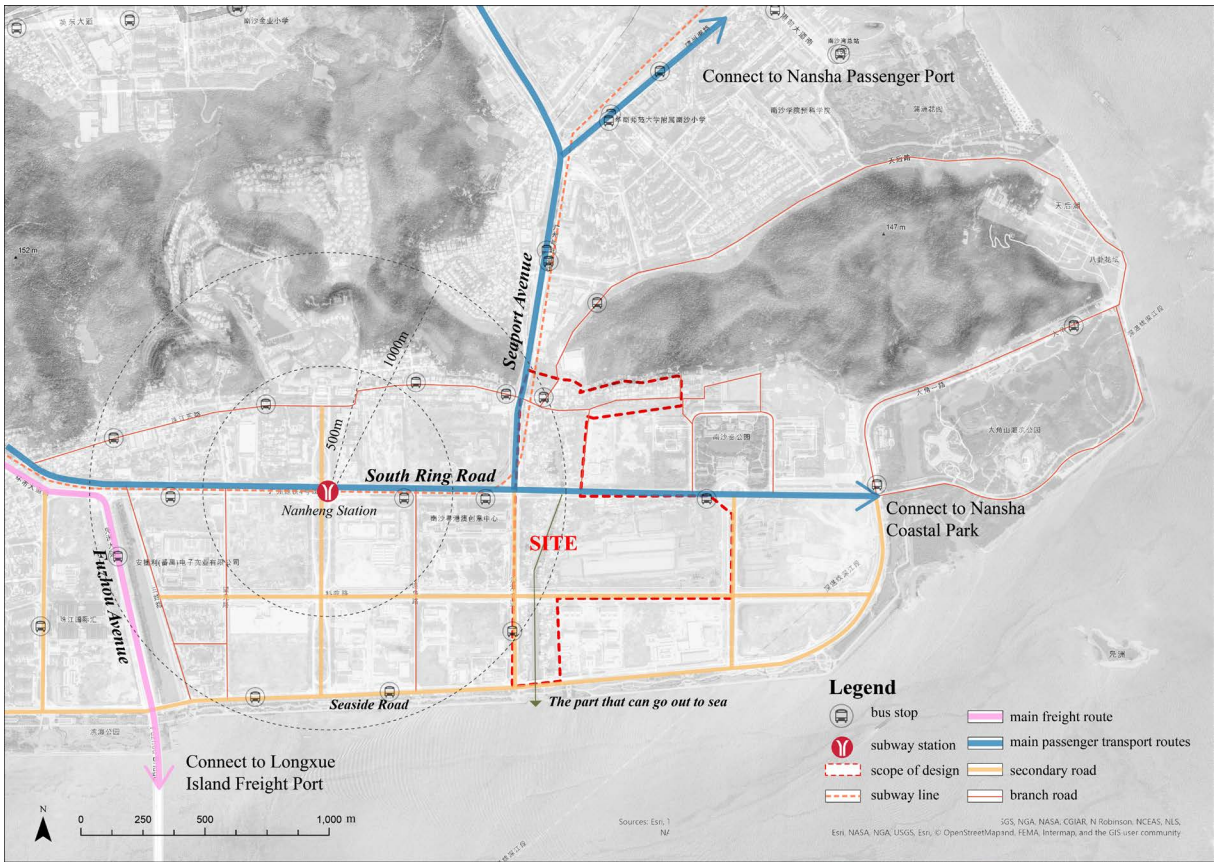


Fig.3-9 Current Traffic Analysis Map

(Source: Created based on an ArcGIS base map analysis)

3.3.2 Analysis of Surrounding Amenities and POI Distribution

The site is surrounded by research and industrial institutions such as the Guangzhou Nansha Science and Technology Innovation Center, the Guangzhou Institute of Industrial Technology of the Chinese Academy of Sciences, the Nansha Information Technology Park, and the Fok Ying Tung Research Institute of the Hong Kong University of Science and Technology. However, according to POI data, the highest values on the core density map are primarily concentrated near Lujing Village to the north, the Tianhou Palace Scenic Area to the northeast, and Tangkeng Village to the southwest. The area surrounding the site is a low-density zone with scarce residential amenities and recreational facilities, and the level of development is relatively low, resulting in a mismatch between demand and available services. (Fig.3-10 left)

As shown in the distribution patterns of different sectors on the right side of Fig.3-10, existing hotel and dining facilities are distributed along the northern and southern sections of Seaport Avenue and the canal within the site, with a concentration in Nanheng Village. However,

there is a lack of integration with the park's supporting facilities, such as commercial retail and leisure and entertainment facilities. Existing retail establishments form a sparse, strip-like distribution primarily along the southwestern section of South Ring Road and the northern side of the village, while leisure and entertainment facilities are clearly concentrated in the area centered around the Nansha Tianhou Temple and the Coastal Park. The site's periphery lacks secondary destinations and leisure activity hubs capable of accommodating overflowing visitor traffic.

Based on the current distribution of facilities, it is evident that residential amenities are concentrated on the northern side of the site, while recreational and entertainment facilities are clustered in the eastern park area. The southern side is designated for a research and innovation cluster, leaving the central portion of the site currently undeveloped. In future urban regeneration efforts, this area has the potential to serve as a space for expanding residential amenities, developing a diverse and distinctive tourism destination, and extending services to the research park.

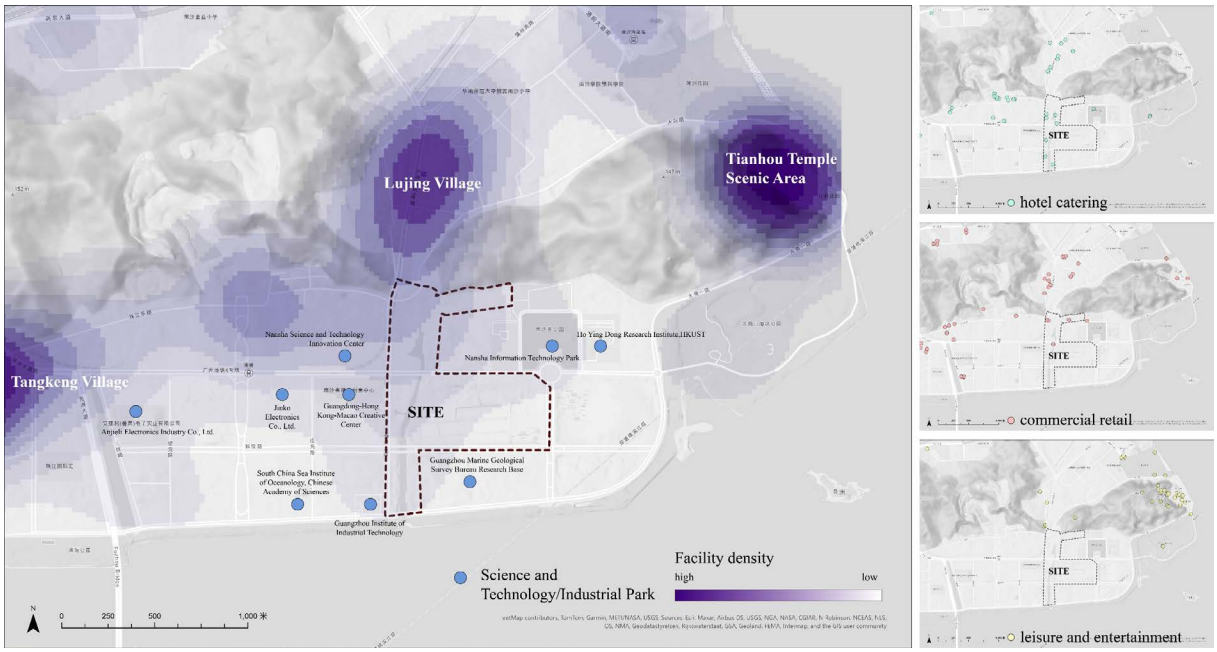


Fig.3-10 Analysis of Nearby Points of Interest

(Base map source: ArcGIS; POI data source: Baidu Maps 2024 POI data)

3.3.3 Analysis of Rainfall and Flood Conditions

Guangzhou is located on the subtropical coast and has a marine subtropical climate, with

an average annual temperature ranging from 21.7°C to 23.1°C. Precipitation is abundant, with an average annual rainfall of 1,923 millimeters and an average of 149 rainy days per year. In 2023, Guangzhou's annual average temperature was 23.7°C, 0.4°C higher than the average of the past decade; annual rainfall was 1,933.6 millimeters, 0.5% higher than the average of the past decade [79]. According to the *2024 Nansha Climate Monitoring Bulletin*[80], temperatures in Nansha District have continued to rise over the past decade (Fig.3-11), and annual precipitation has been nearly 30% higher than the average for the past decade (Fig.3-12). Precipitation in Nansha Subdistrict, where the site is located, has exceeded 1,800 millimeters, primarily due to heavy rain and strong winds caused by severe convective weather.

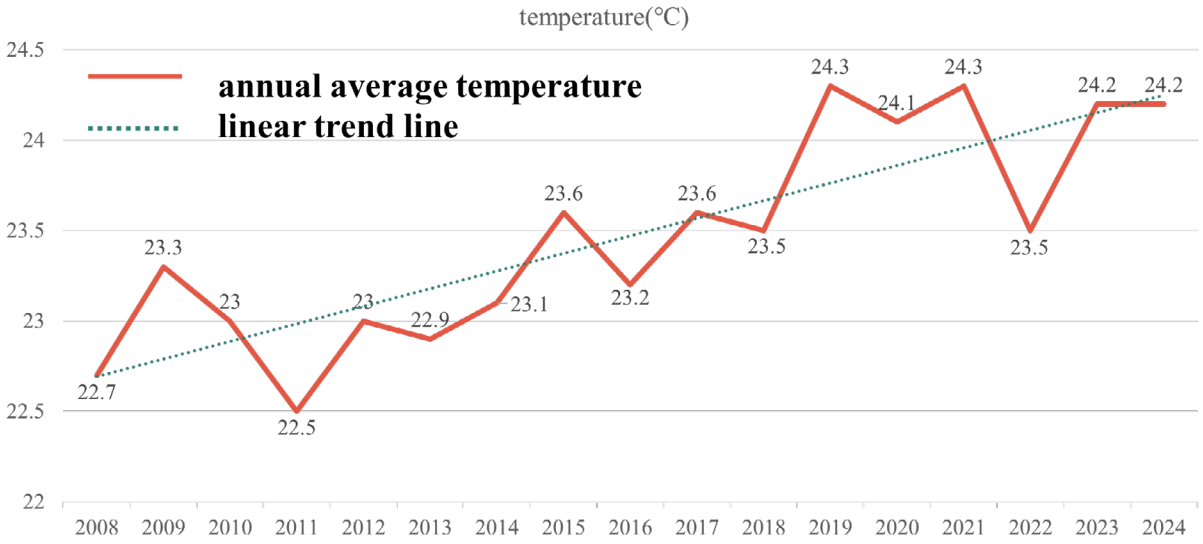


Fig.3-11 Chart of Annual Average Temperature Changes in Nansha District, 2008–2024

(Source: *2024 Nansha Climate Monitoring Bulletin*)

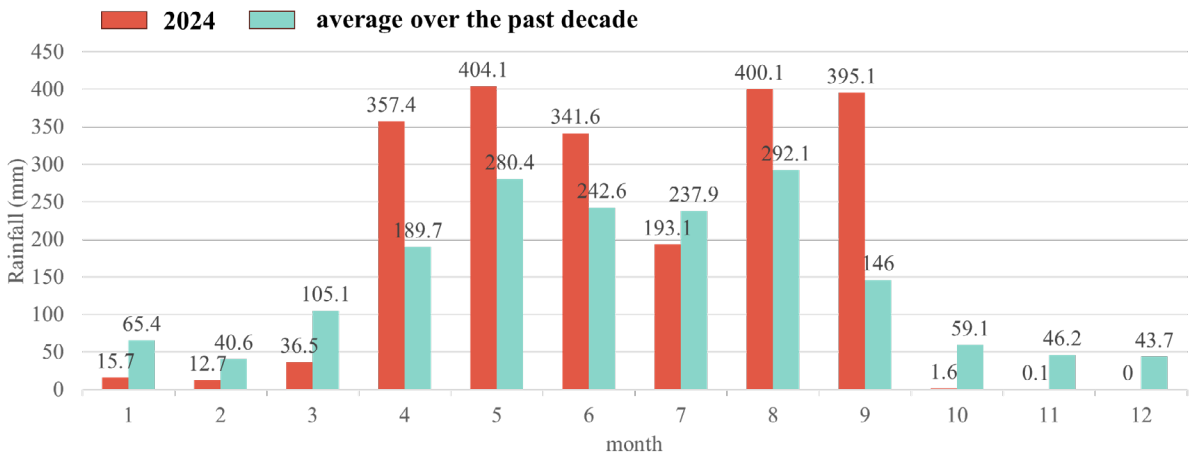


Fig.3-12 Chart Comparing Monthly Precipitation in Nansha District in 2024 with the 10-Year Average

(Source: 2024 Nansha Climate Monitoring Bulletin)

Nanheng Canal is 1,120 meters long, with a watershed area of 0.0336 square kilometers and a surface runoff rate of 50 cubic meters per second (2015 data). A floodgate is located at the point where the Nanheng Canal connects with the Pearl River on its southern side. Super Dike Park is situated along the Pearl River, and the flood control project is designed to withstand a 200-year flood event, with a crest elevation of 8.39 meters (Pearl River base elevation). According to the *Chronicle of Nansha Subdistrict*, Nanheng Village has historically suffered from flood disasters caused by seawater intrusion during heavy rains (such as the severe typhoon strike in 1958 and the 1983 typhoon that caused flooding and submerged the entire village). Field surveys and interviews indicate that since the construction of the Super Dike and the Nanheng Sluice Gate, backwater from the outer river and storm surge inundation have been effectively prevented. However, because the overall construction elevation of Nanheng Village is generally lower than the land used for urban development in the surrounding areas, micro-topographic depressions tend to accumulate water; On the other hand, near-natural water bodies such as farmland surrounding the village have gradually dried up and become disconnected from one another, leading to a significant decline in upstream retention and infiltration as well as local water storage capacity. Furthermore, during periods of high water levels in the Pearl River or storm surges, the opening of the sluice gate at the estuary is often restricted, resulting in increasingly unfavorable drainage conditions. Consequently, short-duration heavy rainfall is more likely to cause waterlogging. The site's soil consists of red-brown soil with a medium

texture, which typically exhibits moderate permeability and water retention properties. However, due to urban development, most of the ground surface has been paved, resulting in shorter runoff times and longer drainage times during heavy rainfall. Consequently, the site's comprehensive water safety profile has been assessed as low[81], with the current focus shifting from "external flood defense" to "internal flooding management." The primary shortcomings in stormwater safety lie in inadequate internal drainage and flood control measures, as well as insufficient storage capacity in blue-green spaces. (Fig.3-13)

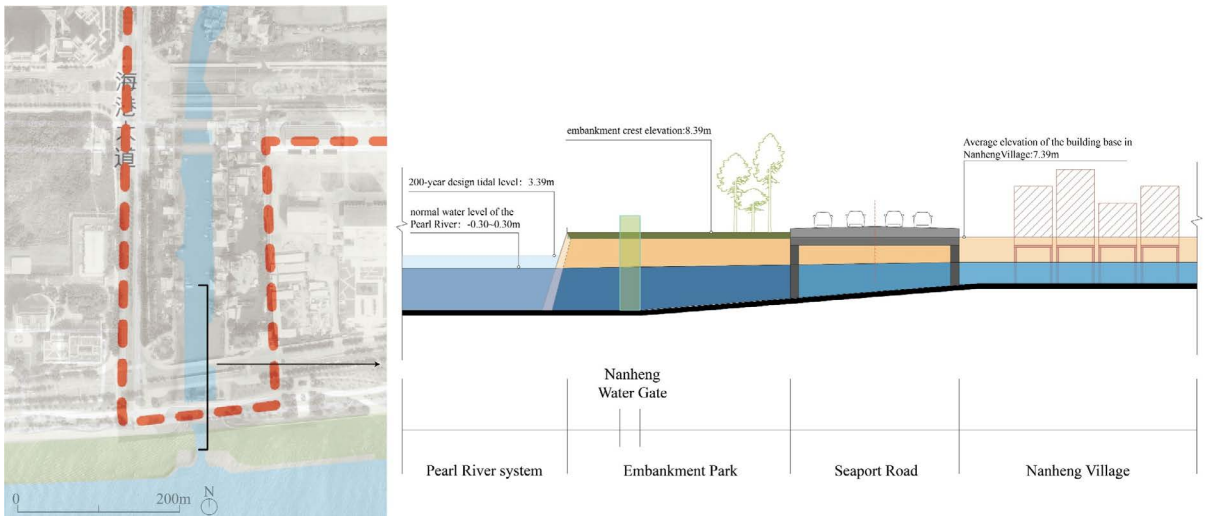


Fig.3-13 Vertical Profile of the Nanheng Canal Estuary

(Mapped using Google Maps as the base layer)

3.3.4 Analysis of Natural Factors

The southern side of this area borders the Pearl River estuary and connects to Super Dike Park, offering a view of the vast waters of the Pearl River and excellent scenic vistas. The eastern side of the site currently consists of a continuous green belt formed by farmland and orchards, with a few rural experiential activities taking place within it. To the north, Guanyin Mountain and Dajiao Mountain form a natural green core, while the western side borders the urban built-up area. Although the Super Dike Park, the surrounding mountains, and the farmland and orchards are all large-scale landscape nodes of high quality, there is a lack of stable ecological corridors and continuous blue-green connections between them. Nanheng Village, which serves as the link between these three elements, is severed by urban roads. This results in a "close yet unreachable" situation due to boundary friction and poor accessibility,

preventing the formation of an interconnected ecological-landscape system. (Fig.3-14)



Fig.3-14 Analysis of Natural Factors

(Source: Created based on an ArcGIS base map analysis)

3.3.5 Building Condition Assessment

Nanheng Village currently has approximately 765 residential buildings on collective land, with a total floor area of approximately 179,400 square meters, as well as 14 collective-owned properties totaling approximately 3,200 square meters; On state-owned land, there are approximately 289 residential buildings, totaling about 95,800 square meters; there are also 31 commercial, office, industrial, warehouse, and other buildings, totaling approximately 102,600 square meters (Source: Guangzhou Nansha New Area Planning and Design Institute). The built environment is characterized primarily by high-density, small-scale residential buildings constructed across multiple eras.

Most building quality issues stem from the impact of the existing topography and drainage systems on the safety and usability of the ground floors of residential buildings. According to reports from villagers in Nanheng Village, the ground floor levels of many buildings are lower than the road surface elevation, making them prone to flooding during periods of heavy convective rain or typhoons[82]. The majority of the buildings are constructed primarily of outdated brick-concrete structures or simplified frame structures, with their envelope systems

generally showing signs of aging; these older homes are prone to water seepage, which reduces living comfort.

Due to the wide range of construction dates in Nanheng Village, buildings with varying structural types and construction standards are intermingled throughout the village. Consequently, spatial issues are distributed across multiple locations, making it difficult to identify areas in need of regeneration. Based on the results of satellite imagery and site surveys, the buildings along both banks of the Nanheng Canal are broadly classified into two structural categories: masonry-concrete structures and concrete frame structures. The concrete frame structures are further subdivided according to function into residential buildings, industrial buildings, single-story commercial buildings, residential buildings with docks, and residential buildings with ground floors below ground level. As shown in Fig.3-15, the southern section of the canal is currently dominated by single-story masonry-concrete residential buildings, most of which are abandoned and uninhabited. In the future, demolition of these structures could be considered to free up land along the canal for new urban development. In contrast, the building types in the middle and northern sections of the canal are more mixed. For buildings adjacent to the canal, it is recommended to retain the structural framework while repurposing their functions to accommodate more vibrant and high-value-added uses. The residential buildings at the northernmost end, at the foot of the hill, are mostly newly constructed concrete frame structures; it is recommended that these be retained, with a focus on the regeneration of small-scale public spaces. Overall, the demolition, renovation, and preservation of existing buildings should adhere to the principle of “eliminating risks while ensuring the continuity of Nanheng Village’s collective memory.”



Fig.3-15 Identification of Building Condition Issues and Recommendations for Remediation

(Source: Created based on an ArcGIS base map analysis)

3.4 Chapter Summary

Based on research into the historical background, master plans, and current status of Nanheng Village, it is evident that, as a traditional village with a unique fishing-village culture and a spatial structure characterized by “life on the water,” Nanheng Village currently lies at a critical juncture of urban expansion and industrial upgrading in Nansha District, presenting both opportunities and challenges for its development.

The core issues facing the site center on the rapid erosion of its cultural context and traditional fabrics caused by urbanization, which has diminished the positive role of blue and green spaces in climate adaptation and ecological conservation.

Specifically, this manifests as:

1. The large-scale road network of the new town conflicts with the existing alleyway structure of the village, resulting in poor transportation connectivity.
2. The uneven distribution of public service facilities in the surrounding area has created an area of service deficiency on the site. How to establish coordinated and integrated

regional facilities should be a key consideration in future functional planning.

3. From an ecological and resilience perspective, while external flood control projects have effectively mitigated river flooding, the risk of stormwater and floodwater inundation within the village is becoming increasingly prominent due to low-lying topography, surface hardening, and reduced water retention capacity.
4. Surrounding ecological landscape nodes are also isolated due to a lack of connecting corridors. The varying quality of buildings and their generally weak resilience to natural disasters further complicate the regeneration process.

The issues outlined above primarily reveal the interactive relationship between external systems and the village, providing key insights for subsequent design. Building on this foundation, the next chapter will analyze the urban form, local memory, and spatial resilience within the design site. Examining issues and identifying values from an internal perspective, it will provide a dual basis for the development of subsequent design strategies.

Chapter 4 Morphology Types and Assemblage Analysis

Han Dongqing believes that the urban fabric not only reflects the physical space but also resonates with factors of local identity, such as cultural customs and lifestyle habits, while also embodying adaptation to the regional climate; the analysis of the causes of its form is intended to reveal the underlying reasons and driving forces behind it[83]. In response to the research question raised in Section 1.2 (namely, How can we preserve and sustain the unique character of Nanheng Village by redefining the historical and spatial relationships of the fishing-village, thereby creating a water-village community that coexists harmoniously with the surrounding areas?), and based on a survey of basic site information, this chapter constructs an analytical framework from the perspective of urban morphology. Within this framework, the analysis of morphological types and assemblages will address the following questions: How is urban morphology identified (physical space)? Why are these spatial forms preserved over the long term (sense of local identity)? And how do urban assemblages adaptively evolve under new natural and urbanization conditions (environmental adaptation)? Based on this, the analysis is conducted across three interrelated dimensions—physical space, sense of place, and environmental adaptation—to inform subsequent strategies for urban regeneration.

First, the urban morphology examines the existing spatial structure and the prototypical characteristics of the fishing-village community surrounding Nanheng Village across three scales—the urban, the neighborhood, and the building complex. It identifies the core features that distinguish Nanheng Village from ordinary urban communities, thereby providing a foundational basis for the layout of neighborhoods and the form of building complexes in the master plan and urban design. Second, the extraction of local memories is conducted through questionnaires and semi-structured interviews. This is not a sociological survey, but rather an effort to identify the connections between residents' memories, daily lifestyles, and specific spatial contexts, thereby supplementing the cultural significance that is difficult to convey through morphology alone. Finally, the resilience analysis of spatial morphologies examines the adaptability of Nanheng Village's current morphology—under natural environmental constraints such as flooding—from two perspectives: the road network and the built fabric. The

analysis focuses on how the existing morphology can be sustainably maintained within the context of urban regeneration, thereby determining which spatial characteristics should be preserved and which high-risk areas should be renovated. (Table 4-1)

Table 4-1 Design Analysis Summary

Analytical Dimension	Methodological Approach	Corresponding Research Sub-question and Design Task
Urban Morphological Mapping	Morphological mapping across the city, block, and building-combination scales	Sub-question 1, Master Planning / Urban Design Assignment
Extraction of Local Memory	Questionnaire survey and semi-structured interviews	Sub-question 2, Site-specific design tasks
Resilience Analysis of Spatial Form	Resilience analysis of road network structure and building morphological fabrics	Sub-question 3, Urban design and site-specific design tasks

4.1 A Multiscale Mapping of the Morphology of Fishing Villages

In his study of urban morphology, Saverio Muratori defined four scales of classification: interior design, architecture, urban planning, and regional planning [30, 84]. Drawing on this classification framework and taking into account the specific conditions of the study site, this paper's mapping of urban morphology divides the research scale into three levels: the identification of settlement types at the urban scale, the identification of characteristic areas at the neighborhood scale, and the analysis of distinctive building complex types at the architectural complex scale. By decoding the space and identifying its "fishing-village prototype"—which distinguishes it from ordinary urban communities—we can clarify which morphological elements serve as the core carriers of identity, thereby avoiding a mere symbolic renovation.

The map data sources are divided into three parts: Data on the historical water town landscape of the Pearl River Delta comes from an open map database established by the Max Planck Institute for the History of Science and the Department of History at Shanghai Jiao Tong

University[85]. This database is based on the highest level of technical support available in China from the late Qing Dynasty to the Republic of China period (1903–1948), depicting the geographic information of that time; it has been digitized and georeferenced; Other historical and contemporary satellite data are sourced from Google Earth, with geographic information current as of 2024; building outline data for Nanheng Village is derived from publicly available information from the Nansha New Area Planning Institute.

4.1.1 Analysis of Settlement Types

In terms of the spatial scale for identifying settlement types, the study first extracted and identified settlement characteristics on a larger scale based on the historical water town patterns of the Pearl River Delta. Subsequently, a 1 km × 1.4 km grid was selected from historical maps for analysis. The study area includes the canals of Nanheng Village and the buildings along their banks, the original settlement sites at the foot of the mountains, and the farmland areas that are inseparable from the villages.

As shown in the analysis map of the historical water town landscape (Fig.4-1), the site is located near the Pearl River Estuary, where a dense network of intertwining waterways, islands, and riverbanks formed by estuarine alluvial deposits creates a network-like landscape pattern, exhibiting a typical parallel, multi-layered structure (estuary waters—a hierarchical water network and farmland—hills and settlements).

On a macro scale (Fig.4-1 left), the Pearl River Estuary covers a vast area; these expansive waters provide a crucial foundation for the circulation of resources in the region and serve as the dominant element of the overall landscape pattern. Between the estuary and the settlements lies a dense network of hierarchical waterways and canals. These hierarchical water systems facilitate the irrigation of farmland and divide the fields into a grid-like pattern. Villages are primarily embedded between the mountains and hills and the water bodies, distributed in linear or clustered patterns along ponds and canals, and are closely linked to the farmland.

At the mesoscale (Fig.4-1 right), the site selection system for Nanheng Village follows the traditional settlement principle of “living by the water and deriving sustenance from it.” The village is situated at the junction of canals and farmland, which shields it from direct tidal

impacts of the Pearl River while facilitating irrigation and daily water use. The settlement is laid out along waterways and roads, exhibiting a typical linear structure. Farmland is distributed around the village, forming an organic integration with the ponds.



Fig.4-1 Historical layout of water towns: macro scale (left), meso scale (right)

(Source of the base map: https://chmap.mpiwg-berlin.mpg.de/lgtu-new/map.html)

An analysis of the historical layout of water towns reveals that Nanheng Village was historically a typical linear waterside settlement; however, this linear morphology faces disruption, fragmentation, and reorganization due to the intervention of new urban development. There are two primary processes through which rural settlements integrate into large cities: assimilation and self-organization[86]. In the process of mapping the history of Nanheng Village, these two processes—assimilation and self-organization—coexist. On the one hand, driven by higher-level planning, agricultural land is being converted, and new communities are being developed in the surrounding areas; on the other hand, Nanheng Village itself continues to undergo self-regeneration and development. (Fig.4-2)

In 2007, the spatial morphology of Nanheng Village centered on agricultural land, with farm fields, ponds, and traditional settlements forming a dense production network. While the southern part of the village largely retained a relatively traditional linear settlement structure centered around canals, the northern part evolved into a clustered settlement structure centered around ponds due to the silting up of canals and the expansion of tidal flats caused by the east-west road cutting through the area, resulting in a divergence between the northern and southern parts of the village.

From 2015 to 2024, urban road construction gave rise to a ring and grid-based transportation system. As urban roads repeatedly bisected the canals, they disrupted the original evolutionary trend of the village's north-south longitudinal development. Settlements began to expand toward the village periphery and transportation nodes, filling in available land wherever possible. Early simple low-rise structures were replaced by multi-story buildings. These new structures are relatively distant from the canals and the village's main roads, resulting in a flexible yet disorderly spatial layout. At the same time, self-organization along the urban road on the western side of the village gave rise to a mixed-use land area integrating commercial, residential, and service functions (known as "Seafood Street"). The village's spatial functions expanded from traditional fishing and agricultural production to a diversified service sector, reflecting a transition from a traditional rural setting to a modern urban space.

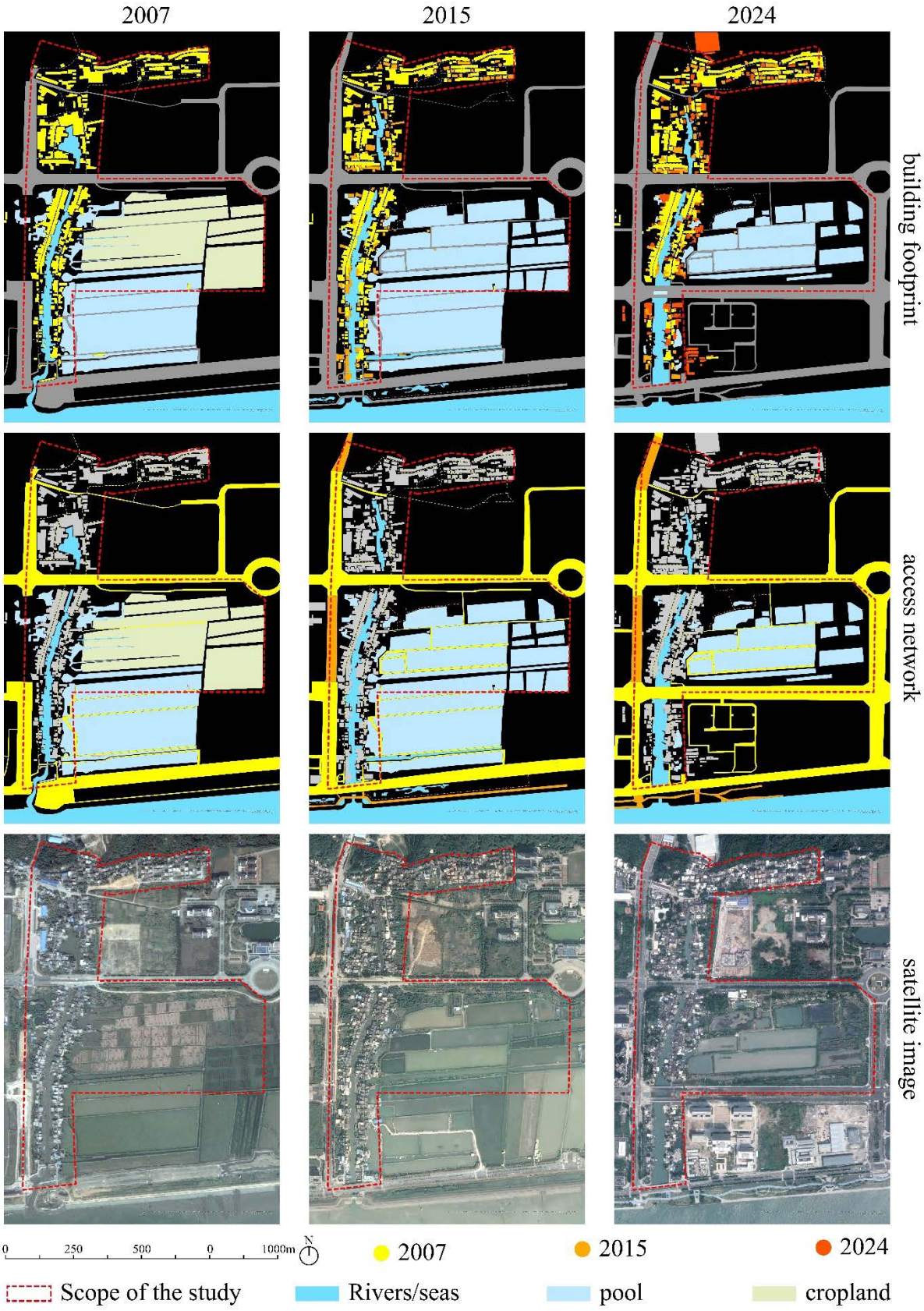


Fig.4-2 Morphological Changes Within the Study Area of Nanheng Village

(Satellite image source: Google Earth)

4.1.2 Feature Region Analysis

Based on field research and analysis of the actual conditions, seven feature types and three feature points were identified according to shared geographical, natural, and sociological features. These include: hills, canal, ponds, and green spaces, urban roads, commercial clusters, aggregation Area of Specialty Buildings (stilt houses), residential agglomerations (ordinary multi-story residential houses), and three feature type points (two Dragon Mother Temples and a feng shui banyan tree). These types encompass elements at the Nanheng village periphery where it meets the urban area, as well as the arrangement of significant building clusters within the village. (Fig.4-3)

Type A hills are located in the northern part of Nanheng Village, creating a distinct elevation difference. The hills connect to the largest mountain in Nansha District (Huangshanlu) to the north. They feature rich vegetation and serve as an ecological barrier for the village. This hill is called Guanyin Hill. According to legend, there is a giant rock at the foot of Guanyin Hill called Guanyin Stone, which is said to have healing properties. The villagers regarded it as divine and thus built a temple at the foot of the hill [14](which explains the origin of the Guanyin Temple in Type I). At the foot of the hills, parallel to the mountain range, lies a Type G residential settlement, considered the village's founding site. However, the appearance of industrial facilities and other structures on the hills has damaged the natural landscape and structural stability of the area. Furthermore, the lack of convenient connecting footpaths between the hills and other core areas of the village limits its potential as a recreational space.

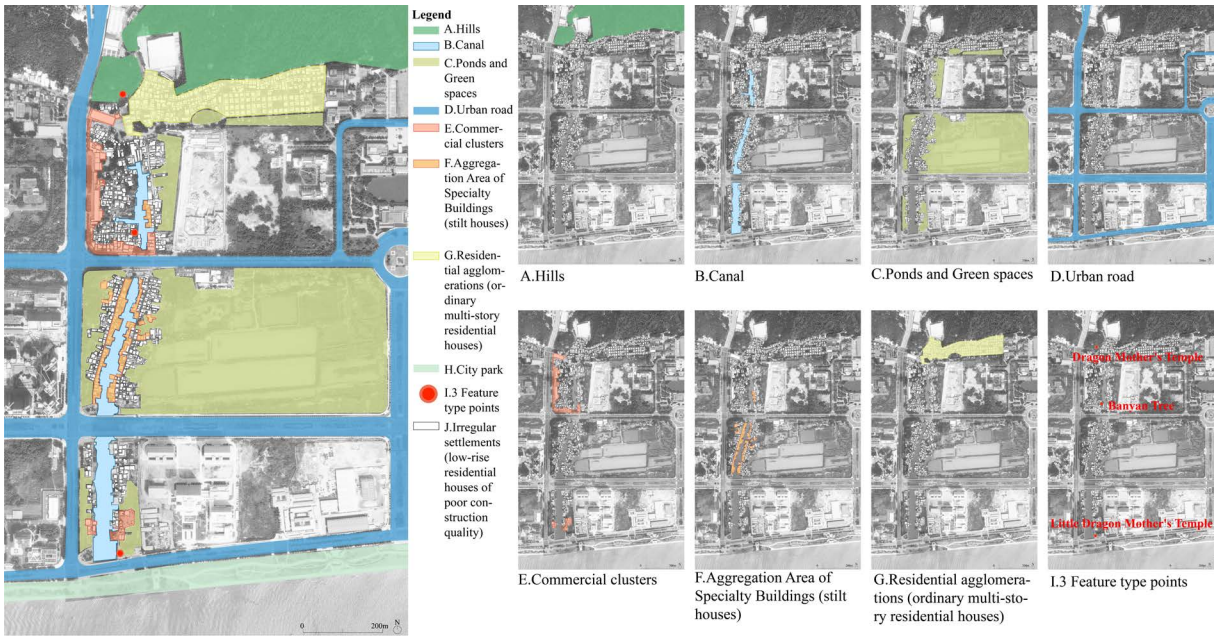
Type B canals are distributed linearly, running through the village's main functional areas and closely intertwined with most of the Type F architectural complexes (stilt houses). This not only reflects the villagers' wisdom in adapting to the natural environment but also serves as a significant manifestation of the village's history and culture. The canal ranges in width from 9 to 50 meters and is connected to the Pearl River via a sluice gate on the southern side of the village. In recent years, due to the disruption caused by urban road construction and changes in production methods, the canal has been divided into three sections: the northern section is no longer navigable, while the central and southern sections remain navigable. As the number of

fishing boats moored along the riverbanks has gradually decreased, some private residences have been converted into restaurants, and a few riverfront platforms have consequently been opened to the public. However, because the stilted houses along the riverbanks are generally dilapidated and some structures pose safety hazards, the continuity of the overall landscape has been disrupted.

Type C ponds and green spaces are primarily located in the northeastern and southern parts of the village. The green spaces in the northeast consist of vegetable gardens, while the ponds in the south not only serve as rainwater retention basins but also often feature structures with platforms extending over the water, creating spaces for public dining and leisure. The green spaces near the buildings on the south side consist primarily of dense orchards, offering potential for ecotourism experiences. However, water quality is currently poor, and the paths between the green spaces are unpaved dirt trails worn down by foot traffic. These paths lack distinctiveness, and the convenience and comfort of traversing them are insufficient, limiting the vitality of the space.

Type D urban roads serve as the main thoroughfares running through Nanheng Village, playing a vital role in connecting the area with the outside world. Lined with Type E commercial buildings and some public service facilities, these roads create vibrant, mixed-use spaces. Some of the original Type E buildings were demolished, and many new, larger, elongated low-rise structures were constructed. The primary commercial functions include seafood restaurants and specialty dining establishments, which have become a key economic pillar of Nanheng Village. However, due to self-organization and unregulated expansion of commercial spaces, the quality of the renovated commercial buildings and supporting infrastructure cannot be guaranteed, thereby affecting the public accessibility and commercial efficiency of the business district.

The seven feature types and three feature points identified in Nanheng Village reflect the complexity and diversity of the village’s morphology. Combined with morphology-based planning analysis and zoning management, these can serve as a guide for optimizing the village’s layout while preserving its historical character and ecological environment, thereby enhancing spatial quality and achieving sustainable development goals.



Morphological characterization region	A.Hills	B.Canal	C.Ponds and Green spaces	D.Urban road	E.Commercial clusters	F.Aggregation Area of Specialty Buildings (stilt houses)	G.Residential agglomerations (ordinary multi-story residential houses)	I.3 Feature type points
IMAGE								

Fig.4-3 Nanheng village morphology feature region

(Source: Photo taken by the author / Adapted from Google Satellite Maps)

4.1.3 Analysis of Distinctive Architectural Complex Types

Due to the influence of the production and living functions of traditional fishing-village communities, architectural morphology and its combinations also exhibit distinct characteristics. The arrangement of traditional building facades significantly affects the openness of street spaces[87] and displays distinctive regional characteristics.

Based on Fig.4-4, the building complexes in Nanheng Village can be broadly categorized into two types: “parallel to the canal” and “perpendicular to the canal.” In the former, the main street runs parallel to the canal, while in the latter, it runs perpendicular to it. Through the combination of buildings and green spaces, as well as the differentiated organization of ground-floor facades, both types address the elevation differences relative to the riverbank and ensure flood safety, while adaptively integrating daily life into the environment.

In the “parallel to the canal” arrangement, the layout unfolds in parallel strips along the canal, with the canal, buildings, main alleyways, and green spaces arranged side by side. On

the outer side (near the water), buildings use steps, platforms, and docks to bridge the height difference with the canal surface, creating a scene where every home has its own dock. The boats of the original fishermen are moored at these docks, which are privately owned by the nearby residential buildings. In future renovations, these docks have the potential to be transformed into public waterfront spaces. On the inner side (away from the water), due to the significant elevation difference on both sides of the buildings, the ground floor is often raised to create a "double ground floor," forming an open, elevated space along the alleyway. Currently, this design leads to ground-floor flooding during high water. However, from the perspective of the street experience, this linear, multi-layered space enhances the street's diversity and charm. Therefore, transforming this disadvantage into an advantage is one of the key focuses for future design.

In the "Perpendicular to the Canal" configuration, the alley runs perpendicular to the canal, with buildings arranged parallel to it on both sides, their primary facades facing the alley. Multiple smaller alleys branch off inward from the main alley, with buildings and courtyards nestled among them. This type places greater emphasis on neighborhood life and the integration of small-scale green spaces, creating a stronger sense of spatial enclosure. In terms of functional allocation, it is better suited for spaces that prioritize quiet or privacy. At the same time, the main alley's line of sight converges on the water's surface at the near end of the street, creating a "drawing the scenery into the alley" experience that serves as a focal point in the design of the street and the public space at its terminus.

Overall, influenced by the traditional fishing culture and way of life in Nanheng Village, the architectural layout has evolved into two distinct types: "parallel to the canal" and "perpendicular to the canal." Through the design of ground-floor facades and the arrangement of green spaces, these layouts address the elevation differences along the riverbank and ensure flood safety. During the renovation process, the key lies in making appropriate trade-offs, preserving local characteristics, and turning disadvantages into advantages.

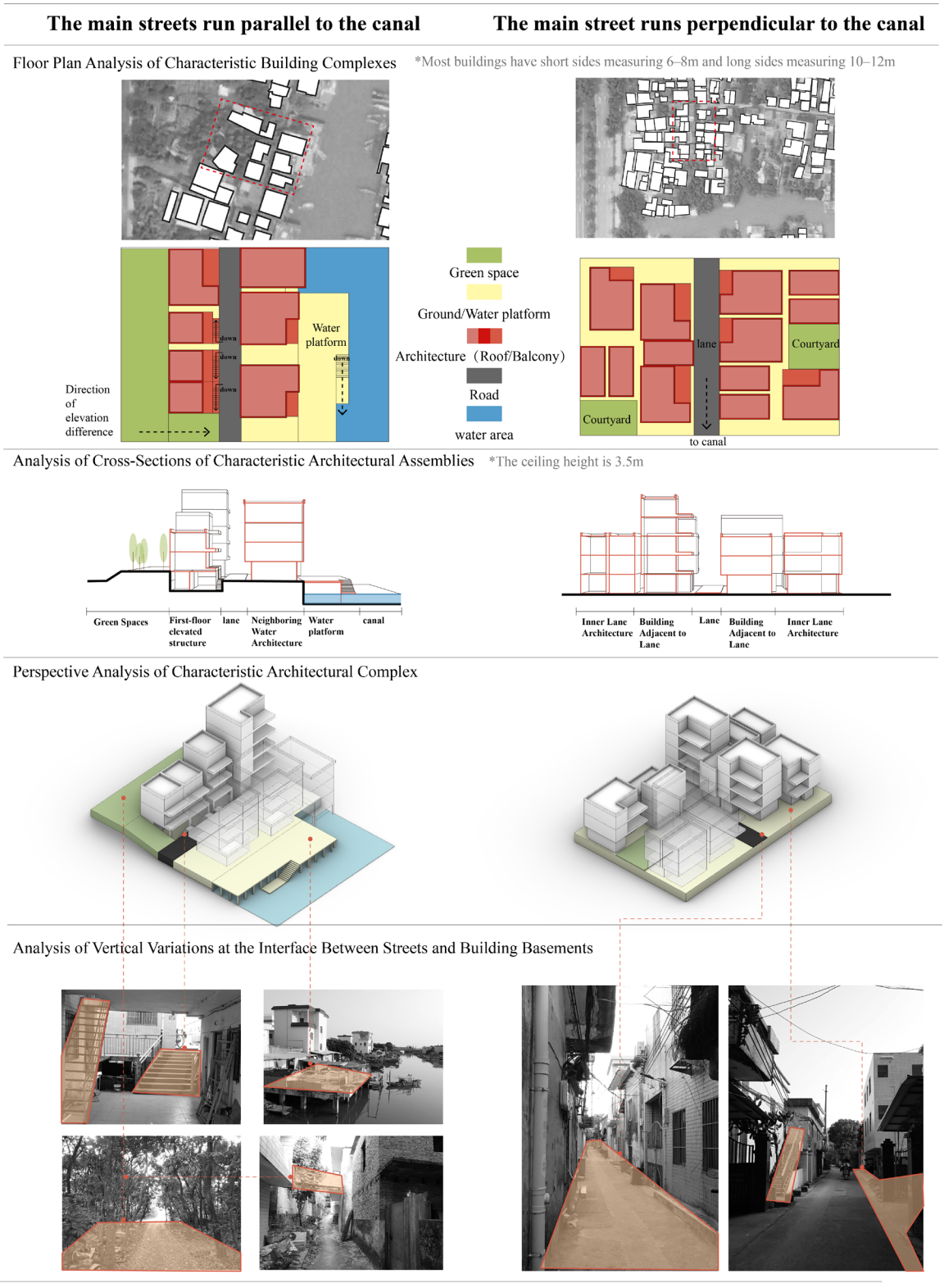


Fig.4-4 Analysis of Distinctive Architectural Complex

(Satellite image source: Google Maps; On-site photos: Taken by the author)

4.2 Identity Morphology Based on Local Memory

As a Lingnan fishing-village with a long history, the spatial morphology of Nanheng Village is shaped not only by natural geographical conditions and modes of production but is also closely intertwined with daily life, collective memory, and cultural identity. Therefore, this paper introduces the dimension of local memory. By delving deeply into the spatial memory and cultural value of Nanheng Village against the backdrop of its impending demolition, we aim to document the village's spatial characteristics, cultural symbols, and the collective memories they embody. We seek to explore how, within the context of urban regeneration, the history of Nanheng Village can be preserved through innovative approaches, thereby fulfilling residents' aspirations for the village's future.

4.2.1 Survey Participants and Sample Characteristics

Given that Nanheng Village is currently in a special phase of demolition, conducting a comprehensive resident survey faces objective operational constraints. Therefore, this study employs a combined approach of questionnaire surveys and semi-structured interviews to enhance the study's reliability and explanatory power.

The questionnaire was modeled after the one used in the case study of Honggang Village in Nansha in Chapter 2, with additions and omissions made based on the actual conditions of the site. The content primarily covered respondents' basic information, preferences regarding activity venues, daily recreational activities, perceptions of existing issues, demands for the renovation of waterfront spaces, and willingness to preserve distinctive features. A total of 102 valid questionnaires were collected. Among the respondents, 87% were homeowners, and 13% were renters, all of whom were long-term residents of Nanheng Village (Fig.4-5). The questionnaire results were used for descriptive analysis to identify high-frequency responses and key issues. Subsequently, interviews were conducted to understand the reasons behind these high-frequency responses and to provide more detailed narratives.

The interviews were conducted based on the results of the questionnaire, with seven participants selected from different age groups and with varying lengths of familiarity with Nanheng Village. This approach reflects the differences in people's memories of Nanheng

Village across time. The interviews reveal a multifaceted sense of place that encompasses not only the memories of residents' daily lives and livelihoods but also the evolving perceptions of leisure and landscape that have emerged during the urbanization process.

4.2.2 Questionnaire-Based Assessment of Perceived Morphological Memory

In a questionnaire survey on activity needs, respondents ranked waterfront spaces, parks and plazas, and sports facilities as their top three priorities. Residents of Nanheng Village tend to prefer public spaces that are open, inviting, and environmentally conscious, with waterfront spaces being particularly favored (50%). Regarding preferences for daily recreational activities, chatting and drinking tea, as well as playing cards or mahjong, ranked in the top three. This indicates that the village's public life is strongly characterized by a familiar-acquaintance social structure, and respondents expressed a higher level of interest in multifunctional public spaces capable of hosting diverse activities and fulfilling social needs(Fig.4-6).

In response to the question "What were the main problems in the original village?", 71% of respondents selected "lack of public supporting facilities" as the top concern, followed by "lack of public open spaces" and "lack of cultural characteristics in residential buildings." Respondents' dissatisfaction with the village's current state focused primarily on deficiencies in the public space system and a lack of cultural expression. (Fig.4-7 left)

Regarding the question "Key Priorities for the Future Renovation of the Nanheng Waterfront Space," the percentages for "increasing public space" (55%), "incorporating cultural characteristics" (54%), and "adding public supporting facilities" (52%) were all close to one another and remained at relatively high levels. This indicates that respondents' expectations for the waterfront space are distinctly multifaceted; they hope to see a form of spatial regeneration that is rooted in local history and combines both public use and cultural exhibition functions. (Fig.4-8)

Among the "characteristic elements most in need of preservation," distinctive architectural forms accounted for 66%, the highest proportion, followed by old and notable trees, and public memory spaces (Fig.4-7 right). This indicates that the external morphology of buildings continues to play a significant role in how respondents identify village characteristics, while

natural elements—represented by old banyan trees—hold a prominent position in respondents' sense of village identity. These spaces are not merely ecological landscapes but also serve as vessels for local beliefs and collective memory.

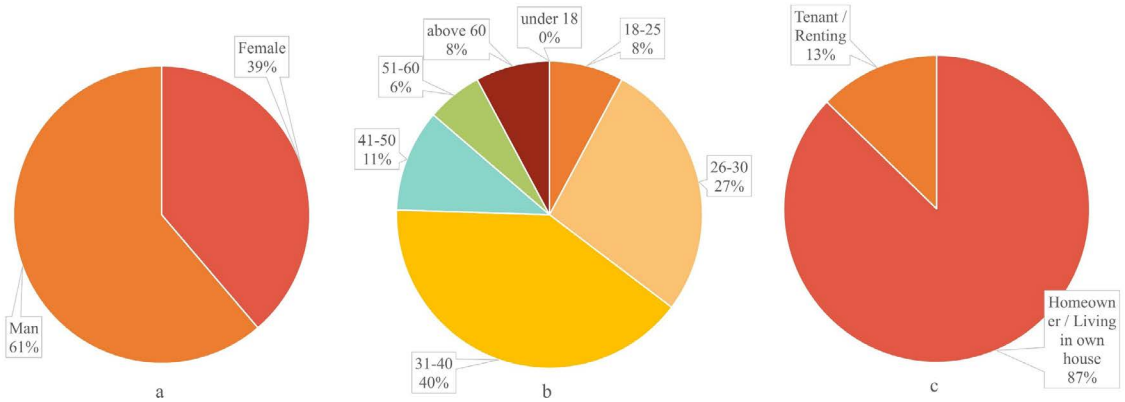


Fig.4-5 Basic Information a: Gender; b: Age Group; c: Housing Type

(Source: Created by the author)

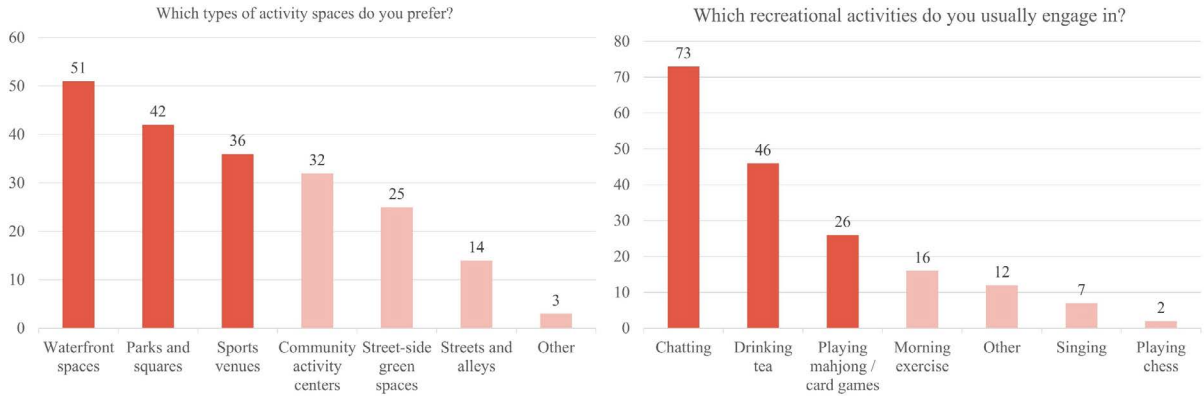


Fig.4-6 Event Requirements

(Source: Created by the author)

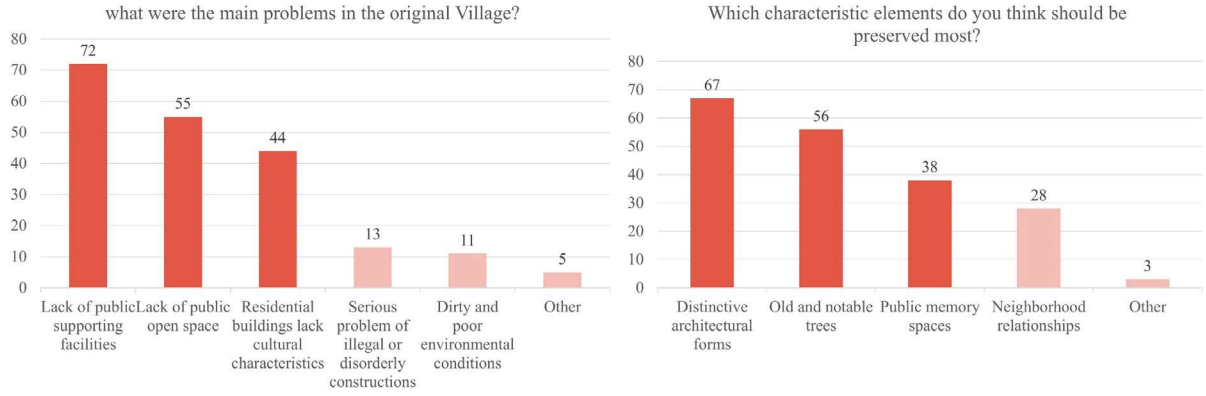


Fig.4-7 Need for comprehensive optimization and improvement

(Source: Created by the author)

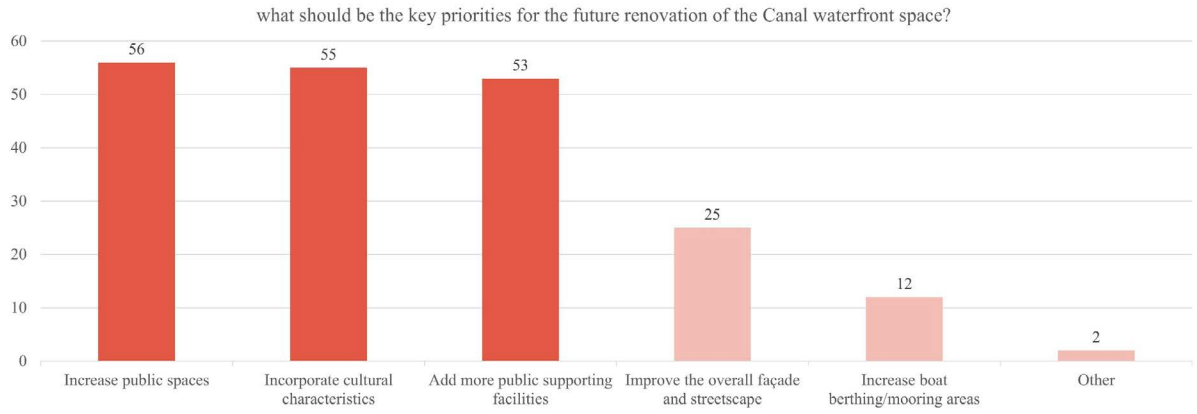


Fig.4-8 Needs for Canal Rehabilitation

(Source: Created by the author)

4.2.3 Interview-Based Analysis of Morphological Memory

Based on the general trends in respondents' spatial identity revealed by the questionnaire, the interviews further elucidated the specific sources of these identities, providing a relatively comprehensive picture of the connection between local memory and spatial morphology in Nanheng Village.

The interviews were conducted using a semi-structured approach, with the outline focusing primarily on three areas: history and memory, daily activities, and future directions for regeneration. After transcribing and organizing the interview content, the findings were summarized in Table 4-2.

Table 4-2 Summary Table of Topics Derived from Interviews

Primary Theme	Keywords	Representative Findings
Cultural Value	Canals, banyan trees, sluice gates, private piers, waterfront housing relationships, and social relations	The canal system and its associated spaces constitute the most distinctive local characteristic of Nanheng Village, serving simultaneously as spaces of production, daily life, and cultural symbolism.
Everyday Memory	Farming, fishing, dragon boat racing, production brigades, hills, schools, markets	Historical memories of Nanheng Village are primarily rooted in traditional agricultural and fishing activities, dragon boat traditions, and the everyday spaces that supported life within a settlement connected to both mountain and sea.
Spatial Perception	Insufficient public facilities, lack of sports spaces, inappropriate locations for children's facilities, and waterfront cafés as attractive destinations	Although infrastructure has improved in recent years and certain contemporary elements have been introduced, there remains a shortage of public spaces and recreational facilities that can accommodate the needs of different age groups.
Regeneration Aspirations	Waterfront amenities, greening, sports facilities, displays of fishing heritage (tools, lifestyles, etc.), and family photograph exhibitions	Future regeneration efforts should preserve the canal system and other significant memory-bearing elements while strengthening the presentation, interpretation, and public engagement of local cultural heritage.

In the interviews, canals were the most frequently mentioned spatial feature. Initially, they served merely as basic channels for transportation and access to the sea. As villagers settled in

the area, cultural activities such as dragon boat racing took place there, shaping a unique relationship between residential areas and the water. In the survey, waterfront spaces emerged as the most popular venues for activities. In addition to memories of the waterfront, farmland, and mountains were also frequently mentioned. New commercial establishments (such as restaurants and cafes) are mostly distributed along the canals and connect with the rural landscape; these all represent the continuation of historical memories within contemporary perceptions. Nanheng Village is not merely a fishing village but exhibits distinct characteristics of a mixed fishing and farming community. Therefore, the waterside and pastoral landscapes will serve as the most stable and recognizable morphological foundation for reawakening the site's memories during the urbanization process.

The appeal of local memory is not about nostalgia, but rather the hope that traditional spatial elements, through spatial translation, can be utilized, experienced, and recounted in contemporary life, thereby ensuring their continuity.

4.3 Analysis of Morphological Resilience for Adaptive Regenerations

The location and unique characteristics of Lingnan fishing-villages determine the dynamic relationship between spatial morphology and resilience. At the same time, assemblage theory views villages as assemblages composed of various heterogeneous elements; while each element maintains relative autonomy, they also form phased connections through external relationships such as road networks and spatial configurations. Therefore, this subsection explores whether these existing morphologies can continue to persist under contemporary flood risks and urban regeneration conditions, and in what ways they might be adapted. At the same time, an analysis of spatial resilience in Nanheng Village can address the lack of quantification in traditional urban morphology research, supplementing and refining space-based analyses to make the research findings more scientific and objective [52]. It should be noted that, as resilience assessment is a broad field with multiple classification methods and evaluation indicators, this section focuses solely on the research objectives of this thesis and the characteristics of the study site, analyzing aspects related to urban morphology and flood risk, without attempting a comprehensive resilience assessment.

4.3.1 Analysis of Road Network Resilience

A road network is not merely a means of traffic organization; it also serves as the fundamental framework for the formation and evolution of settlement morphology. In this paper, the resilience of a road network structure refers to the spatial characteristics of a road network system that enable it to maintain accessibility, evacuation capacity, and rescue access under conditions such as heavy rainfall, flooding, or localized road blockages. The resilience analysis of the road network structure primarily employs the Depthmap software for spatial syntax analysis and the ArcGIS software for graphical representation and flood risk overlay analysis. The analysis area extends two city blocks eastward and westward from the center of Nanheng Village to minimize the impact of boundary effects on the results. The indicators selected for the spatial syntax analysis are shown in Table 4-3.

Table 4-3 Indicators for Spatial Syntax Analysis

Indicator	**Significance in Spatial Analysis**	**Relationship to Resilience**
Connectivity	Number of directly connected streets	High value—multiple escape routes[88]
Integration	Accessibility to all nodes	High value—greater accessibility for rescue operations[89]
Intelligibility	R^2 value for the correlation between connectivity and integration	High value—stronger spatial cognition among residents[90], with an intelligibility score >0.5 being optimal [91]

As shown in Fig.4-9 (left), within the scope of the connectivity analysis, the South Ring Road exhibits the highest connectivity (connectivity score of 10). Within the internal sections of Nanheng Village, connectivity scores are mostly between 1 and 4. There are a few east-west thoroughfares, and escape routes within the village are limited and prone to dead ends. The integration analysis in Fig.4-9 (right) further indicates that the highest levels of integration are concentrated on the urban arterial roads of the outer grid network, while higher integration

values within the villages are found at points where they connect to the main roads. These areas are more conducive to evacuation in the event of flood risks. It also indicates that pedestrian and vehicular traffic in these areas converges along a few key axes; once the connection between the village and external arterial roads is blocked, the village interior will become fragmented, making detours difficult. The correlation scatter plot in Fig.4-10 analyzes the relationship between connectivity and integration (the Pearson correlation coefficient between the two is $r = 0.386$, indicating a moderately weak positive correlation; Sig. (two-tailed) = .000: $p < 0.001$, significant correlation). The R^2 of the scatter plot is approximately 0.15, indicating that local connectivity is a poor predictor of global status, has low interpretability, and suggests that residents have a weak sense of spatial awareness.

In short, the lack of redundancy and loops, coupled with a heavy reliance on single-lane roads, constitutes the primary vulnerability in the current resilience of the Nanheng Village road network and represents the key focus for future morphological improvements.

Based on the overlay analysis of the Fig.4-11 Integration model and the 2030 flood inundation risk simulation, it is evident that the intersection of Seaport Avenue and Keyuan Road represents the highest flood risk point in Nanheng Village, where the “most critical corridor” and the “most exposed water zone” partially overlap. The vulnerability of this critical corridor means that north-south connectivity would be severed during flooding, leading to a significant decline in overall accessibility and the efficiency of rescue operations, and thereby weakening the structural link between the village and surrounding areas. In subsequent urban design efforts, resilience design under stormwater conditions should be strengthened for this area.

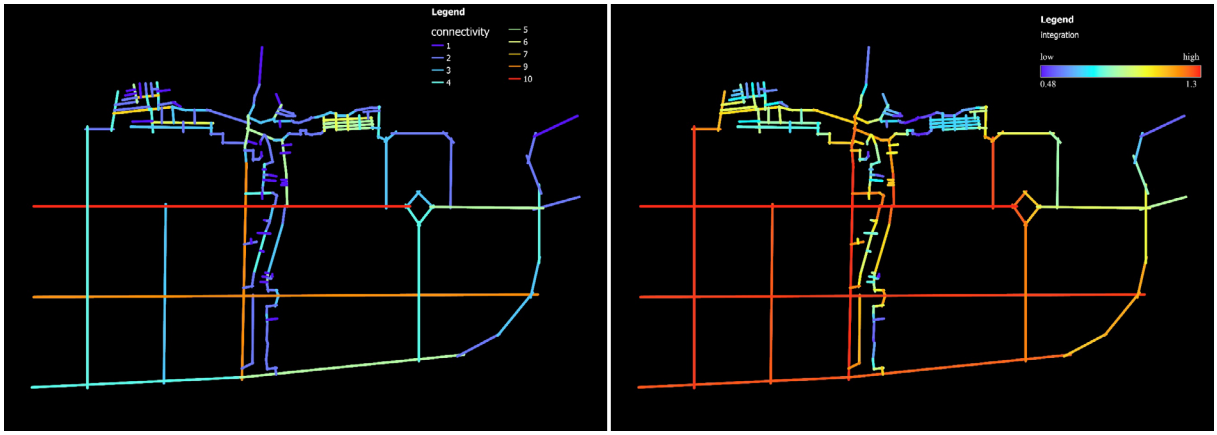


Fig.4-9 Analysis of Connectivity (left) and Integration (right) in Nanheng Village and Its Surroundings

(Source: Created by the author)

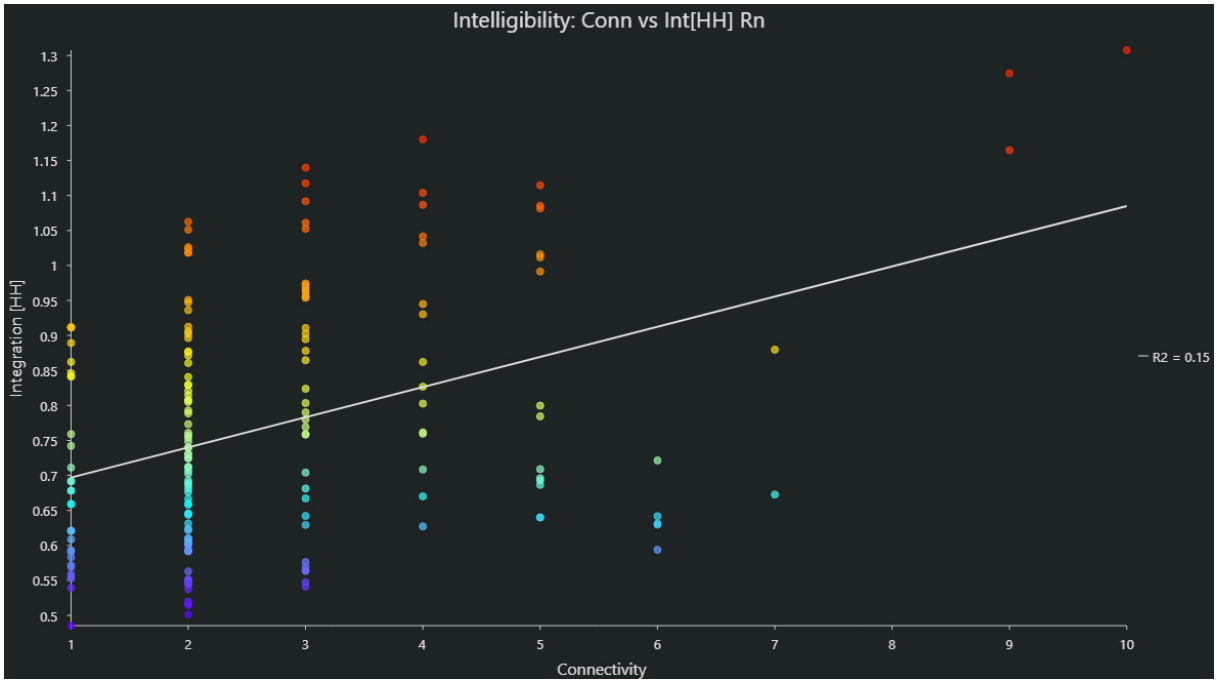


Fig.4-10 Intelligibility Analysis

(Source: Created by the author)



Fig.4-11 Integration and Overlay Analysis with 2030 Flood Inundation Risk Simulations

(Base map source: Google Maps; Flood simulation data source: IPCC 2021 model https://coastal.climatecentral.org/)

4.3.2 Analysis of the Resilience of Building Fabric

The architectural morphology, functions, and surface characteristics within the village distinguish differences in flood resilience and recovery capacity among various sub-areas from a more micro-level and specific perspective, complementing the resilience analysis of the road network structure discussed in the previous subsection. In this paper, architectural texture resilience refers to the adaptability of microspatial textures—such as ground-floor interfaces, alleyway widths, mixed-use development, and surface permeability—under conditions of urban regeneration and stormwater risk. The scope of the building fabric resilience analysis was limited to the built-up area of Nanheng Village east of Seaport Avenue (within the red line in Fig.4-12). This area represents the most concentrated zone of Nanheng Village's traditional settlement morphology and reflects the micro-level adaptive relationship between the village's form and the natural environment. From a vast array of resilience indicators, we selected operational indicators with strong relevance to the research topic for analysis [92, 93, 94, 95, 96], and

employed equal weighting of indicators to ensure the transparency and reproducibility of the study[97].

The analysis results show that the comprehensive resilience value is 34.81%. Although this is generally at a low-to-medium level, an analysis of the individual metrics reveals that both the evacuation safety value and ecological regulation capacity within the study area exceed 45%. The specific factors affecting the resilience of the built environment lie in the flood prevention capacity of buildings and the diversity of their functions. Therefore, in subsequent designs, increasing the proportion of elevated ground floors and incorporating mixed-use functions into the site's functional layout will not only enhance the vitality of the area but also serve as an effective strategy for improving the resilience of Nanheng Village. (Table 4-4)

At the same time, as shown in Fig.4-12, most of the land with strong ecological regulation capacity consists of water bodies and farmland, while the roads in built-up village areas consist of paved surfaces, which increases ecological vulnerability. In future designs, the combined implementation of permeable design and rain gardens could be considered to enhance overall ecological regulation capacity.

Table 4-4 Summary Chart of Resilience Analysis of Building Fabrics

Resilience Dimension	**Morphological Interpretation**	**Quantitative Indicator**	**Description**	**Data Source**	**Value**
Flood Prevention Capacity	Degree to which ground-floor interfaces are adapted to flood conditions	Percentage of buildings with raised first floors	Percentage of buildings with raised first floors	2024 Vector File of Basic Information for Nanheng Village	19.42 %
Evacuation Safety	The Impact of Building Spacing and Alleyway Cross-Sections on	Percentage of streets with an effective width of ≥2	Meeting the two-person parallel width requirement is the threshold for	Nanheng Village Basic Information Vector File (2024); Baidu	70.65 %

Resilience Dimension	Morphological Interpretation	Quantitative Indicator	Description	Data Source	Value
	Evacuation and Pedestrian Flow Capacity	m	efficient evacuation during a disaster.	Maps Road Information (2024)	
Emergency Functionality	Mixed-Use Development and Spatial Resilience	Percentage of mixed-use buildings (%)	A mixed-use commercial and residential building that can be converted into an emergency shelter or supply distribution center during disasters	2024 Public Notice of the Basic Data Survey for Nanheng Village	4.09%
Ecological Regulation	The Adaptability of Land Surface Composition to Hydrological Regulation	Percentage of Non-Impervious Surfaces (%)	Non-impervious surfaces directly enhance stormwater infiltration and reduce peak runoff.	Sun Genyun. China University of Petroleum (East China). China Multi-Temporal Impervious Surface Data (CAIS). 2026 (Fig.4-12)	45.10 %

Resilience Dimension	Morphological Interpretation	Quantitative Indicator	Description	Data Source	Value
Equally Weighted Composite Resilience value		Normalized arithmetic mean	Equally weighted index		34.81 %



Fig.4-12 Analysis of Non-Impervious Surfaces Within the Built-Up Area on Both Banks of the Nanheng Canal

(Mapping and analysis based on ArcGIS map data and Sentinel-2 satellite data)

4.4 Chapter Summary

This chapter establishes a design analysis framework for Nanheng Village based on urban morphology. The analysis is conducted from three perspectives: the identification of morphological prototypes, the interpretation of local identity, and an adaptive analysis. The findings are then translated into corresponding design guidelines, laying the groundwork for

harmonizing local characteristics with regional development in the Nansha Bay area—where Nanheng Village is located—against the backdrop of urban regeneration. (Table 4-5)

Table 4-5 Design Analysis Summary

Analytical Content	**Analytical Method**	**Key Findings**	**Main Design Implications**
Urban Morphological Mapping	Analysis of Settlement Types	The morphology of linear waterside settlements during urbanization involves a dual process of integration and self-organization.	Capturing the distinctive character of settlements on a macro scale, while ensuring seamless integration with new urban development
	Feature Region Analysis	The Formation of 7 Feature Types and 3 Types of Feature Points	Guide the design and management of zoning to preserve the historic character and ecological environment
	Analysis of Distinctive Architectural Complex Types	"Parallel to the canal" and "perpendicular to the canal"	A yardstick for weighing demolition against renovation on a micro scale, preserving distinctive features and turning disadvantages into advantages
Extraction of Local Memory	Survey + Semi-structured interview	Descriptive Analysis of Data from 102 Questionnaires Summary of Key Themes from 7 Interviews	The Need for Diverse Public Spaces The revitalization of waterfront areas should serve both public use and

Analytical Content	Analytical Method	Key Findings	Main Design Implications
			cultural exhibition purposes. The Reuse of Waterfront and Rural Landscapes
Resilience Analysis of Spatial Morphology	Resilience Analysis of Road Network Structures	Connectivity, integration, and Intelligibility of Nanheng Village and its surrounding areas; overlay analysis of integration and flood risk	Key priorities for improvement: The network has limited redundancy and few alternative loops, resulting in a high dependence on a single axial roadway. This vulnerability is particularly pronounced where the most critical corridor in the overall network overlaps with the area of highest flood exposure.
	Analysis of the Resilience of Architectural Fabrics	Composite resilience score: 34.81%	Increase the proportion of ground-floor open space and incorporate mixed-use functions.

Chapter 5 Construction of Design Methods

5.1 Design Concept

The design methodology presented in this chapter is based on urban morphology and methods, and incorporates concepts from assemblage theory throughout. Building on previous research, urban morphology views a village as a continuous morphological system formed through the interplay of the natural site, road systems, plot boundaries, public spaces, building typologies, and modes of production. Therefore, the value of Nanheng Village's regeneration lies not merely in the village's architecture or localized landscapes, but is embodied in the holistic spatial relationships among these multiple elements. This chapter transforms the historical morphological elements identified in the preceding research into generative rules for urban design. Specifically, the methodology first identifies the morphological framework within the site that possesses enduring value through the overlay of historical base maps and the reconstruction of waterways and road networks; second, the road system is used as the basis for plot subdivision and the adjustment of height limits for development parcels. Building configurations and public-space elements are then decomposed to extract their typological characteristics and organizational principles, which are subsequently translated into the basic spatial layouts of the architectural forms within each plot. Under this logic, the design framework constructed in this chapter does not simply project the form of a traditional fishing-village onto the design of the new town, but rather offers a contemporary expression of its spatial relationships and generative fabrics.

Building on the logic of the aforementioned study of urban morphology, this design transforms the analysis of Nanheng Village's historical form, spatial perception, and resilience issues presented earlier into an actionable urban design framework. The design unfolds in a stepwise manner across three levels: the Nansha Bay area (macro level), the Nanheng Village priority area (meso level), and specific design nodes (micro level). At the macro level, the Nansha Bay District serves to establish the overall structure, addressing issues such as the mountain-and-sea landscape, waterway restoration, the road network framework, land-use organization, and urban morphology control. At the meso level, Nanheng Village and its

surrounding plots are tasked with integrating the village and the city, translating functions, and facilitating spatial transitions. At the micro level, detailed design of individual nodes transforms traditional morphological elements into spatial scenarios that can be utilized, operated, and guided. (Fig.5-1)

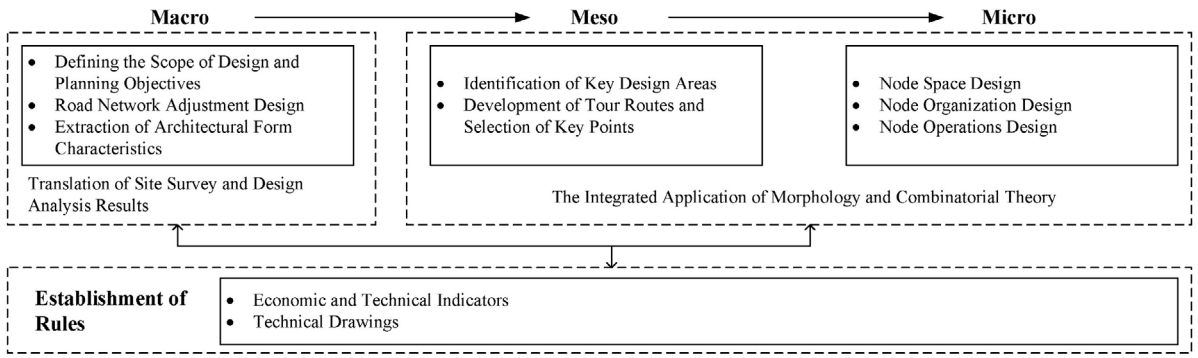


Fig.5-1 Design Framework

(Source: Created by the author)

The premise for selecting Nansha Bay as the broader planning scope is that Nanheng Village is nestled in the heart of Nansha Bay, situated between the mountains, waterways, coastal shoreline, and urban development clusters. It serves as a pivotal link in the holistic spatial relationship of "mountains–village–canal–fields–city–sea," and its development should not be confined to the village's own boundaries but should instead be integrated with urban development. Therefore, this design first establishes an overall development framework for the Nansha Bay area and defines the spatial skeleton for regional development. It then focuses on Nanheng Village as a key sub-area embedded within this framework, ensuring that the village's regeneration forms a continuous relationship with urban development, ecological corridors, and industrial networks. Furthermore, considering the current state of regional development, existing urban design outcomes primarily involve planning arrangements for local vacant lots in Nanheng Village and Nansha Bay based on the existing road network and built environment. Although these provide some guidance regarding building heights and land use functions, the existing outcomes are insufficient to support the urban design and implementation of Nansha

Bay as an integrated mountain-sea bay area. At the same time, the Nansha Bay International Urban Design Competition continued throughout the research period [98], further indicating that the spatial quality, urban character, and external development models of the Nansha Bay area remain subject to ongoing optimization and open discussion. This provides a practical basis for this design to address urban design from the perspective of Nansha Bay as a whole and to discuss the regeneration of the Nanheng Village area.

In macro-level planning and design, Nanheng Village is not treated as residual space left over after high-density urban development, but rather as a key network node and spatial buffer interface within the Nansha Bay area. On the one hand, the Nanheng Canal connects mountains, paddy fields, villages, the coastal shoreline, and the Pearl River estuary, making Nanheng Village a convergence point for ecological networks, pedestrian and bicycle systems, the display of local heritage, and industrial transformation; On the other hand, as shown in Fig.5-3—which depicts the post-planning urban skyline and a longitudinal section of the mountain-sea landscape—the low-density fabric of Nanheng Village and its surroundings forms a transitional zone and an “urban breathing space” between high-density research, business, and residential clusters. The visual buffering, architectural identity, capacity for public activities, and ecological regulation it provides are indispensable components of Nansha Bay’s future urban morphology.

Based on the above discussion, this design adopts a hierarchical approach. Fig.5-2 shows the master plan for the Nansha Bay planning area, focusing on the regional structure, road system, water system organization, blue-green network, and overall morphology control, which serve as the background framework supporting the regeneration of Nanheng Village (Fig.5-4). The master plans, renderings, and functional organization diagrams for key areas focus on Nanheng Village and its surrounding plots, with detailed design carried out through technical drawings, functional analyses, and renderings in conjunction with the design of specific nodes. Finally, urban design guidelines are established to provide regulatory direction for the urban design process.

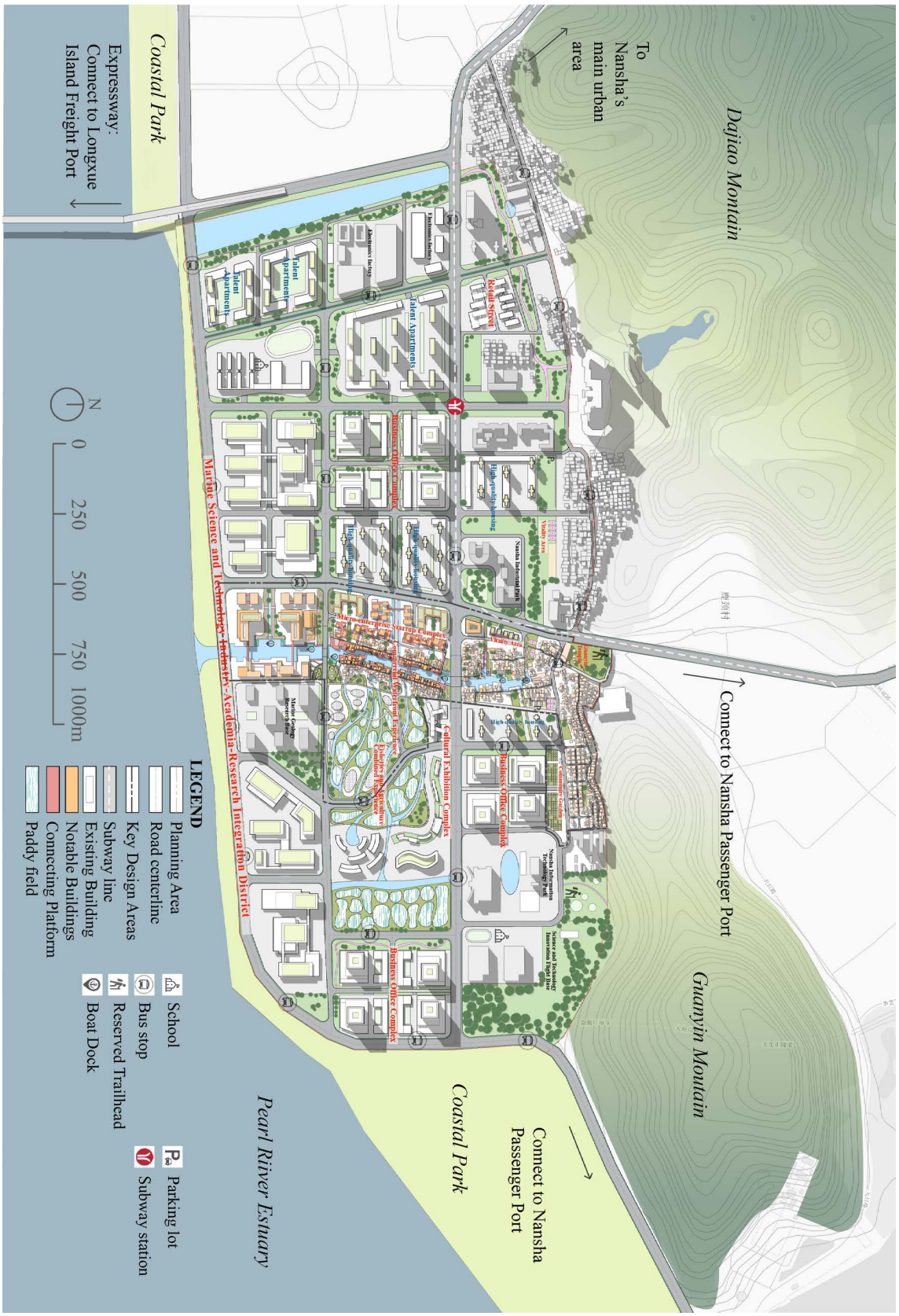


Fig.5-2 Master Plan

Source: Created by the author)

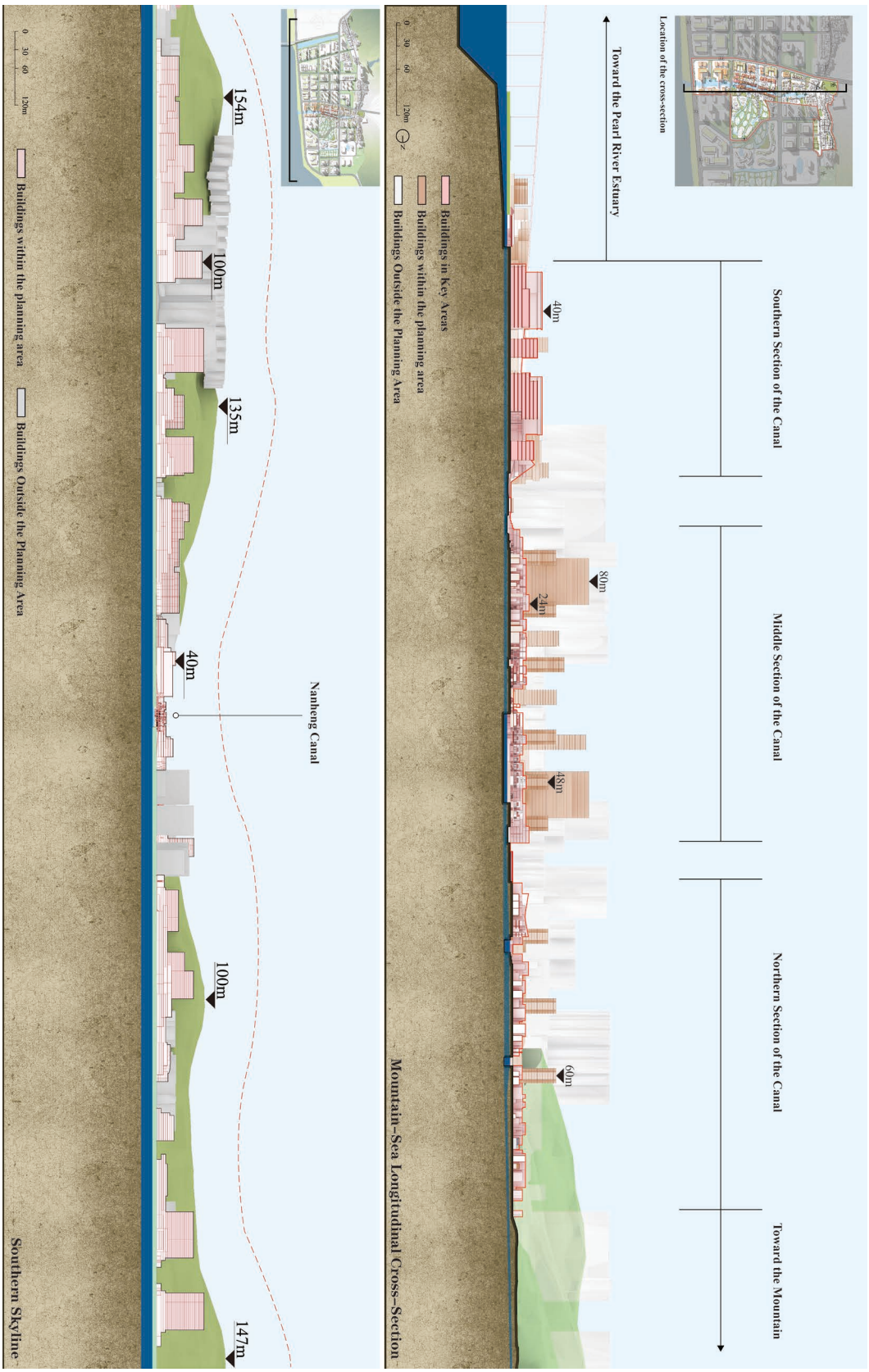


Fig.5-3 Skyline Analysis (left) and Longitudinal Profile Analysis of Nanheng Village (right)

(Source: Created by the author)



Fig.5-4 Rendering of the overall design

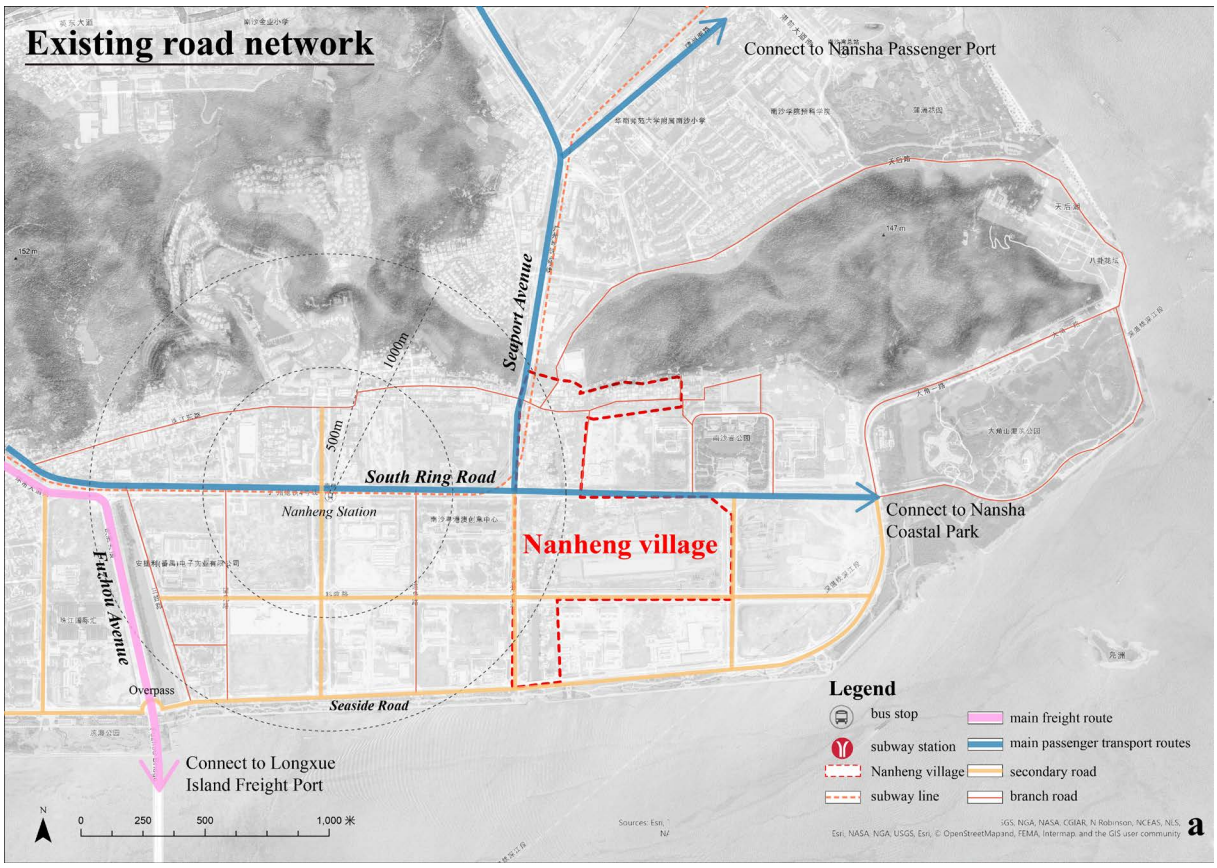
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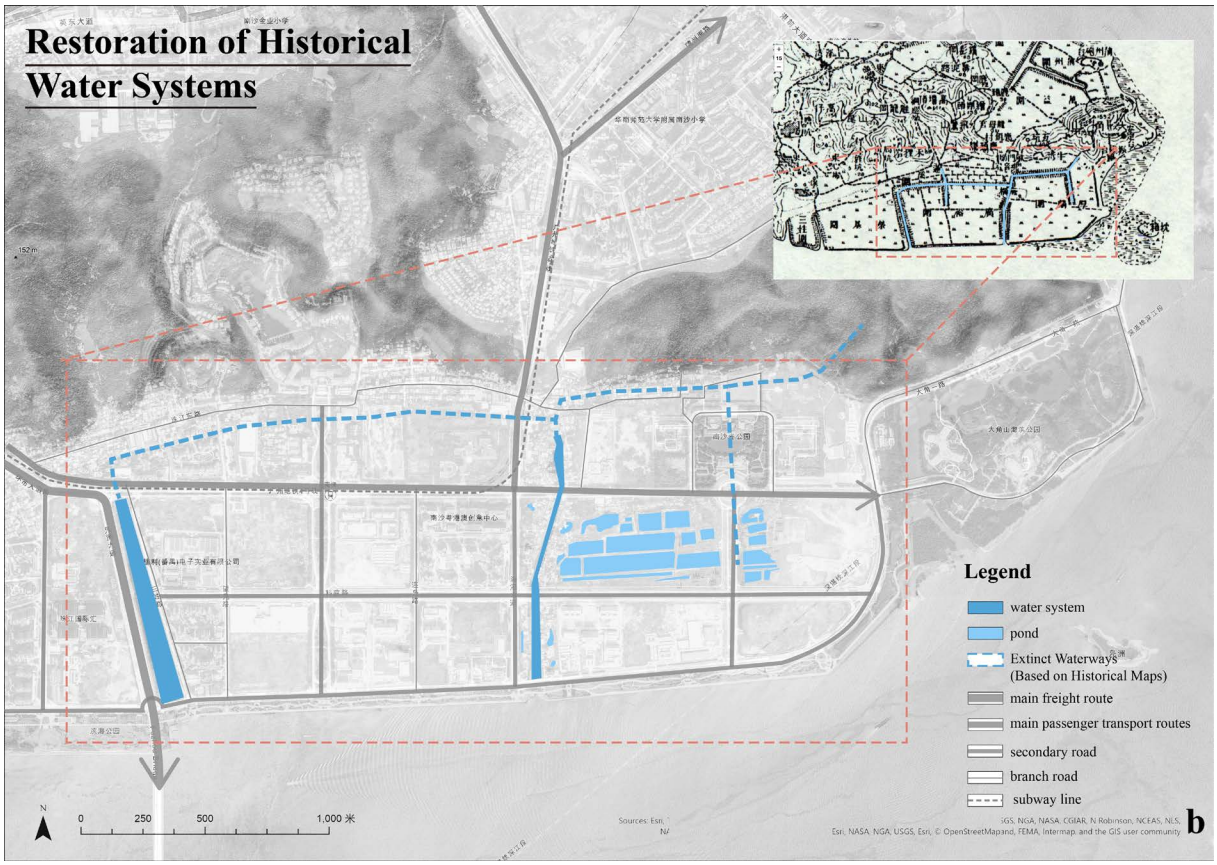
5.2 Defining the Scope of Design and Planning Objectives

5.2.1 Determination of the Planning Area

Building on the transportation network analysis of the site conducted in Chapter 3, historical maps were overlaid, and the waterway network was reconstructed on the maps to delineate the planning area. The objective is to retain the site's two main transportation entrances while conducting experimental adjustments to the road network, functional organization, and planning structure within the area defined by the traditional water system. This will focus on zones where the grid road network has been established but has lost its traditional morphological logic and has undergone modern urban development. Additionally, the area surrounding Nanheng Village will be selected for detailed node design.

Therefore, as shown in Fig.5-5, the planning area extends north to the foothills of Guanyin Mountain and Dajiao Mountain, east to Nansha Coastal Park, south to Seaside Road, and west to Fuzhou Bridge, covering an area of approximately 395 hectares.




Restoration of Historical Water Systems
Legend
water system
pond
Extinct Waterways (Based on Historical Maps)
main freight route
main passenger transport routes
secondary road
branch road
subway line
0 250 500 1,000 米
b

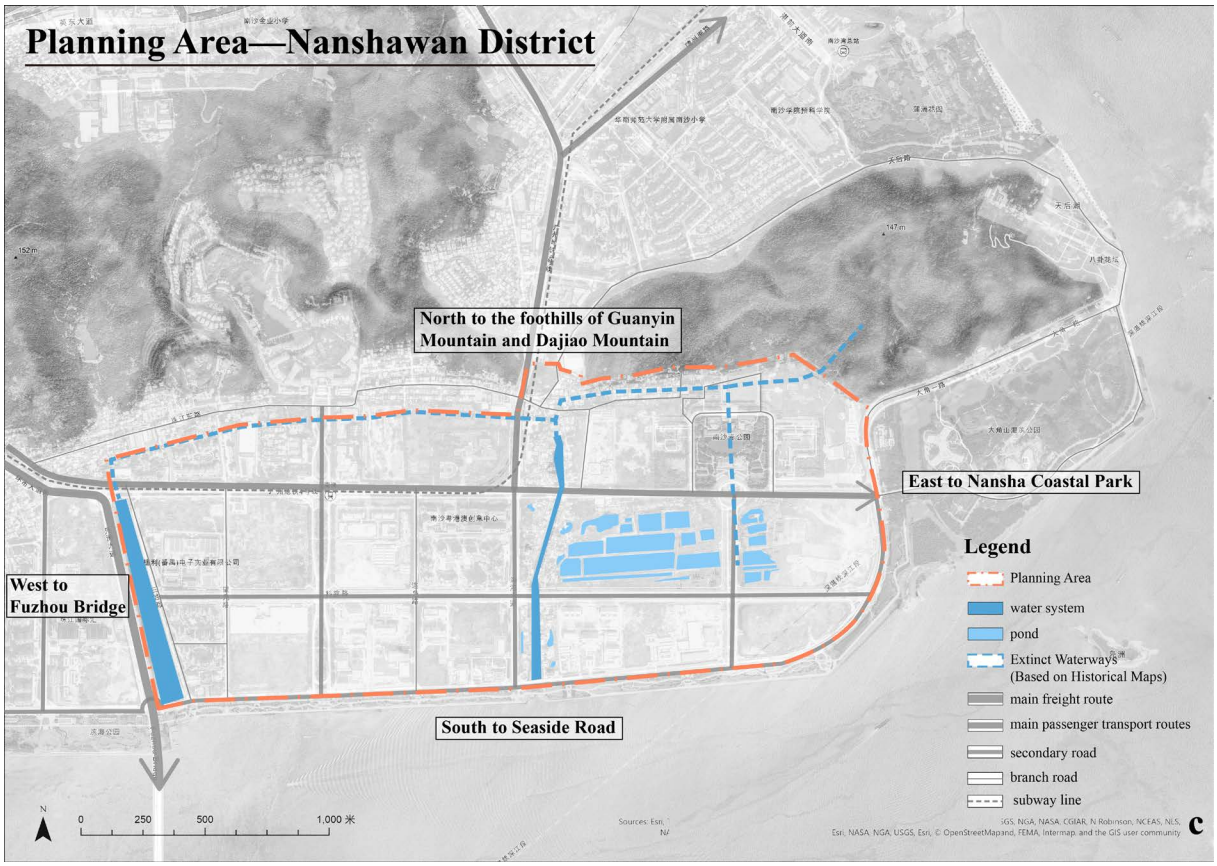

Planning Area—Nanshawan District
North to the foothills of Guanyin Mountain and Dajiao Mountain
East to Nansha Coastal Park
West to Fuzhou Bridge
South to Seaside Road
Legend
Planning Area
water system
pond
Extinct Waterways (Based on Historical Maps)
main freight route
main passenger transport routes
secondary road
branch road
subway line
0 250 500 1,000 米
c



Fig.5-5 Generation of the Planning Area

(Order of steps: From a to d; Source: Created by the author)

5.2.2 Planning, Positioning, and Structure

The analysis of the overarching plan in Section 3.2 has clearly defined the positioning of the Nansha Bay Marine Science and Technology Development Research Cluster. Furthermore, given the area's ecological framework that connects mountains and the sea, the cluster must assume greater ecological responsibilities and adopt a more diverse range of business models to provide more resilient support nodes for the urban design of the coastal region. Therefore, in accordance with the master plan's expectations for the site in terms of production, living, and ecology, a waterfront experience belt connecting the mountains to the sea will be formed within the planning area, centered around the canals. Distinctive blue-green networks will develop on either side of this experience belt; At the canal mouth, a new marine science & innovation axis extends along both sides of the embankment; on the eastern and western sides of the site, using the mountain views as focal points, multiple urban vitality corridors connecting the city and the

countryside are linked by waterways or green spaces; diverse points of interest are scattered throughout the intersections of these axes, forming the planning structure shown in Fig.5-6.

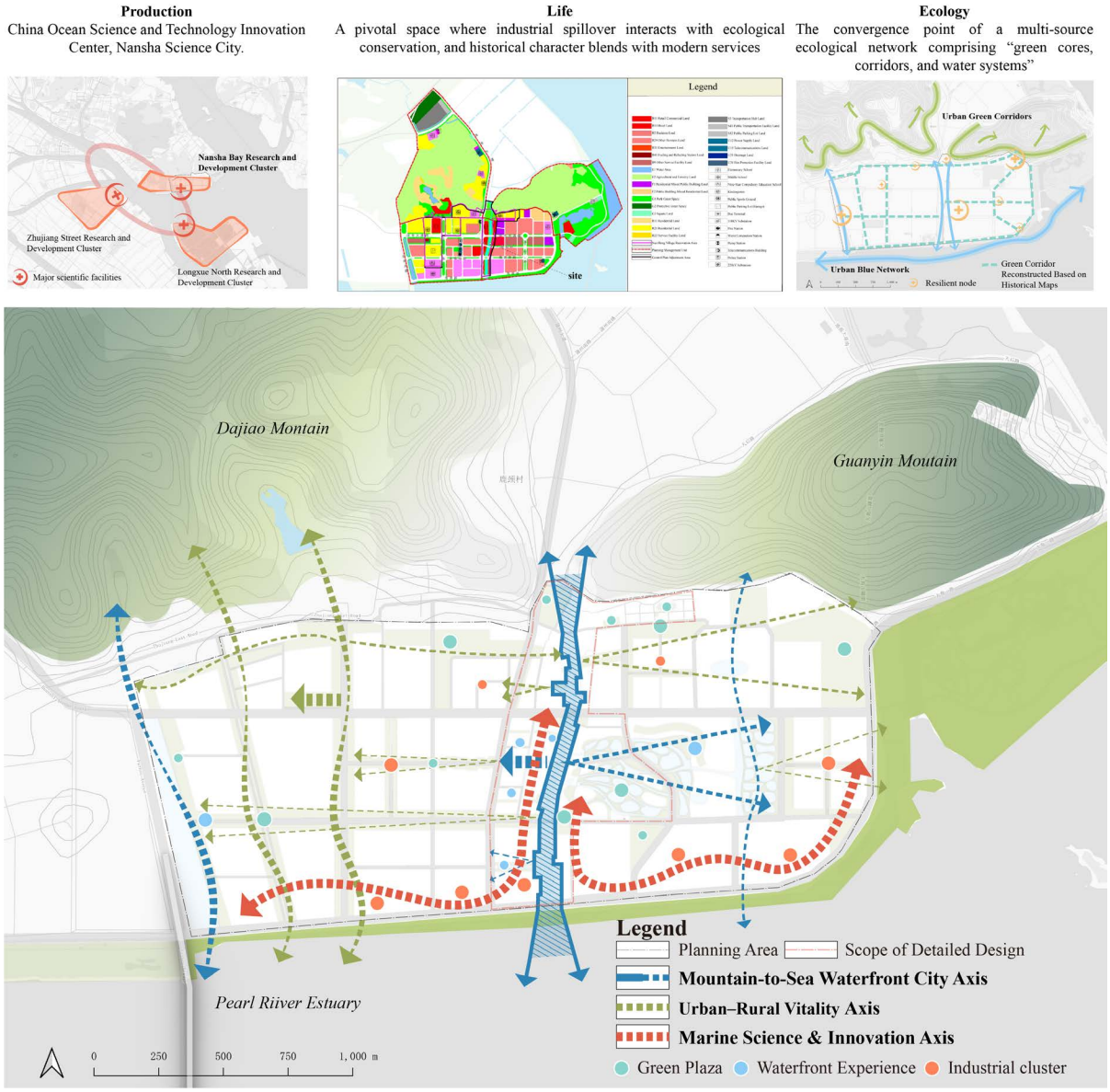


Fig.5-6 Master Plan Layout Diagram

(Source: Created by the author)

5.3 Adaptive Planning for Road Systems

During the development of the planning area, the grid of roads and waterways depicted on historical maps was overlaid onto the existing road network, establishing the mountain-and-sea

landscape within the planning area. Combined with other factors, this formed the planning structure described in Section 5.2. Based on this planning structure and the results of the resilience analysis of the existing road network structure in Section 4.3, adjustments were made to the design of the road network within the planning area.

First, the optimization of the main thoroughfares focuses on two aspects: route alignment and the organization of waterways. Seaport Avenue, the north-south main thoroughfare, will be shifted westward from its original alignment within the planning area and will follow the course of the canal with a slight deviation. A buffer zone of approximately 200 meters is established between the new main road and the canal to mitigate the impact of high-density development along the urban main road on the waterfront ecological space, while also creating a transitional zone between the village and the urban development area. In the east-west direction, the South Ring Road, as it passes through Nanheng Village, is modified from a direct crossing to an elevated bridge spanning the waterway. While ensuring the continuity of main road traffic, the water flow is restored to its natural state via culverts, and the space beneath the bridge connects north-south pedestrian routes within the village at the same elevation, thereby restoring the continuity of the water system and the connectivity of the pedestrian network. (Fig.5-7 a)

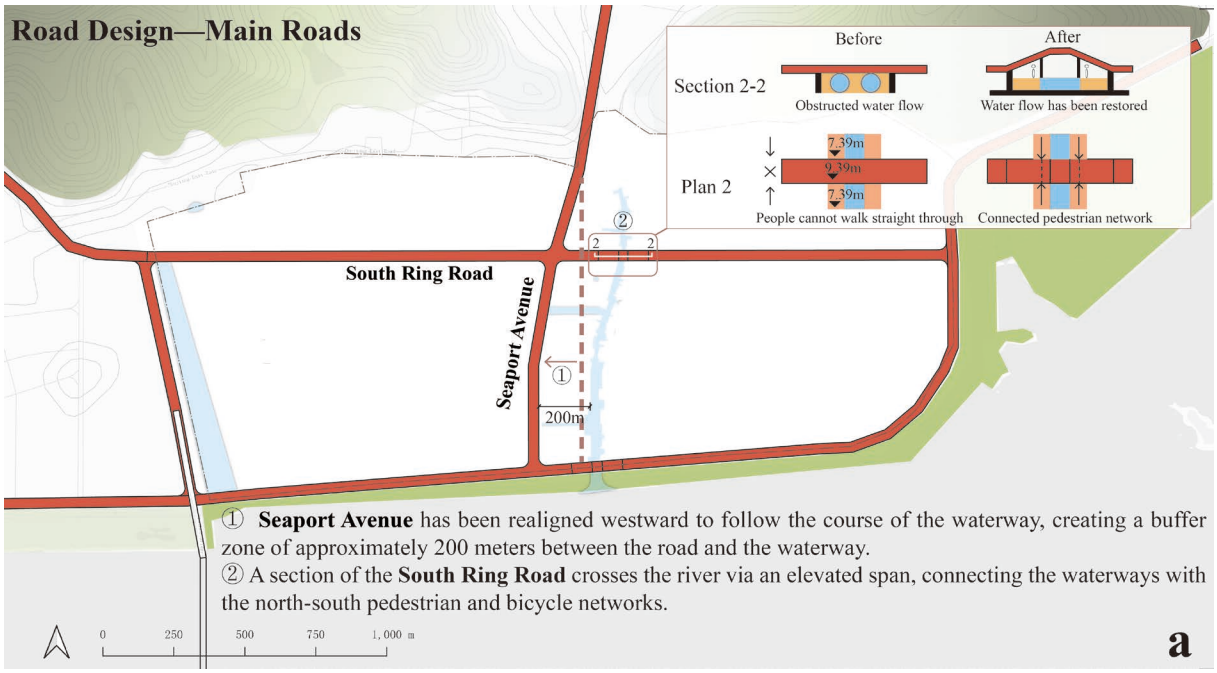
Second, the design of secondary roads emphasizes the integration of road structures with the overall planning framework. In the section where Keyuan Road passes through the village, it takes a detour to the north and connects with the north-south arterial roads, thereby diverting east-west vehicular traffic and reducing the need for vehicles to traverse the village. Blueways and greenways are incorporated into the planning structure of other secondary roads, embedding the secondary roads within these corridors to enhance the integration of traffic management and ecological functions. (Fig.5-7 b)

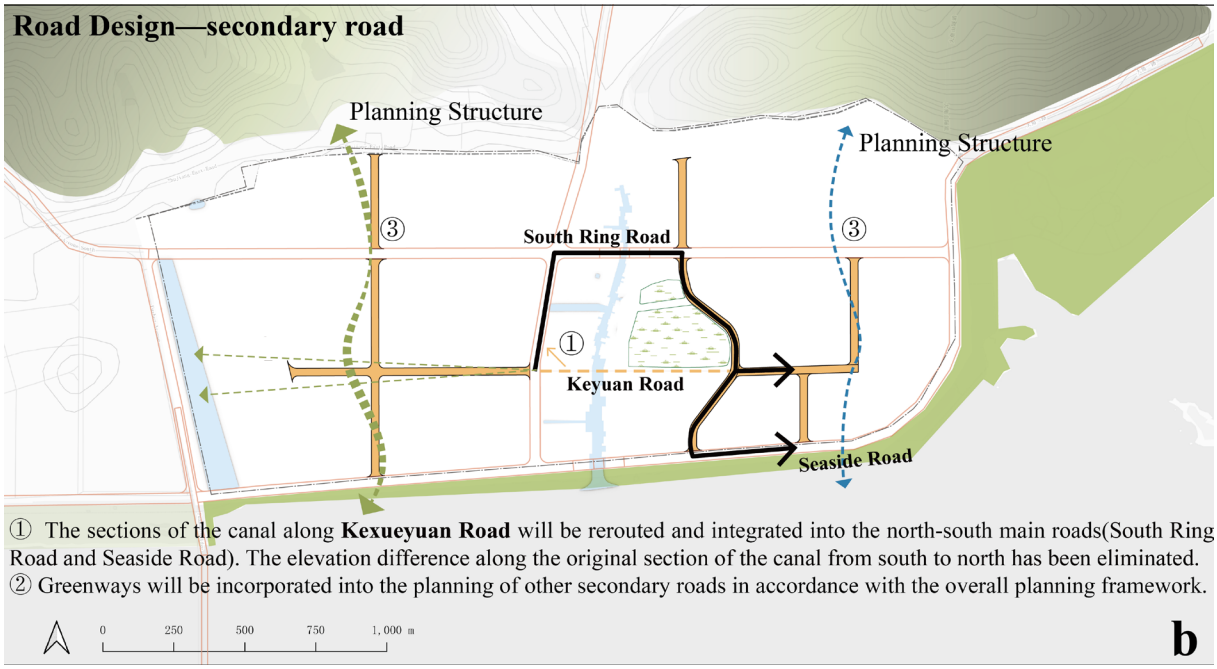
In the design of the branch roads, the western branch road (Three-surname Road) follows the morphology of the waterway and is shifted eastward to create a buffer zone, thereby restoring the waterfront space for pedestrian and bicycle use. After Keyuan Road is diverted to bypass the village, the original road alignment is narrowed, further strengthening the connection between the north and south plots. Building on this, based on the results of the street network

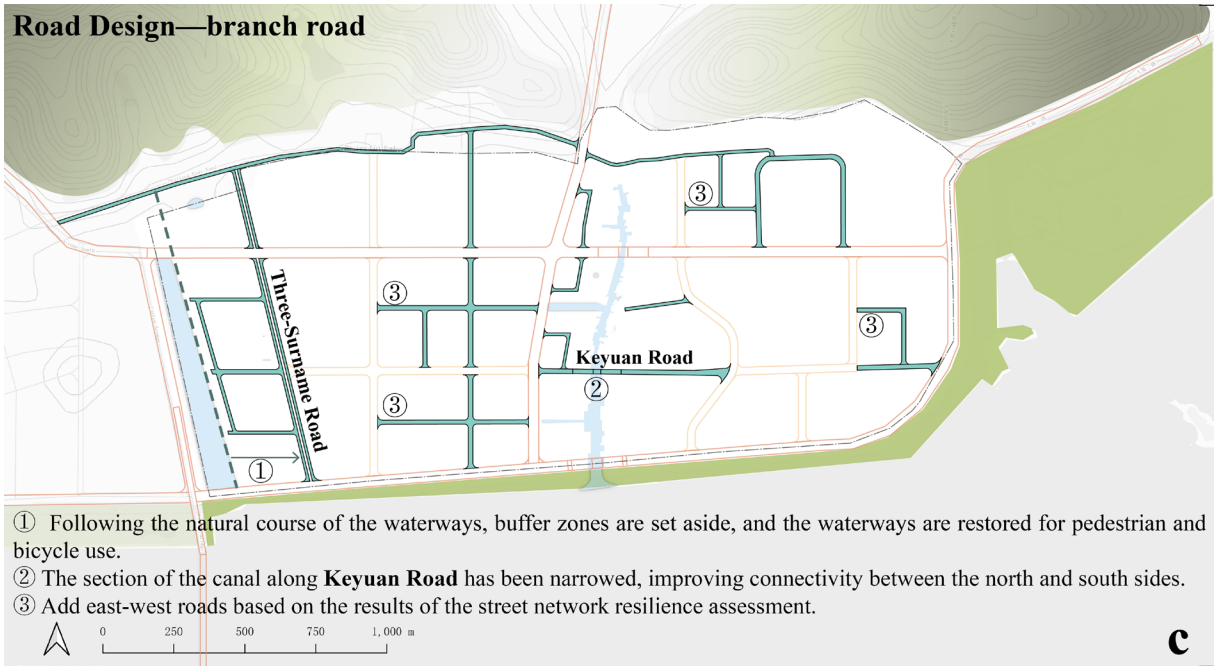
resilience analysis, the use of branch roads further increases the density of the road network, provides more redundant space, and enhances traffic diversion capacity. (Fig.5-7 c)

Finally, the design of other roads primarily involves the development of a pedestrian and bicycle network and the optimization of the loop road system. The plan builds upon the village's existing street and alley system, using loop roads to connect dead-end streets and improve the continuity and accessibility of the internal road network. Service roads are added on both sides of the main thoroughfares (within the red dashed lines in Fig.5-7 d) to reduce the disruption and traffic hazards caused by some branch roads and other roads connecting directly to high-traffic main roads. At the same time, at the foot of the hill on the northeast side of the site, the road network connects to form an access point for a planned hiking trail. This strengthens the connection between the site's interior and the surrounding mountainous ecological areas, linking previously isolated landscape nodes through a planned corridor. This approach not only enhances overall resilience under complex climatic conditions but also promotes an organic integration between the urban landscape and the natural landscape. (Fig.5-7 d)

The final road system is shown in Fig.5-8. Bus stops have been adjusted based on the original locations in accordance with the revised road alignment and supplemented at 500-meter intervals to improve public service coverage and enhance travel convenience for residents. Furthermore, utilizing the reconnected canals, boat dock stations are arranged at key nodes to establish a waterborne transportation network that integrates with land-based transportation. This enhances the accessibility of waterfront spaces and their recreational functions. Additionally, the waterway at the outlet of the Nanheng Sluice will be widened to preserve the possibility of future connectivity with the passenger ferry terminal at Nansha Passenger Port. Consequently, a coordinated organization of the road system, waterway spaces, and public transportation network is established across the entire planning area, forming the framework for the subsequent generation and layout of buildings within the site.


Road Design—Main Roads
Before
After
Section 2-2
Obstructed water flow
Water flow has been restored
Plan 2
7.39m
9.39m
7.39m
People cannot walk straight through
Connected pedestrian network
South Ring Road
Seaport Avenue
200m
① Seaport Avenue has been realigned westward to follow the course of the waterway, creating a buffer zone of approximately 200 meters between the road and the waterway.
② A section of the South Ring Road crosses the river via an elevated span, connecting the waterways with the north-south pedestrian and bicycle networks.
0 250 500 750 1,000 m
a


Road Design—secondary road
Planning Structure
Planning Structure
South Ring Road
Keyuan Road
Seaside Road
① The sections of the canal along Kexueyuan Road will be rerouted and integrated into the north-south main roads(South Ring Road and Seaside Road). The elevation difference along the original section of the canal from south to north has been eliminated.
② Greenways will be incorporated into the planning of other secondary roads in accordance with the overall planning framework.
0 250 500 750 1,000 m
b



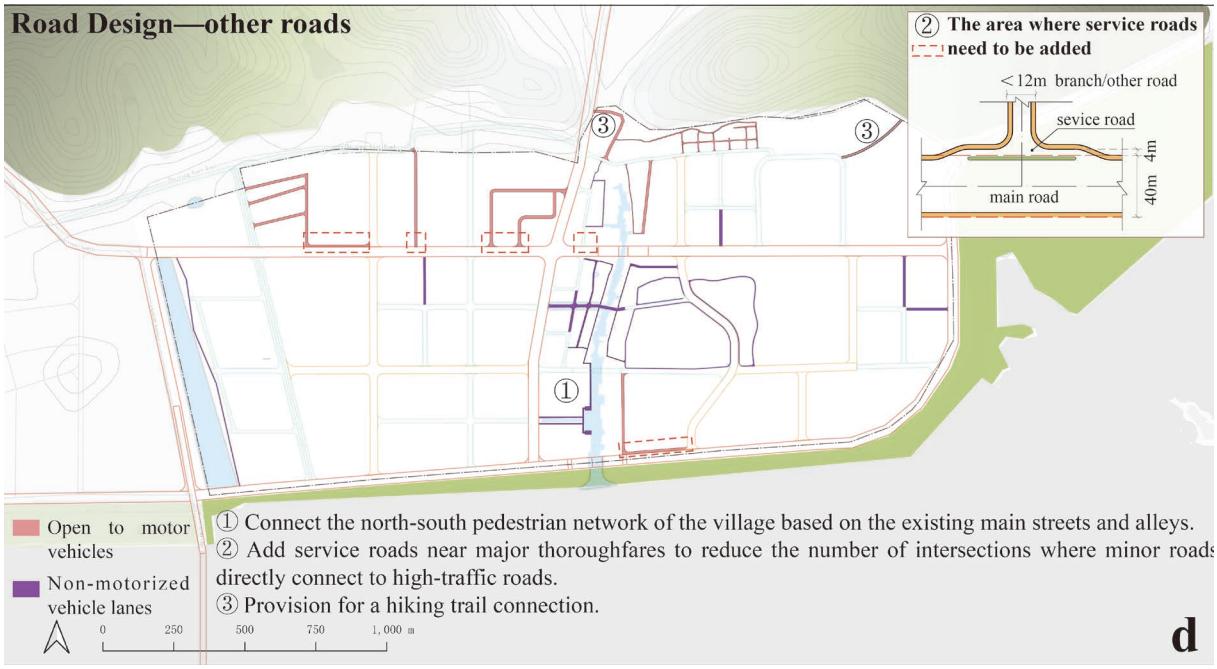


Fig.5-7 Transportation System Optimization Analysis Diagram

(Source: Created by the author)

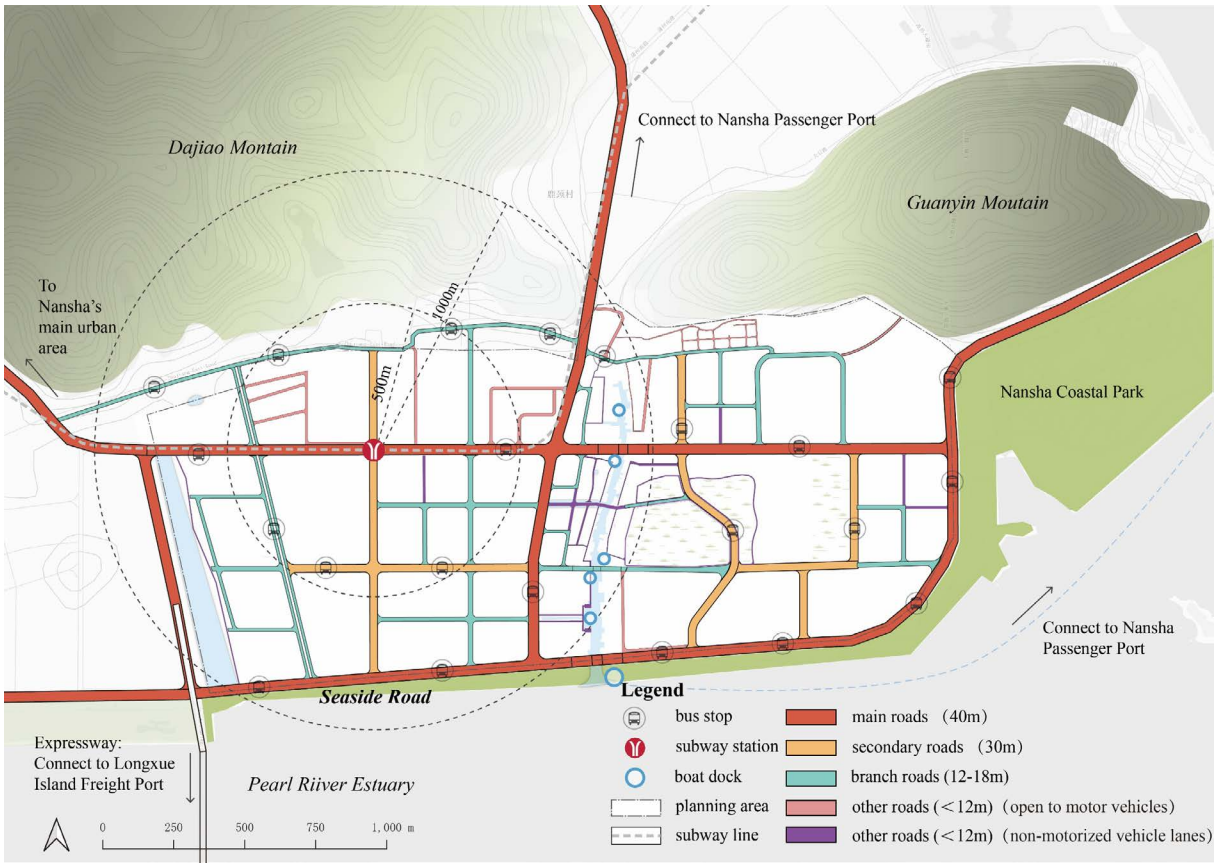


Fig.5-8 Master Plan of the Road Network

(Source: Created by the author)

5.4 Building Height and Development Intensity Controls

After clarifying the planning orientation and overall spatial structure, and completing adjustments to the road network and water systems, the development plots within the planning area were finalized. Building on this foundation and using the height restrictions stipulated in the existing control plan as a baseline, the project adopts an urban morphological perspective to integrate the plot's height, massing, and floor area ratio—which were previously treated as independent technical indicators—into the holistic morphological relationship of "mountains—villages—canal—fields—city—sea" for comprehensive evaluation. The focus is on harmonizing new development clusters with the fabric of existing villages, the waterfront interface, mountain-to-sea sightlines, and the scale relationships with urban roads. Local adjustments were made to plot height limits, and plot volumes were determined through the architectural form translation described in the following section. This process then allowed for the calculation of floor area ratios and development capacity, thereby translating the two-

dimensional planning structure into a three-dimensional urban space.

Although there are some variations in building heights under the current zoning plan, height limits for certain plots at the base of the mountains exceed 120 meters—with some plots even reaching 180 meters—while the average elevation of the mountains in the northern part of the planning area is 120 meters, which will partially obstruct the mountain-to-sea views. At the same time, in the east-west area of the central part of the planning area, adjacent plots exhibit excessive height disparities and insufficient spatial transitions, resulting in overly cramped urban spaces and exacerbating the scale conflict between the new district's high-rise buildings and Nanheng Village. Additionally, the uniform 24-meter height limit along the waterfront extends approximately 600 meters inland from the main coastal thoroughfare, restricting the creation of architectural variation along the waterfront. Therefore, the height design in this urban design plan adjusts the height limits for specific plots based on the current control plan. First, regarding buildings surrounding the mountains, the primary objective is to ensure the continuous visibility of the mountain contours. The design lowers the building heights at the base of the mountains and on adjacent plots, limiting the height of developable plots within the planning area to below 100 meters to prevent high-rise buildings from continuously obscuring the mountain backdrop. Second, the height relationships between adjacent plots have been adjusted from the previous sharp jumps to relatively continuous gradients. In the canal areas, relatively open spatial interfaces are preserved to prevent high-rise buildings from directly looming over canals and villages, thereby forming a wide and highly recognizable mountain-to-sea corridor. Finally, a combined approach of overall height restrictions along the coastal front and stepped controls within individual plots is implemented. Height limits are established based on two control lines—150 meters and 250 meters—from the main thoroughfare along the coastal front, guiding buildings to form a stepped layout where "buildings are lower near the water and higher farther from it," thereby creating a landscape permeation relationship between coastal public spaces and urban buildings. As shown in Figure 5-9, which compares the development site before and after height restrictions were adjusted, the revised height limits have established a spatial sequence ranging from the low-density traditional village to the

urban-rural transition zone, and from the medium-density coastal front to the high-density research, business, and residential clusters. This ensures the clarity of the planning structure and maintains the visual distinctiveness of Nanheng Village within the urban new district environment.

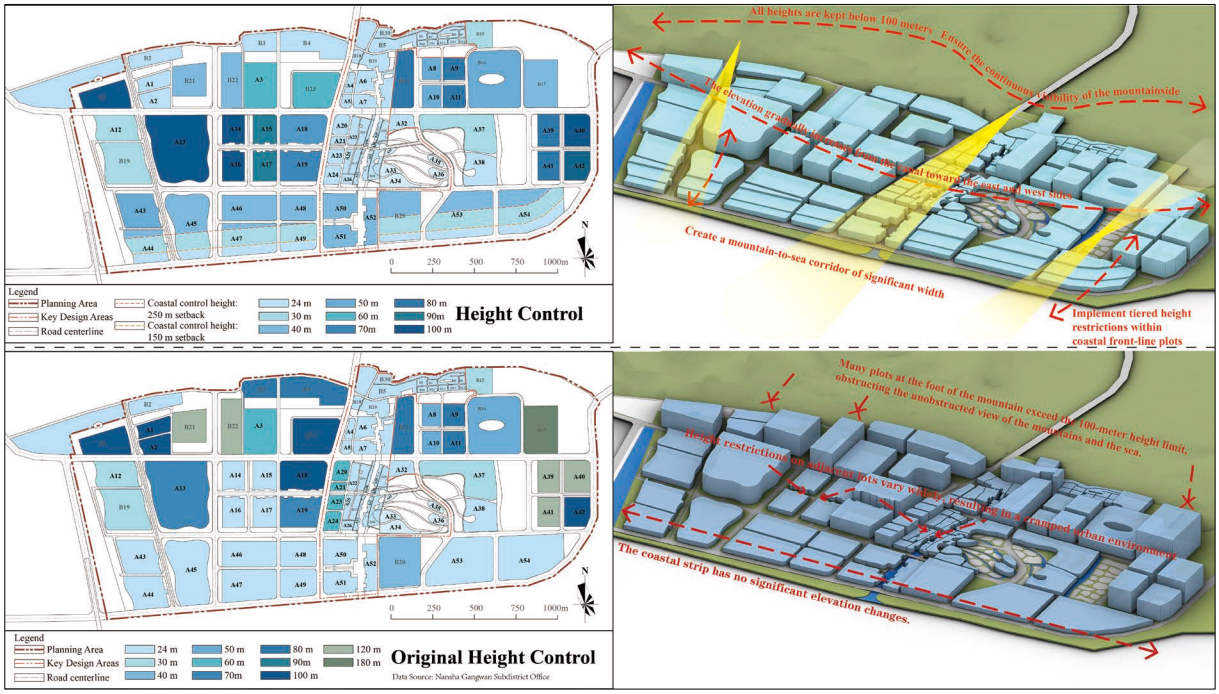


Fig.5-9 Before-and-After Comparison of Height Restrictions on the Construction Site

(Source: Created by the author)

Given the potential discrepancies between the urban design plan and future market demand, as well as between project planning and phased implementation, this design uses the urban design plan—derived from height restrictions and the architectural form translation outlined in Section 5.5—as the basis for calculating the floor area ratio (FAR). A guidance range with a ±0.5 fluctuation margin has been established, transforming “rigid indicator controls” into “flexible guidance” to allow for flexibility in response to market changes and project implementation. For specific drawings, see Section 6.5, “Urban Design Guidelines.”

5.5 Translation of Architectural Morphology Characteristics

Building on the analysis in Chapter 4 regarding the arrangement and combination of buildings in Nanheng Village and the logic underlying the organization of public spaces, this design refines and interprets the architectural morphology to establish the fundamental

principles for the building morphology within the urban design site.

The necessity of translating architectural form is evident in three aspects. First, the quality of existing buildings in Nanheng Village varies widely, and some waterfront structures pose safety hazards, making it difficult to achieve regeneration through comprehensive preservation. However, complete demolition and reconstruction would result in the loss of the original village's scale, waterfront character, and local memory. Second, new research, residential, and commercial clusters are emerging around Nanheng Village. If new buildings were to adopt the large-scale models common in the new district, this would further exacerbate the synchronic spatial disconnect between the traditional village and the modern city, and hinder the diachronic continuity of its morphology. Furthermore, surveys and interviews reveal that residents have a strong sense of attachment to distinctive architectural forms, waterfront spaces, old banyan trees, and spaces of collective memory, indicating that architectural morphology is not merely a visual characteristic but a vital carrier of local identity. Therefore, the "translation of architectural morphology" referred to in this paper pertains to the translation of morphological relationships and generative rules, including: the parallel or perpendicular relationship between buildings and water bodies; the interfaces between waterfront platforms and piers; elevated ground floors and dual-level ground-floor spaces; enclosed courtyards; small-scale clusters; gaps between streets and alleys; and locally distinctive materials and colors such as red brick and gray-white. By extracting these rules, newly constructed and renovated buildings can functionally meet the needs of scientific research, commerce, community services, and residential living, while simultaneously preserving the characteristics of Nanheng Village's water town settlement in terms of spatial scale and sense of place.

Based on the analysis in Fig.5-10, the morphology of newly constructed public buildings in the district can be categorized into two prototypes:

One approach is a comb-like layout along public spaces or major urban facades, where the short sides of the buildings face the public space and are arranged in parallel rows, creating a continuous and rhythmic linear layout. This arrangement forms open gaps between the buildings that facilitate ventilation, natural light, and visual connectivity. Furthermore,

connections between plots are established through sky bridges, platforms, and other means to enhance continuity and shared use. This arrangement is primarily suited for Research and Development (R&D) plots situated along major roads or central axes, where each building has a short side of 40–80 meters and a frontage of 90–130 meters. This creates a clear urban façade while also facilitating interaction and collaboration between urban life and innovative activities.

The second approach features an enclosed layout: within a single plot, buildings are arranged in a perimeter configuration to create multiple courtyard spaces; between plots, multiple plots can be combined, with major thoroughfares encircling the outer perimeter. This creates cohesive urban courtyards within pedestrian-friendly streets, thereby extending the organizational logic of traditional courtyard spaces across different scales and multiple elevation levels. This typology is suitable for commercial office sites. The floor plan dimensions of a single tower are 60x60m, with the short side of the podium controlled between 80–100m and the long side between 100–150m. This creates quiet, comfortable, and socially engaging semi-open spaces that meet the complex demands of business activities for order, privacy, and shared spaces.

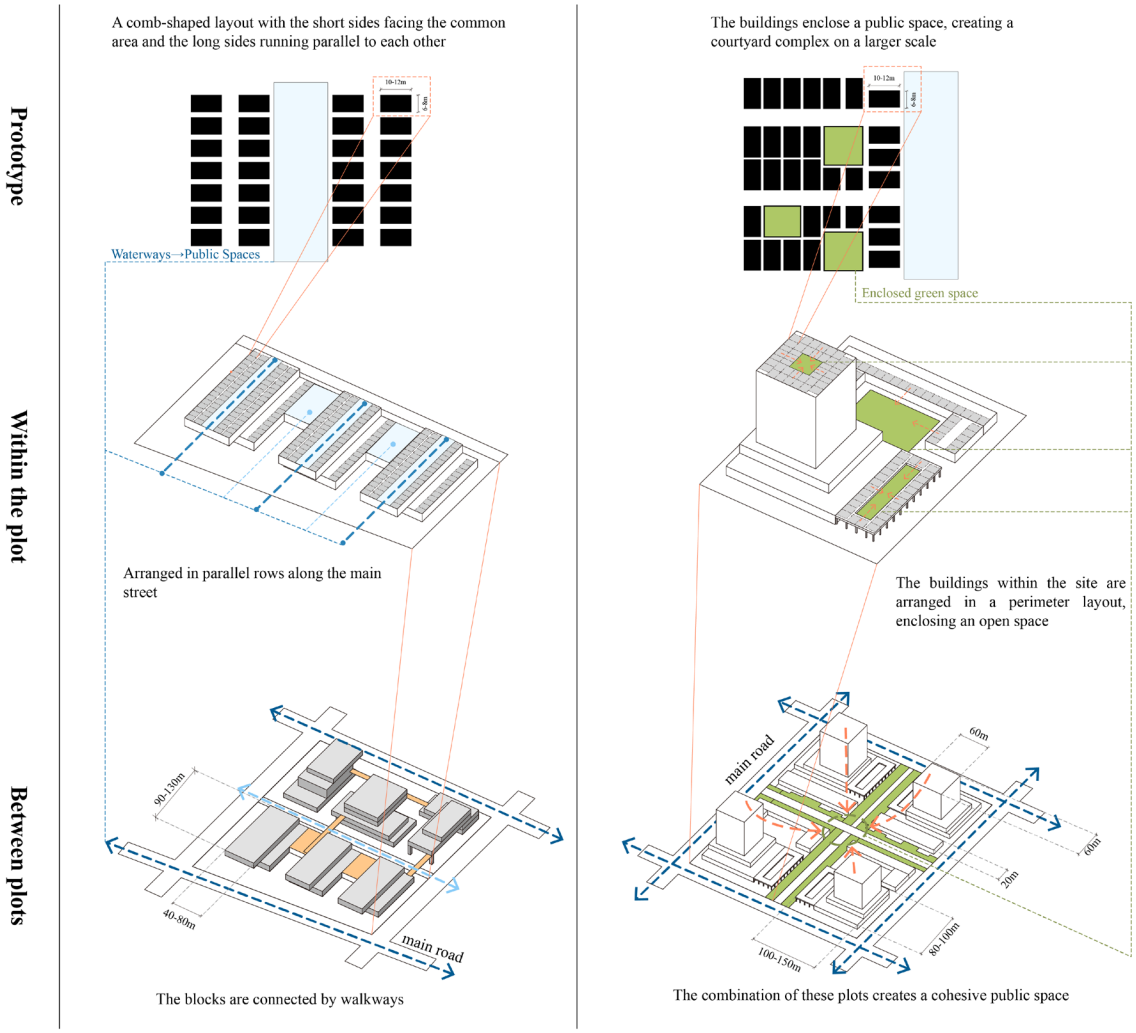


Fig.5-10 Diagram of Architectural Configuration Analysis

(Source: Created by the author)

Residential buildings are divided into two categories: conventional housing and talent apartments. As shown on the left in Fig.5-11, conventional residential buildings primarily consist of point-block or short-block high-rises measuring 20 x (35–40) m, arranged in parallel clusters. This parallel, staggered layout maximizes development density while allowing visual corridors to flow continuously throughout the site, promoting ventilation, natural light, and access to the landscape. At the same time, the staggered arrangement creates multiple distinctive landscape zones and allows for the combination of these zones to form larger garden spaces. The site perimeter is surrounded by commercial podiums that open onto residential streets, creating a vibrant street-facing commercial frontage. The enclosed layout is primarily used for

apartments along the waterfront and riverside boundaries, featuring wider facades. The basic typology consists of 20x60m long-block buildings with podiums (Fig.5-11 right). Given the high degree of public openness surrounding the site, the enclosed layout organizes residential towers and low-rise commercial spaces along the plot boundaries. This arrangement ensures the continuity of the waterfront façade along the street frontage while creating relatively quiet shared courtyard spaces internally, facilitating a peaceful transition from dynamic to tranquil environments.

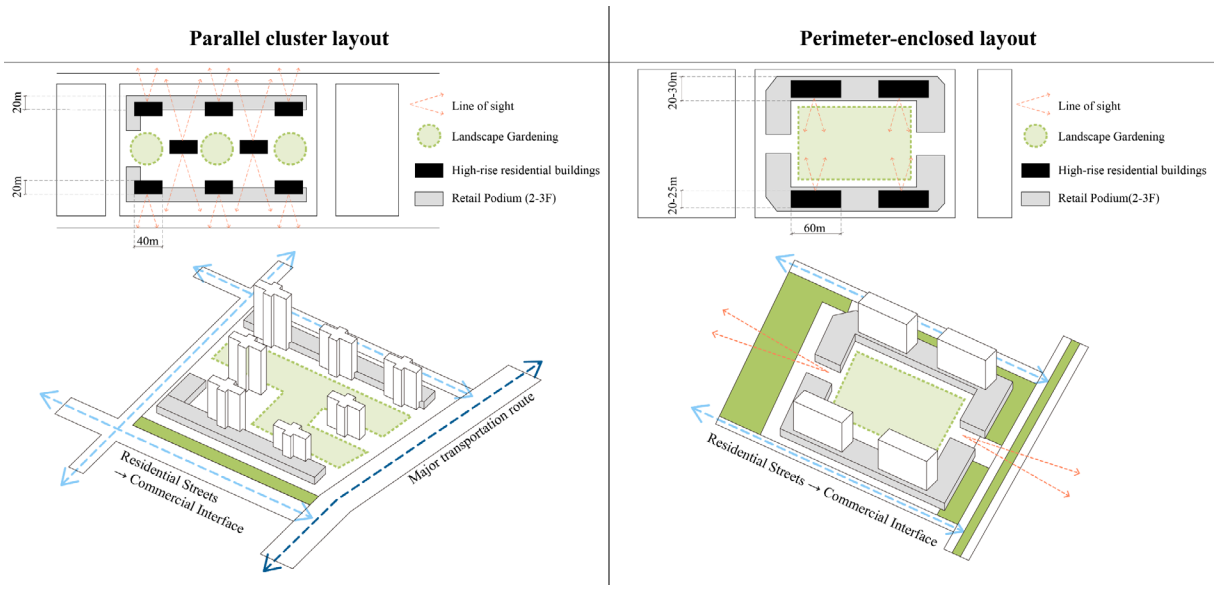


Fig.5-11 Analysis of Residential Cluster Layouts

(Source: Created by the author)

The form of elevated pedestrian walkways, derived from traditional riverside architecture, serves as a crucial transitional interface connecting buildings and public spaces. In urban design, it plays a multifaceted role in organizing traffic, extending activities, and shaping places. The design explores three variations of this elevated platform, ranging from large-scale to small-scale applications. First is the opening of the ground-floor connection interface, creating a continuous flow between the building's base and the street space. Simultaneously, the elevated void provides additional shade for the city; this form is suitable for the ground-floor spaces of high-rise buildings, creating extended corridor spaces. Second, by elevating and staggering the building mass, the platform transforms from an ancillary circulation space into a multi-level

activity interface. This approach is suitable for medium-scale public service buildings, such as research and office facilities, as it preserves the integrity of the building form while enhancing the public openness of the ground floor. Finally, the platform system connects the forms of clustered buildings, promoting holistic collaborative design. This approach is particularly suitable for low-density, small-scale clustered building environments, especially commercial or small startup office spaces, where platforms are used to create an integrated pedestrian system and shared interfaces. (Fig.5-12)

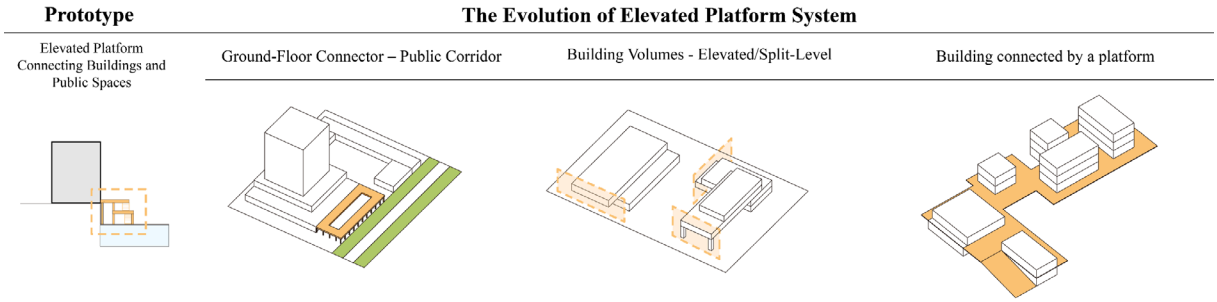


Fig.5-12 Analytical diagram showing the evolution of the elevated platform system

(Source: Created by the author)

5.6 Chapter Summary

This chapter establishes a design framework for Nanheng Village within the broader context of Nansha Bay from macro-, meso-, and micro-level perspectives, further transforming urban morphology into a methodological basis for design generation. At the macro level, the planning scope was defined based on an analysis of historical maps. By integrating the site's overarching master plan and ecological factors, a planning structure was established centered on the Mountain-Sea Corridor as the main axis, interwoven with a blue-green network and urban vitality axes. At the meso level, drawing on the results of the design analysis and building upon the planning structure, the road network was adjusted to form the basic framework of urban design that balances traffic diversion efficiency, pedestrian and bicycle experiences, and connectivity with the water system. Based on this road network, adjustments will be made to the development height and density of the construction sites. At the micro level, based on research into the building clusters of Nanheng Village and analysis of distinctive individual building structures, we established prototypical guidelines for architectural morphology across

plots with different functions within the urban design, along with a diverse system of elevated pedestrian walkways. This lays the spatial foundation for subsequent node detailing and urban design guidelines.

In summary, this chapter has completed the critical transition from morphology recognition to design translation, laying the foundation for the next chapter, which will focus on the detailed development of key nodes, functional organization, and the formulation of urban design guidelines for Nanheng Village and its surrounding key areas.

Chapter 6 Urban Design Proposal for Nanheng Village and Its Surrounding Area

Building on the analytical methodology outlined in the preceding section—"Multiscale Visualization of Urban Morphology—Residents' Perceptions and Memories—Analysis of Urban Morphology Resilience"—and drawing upon the design framework established in Chapter 5, this chapter ultimately results in design practices tailored to the research subject—transforming the findings of urban morphology analysis into spatial scenarios that can be experienced, used, operated, and managed. This chapter treats areas with distinct morphological characteristics as design operational units: Nanheng canal is regarded as a linear framework connecting mountains, villages, rural landscapes, urban areas, and coastal spaces; waterfront platforms, piers, and riverside buildings constitute the waterfront interface unit; the textures of paddy fields, fish ponds, and farmland form the productive landscape unit; while banyan trees, village alleys, enclosed buildings, and public spaces constitute the everyday spatial units that carry local memories and community life. Node design revolves around the preservation, restoration, reinterpretation, and recombination of these units, embedding them—through circulation routes and functional organization—into Nansha Bay's overarching Mountain-Sea Corridor and the synergistic "production–living–ecology" network. Through the combined application of urban morphology and assemblage theory, the regeneration of Nanheng Village shifts from a mere physical transformation to a process of spatial regeneration driven by the interplay of historical form, social relationships, industrial functions, and ecological resilience.

6.1 Overview of the Key Design Area

The key design area is the red-shaded zone shown in Fig.6-1, covering approximately 60 hectares of land. From south to north, this area encompasses a cluster of villages, an urban-rural integration zone, a creative canal street, and a technology incubation and exhibition complex. The design involves a variety of building morphologies and the coordination of functions across these different zones (Fig.6-2).

As shown in Fig.6-3, the functional organization of the key areas is based on the synergy

of “production, living, and ecology.” The northern section of the canal focuses primarily on micro-upgrades of scattered rural areas, enhancing the supporting infrastructure for industries and public services in the water-village community and improving the quality of existing living spaces. The central section of the canal combines creative industry incubation and experiential commerce with the preservation and recreational development of paddy fields to create a mixed-use industrial landscape. The southern section of the canal connects with the laboratory clusters to the north and on the east and west sides to facilitate the transfer of research outcomes and industrial incubation. It also incorporates functions for cultural exhibitions, science and technology innovation displays, and the exchange of research results, thereby forming an industrial interface between Nanheng Village and the Nanshawan research cluster. Throughout the urban operation, industries will continuously interpenetrate, connect, and circulate. Material and personnel flows will also occur between different functional zones, with ecological design providing the environmental foundation to support sustainable development across the urban complex.

The following section provides a detailed description of the node designs within the key design areas.



Fig.6-1 Master Plan for Urban Design in Key Areas

(Source: Created by the author)



Fig.6-2 Renderings of Key Areas

(Source: Created by the author)

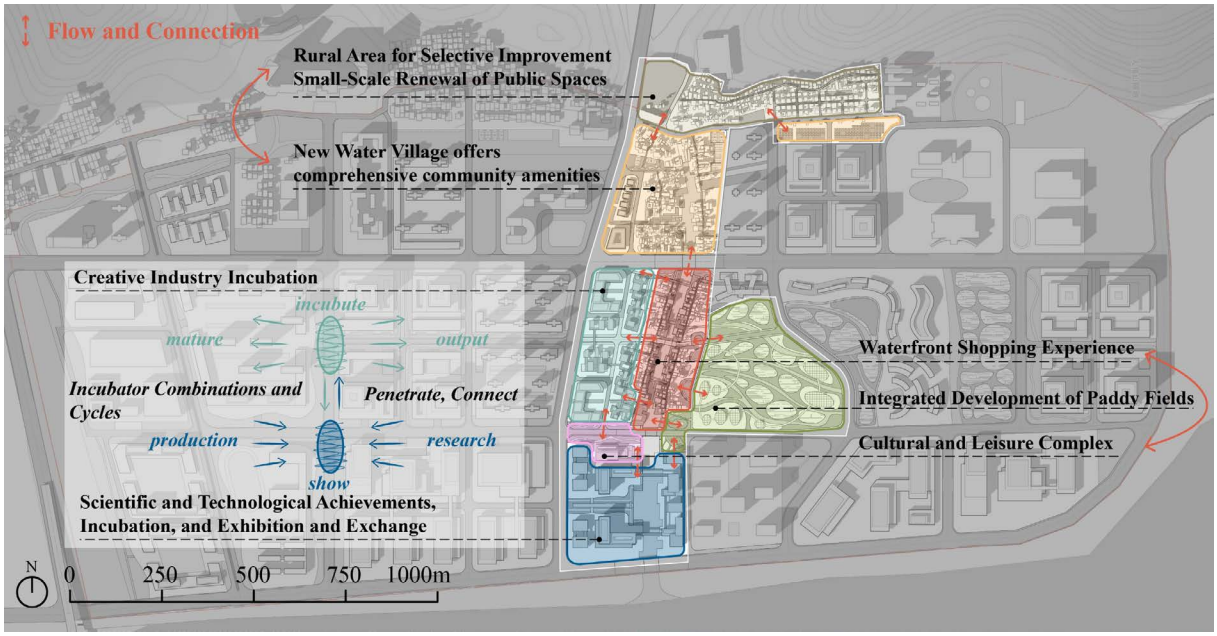


Fig.6-3 Functional Layout Map of Key Areas

(Source: Created by the author)

6.2 Development of the Mountain-Sea Corridor Tour Route

The design of the key area will center on the Nanheng Canal, specifically the two sides of the city's main axis—the Mountain-Sea Corridor—as defined in the master plan. Building on this foundation, the canal will function as a linear assemblage, bridging the physical connection between "mountains, villages, cities, and the sea" while integrating their diverse morphological characteristics and historical memories. The design puts forth three core spatial strategies: reorganizing the waterfront interface of traditional fishing villages through the integration of PLES, which coordinates waterfront public life, cultural-tourism and sci-tech innovation industries, and ecological resilience; transforming productive spaces through public landscape-making and cultural-tourism translation, which coordinates agricultural production, agro-cultural tourism experiences, and ecological regulation; and revitalizing local memory through its symbiosis with urban regeneration, which coordinates the enhancement of community life, the introduction of new programs, and the continuity of cultural heritage. These elements are interconnected through multi-dimensional pedestrian and waterborne transportation hubs, forming a continuous cultural, scenic, economic, and exhibition narrative route. (Fig.6-4)

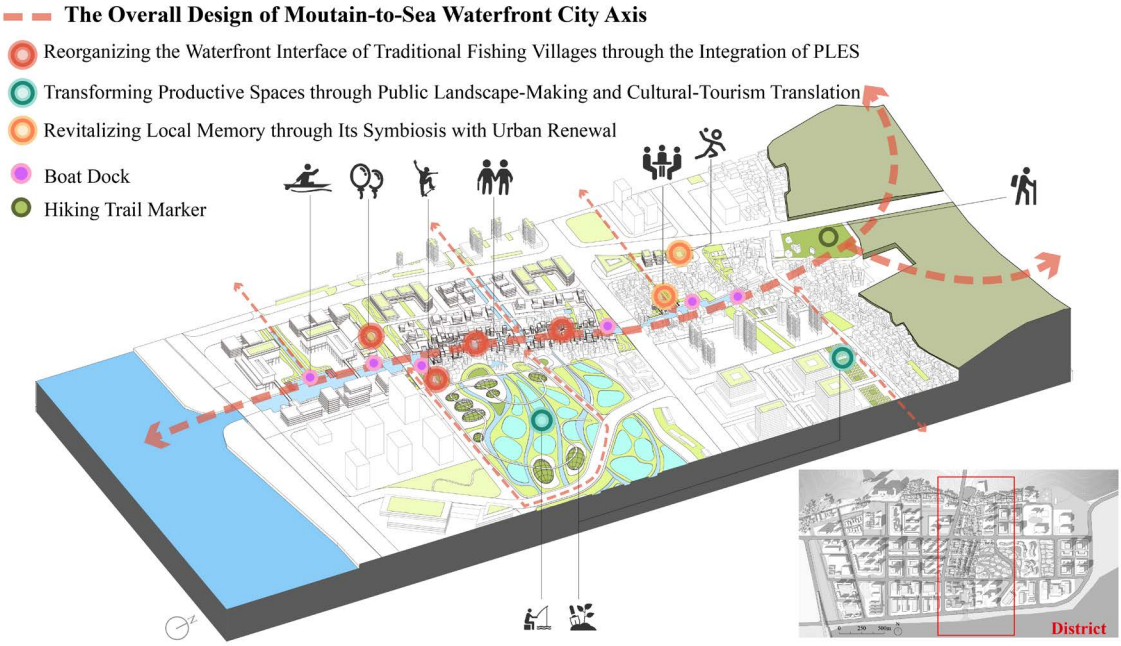


Fig.6-4 Map of the Mountain-Sea Corridor Tour Route

(Source: Created by the author)

6.3 Design of Key Nodes

6.3.1 Reorganizing the Waterfront Interface of Traditional Fishing Villages through the Integration of PLES

The architectural morphology along the waterfront of the canal, along with the production, transportation, and daily life functions they accommodate, constitutes the most distinctive and evocative interface within the design site. In the past, the waterfront served as a backdrop for the fishing industry and dock life that flourished in Nanheng Village. Today, it holds the potential to support contemporary cultural and tourism activities, community events, and technology innovation exhibitions. Drawing on urban morphology and inspired by the reconfiguration of heterogeneous elements in assemblage theory, this section systematically reorganizes the traditional waterfront interface of Nanheng Village by focusing on the relationship among “architecture, waterfront, and water.” This approach creates a continuous waterfront spatial system that integrates daily use, cultural display, and resilience-enhancing functions.

1. Double-level design on Water Street in the Middle Section of the canal

In the middle section of the canal, on the one hand, the existing waterfront platform has been privatized and is inaccessible to the public, while the elevation differences between the platform and the buildings lining the inner street lead to water accumulation. On the other hand, the original pier served a single function; from the perspectives of district planning and urban regeneration, the goal is to create a venue offering diverse and distinctive tourism experiences. To address this, while preserving the existing building structures, a design strategy of “dual ground levels for the waterfront and street” is proposed. By adjusting the elevation relationship between the waterfront buildings and the platforms, a multi-layered composite interface is created along the canal. The lower level retains the daily passage functions connecting to the inner street, while the elevated void space—under Lingnan’s climate conditions—can be transformed into a semi-outdoor activity space with ample shade and ventilation, serving as a venue for lingering, cooling off, and neighborhood interaction; The upper level, supported by a continuous platform system, forms a waterfront leisure and commercial tourism interface for

visitors. Steps and other features allow access to the water from the platforms, thereby achieving a transformation from a closed to an open interface and from a single-function to a multi-functional space. (Fig.6-6)

In terms of building regeneration, as shown in the cross-section from the inner street toward the canal (Fig.6-5 section1-1), adjustments to ground level and the creation of raised ground floors for both waterfront and inner-street buildings allow surface runoff to flow smoothly toward the canal. In terms of building functions, the residential buildings on the inner street retain their residential use, while the waterfront buildings undergo differentiated renovations based on their scale and morphology. As shown in Fig.6-5, it is recommended that the platform level be fully converted to commercial use, introducing small-scale businesses such as seafood restaurants, cultural tourism, and pop-up retail. Spaces on the second floor and above may selectively retain residential functions. For residential buildings with a smaller footprint, a comprehensive commercial conversion can be implemented either through the conversion of individual units or the combination of multiple units. For larger, taller buildings, a mixed approach such as “comprehensive renovation” or “commercial below, residential above” can be adopted to unlock the commercial potential of the second-floor platform while preserving the original residential attributes. This mixed-use approach avoids the disruption of the traditional social fabric caused by large-scale demolition. At the same time, appropriately retaining residential functions allows original residents to participate in the regeneration, design, and operation of their own homes, breaking down social barriers between old and new buildings. This shifts spatial regeneration from purely physical transformation to comprehensive regeneration that balances the continuity of local relationships and the preservation of lifestyles. (Fig.6-7)

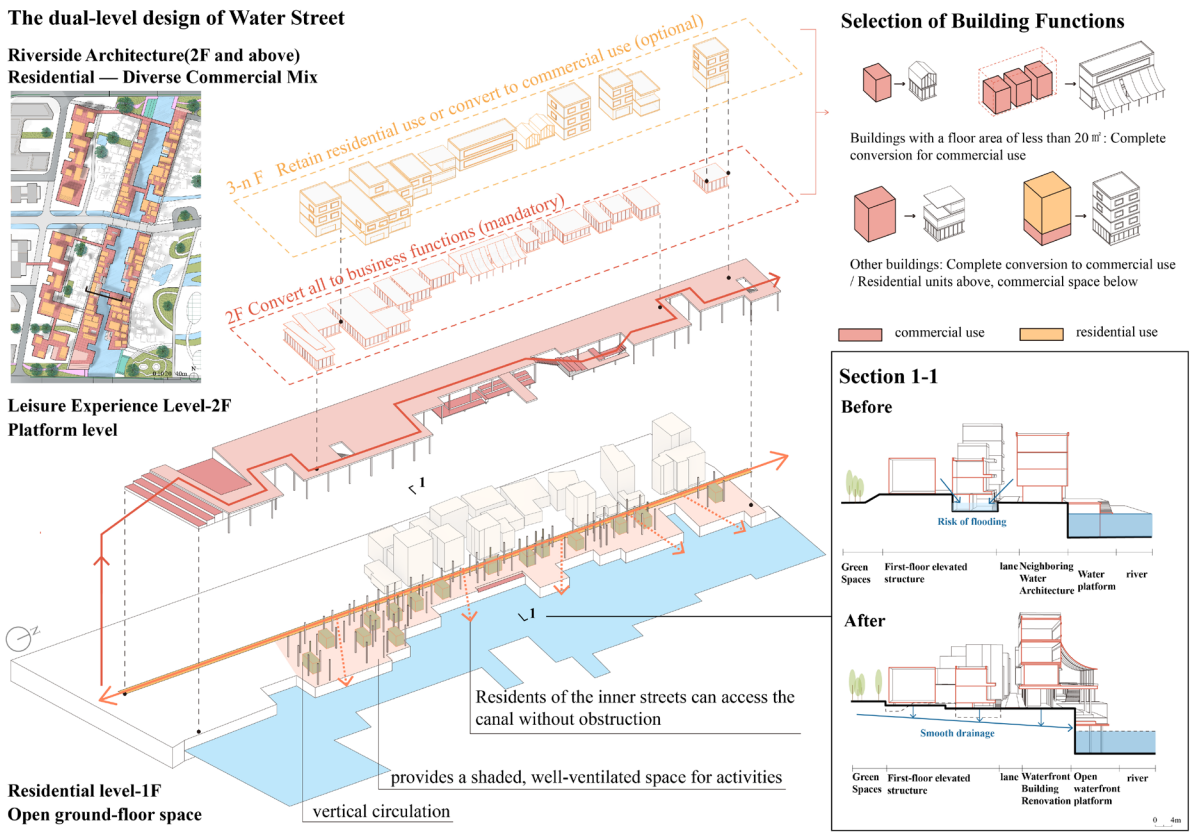


Fig.6-5 Design Drawing of a Section of Canal Water Street

(Source: Created by the author)

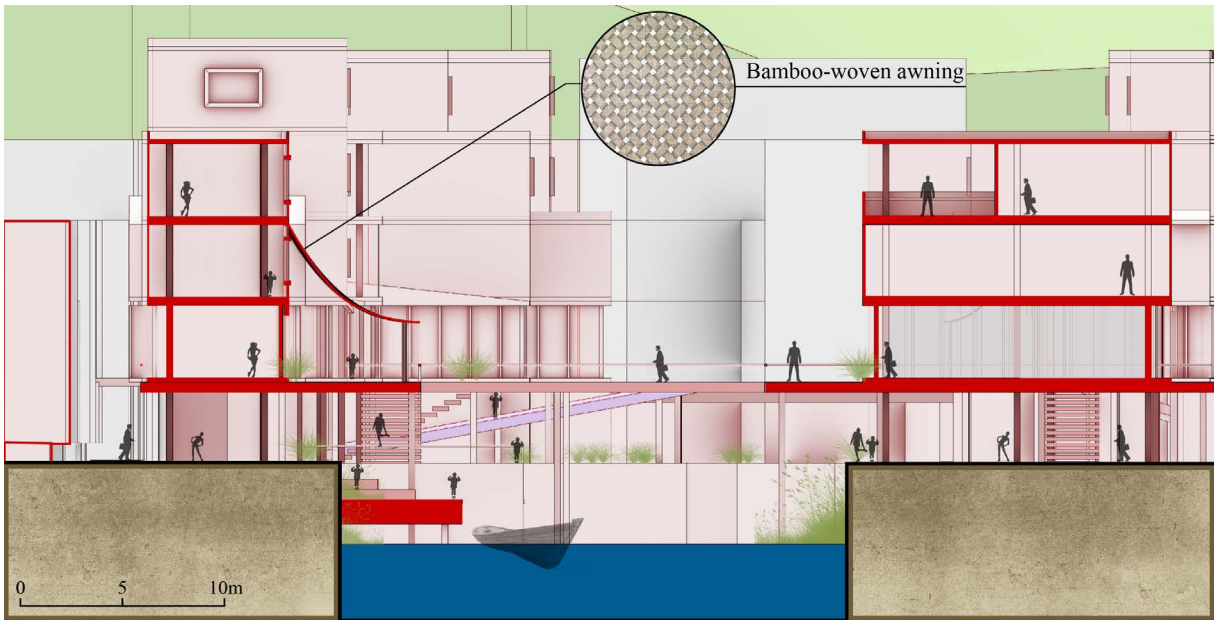


Fig.6-6 Cross-Section of Canal Water Street

(Source: Created by the author)



Fig.6-7 Rendering of Canal Water Street

(Source: Created by the author)

2. Floodable Water Square Design

In addition to the deterioration of the waterfront quality, the integration of modern road infrastructure has disrupted the original spatial continuity of the traditional fishing-village area in Nanheng Village. Based on the road network design outlined in the master plan, the roadway in the middle section of the canal has been narrowed, reducing vehicular traffic. At the same time, pedestrians can cross the road via the space beneath the bridge, creating opportunities for the integration of public land spaces on both sides of the road. Building on the identification of resilience vulnerabilities in Nanheng Village discussed in Chapter 4, in areas where risks overlap, we will utilize micro-topography shaping and elevation adjustments in public spaces to create multi-layered, composite public venues. Through facilities such as sunken skateparks, gently sloping lawns, retention basin stages, road drainage inlets, and underground drainage pipes, we will establish a “Floodable Water Square” system that integrates daily activities with stormwater retention functions. As shown in Fig.6-8, on sunny days, the loodable Water Square can serve as a skatepark, an event lawn, a performance venue, and a space for neighborhood interaction, thereby enriching the variety of large-scale, high-quality open public spaces in Nanheng Village. In rainy conditions, however, each open space can be converted into a

temporary flood detention area; furthermore, through drainage channels in the roads, different plots can work together to collect, store, and slowly discharge water. Even when a retention basin reaches its design capacity, the surrounding retention basins can still be used to continue providing flood detention. Located at the intersection of the boat dock and Water Street, Floodable Water Square serves not only as an ecologically resilient facility but also as a public platform that supports waterfront commerce, community activities, and daily interactions. By regulating stormwater runoff, it provides a safe environmental foundation for waterfront commerce and public life, transforming the ecological space from a passive protection system into a spatial framework that sustains both economic activity and daily life. (Fig.6-9)

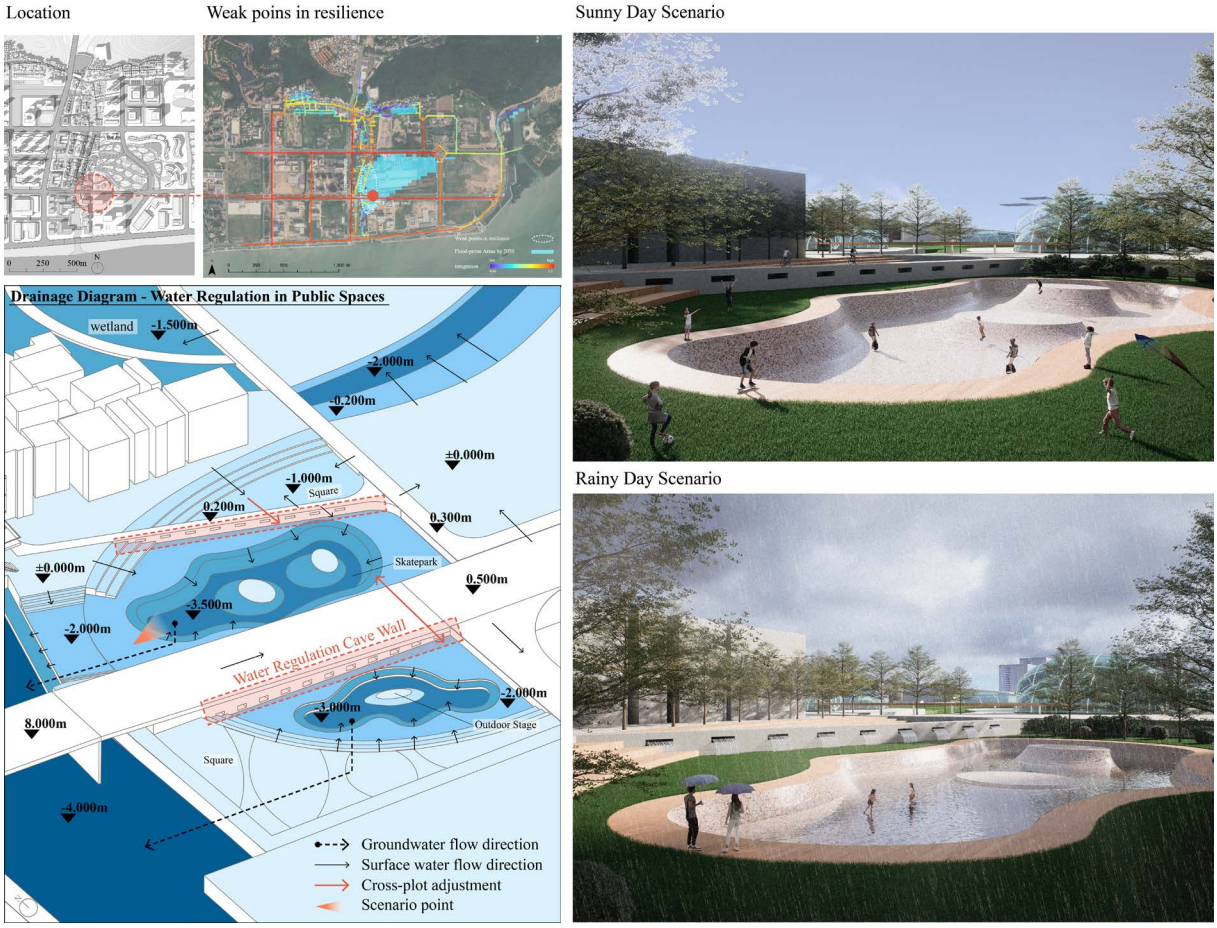


Fig.6-8 Design Drawing for the Floodable Water Square Node

(Source: Created by the author)

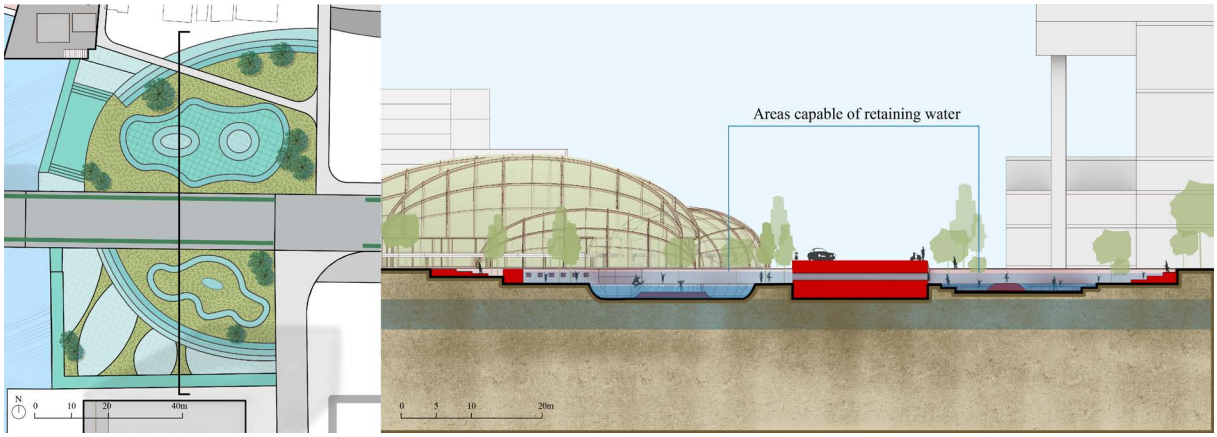


Fig.6-9 Cross-Section of Floodable Water Square

(Source: Created by the author)

3. Waterfront Urban Living Room

Based on the results of the previous questionnaire and interviews, the residents of Nanheng Village wish to preserve and carry forward elements such as the canals, private piers, the fishing way of life, displays of fishing gear, and the history of the fishing-village area. Therefore, in addition to preserving and renovating the distinctive features of the existing architecture, the design includes a waterfront urban living room centered around the “Fishing Village Memory Museum” at the entrance to the waterfront. The Fishing-Village Memory Museum primarily displays fishing and farming tools, and it is recommended that multimedia and interactive technologies be incorporated to recreate the pastoral lifestyle and daily activities of the Lingnan water towns in Nanheng village in days gone by. As shown in Fig.6-10, the museum, the pier, and the open green space are not isolated from one another; ramps extend the architectural experience to the waterfront pier, and visitors touring the village by water can disembark at the pier and proceed directly into the museum. The green space in front of the museum’s main façade adapts to both routine and peak-use scenarios. During normal operations, it serves as both a museum plaza for visitor flow and a public recreational area; during high-intensity events such as festivals, performances, and markets, it transforms into an open space for temporary stalls, public gatherings, and cultural activities. The museum’s multiple platforms can also become part of the festival venue, and the main façade can be used for promotional displays or film screenings. (Fig.6-11)

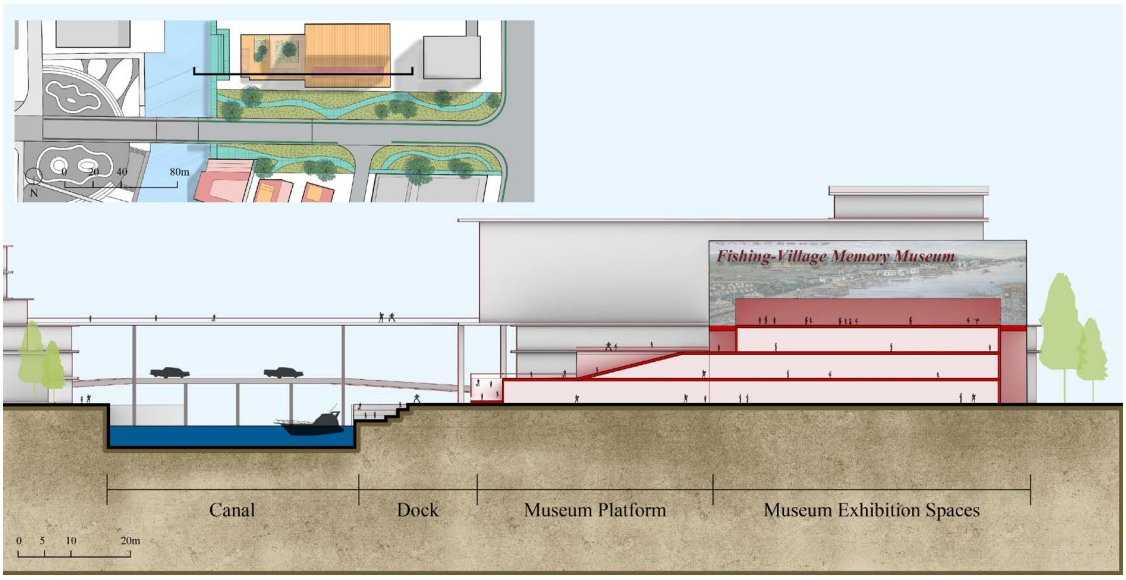


Fig.6-10 Cross-Section of the Urban Waterfront Living Room

(Source: Created by the author)

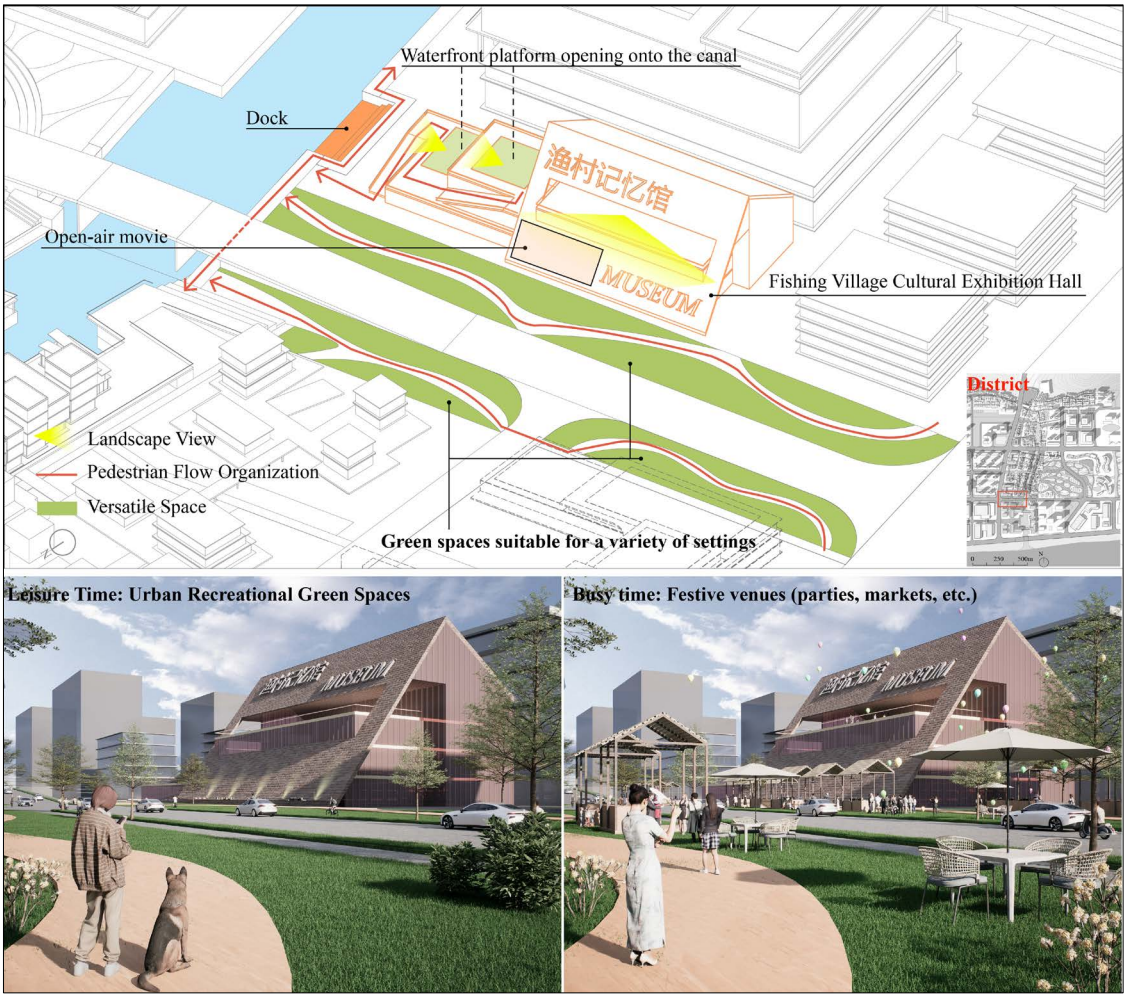
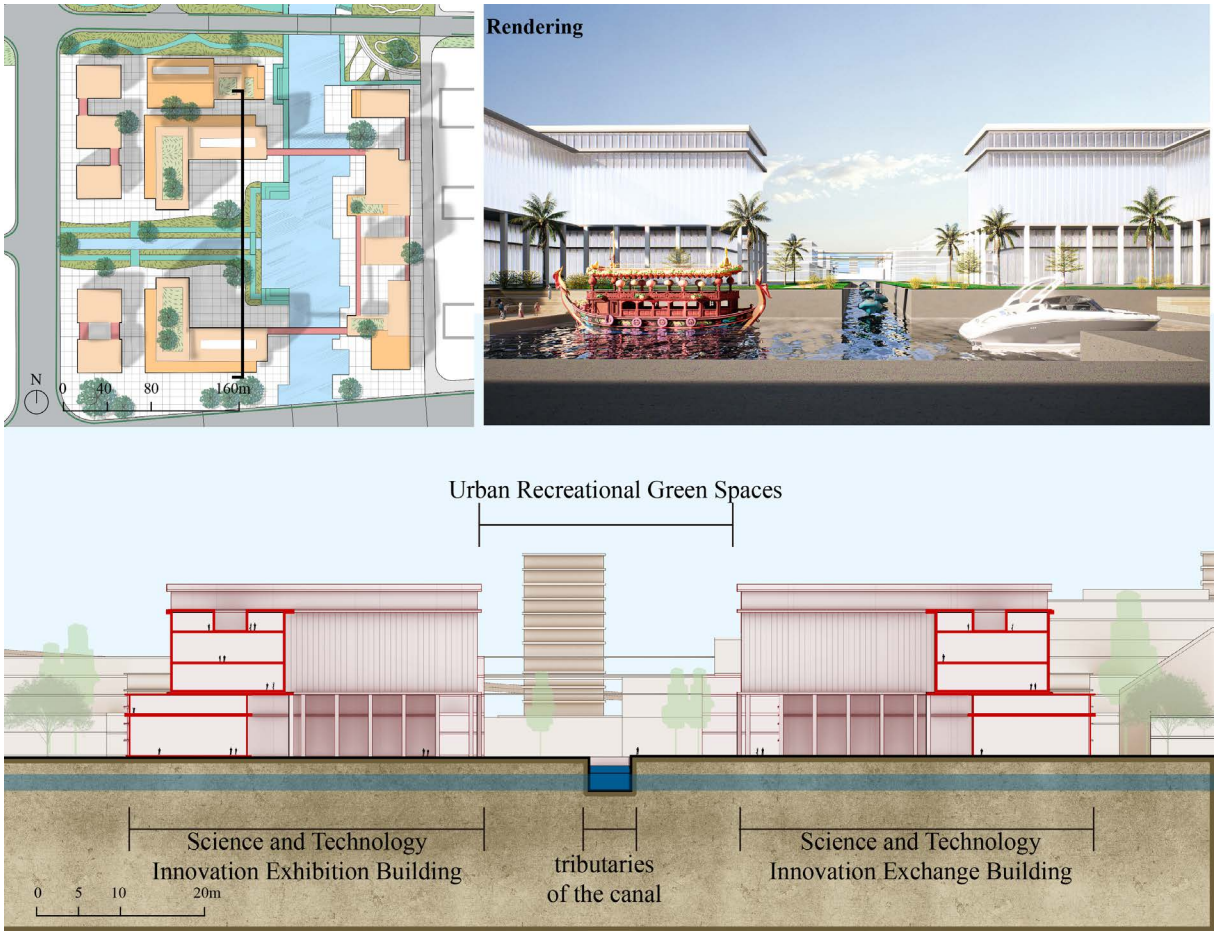


Fig.6-11 Design Analysis Diagram of the Urban Waterfront Living Room

(Source: Created by the author)

To the south of the Fishing-Village Museum, where the southern section of the canal flows toward the sea, a new complex is taking shape. Drawing inspiration from traditional elements—such as the layout of parallel waterways and elevated ground floors—this modern research complex is being developed to serve as a hub for incubation, exhibition, and exchange. A T-shaped channel, recessed perpendicular to the Nanheng Canal, provides mooring space for the remaining fishing boats, while the main canal has been freed up for recreational boats. The technology incubation cluster in the southern section of the canal connects with the Flower Boat Pier, creating new industrial links between traditional water transportation and contemporary technology innovation. (Fig.6-12)

Through the organic synergy of various elements, a wide range of usage scenarios is created. The historical character of the fishing-village is no longer confined to static displays; instead, it is continuously revitalized and expressed in a contemporary context through the combined effects of spatial navigation, waterside experiences, and public activities.



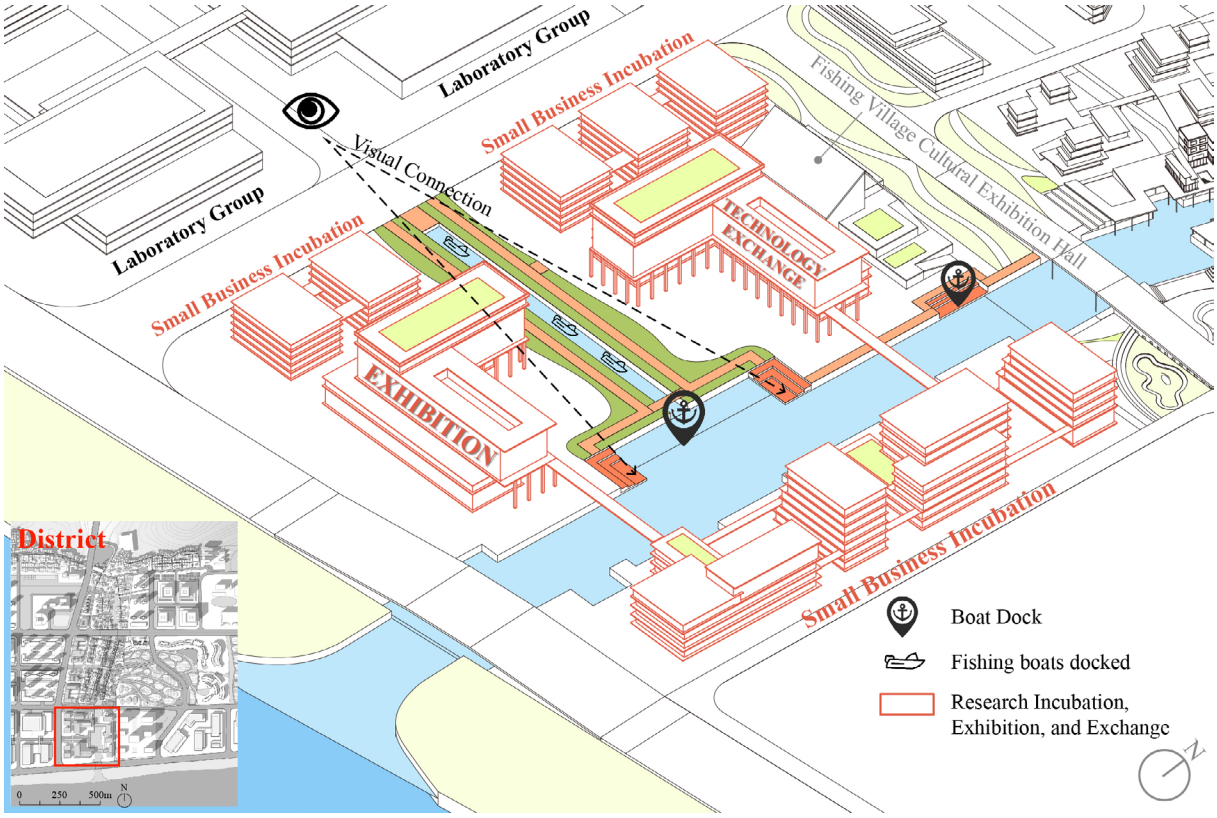


Fig.6-12 Design Analysis Diagram of the Technology Incubation Cluster and Flower Boat Pier

(Source: Created by the author)

6.3.2 Transforming Productive Spaces through Public Landscape-Making and Cultural-Tourism Translation

As Nanheng Village has evolved, both paddy fields and farmland have faced the risk of being encroached upon and marginalized. These spaces are not only valuable means of production but also cultural landscapes that carry deep local memories. To revitalise the remaining farmland within the city and enhance its ecological and social value, this design proposes transforming productive spaces through public landscape-making and cultural-tourism translation. Drawing on the analysis of water systems and agricultural land patterns in urban morphology, as well as the conceptualization of space as a dynamic network of elements in assemblage theory, the design integrates spatial interventions, visitor-route organization, interpretive narratives, and the introduction of new programmers and business activities. In doing so, it transforms traditional agricultural production spaces into multifunctional cultural-agricultural settings that can be collectively experienced and used by contemporary residents,

tourists, and researchers from nearby institutions, while simultaneously fostering ecological resilience, recreational experiences, and economic benefits.

1. Fisheries and Agriculture Integrated Experience Area

The existing paddy fields on the site serve as key elements for fostering resilience within the planning area. Furthermore, during interviews, people consistently expressed a deep attachment to the waterside and pastoral landscapes. Consequently, the design addresses both of these concerns by reinterpreting the layout of the paddy fields. By extracting the two most representative production elements—the grid pattern of reclaimed paddy fields and the elliptical mesh of traditional fishing nets—and applying geometric superimposition and deformation, organic morphology is created, as shown in Fig.6-13. This interwoven texture not only visually embodies the “half-fishing, half-farming” landscape of Nanheng Village but also, through its curved boundaries, reduces local frictional resistance to water flow compared to orthogonal farmland, thereby creating a more efficient rainwater retention capacity.

Building upon a reimagined interpretation of paddy field dynamics, the design incorporates new elements to revitalize the site and create a multifaceted experiential environment. The construction of glass greenhouse structures enables year-round rural experiences and immersive fruit-picking activities within the greenhouses, while also supporting modern agricultural research. An elevated pedestrian walkway connects the greenhouses and traverses the paddy field area, providing fishing spots along the way. This creates a three-dimensional, immersive agricultural, cultural, and tourism leisure zone while minimizing disruption to the natural landscape. As a result, traditional paddy fields have been transformed from a purely agricultural space into a platform for agro-cultural tourism industries that integrates agricultural exhibitions, agricultural product consumption, educational tours, and recreational experiences. (Fig.6-13)

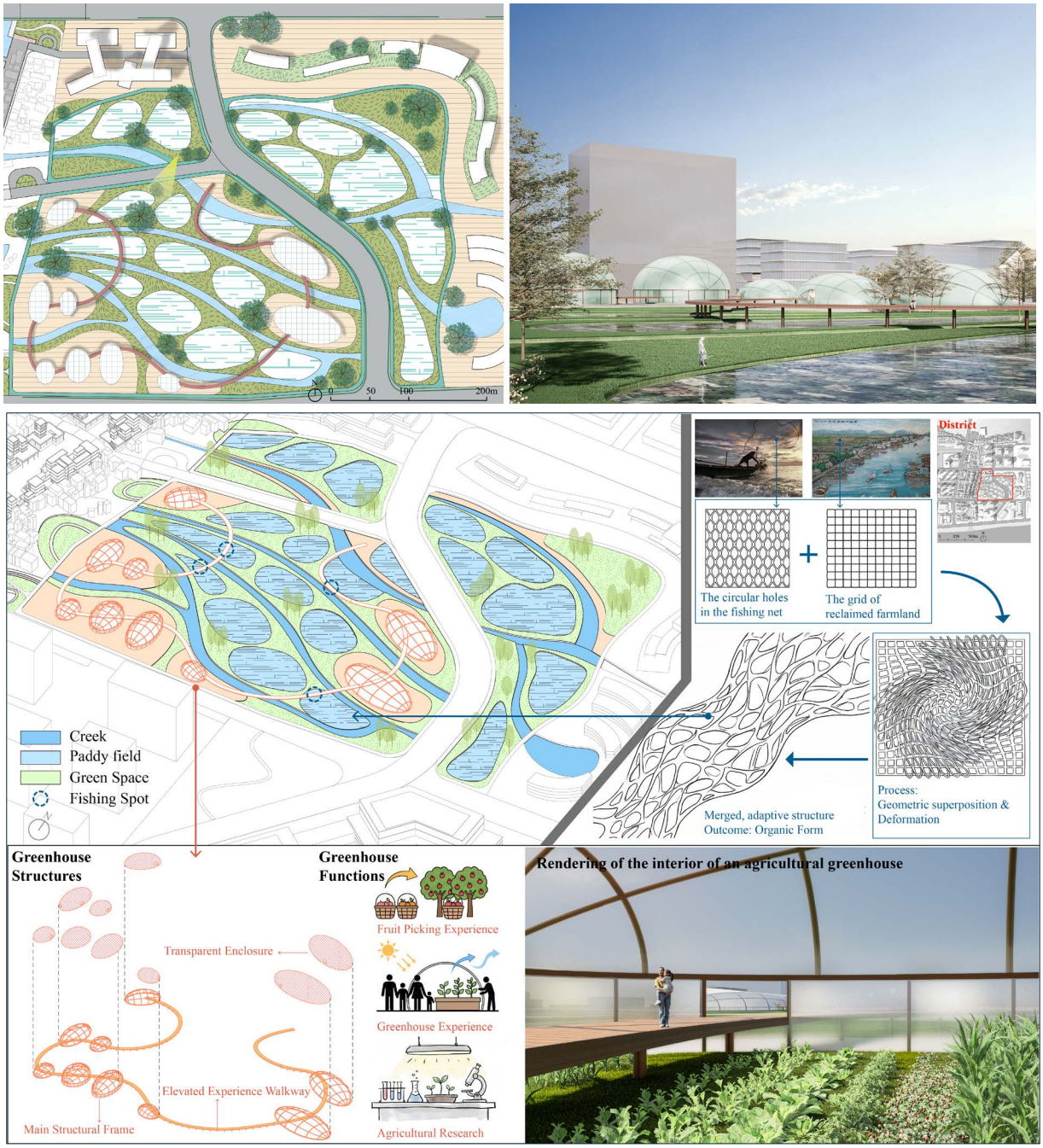


Fig.6-13 Design Plan for the Fishing and Farming Wetland Experience

(Source: Created by the author)

2. Urban Farm

The disconnect between urban and rural systems is felt not only spatially but also in terms of population mobility and the interaction between cities and villages. Shared urban farms are situated between urban built-up areas and traditional villages, utilizing a modular, grid-like farmland layout (in three different sizes) to create a flexible green buffer zone (Fig.6-14). This area will be developed into urban farms, incorporating three distinct management models: the

full-managed model, in which citizens pay annual rent and villagers handle the entire process from planting to harvesting and delivery; the semi-managed model involves residents paying rent, with villagers handling only the cultivation process, while residents can visit the farm to harvest produce in their spare time; and the villager-run model reserves plots for villagers to cultivate on their own. Through three distinct operational models, traditional agricultural production spaces are transformed into natural recreational areas shared by both urban and rural communities, directly linking urban capital, consumer demand, and rural production organizations to create more job opportunities and stable economic income for villagers. (Fig.6-15)

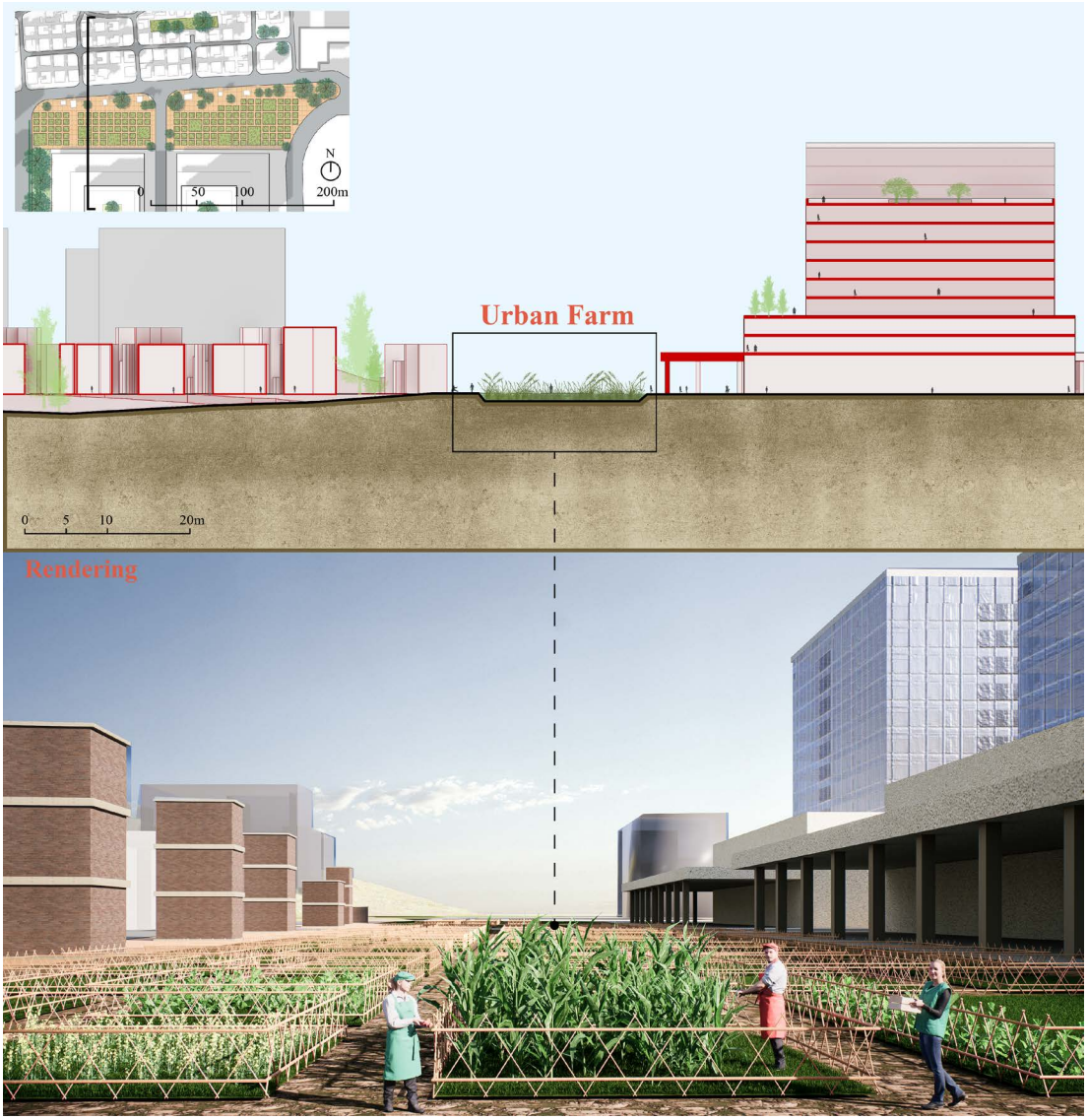


Fig.6-14 Design Plans for a Multifunctional Urban Farm

(Source: Created by the author))

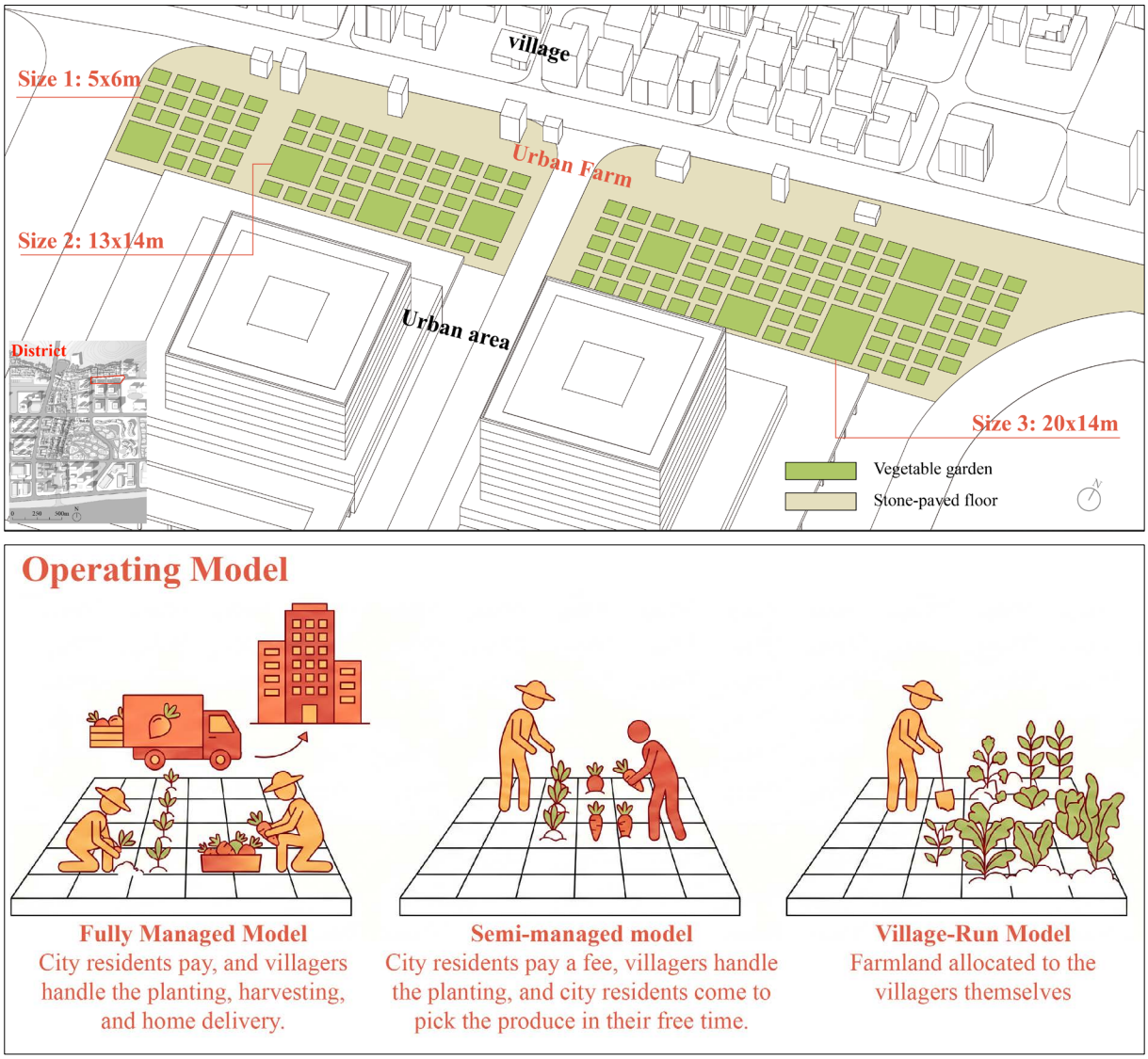


Fig.6-15 Design Plans for a Multifunctional Urban Farm

(Dimension Analysis (Top) and Business Model (Bottom) ; Source: Created by the author)

6.3.3 Revitalizing Local Memory through Its Symbiosis with Urban Regeneration

Urban regeneration is not the end of history, but rather the continuation and rebirth of memory. The regeneration design for Nanheng Village strives to find a balance between local memory and modern life. By integrating key nodes with new needs, this section transforms banyan trees, canals, piers, enclosed building complexes, and village alleyways into mixed-use spaces that support community life, cultural exhibitions, and related commercial activities. This achieves a symbiosis of local memory and modern vitality, forming a highly cohesive new

water-village community.

1. Banyan Tree Plaza and the Integration of Community-oriented business

The old banyan tree in the northern section of the canal is not only an iconic plant of the Lingnan water towns but also a symbol of the village's feng shui and a source of emotional attachment for the villagers. The space surrounding the original banyan tree has gradually been encroached upon by newly constructed village houses, and the area in front of the tree—once a simple paved path—has been steadily squeezed. Banyan Tree Square centers on the ancient banyan tree as its visual focal point. By integrating the canal's existing waterway—which extends toward the village at this point—it forms a T-shaped park. Facing the canal, a terraced waterfront plaza has been created to provide space for diverse public activities. Meanwhile, the section of water extending into the village has been designed as an area for storing dragon boats and mooring fishing boats. Combined with the pleasure boat dock and the surrounding recreational park, water-based activities and onshore spaces are closely integrated. This area will become a key spatial node for showcasing Nanheng Village's water culture and strengthening community identity. (Fig.6-16)

The northern section of the canal has a morphology characterized by a cluster of enclosed building complexes. On the one hand, the T-shaped park design allows the area's streets and alleys to "bring the scenery into the alleys"; on the other hand, small green public spaces are strategically incorporated into the center of each enclosed building complex, and efforts are made to encourage the conversion of some residential functions within these complexes into community-oriented businesses. These community-oriented businesses should adhere to the principles of low impact, public engagement, and sustainability, with priority given to introducing bed-and-breakfasts, coworking spaces for digital nomads, art therapy studios and so on. Through village-run operations, cooperative management, and space leasing, residents will be involved in the operation of the revitalized spaces, preventing local heritage from being reduced to mere commercialization or completely supplanted by external capital. The juxtaposition of old and new elements will attract nearby research communities and tourists to the traditional village, fostering a vibrant socio-economic ecosystem. (Fig.6-16)

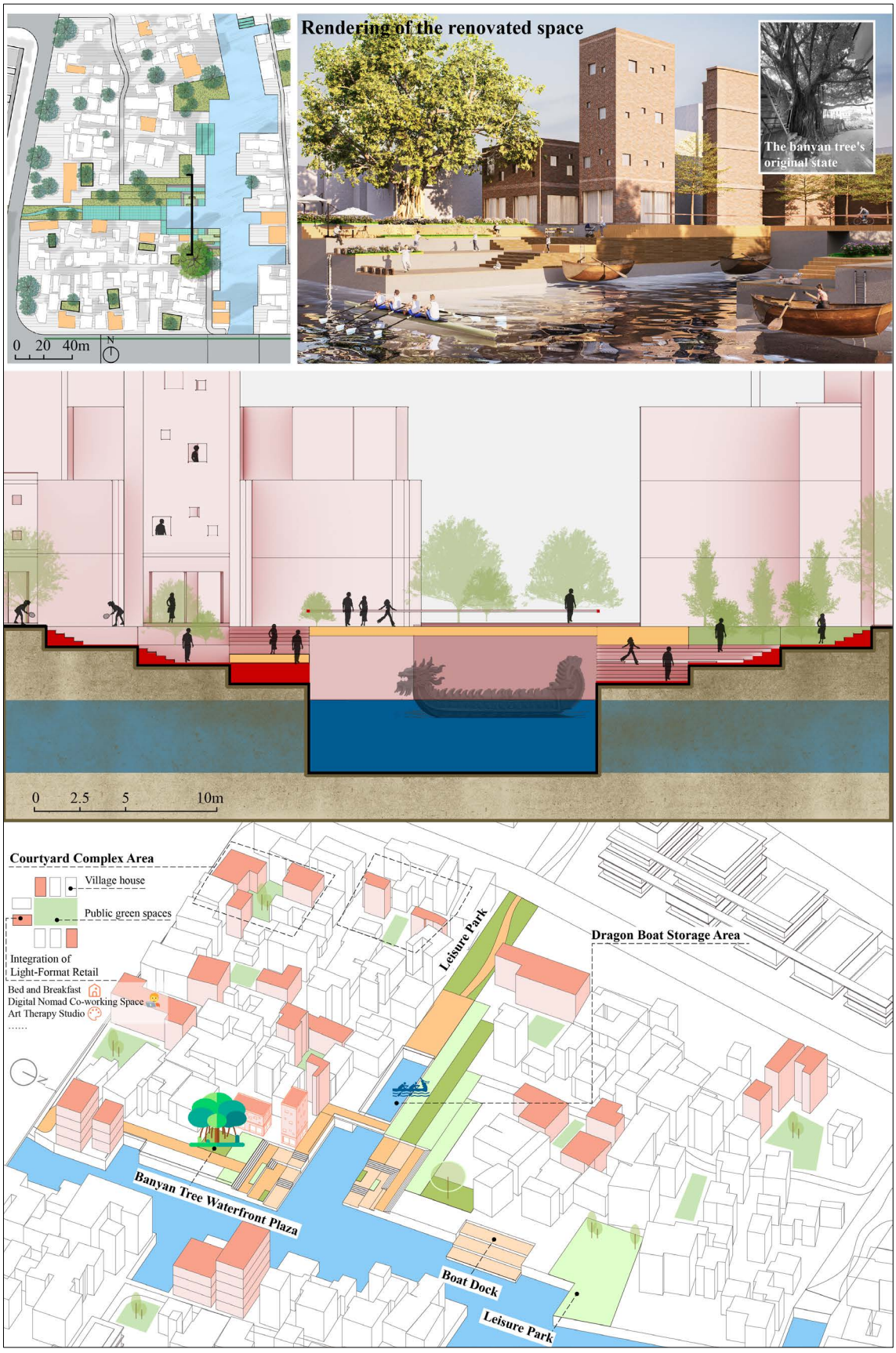


Fig.6-16 Design Drawings for Banyan Tree Plaza

(Source: Created by the author)

2. Planning for Community Activity Facilities

Based on site surveys and design analyses, improving the overall quality of life in the community urgently requires the development of modern public service facilities. The design proposes a series of modern community activity facilities on the west side of the northern section of the canal, along the main urban thoroughfare. These include an indoor gym, a swimming pool, indoor courts for various ball sports, and outdoor park courts, all integrated with the community center. These facilities not only meet the modern lifestyle needs of residents but also serve the newly developed research and development clusters in the surrounding area, acting as a bridge connecting long-time residents, newcomers, visitors, and the research community. This will help transform Nanheng Village from a traditional, insular village into an open, inclusive, and vibrant modern urban community. (Fig.6-17)

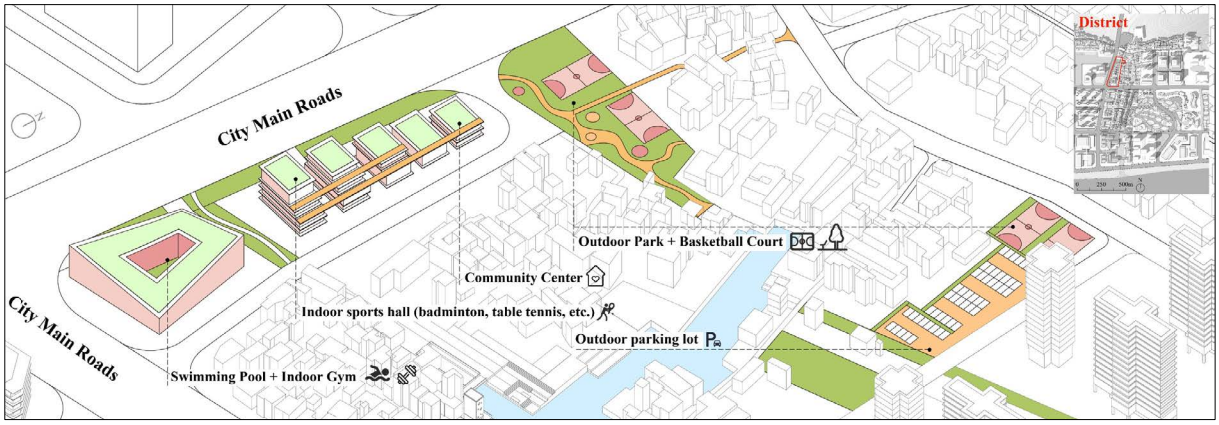


Fig.6-17 Community Activity Facility Layout Plan

(Source: Created by the author)

6.4 Economic and Technical Indicators

As shown in Table 6-1, the total land area of this project is 395 hectares, with approximately 2.245 million square meters designated for construction. While accommodating a total floor area of approximately 4.02 million square meters, the project maintains a floor area ratio (FAR) of exactly 1.8 and achieves a high green space ratio of 40%, aligning with the regeneration objectives of balancing high-density development with the preservation of the fishing-village character against the backdrop of rapid urbanization. More specifically, the total

land area of the key design zone is approximately 64 hectares, with approximately 330,000 square meters of developable land and a total floor area of approximately 351,000 square meters. The floor area ratio is capped at 1.1, and the green space ratio is 30%. The key design area is a zone requiring detailed design to extend the village's fabric, shape the waterfront, enhance public spaces, and create distinctive settings; the low floor area ratio helps preserve the original fishing-village character, livability, and sense of scale.

Table 6-1 Economic and Technical Indicators

	Planning Scope	**Key Design Scope**
Type	Value	Value
Total Land Area	3944690 ㎡ (395 ha)	644053 (64 ha)
Construction Land Area	2245098 ㎡	329644 ㎡
Total Gross Floor Area	4022762 ㎡	351232 ㎡
FAR	1.8	1.1
Green Space Ratio	40%	30%

As shown in Table 6-2, during the urban regeneration process, based on a site survey of Nanheng Village and its surroundings and an assessment of building quality, existing buildings were classified for different treatments (see Section 3.3.5 for details), resulting in a phased regeneration strategy that combines "preservation, renovation, demolition, and new construction." Preserved buildings primarily fall into two categories: the first consists of village structures that continue to serve residential functions, mainly distributed within the relatively intact original village spaces at the foot of the mountain; their preservation helps maintain Nanheng Village's original human scale, street and alley relationships, and community continuity. The second category comprises research institutions and public buildings that already possess a certain level of structural foundation and spatial quality. Renovation of buildings will primarily focus on the canals and their surrounding interfaces. By repurposing existing building functions, updating facades, and enhancing spatial openness, these

renovations will create key interfaces connecting the mountains, the village, and the coastal areas, thereby further strengthening the continuity and recognizability of the Mountain-Sea Corridor. Building on this foundation, the new structures adopt a posture of retreat and nesting in relation to the canals. By varying their heights and volumes, they guide the gaze toward the core area, thereby creating a smooth transition between the urban area and the village on a macro scale of urban design. (Fig.6-18)

Table 6-2 Summary of Demolition, Renovation, Retention, and New Construction Floor Area

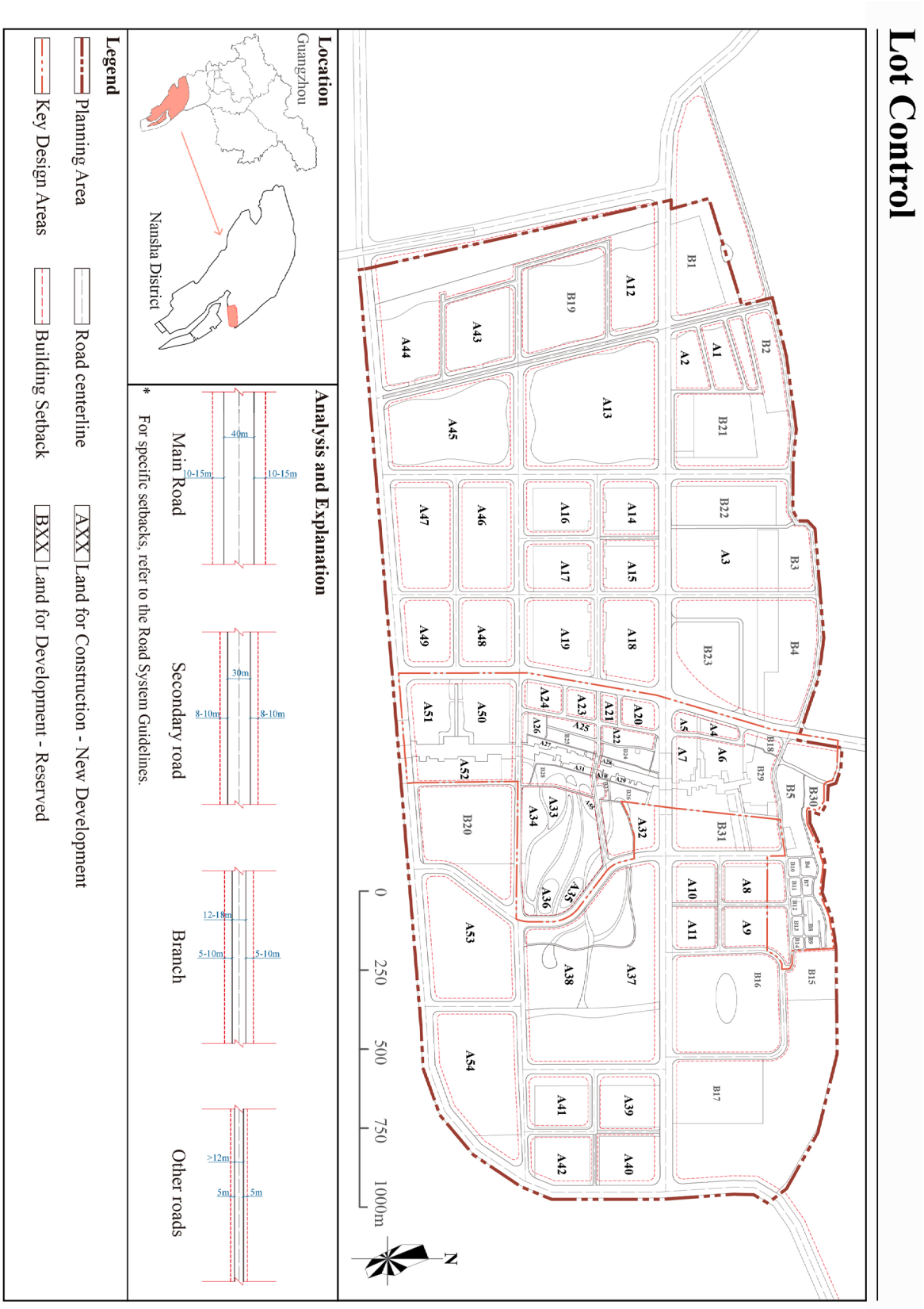
	Area Planning Scope		**Key Design Scope**	
Type	㎡	Percentage/%	㎡	Percentage/%
Original Gross Floor Area	1342087	33.36%	131456	37.43%
Demolished Gross Floor Area	33300	0.83%	33300	9.48%
Renovated Gross Floor Area	33279	0.83%	33279	9.48%
Preserved Gross Floor Area	1275507	31.71%	122071	34.76%
Newly Constructed Gross Floor Area	2713975	67.47%	195881	55.77%



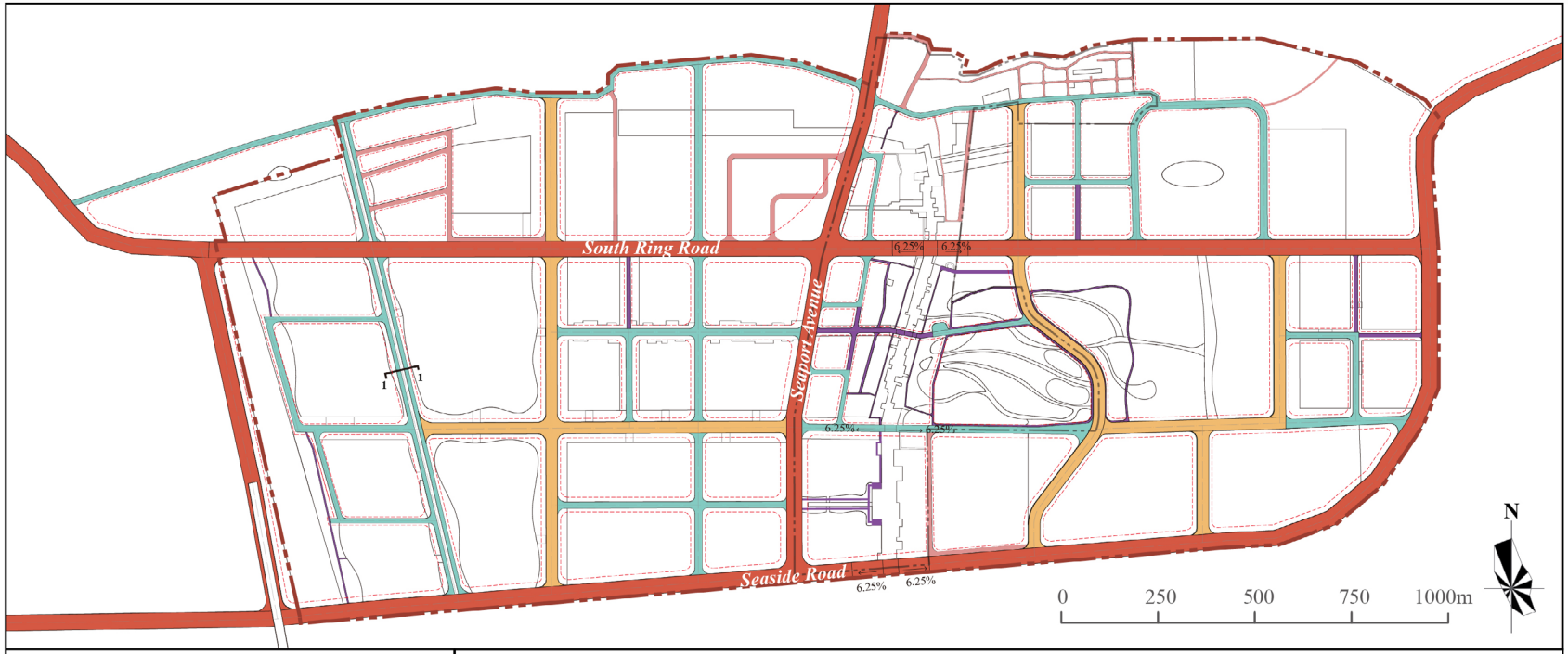
Fig.6-18 Schematic Diagram of Demolition, Renovation, and Retention vs. New Construction

(Source: Created by the author)

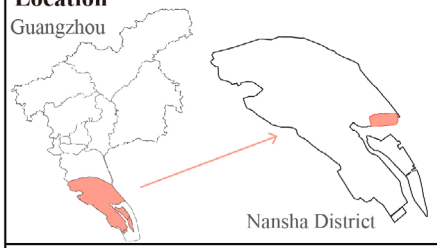
6.5 Urban Design Guidelines



Road System



Location

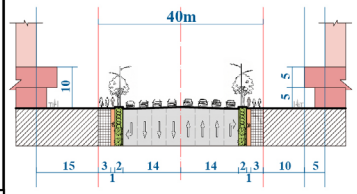


Legend

- Planning Area
- Key Design Areas
- Road centerline
- Building Setback
- main roads (40m)
- secondary roads (30m)
- branch roads (12-18m)
- other roads (<12m) (open to motor vehicles)
- other roads (<12m) (non-motorized vehicle lanes)

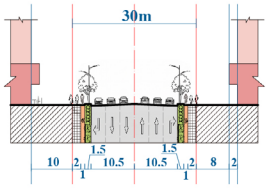
Analysis and Explanation

Main Road



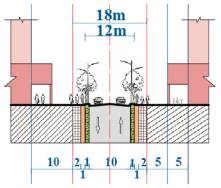
Main For buildings under 10 meters in height, the building setback may be relaxed to 10 meters provided that outdoor seating is provided on the ground floor.
For buildings over 10 meters in height, the building setback must be 10 meters.

Secondary road



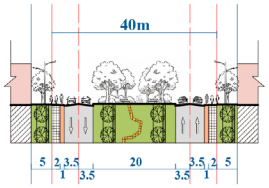
Buildings under 10 meters in height may project 2 meters from the second floor to provide an elevated shaded area.

Branch



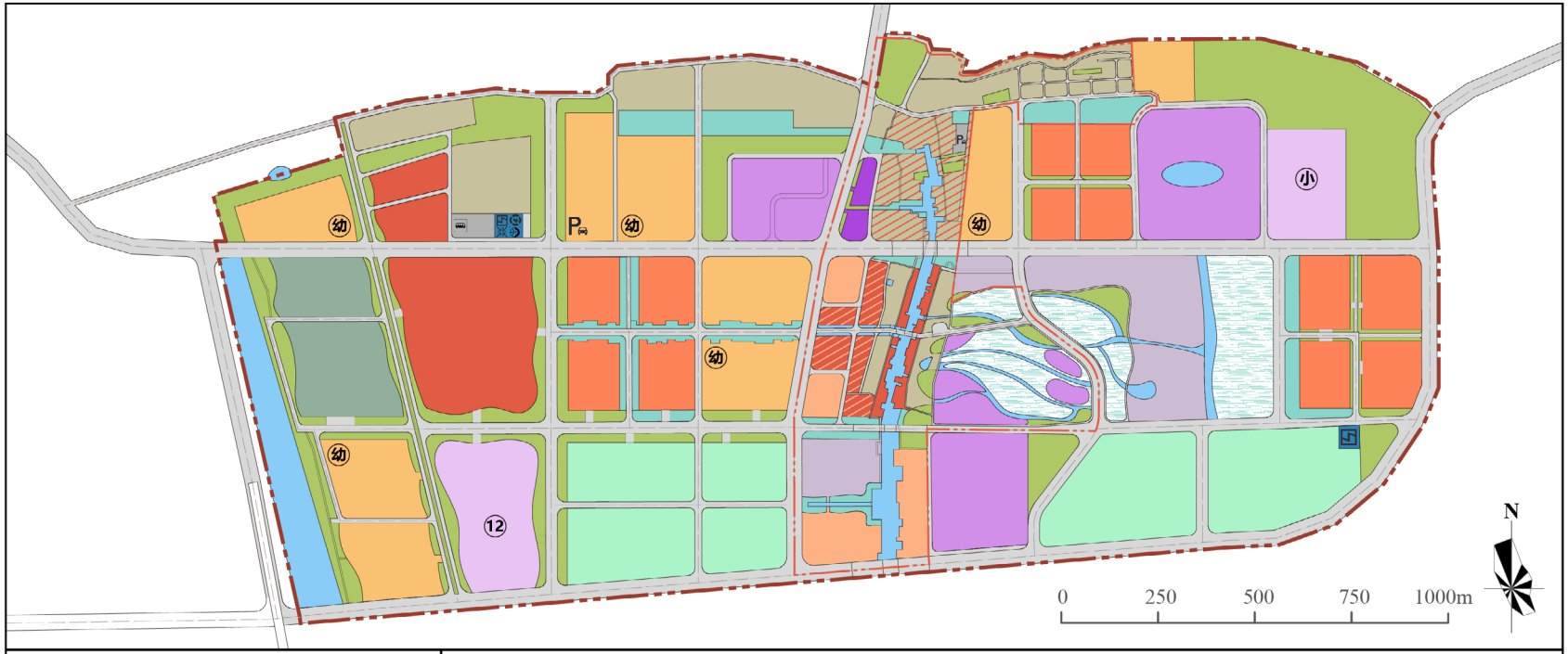
In areas where the building height is less than 10 meters, the building setback may be reduced to 5 meters, provided that a ground-floor walkway is provided for pedestrian use.

Landscape Branch

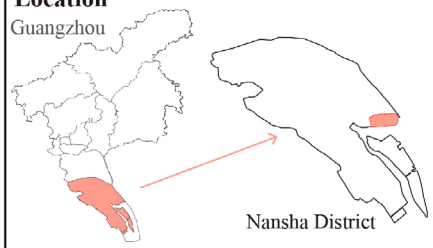


A 20-meter-wide urban park is provided in the central section of the Landscape Branch.
The specific location is at Section 1-1.

Land Use



Location



Legend

- Planning Area
- Road centerline
- Key Design Areas
- Urban residential land
- Rural residential land
- Commercial land
- Commercial and Financial Land
- Other Commercial Services Land
- Research and Development Land
- Educational land
- Cultural Land
- Sports land
- Class I industrial land
- New Industrial Land
- Rural residential land mixed with commercial land
- Commercial and Other Commercial Services Land
- Land for urban, town, and village roads
- Transportation Facilities Land
- Inland waters
- Paddy field
- Parks and Green Spaces
- Square Land
- Public utility land
- Bus terminal
- Kindergarten
- Elementary School
- K-12 School
- Waste Transfer Station
- 110-kilovolt substation
- Telecom Building
- Fire Station
- Public parking lot

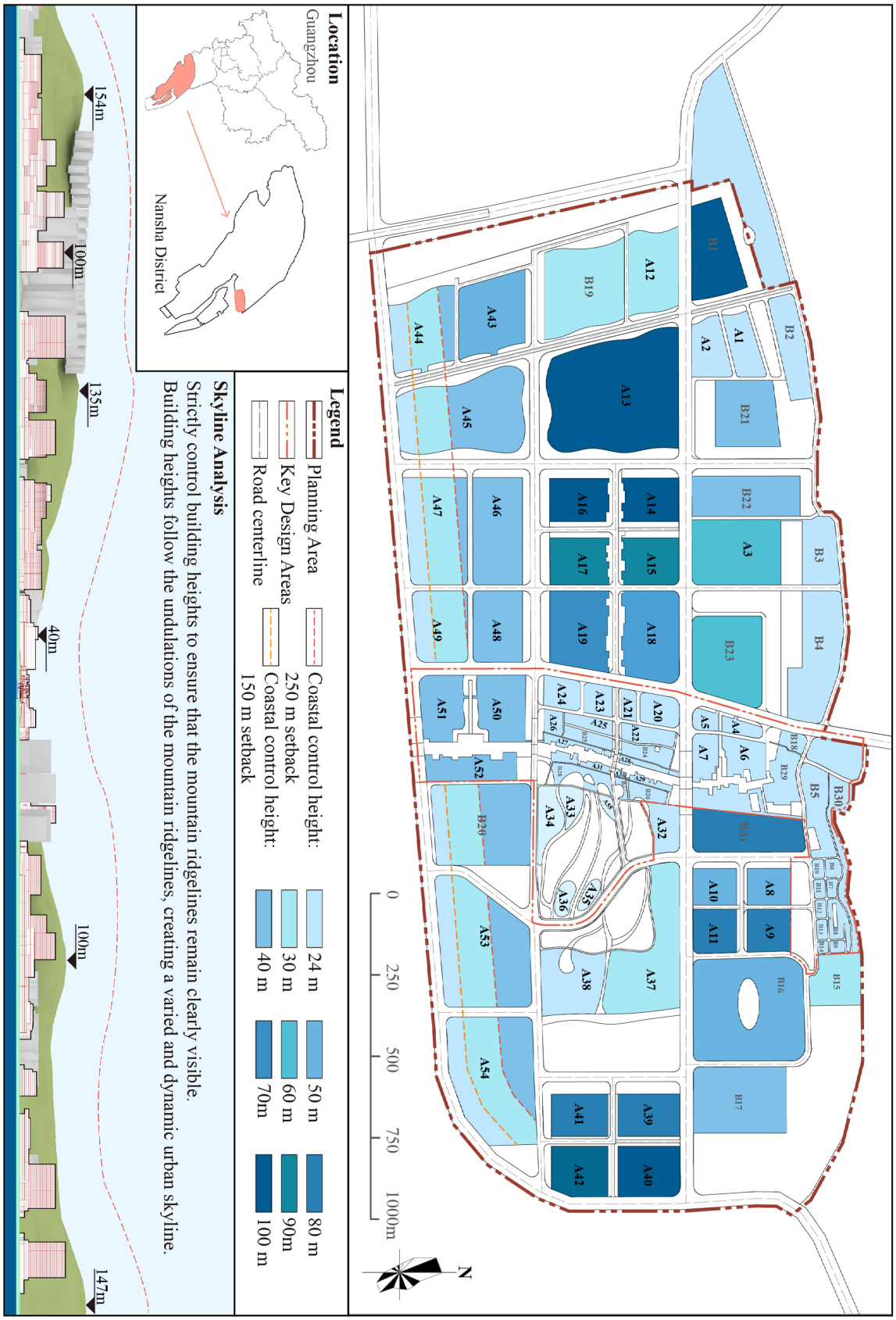
Analysis and Explanation

The classification used in this table follows the **Classification of territorial spatial survey, planning and use control* (T/GDSTD 018-2026)*.
Most land uses are classified according to the second-level classification standard.

Table 6-3 Land Use Balance Sheet

No.	Land Use Type	Land Area / m²	Percentage of Total Land Area
1	Urban residential land	377334	9.57%
2	Rural residential land	227104	5.76%
3	Rural residential land mixed with commercial land	55123	1.40%
4	Commercial land	184840	4.69%
5	Commercial and Financial Land	268074	6.80%
6	Other Commercial Services Land	68706	1.74%
7	Commercial and Other Commercial Services Land	31225	0.79%
8	Sports land	10398	0.26%
9	Cultural Land	142034	3.60%
10	Research and Development Land	265189	6.72%
11	Educational land	142198	3.60%
12	Class 1 industrial land	100749	2.55%
13	New Industrial Land	372124	9.43%
	Subtotal of Construction Land	**2245098**	**56.91%**
14	Road land for urban, town, and village roads	732862	18.58%
15	Transportation Facilities Land	14684	0.37%
	Subtotal of Transportation Land	**747545**	**18.95%**
16	Paddy field	170376	4.32%
17	Inland waters	145206	3.68%
18	Parks and Green Spaces & Square Land	636465	16.13%
	Total	**3944690**	**100.00%**

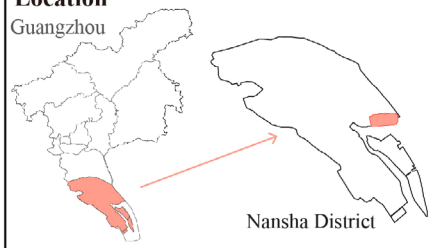
Height Control



Strength Control



Location



Legend

- Planning Area
- Road centerline
- Key Design Areas

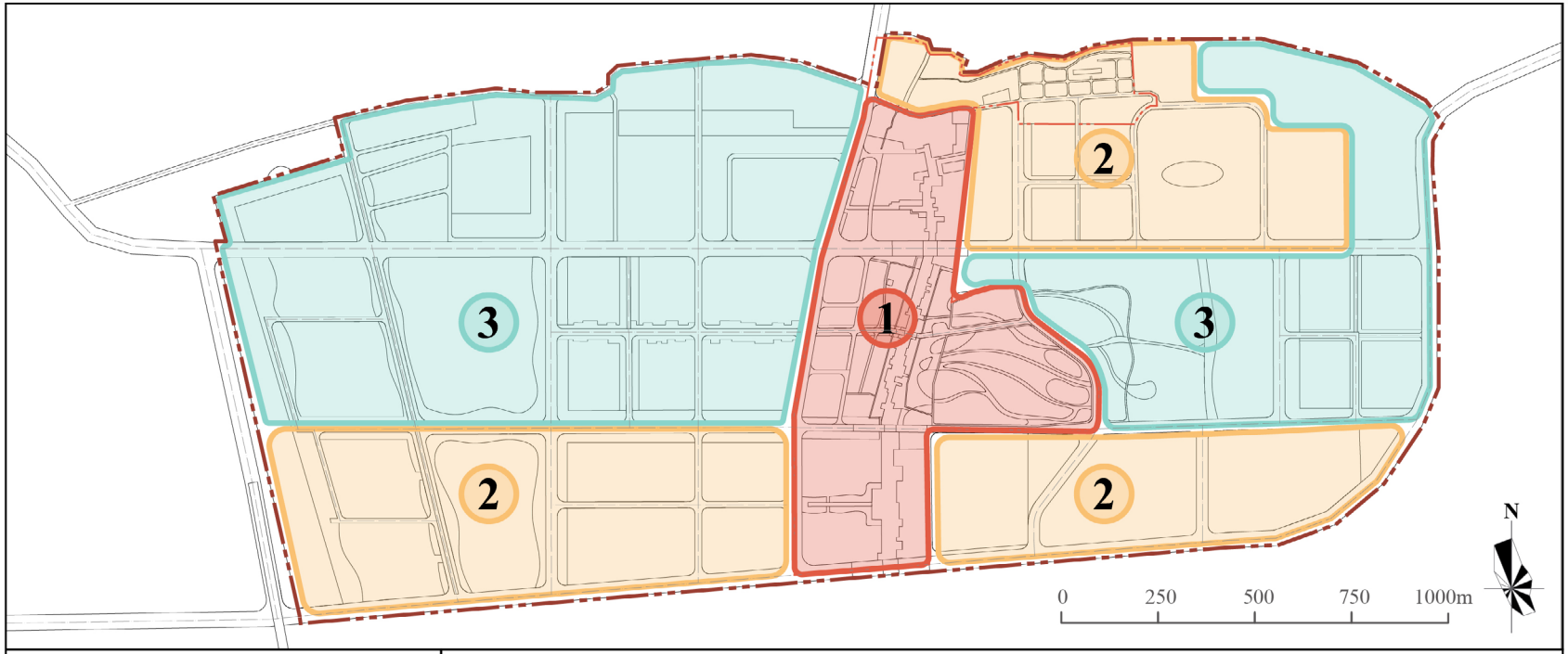
FAR

- <1
- 0.5-1
- <2
- 1-1.5
- 1-2
- 1-2.5
- 1-3
- 1.5-2
- 1.5-3
- 2-4
- 2.5-4.5

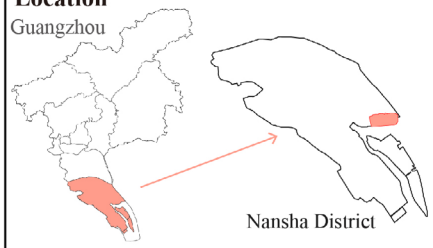
Analysis and Explanation

The floor area ratio reflects the intensity of a site's development.
Guided byAssemblage Theory, plots with high floor area ratios are interspersed throughout the site to avoid the traffic congestion and oppressive street-facing facades that result from concentrated, contiguous development.

Phased development



Location



Legend

- Planning Area
- Road centerline
- Key Design Areas

Analysis and Explanation

Phase 1 Development

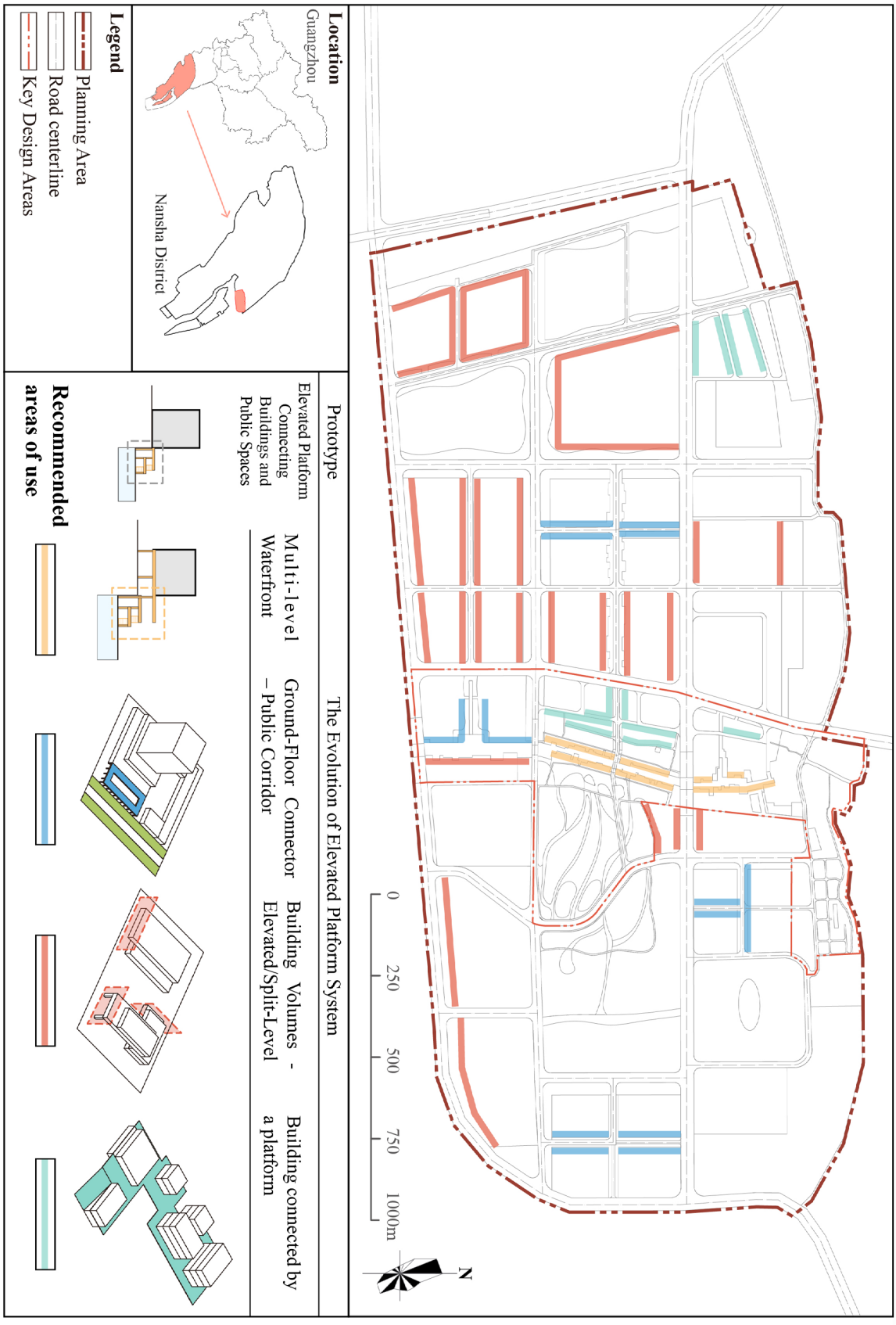
Starting from the core of urban design, we will first launch the construction of the Integrated Mountain-Sea Corridor.
We will enhance the value of the site with high-quality commercial and cultural facilities, while providing small-scale incubation spaces for the research and development base currently under construction. This will facilitate capital reinvestment and attract a vibrant community.

Phase 2 Development

During the mid-phase of development, industrial projects will be introduced along the waterfront and main thoroughfares (areas circled in yellow) to create jobs.
Additionally, construction of infrastructure for commercial, residential, and educational facilities will begin in areas adjacent to the Phase 1 development to achieve the integration of industry and urban development.

Phase 3 Development

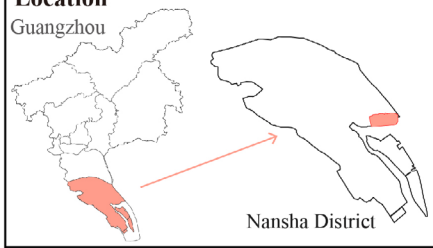
Future development sites will enhance the functionality and quality of the area and foster the growth of local businesses into industry leaders.


Street Interface
Location
Guangzhou
Nansha District
Legend
Planning Area
Road centerline
Key Design Areas
0
250
500
750
1000m
N
Prototype
The Evolution of Elevated Platform System
Elevated Platform Connecting Buildings and Public Spaces
Multi-level Waterfront
Ground-Floor Connector – Public Corridor
Building Volumes - Elevated/Split-Level
Building connected by a platform
Recommended areas of use

Architectural Guidelines



Location



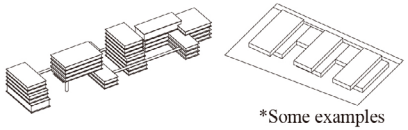
Legend

- Planning Area
- Key Design Areas
- Road centerline
- AXX Land for Construction - New Development

Recommended Layout Options

Parallel layout

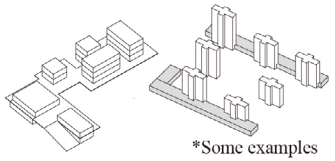
The building faces the main street in a parallel arrangement



*Some examples

Clustered layout

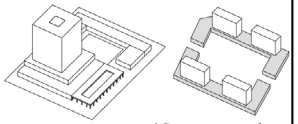
The buildings are arranged randomly throughout the site, forming clusters where several buildings come together.



*Some examples

Courtyard Layout

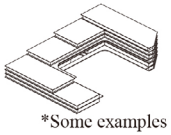
The buildings are arranged along the perimeter of the land, creating a courtyard in the center.



*Some examples

Semi-enclosed layout

The building is arranged around the perimeter of the site and opens onto the open space.



*Some examples

6.6 Chapter Summary

This chapter translates the design guidelines derived from the design analysis based on urban morphology and assemblage theory, as well as the design framework presented in Chapter 5, into concrete urban design proposals for the area surrounding the Nanheng Village site.

First, the basic information and functional zoning of key design areas were defined. The Mountain-Sea Corridor connects the village clusters, the urban-rural integration zone, the Creative Waterfront Street, and the technology incubation cluster. Industrial functions are integrated with canals, farmland, village lanes, and spatial nodes, forming an interwoven relationship with the existing spatial patterns and residents' daily lives. Second, the design of key nodes specifically addresses the site's core challenges: through the creation of "dual-level waterfront streets," "Floodable Water Square," and "waterfront urban living rooms," the project shapes a waterfront interface for the new water-village community that integrates industrial capacity, flood resilience, and public vitality; Through the "fisheries and agriculture integrated experience area" and multi-operational "urban farms," the project transforms productive farmland into public landscapes shared by both urban and rural residents; by creating "banyan tree square," introducing community-oriented businesses, and constructing new recreational facilities, the project revitalizes existing village houses and public nodes, ensuring that local memories are preserved within modern urban life and sustainable operations. Finally, this chapter compiles urban design guidelines covering multiple dimensions—including land use, building height, floor area ratio, street interface, and architectural morphology—based on development requirements and economic and technical indicators.

The urban design proposal presented in this chapter serves as a systematic validation of the theoretical framework outlined earlier, providing a methodological approach and practical model for the adaptive regeneration of urban villages in Nanheng Village and similar areas within the GBA.

Summary and Outlook

Summary of Key Findings

This study centers on the core question of "How can we preserve and sustain the unique character of Nanheng Village by redefining the historical and spatial relationships of the fishing-village, thereby creating a water-village community that coexists harmoniously with the surrounding areas?" Taking Nanheng Village in Nansha District, Guangzhou, and its surrounding areas as the subject of research and design, the study proceeds step-by-step from background context, theoretical review, design analysis, methodology development, and design practice. Grounded in urban morphology and incorporating the dynamic generative thinking of assemblage theory, it explores adaptive regeneration pathways for Lingnan fishing-village communities in the context of rapid urbanization. The main conclusions of this study are as follows:

1. The spatial value of Lingnan fishing-villages, as exemplified by Nanheng Village, should be understood within the holistic relationship between mountains, villages, canals, fields, cities, and the sea. Given the GBA's dense network of waterways, integrated fishing and farming practices, intertwined village-community relationships, and rapid urbanization, the urban regeneration of Lingnan fishing-villages should not be limited to architectural facades or simple commercial repurposing. Instead, it must focus on how to sustain the visual relationships between settlements and the waterways, farmland, forests, and cities.

2. Urban morphology and assemblage theory together provide the theoretical foundation for the regeneration of Lingnan fishing villages. Through theoretical research and design practice, this paper demonstrates the complementary relationship between the two in urban regeneration. Urban morphology addresses the questions of "which spatial forms possess value worthy of preservation and how to translate them into new urban elements through design," while assemblage theory further helps to determine "how new urban forms interact with one another and adapt to complex and variable climatic environments." Specifically, regarding the design site of this study, urban morphology helps identify its linear water town layout, waterfront building facades, architectural composition relationships,

distinctive public space nodes, alley networks, and the texture of farmland and ponds. Assemblage theory further supports the reorganization of these existing elements with waterfront commerce, research and incubation, public services, ecological retention, and the urban transportation system.

3. This study has developed a method for the regeneration of Lingnan fishing villages, comprising the following stages: "morphological mapping—morphological identification—resilience analysis—design translation." This is a transformative approach that bridges value judgments and design generation. Taking the design object in this paper as an example, the Nanheng Canal, waterfront interfaces, ancient banyan trees, stilted platforms, and distinctive architectural ensembles constitute the core morphologies that require preservation; conversely, inefficient and enclosed shorelines, fragmented and dead-end roads, and buildings and public spaces with inadequate flood resilience require restoration and reconstruction to enhance their adaptability; Farmland, ponds, and the village's peripheral spaces hold the potential to be transformed into ecological retention areas, public activity spaces, and shared urban-rural spaces. Building on this foundation, the study further translates spatial morphology assessments into the organization of industrial functions: the waterfront interface accommodates waterfront retail, cultural tourism, and innovation and technology exhibitions; the productive rural landscape supports agro-cultural tourism research and experiences; and nodes of village heritage are infused with new business formats and community services. This ultimately crystallized into a design practice centered on the "Mountain-Sea Corridor," achieving synergy among morphology preservation, functional regeneration, and resilience enhancement. Nanheng Village is no longer an urban village encircled and encroached upon by the city; instead, it has become a new type of water-village community connecting the city, the countryside, water systems, ecology, and innovative industries.

Discussion and Summary of Key Innovations

In the context of rapid urbanization, the regeneration of urban villages is prone to falling into two traps: one involves wholesale demolition followed by development, leading to the loss of local character and collective memory; the other involves excessive commercialization,

forcing original residents to relocate and leaving behind whitewashed shells filled with standardized businesses. This paper proposes a third approach: through the identification, translation, and reorganization of morphological relationships, traditional fishing-village communities can continue to thrive within the new urban system.

The innovative aspects of this study are primarily reflected in:

1. At the methodological level, this study combines urban morphology with assemblage theory and proposes an analytical method and design framework applicable to Lingnan fishing-village communities from the perspective of urban design. By addressing aspects such as master planning, transportation system adjustments, the derivation of architectural prototypes, node design, and urban design guidelines, it responds to the trend of transforming urban morphology from descriptive analysis into design practice, while providing a comprehensive demonstration of the operational approach.

2. In terms of practical application, this study proposes a “New Water Village Community” regeneration model tailored to the context of urban new districts. Nanheng Village is not merely an isolated traditional settlement; it serves as a key node situated between the Nansha Bay Research Cluster, the Coastal Park, the surrounding mountains, and the Pearl River estuary. Consequently, the New Water Village Community model proposed in this study emphasizes the symbiotic relationship between the fishing-village and the surrounding urban areas, seeking to preserve local elements while integrating technology incubation, community services, cultural exhibitions, leisure and retail, and ecological regulation functions. This model offers valuable insights for numerous traditional fishing villages and other waterside settlements in the GBA that are soon to be surrounded by new urban development.

Shortcomings and Outlook

Research on urban morphology still has some shortcomings due to limitations in research practices, data availability, and the depth of design analysis. First, given the limited temporal scope and spatial precision of some historical data, it is difficult to fully reconstruct the subtle changes in Nanheng Village across different historical periods. At the same time, information regarding building quality and property ownership remains relatively vague, making it difficult

to precisely map these details to the actual physical space. Future research could incorporate more detailed surveying data; for instance, in actual projects, methods such as drone oblique photography and building surveys could be employed to enhance the accuracy of spatial analysis and assessment of changes.

Furthermore, the sample used in the sociological survey has certain limitations. Since Nanheng Village is currently undergoing urban regeneration and demolition, most residents have already moved away, making it difficult to conduct a comprehensive community survey. The questionnaire section of this paper provides a preliminary exploration of residents' spatial identity and regeneration aspirations; however, the perspectives of government administrative departments, users from nearby research institutions, and future residents have not been fully addressed in this study. Future research could systematically document local memories of Nanheng Village and the surrounding area through participatory workshops, public exhibitions, and collaborative initiatives with residents. In practical projects, operational feedback and post-occupancy evaluations can also be utilized to ensure that local memories and daily needs are integrated into the ongoing regeneration process.

With advances in generative artificial intelligence and digital design tools, urban regeneration is gradually entering a phase of refined governance. In future research, we could explore the use of generative design and intelligent multi-alternative evaluation methods to rapidly simulate different road network configurations, building combinations, and blue-green space layouts. Guided by the principles of urban morphology and assemblage theory, this approach would provide urban design with a wider range of comparable design alternatives.

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Appendix

Appendix 1 Survey Questions

Questionnaire on the Renovation of the Waterfront Space in Nanheng Village

Dear Resident/Respondent,

Hello!

To better understand the current use of the waterfront space in Nanheng Village, residents' activity needs, and their opinions and suggestions regarding its future renovation, we are conducting this questionnaire survey. The questionnaire is anonymous, and the results will be used solely for research and planning analysis, without any commercial purpose. Thank you for your support and cooperation!

I. Basic Information

1. What is your gender?

A. Male

B. Female

2. What is your age group?

A. Under 18

B. 18–25

C. 26–30

D. 31–40

E. 41–50

F. 51–60

G. Above 60

3. What is your current housing status in Nanheng Village?

A. Homeowner / Living in own house

B. Tenant / Renting

II. Use of Activity Spaces and Recreational Activities

4. Which types of activity spaces do you prefer? (Multiple answers allowed)

A. Parks and squares

B. Street-side green spaces

C. Community activity centers

D. Sports venues

E. Waterfront spaces

F. Streets and alleys

G. Other: _____

5. Which recreational activities do you usually engage in?(Multiple answers allowed)

A. Playing chess

B. Drinking tea

C. Chatting

D. Singing

E. Morning exercise

F. Playing mahjong / card games

G. Other: _____

III. Perceptions of Existing Problems

6. What were the main problems in the original Nanheng Village? (Multiple answers allowed)

A. Dirty and poor environmental conditions

B. Serious problems of illegal or disorderly construction

C. Residential buildings lacking cultural characteristics

D. Lack of public open spaces

E. Lack of public supporting facilities

F. Other: _____

IV. Renovation Needs

7. What should be the key priorities for the future renovation of the Nanheng Canal waterfront space? (Multiple answers allowed)

A. Increase public spaces

B. Add more public supporting facilities

C. Incorporate cultural characteristics

D. Improve the overall façades and streetscape

E. Increase boat berthing/mooring areas

F. Other: _____

V. Willingness to Preserve Local Characteristics

8. Which characteristic elements do you think should be preserved most? (Multiple answers allowed)

A. Distinctive architectural forms

B. Public memory spaces

C. Old and notable trees

D. Neighborhood relationships

E. Other: _____

Appendix 2 Interview Transcript

Interview Guide

1 Memories and History

- When did you—or when did your family—first begin living here?
- What memories do you have of life in Nanheng Village in its early years? What were the main ways of life and local industries at that time?
- Could you describe what the wharves, the river mouth, and other such places looked like in your memory? What events or scenes left the deepest impression on you?

2 Daily Activities

- What are your main daily activities now? Where do you usually engage in these activities?
- Do you think there is enough public space in Nanheng Village at present? Which spaces do you visit frequently, and why?
- In your opinion, how have the spaces of daily life in Nanheng Village changed compared with the past?

3 Suggestions for Improvement

- During the demolition and redevelopment process, what would you most like to see preserved—for example, particular buildings, stories, or landscapes?
- If an exhibition or a dedicated place were created to commemorate Nanheng Village in the future, what would you like it to display?

Interview 01

Participant: Male, aged 45–65, born in the 1970s, local resident

Interview Notes

- Every year, the government adds or improves public facilities and infrastructure, including roads, landscaping, and bus stops.
- The east–west roads were built in recent years.
- I have lived here since the 1970s. The fishing community consisted of families with many different surnames. People mainly engaged in farming and fishing, with production teams serving as the basic unit of collective organization.
- There were dragon boat races in the 1970s, and they were very lively at the time. The races stopped in the 1990s because road construction blocked the canal.
- My daily activities mainly take place along the Super Embankment.
- There are not enough public facilities, especially sports facilities. The village cultural center is the only available venue, but it is very small. Villagers can apply to the village committee to use it for banquets, meetings, and other activities.
- There is only one basketball court, which cannot meet the needs of both adults and children.
- I hope more basketball and badminton courts can be provided, particularly indoor courts with lighting. I also hope professional coaches can be brought in to provide instruction.
- At present, the urban renewal project has only begun in certain areas along both sides of the canal. There is currently no policy concerning the redevelopment of the parts farther inside the village.

Elements to Be Preserved

- The canal
- The banyan trees, which have significance in terms of *feng shui*

Suggested Exhibition Content

- The history of the fishing community
- Fishing gear
- Fishing boats
- Traditional rice-threshing equipment, possibly a threshing tub

Collection of Historical Materials

- The district government previously collected old photographs.
- A Hong Kong magazine once visited the village and took photographs.
- Relevant materials include before-and-after comparisons, changes in Nanheng's mudflats and tidal flats, and the village's agricultural history.

Interview 02

Participant: Female, aged over 65; an elderly woman who married into Nanheng Village approximately 40 years ago

Interview Notes

- Dragon boat racing used to be a very prestigious and lively event. It was organized by the production brigade. In this sense, political organizations may have taken over some of the roles traditionally performed by lineage or clan organizations.
- Before the land was expropriated, villagers mainly farmed the land and grew rice. After the land acquisition, I went to work at a home for older people.
- I live at the foot of the hill, and negotiations over land acquisition are currently underway.
- I enjoy watching people play cards in the market, where some public space is available. There are not many other recreational activities.
- In the past, I spent most of my time growing vegetables and working. Now, I look after my grandchildren and simply pass the time.
- In the morning, people sell meat, cloth, and other goods in the market. The stalls close later in the day. Around noon, some people play cards or mahjong there, while several barbecue restaurants open in the evening.
- My daughter runs a restaurant near the front of the village, close to the Super Embankment.
- The village currently has a community canteen for older residents, organized by the district government.

Interview 03

Participant: Male, aged 31–40; lived here as a child and moved elsewhere for work after growing up

Interview Notes

- Even when I was a child, very few people were still fishing. For more than 20 years, most villagers had mainly been engaged in farming.
- When I was young, there were not many recreational facilities or things to play with. Children simply wandered through the fields and ran around in the hills.
- In the past, villagers' privately owned houses could have their own wharves, allowing residents to board boats directly from their homes.
- There are very few sports facilities now. I hope more sports spaces can be provided, especially indoor spaces for activities such as table tennis.
- There used to be two sluice gates.
- I hope my former school and the canal can be preserved.

Interview 04

Participant: Male, aged 41–50; homeowner

Interview Notes

- I have lived here since childhood. When we were young, we used to play on the hills.
- If a memorial hall were to be established, I believe the history of the Opium Wars would also be worth commemorating.

Interview 06

Participant: Female, aged 26–30; new resident of Nanheng Village

Interview Notes

- I married into a family in Nanheng Village two years ago. I find it very comfortable to live here.
- Before moving here, I once came to Nanheng Village and ate beside the canal, on a boat. It was a very memorable and atmospheric experience.
- Compared with the past, the facilities are now more comprehensive. However, the location of the children's slide is not ideal. It is in a relatively isolated, shady area with many mosquitoes. I hope children can have a sunnier place where they can spend more time outdoors.
- It would also be good to introduce more innovative cultural elements and activities.
- If a memorial hall were created, I would like it to present the village's former environment, its social and interpersonal relationships, and other aspects of community life.
- More family photographs could also be taken and collected to preserve the character of the village at this point in time, allowing younger generations to understand and experience its past way of life.
- Farmland acquisition began around 1990. After the science and technology park was established here around 2000, there were fewer parks and open spaces.
- I hope the redevelopment project will add more greenery along both sides of the canal to make the area more attractive. I would also like to see steps and other facilities that improve physical access to the waterfront.
- The jobs in the science and technology park are mainly intended for highly educated people, such as those with postgraduate degrees, and have little connection with local villagers.
- Our main source of income is renting houses to people who work there.
- Perhaps after the electronics factories are established, they will provide some employment opportunities for local villagers.

Interview 05

Participant: Female, aged 31–40; has lived here since birth

Interview Notes

- My childhood memories are mainly associated with agriculture and farmland.
- The sight of boats setting out to sea from both banks of the canal was extremely spectacular and left a deep impression on me.
- Compared with the past, there are now more community activity centers.

Interview 07

Participant: Female, aged 26–30; visitor

Interview Notes

- The relationship between the canal and the houses is very distinctive. However, most waterfront areas can now only be accessed by passing through other people's houses. It would be better if more designated viewpoints and photo spots were created.
- The sunset and scenery outside the sluice gate at the village entrance are beautiful.
- Several cafés in the village are also quite distinctive. They have a retro style and appeal to younger people.
- The village feels like a secluded retreat where visitors can relax, sit quietly, and let their minds wander.

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）：**

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注：1.请在“作者”一栏填写本人是第几作者，例：“第一作者”或“导师第一，本人第二”等；
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二、与学位内容相关的其它成果（包括专利、著作、获奖项目等）

论文竞赛：Arup Research Competition, Honorable Mention，2025

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September 2026

In SCUT