华南理工大学

South China University of Technology

Professional Degree Master's Thesis

Research on the Renewal Design of GuangZhou Water-front Industrial Relics from the Perspective of Land-scape Urbanism - A Case Study of Wenchong Shipyard

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摘 要

城市由快速增长扩张逐渐转向高质量内涵式发展，城市物质空间环境改善、资源集约利用等多方面发展内容开始被关注。滨水工业遗存作为城市宝贵的存量资源，其所蕴含的多元价值正在逐渐受到人们的重视。如何通过更新措施协调好建筑、城市、与景观资源的关系，将滨水工业生产岸线转化为城市公共生活岸线，已成为社会各界共同关注的焦点。因此，为推动广州滨水工业遗存高质量更新发展，本文探索性地将景观都市主义与广州滨水工业遗存更新相结合，欲寻求利于塑造充满活力、清新无污、工业文化突出的城市滨水的地方性更新方式。

本文从景观都市主义视角提出针对广州滨水工业遗存更新缺陷的更新策略方法，并以广州黄埔文冲船厂更新设计为实际案例检验其策略可行性。在基础研究章节，辨析了景观都市主义的内涵，明确其核心原理。通过梳理国内外已有研究更新的薄弱之处，来探讨借鉴景观都市主义指导滨水工业遗存更新的契合点和指导意义。此后通过案例研究进一步明确景观都市主义视角下滨水工业遗存更新可借鉴的更新路径及与之匹配的操作对象和尺度范畴。

此后梳理了广州滨水工业遗存近年来的发展概况并从中总结其更新趋势，并结合现有广州工业遗存的特征分析进行分析明确其更新缺陷。在此基础上结合理论原理和案例分析结论构建了“优化空间结构”、“折射行为模式”、“适应动态变化”“延续工业文化”“加厚城市地表”的更新方法。

实证研究以文冲船厂为例，通过实地调研、文献查阅、定量分析等方式对其历史发展、上位规划及现状问题进行详细分析。并以上述更新方法来验证设计策略的在地可行性，以便为广州日后的滨水工业遗存更新提供新的参考。

关键词：滨水工业遗存；景观都市主义；城市更新；地方性

Abstract

As a valuable stock of city, waterfront industrial relics are gradually being emphasized for their multiple values. How to harmonize the relationship between architecture, city, and landscape resources by renewal measures, and to transform the waterfront industrial production shoreline into the urban public shoreline, have become the focus of society. Therefore, to promote the development of high-quality renewal of waterfront industrial relics in Guangzhou, it is proposed in this thesis to explore the combination of landscape urbanism and the renewal of waterfront industrial relics in Guangzhou, with the aim of seeking for a local renewal approach that is conducive to the shaping of a vibrant, fresh and pollution-free environment with a distinctive industrial culture.

In the basic research chapter, the connotation of landscape urbanism is analyzed, with clarified core principles. The weaknesses of the existing domestic and international studies on regeneration are examined to explore the fit and significance of drawing on landscape urbanism to guide the regeneration of waterfront industrial relics. After case study, the renewal method、the matching operation object and scale scope of water-front industrial relics are identified based on Landscape Urbanism.

Thereafter, the overview of the development of waterfront industrial relics in Guangzhou in recent years are summarized, then the renewal trend, and the shortcomings of the existing industrial relics in Guangzhou are analyzed with the characteristics of the existing industrial relics in Guangzhou. Based on this analysis, the theoretical principles and conclusions of the case study are used in combination to construct the methodology that including "optimization of spatial structure", "refraction of behavioral patterns", "adaptation to dynamic changes", "continuation of industrial culture", and "Thickening Urban Surface".

Finally, Wenchong Shipyard is taken as an example for the empirical study, whose historical development, superior planning, and current problems are analyzed in detail through field research, literature review and quantitative analysis. The above regeneration methods are used to verify the feasibility of the design strategies, to provide new references for future waterfront industrial relic regeneration in Guangzhou.

Key words： Waterfront industrial relics; Landscape urbanism; Urban renewal; Locality

Content

List of Figure

List of Table

Chapte1 Introduction

1.1 Research Background

The development of industry has created the core areas of cities, which are indispensable "catalysts" for urbanization and an important stage in the history of human civilization. With the expansion of cities, the original waterfront industrial areas could not meet the functional needs of the core areas and had to be relocated. Many remaining industrial spaces have undergone large-scale urban renewal movements. In the late 19th century, awareness of industrial heritage conservation began to emerge in developed Western countries, and the practice of renovation and reuse has been growing. With the rapid development of urban economy, China has gradually entered the "post-industrial era," and coastal developed cities also face the issue of revitalizing waterfront industrial relics. Among them, the industrial relic zones built along the waterfront in the early days have become the areas in most urgent need of intervention. These highly valuable spaces need to be revitalized and returned to the city and its residents.

1.1.1 The Growing Movement to Renew the Relic of Urban Waterfront Workers

In its long history the development of cities has been closely intertwined with the advancement of industry. The industrial revolution acted as a catalyst for urbanization. As the process of urbanization progressed and city centers expanded, many old industrial areas that were once rooted in the central urban areas gradually lost their development momentum due to macro policies, production costs, environmental pollution, and other pressures. Consequently, they had to undergo relocation and migration. The waterfront industrial relics, which relied on river and maritime transportation in their early stages, became the primary targets. Due to the decline in water transport, technological advancements in ports, and the abandonment of old port lands, these relics remained vacant, occupying a significant portion of the waterfront space. Despite the cessation of production, the rusty remnants of old buildings and unique industrial structures within these former industrial areas serve as records of the past, narrating history, and showcasing the glorious industrial civilization of the city. The fate of waterfront industrial relics has attracted widespread attention[1] .

Figure1-1 U.S. Naval Shipyard Philadelphia Before and After Renewal

（Source：Google Images）

Compared to China, developed Western countries entered the "post-industrial era" earlier and initially recognized the importance of preserving industrial heritage in the late 19th century. In the 1970s, a wave of ideas and practices for renovating and reusing old buildings emerged [2]. Developed countries such as the United Kingdom, Germany, Canada, the United States, and Australia have already carried out several excellent practices in updating industrial relics. They have accumulated a wealth of experience in the field of renovation, such as the redevelopment of the inner harbor of the Philadelphia Navy Yard in the United States (Figure 1-1). Local governments hope to promote urban economic by leveraging the exhibitions of these updated projects. This approach is directly related to the development of service industries in the "post-industrial era," and is therefore identified as an update and development driven by industrial structural transformation. [3] As China's urbanization rate surpasses the 50% mark and gradually enters the "post-industrial era," developed coastal cities face the same challenge of how to update and transform the abandoned "shells" that have lost their original functions. This has become the most urgent task at hand.

1.1.2 The Immense Comprehensive Value of Urban Waterfront Spaces is Highly Valued

American designer Charles Moore once said, "Waterfront spaces are extremely precious resources in a city and present challenging opportunities for urban development. People seek refuge from congested and high-pressure urban life through waterfront spaces, and they provide an opportunity to breathe fresh air amid the busy city life [4] ." Some necessary functions were provided by waterfront spaces for development of city. From the early, middle, and late stages of the industrial era, people's pursuit of their functions and value is reflected in different aspects, and the relationship between people and water is also in different conditions.

In the "pre-industrial era," waterfront areas were the primary consideration for city location. People settled near water to benefit from the survival value provided by "water resources." They sought water for agricultural irrigation, domestic water supply, and drainage functions. During this stage of "industrial era," industrial areas were predominantly located along waterfronts, due to the demand for water transportation and industrial water. The economic value provided by "water power" became the primary pursuit of human. However, the negative effects generated by industrial activities disrupted the natural balance of water environments. During the transition to the "post-industrial era," the abandoned and heavily polluted old industrial areas left behind by industrial relocation remained undesirable for people to approach. At this stage, the relationship between people and water is characterized by a sense of being "forced to live by the water's edge" due to the circumstances.

It was not until today, when we truly entered the "post-industrial era," that urban construction space became increasingly limited. People began to realize that these former waterfront industrial sites have excellent conditions for redevelopment, as if they had discovered a tremendous wealth that had been overlooked. The enormous social, economic, and environmental value of waterfront spaces suddenly emerged, especially with various stakeholders pursuing their economic value. With the resurgence of the "people-oriented" values, the relationship between people and water gradually moved towards "living by the water's edge." The waterfront spaces needed by city residents should be open public spaces, and through renewal efforts, they will become the most accessible areas for people to connect with nature in the city center (Figure 1-2). The "water landscape" transforms waterfront areas into aesthetically pleasing environments and central zones for urban public activities. It is essential to adhere to a sustainable development perspective to achieve a balance and unity of social, economic, and environmental benefits in these areas[5].

Figure 1-2: Comparison of Chelsea Industrial Waterfront Before and After Renovation in London.

（Source：Google Image）

1.1.3 Regeneration of Guangzhou's Urban Waterfront Industrial Relics Requires More Targeted Guidance

Guangzhou has been an important industrial city in southern China since ancient times, and it was one of the earliest places in China to be exposed to Western modern industry. It was the birthplace of modern and national capitalist industry in China, as well as the birthplace of China's modern industrialization. Due to its reliance on Pearl River shipping, one of the characteristics of the distribution of industrial areas within Guangzhou's urban area is that they are clustered along banks of the Pearl River. The industrial relics along the Pearl River cover different stages of Guangzhou's modern industrial development, fully showcasing the history of Guangzhou's modern industry[6] . In terms of the renovation and transformation of old industrial areas, Guangzhou has always been a "leader" in China. In 2008, the Guangzhou Municipal Government launched the "Opinions on Promoting the Transformation and Upgrading of Industrial Areas in the City." In 2010, the Office for the Transformation of "Three Olds" (Old Industrial Buildings, Old Residential Areas, and Old Villages) was established in Guangzhou. In 2011, the Guangzhou Municipal Planning Committee reviewed and approved the "Special Plan for the Transformation of Old Factory Buildings in Guangzhou[7] ." The "Guangzhou Master Plan (2010-2020)" formulated in 2012 proposed combining the implementation of the "retreat from two and enter into three" policy to guide industrial restructuring and promote optimization and upgrading through the renovation and transformation of old industrial areas. The plan aimed to accelerate the pace of updating waterfront industrial remnants characterized by low efficiency landing, severe environmental pollution, and inadequate supporting public service facilities. It also aimed to optimize the functional layout of the urban area and improve environmental quality [8]. Through the renovation and transformation of industrial relics, it provides space for the survival and development of new industries in the city. The converted industrial land is prioritized for the construction of municipal and public facilities, as well as urban green spaces. In February 2015, the Guangzhou Urban Renewal Bureau was established, marking the entry of the renewal work into a sustainable development phase under the new normal. The implementation of these policies and the establishment of relevant institutions provide important foundations and bases for the renovation and reuse of numerous waterfront industrial remnants in Guangzhou's urban area.

So far, the renovation of waterfront industrial relics in Guangzhou has achieved certain results. Some waterfront industrial remnants located in the central urban area have undergone a round of renovation and transformation, and some have already been implemented, such as Hongzhuan Factory, Taikoo Warehouse, Pati, and 1850 Creative Park (Figures 1-3). Some planned renovations are yet to be implemented or are already in the process of being renovated, including Guangzhou Shipyard, Guangzhou Steel Plant, and Guangzhou Paper Mill, among others. Additionally, there are still active waterfront old industrial areas like Huangpu Shipyard and Huangpu Power Plant, which may face relocation and renovation in the future. Therefore, it is necessary to analyze the current practical issues facing the waterfront industrial remnants and provide reasonable guidance and suggestions for several spaces awaiting renovation.

Figure 1-3: Taikoo Warehouse Fashion Park (left) and Pearl River Paiti Beer Cultural Creative Art Zone (right).

(Source: Baidu Images)

1.2 Research Object and Explanation of Relevant Concepts

1.2.1 Landscape Urbanism

Landscape Urbanism, as a combination of the words "landscape" and "urbanism," expresses the concept of addressing urban issues and considering the future of cities from a landscape perspective. Traditionally, urban planners focus on spatial planning and layout, architects specialize in building design, and landscape designers create external environmental spaces. While each discipline has its own roles and influences in the design process, they also face contradictions in terms of their operational methods and implementation paths. Recognizing this, Landscape Urbanism proposes the organic integration of these three disciplines, viewing the city as an organic ecological system and considering landscape as a fundamental component of urban infrastructure. Achieving urban

landscaping and the urbanization of landscapes is goal. Urban landscaping refers to incorporating landscape as an important factor in the process of urban renewal, aiming to achieve the coordinated development of "landscape" and "city[9] ." Landscape urbanization involves integrating natural landscape elements with the rigid elements of the city, making the landscape a vehicle for urban construction and expansion. The form of a city is not a static structure, and when the existing spatial order fails to meet the human need for a green ecology, the relationship between humans and the environment needs to be reconstructed, resulting in a transformation and adjustment of spatial structure. After the wave of rapid urbanization, desolate industrial wastelands, outdated old urban areas, crowded and dilapidated urban villages, and slums have become regions in contemporary cities with tense human-environment relationships and prominent urban issues. The focus and challenge of related research lie in how to reconstruct the spatial structure of these areas based on what concepts and paths are.

Landscape Urbanism is a new trend and approach that emerged against this development background, using "landscape" as the basic medium and considering it as the fundamental structural unit for the generation, evolution, and development of urban space. It involves reinterpreting, designing, and reproducing contemporary cities with new ideas and methods[10].

1.2.2 Waterfront Industrial Relics

The concept of waterfront industrial relics involves two concepts: the waterfront old industrial area and industrial relics. The Nizhny Tagil Charter for the Industrial Heritage provides a clear definition of industrial heritage as "industrial cultural remains that encompass historical, technological, social, architectural, or scientific value. These remains include buildings and machinery, workshops, factories, mines, refining and processing sites, warehouses, locations for energy production, transformation, and utilization, transportation, and all associated infrastructure. It also includes social activity sites related to industry, such as housing, religious sites, and educational facilities[11] ." Due to the International Committee for the Conservation of Industrial Heritage (TICCIH), which issued "The Nizhny Tagil Charter for the Industrial Heritage," its main research areas are related to industrial remnants and industrial archaeology from the Industrial Revolution. The concept of "industrial heritage" emphasized in the charter focuses more on the cultural value of "industrial relics" as spatial carriers. In comparison to "industrial heritage," "industrial relics" (Table 1-1) may not have strict legal status, even though they are generally recognized with cultural value as industrial

heritage. The emphasis may not necessarily be on the preservation value of heritage, but for industrial relics, any means of reuse similar to preservation can be seen as an attitude towards the future development of these relics. As long as the spatial value of the relics can be effectively utilized, there is a broader attitude towards their utilization. Additionally, when the historical and cultural value of relics is acknowledged, there is also the possibility for them to become heritage[12]. Research on industrial heritage in China began in the mid to late 1990s. In 2006, during the First China Industrial Heritage Protection Forum, the "Wuxi Proposal" was passed, which further defined the connotation and extension of industrial heritage based on representative documents such as "The Nizhny Tagil Charter" [13].

The concept of "waterfront industrial relics" mentioned in this article broadly refers to industrial sites or industrial building clusters in urban areas where the original production functions are disappearing or will be discontinued. The characteristics are as follows：

1. The buildings are laid out along the river, occupying an independent area in the city and covering a large area [14].

2. With the original industrial production function or about to be discontinued and abandoned

3. Within the area, there are still many industrial facilities such as factories, docks, warehouses, and machinery. While a few of them possess preservation and utilization value, most of them have low preservation value. They have greater flexibility and potential for redevelopment.

Table1-1 Conceptualization of Industrial Heritage and Industrial Relic

Name	Conceptual Identification	Distinction
Industrial Heritage	Industrial heritage includes industrial cultural relics with historical, technological, social, architectural, or scientific value. These relics include buildings and machinery, workshops, factories, mines, refining and processing plants, warehouses, energy production and utilization sites, transportation, and all other related infrastructure, as well as social activity areas related to industry such as housing, religious sites, educational venues, etc.	Industrial relics is the extension of the concept of industrial heritage. Compared with industrial heritage, there is no specific legal requirement for recognizing the value of industrial relics. The historical and socio-cultural value of industrial relics is more

Industrial Relics	A more accurate and comprehensive research focus can be got from concept of industrial relics. The term "relics" does not solely imply "protection," as not all old things need to be preserved as "heritage," "history," or "culture." On the contrary, "relics" are considered industrial heritage when these industrial spaces and structures are perceived by people as something worth preserving, even if they have not yet received legal recognition and protection.	debatable.

In general, industrial relics can be understood as industrial heritage that currently lacks legal protection. During the process of renovation and transformation, specific historical and cultural values of these relics can still be explored based on their value orientation.

1.3 Purpose and Significance of the Research

1.3.1 Research Purpose

The thesis integrates content from different disciplines such as landscape ecology and architecture with conducts research by combining domestic and foreign practice cases. From the perspective of landscape urbanism, design methodology was constructed for the renovation of Guangzhou's waterfront industrial relics, aiming to provide new design ideas and operational methods. Three research objectives can be included as following:

1. By reviewing the mainstream ideas and application areas of landscape urbanism from its development until now, core principles of landscape urbanism and its alignment as a fitting approach for the renovation of waterfront industrial relics can be clarified. The applicable scales and elements of relevant practical operations can also be summarized.

2. The current characteristics and trends of the renovation of Guangzhou's waterfront industrial relics can be clarified, as well as the deficiencies in the renovation from perspective of landscape urbanism,

3. This study also aims to analyze the adaptability of Guangzhou's waterfront industrial relics from the perspective of landscape urbanism and proposes suitable renovation design methods for these relics by combining theory and case studies. The practicality of these methods will be verified by the renovation of the Wen Chong Shipyard. This research will provide new insights and practical

paths for the protection and renovation of Guangzhou's waterfront industrial relics, as well as promote the coordinated development of cultural heritage protection and sustainable urban development in China.

1.3.2 Research Significance

Nowadays, there has been significant development in the theory and practice of renovating and renewing urban industrial relics. In the context of urban construction, renovation projects related to industrial relics are increasingly being valued. Over half a century of exploration and practice abroad has led to continuous self-innovation and development of industrial heritage renovation in terms of theory, technology, and practice, achieving great success. The utilization of urban industrial relics not only effectively alleviates the shortage of urban land, enhances land value, creates a diversified urban landscape pattern, but also drives the economic development of surrounding areas and brings vitality to the city. By drawing on innovative design techniques and unique design concepts of landscape urbanism, such as respect for the site, effective utilization of waste materials, and ecological treatment methods, they are particularly applicable to the renovation and renewal of urban industrial relics. The organic combination of the two has important significance in achieving a balance between the protection and utilization of industrial relics, urban expansion, and nature conservation, while bringing about a rich and diversified leisure environment for people.

1.4 Research Content, Methods, and Framework

1.4.1 Research Content

The Thesis focuses on the renewal design of urban waterfront industrial relics from the perspective of landscape urbanism, with the main contents beginning from Chapter 2. An overview of landscape urbanism theory can be concluded, as well as its theoretical origins, mainstream ideas, and application areas. The chapter also clarifies the connection between the theory and the renewal of waterfront industrial relics. In Chapter 3, typical foreign cases are listed and researched in detail, providing ample empirical evidence and supplementary explanations for the theoretical part of the article. A series of related renewal strategies and operational elements are summarized. In Chapter 4, the development of Guangzhou's waterfront industrial relics is reviewed and analyzed, including their characteristics, renewal trends, and shortcomings. The applicability of landscape urbanism is also analyzed and discussed, paving the way for the proposed strategies. In Chapter 5, local-specific renewal strategies are proposed by combining the strategic approaches from Chapter 3 and the

shortcomings of renewal discussed in Chapter 4. In Chapter 6, a localized analysis of the objective problems of the Wen Chong Shipyard is provided, along with a summary of proposed solutions utilizing landscape urbanism strategy. The final chapter tests the feasibility of these theoretical applications through practical implementation.

1.4.2 Research Methods

(1) Literature Review Method:

This method involves reviewing relevant journals, articles, and publications to gather information. The collected data is then organized, classified, summarized, and analyzed. During the process of data integration, mature methods and related theories used by scholars both domestically and internationally in the application of landscape urbanism theory are identified.

(2) Case Study Method:

This method involves studying exemplary design cases of landscape urbanism in cities worldwide. By analyzing these cases, methods and strategies specific to the design of post-industrial waterfront areas utilizing landscape urbanism principles are identified, providing a basis for subsequent design work.

(3) Field Research Method:

Field research involves conducting on-site observations, questionnaire surveys, interviews, and other methods to understand the current usage status of the prospective design site and collect data and information. This data serves as material for qualitative and quantitative analysis. Additional research may also be conducted on other valuable renewal cases, as needed.

(4) Quantitative Analysis Method:

Quantitative analysis is a method used to analyze the quantitative characteristics, relationships, and changes of social phenomena. Its purpose is to reveal and describe the interactions and development trends of social phenomena.

1.4.3 Research Framework

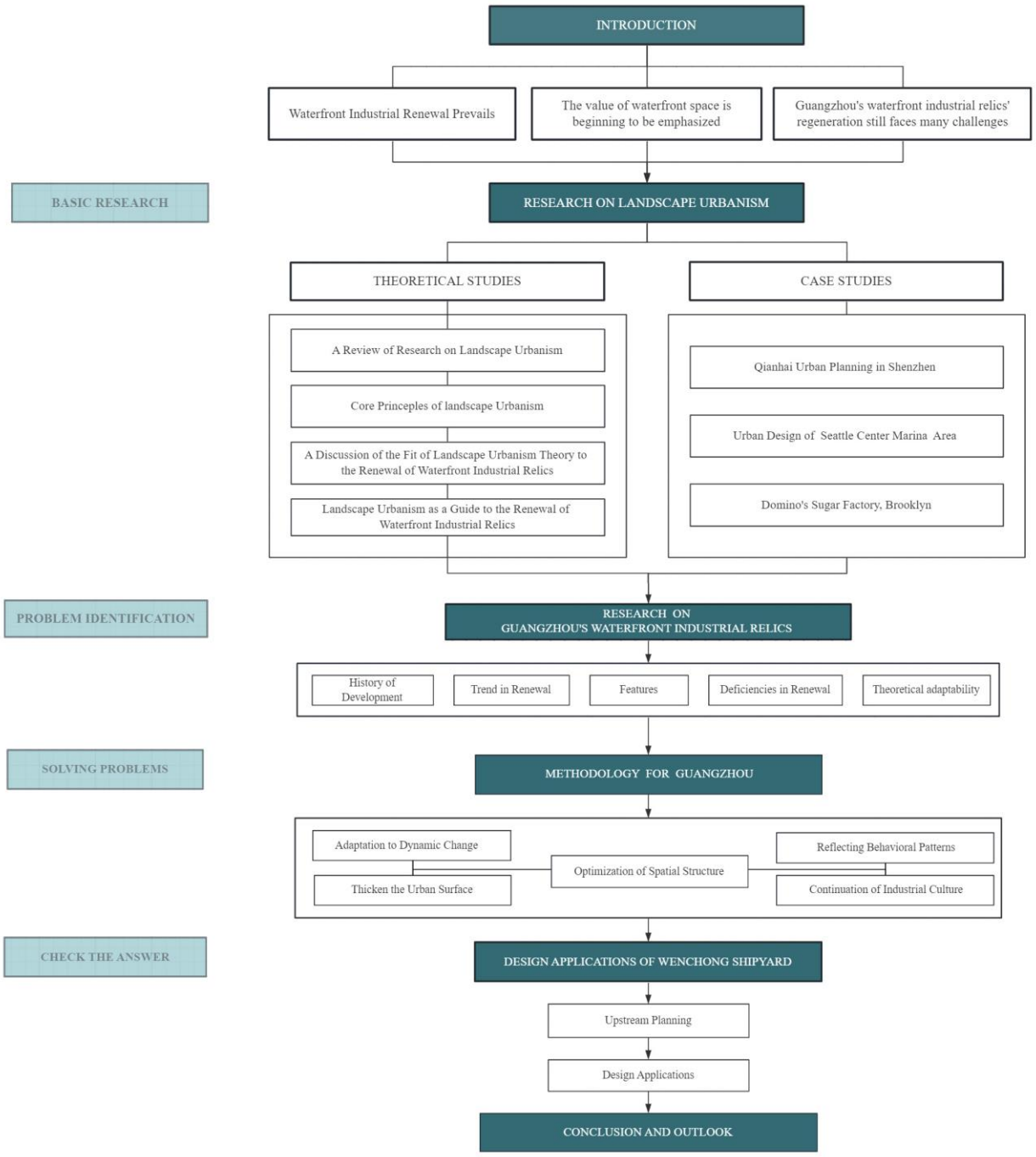


Figure1-4 Research Framework

(Source：Author）

Chapte2 Research on Landscape Urbanism Theory

2.1 Overview of Research on Landscape Urbanism

2.1.1 Foreign Research on Landscape Urbanism

(1) Emergence stage: 1960-1990——Landscape has been recognized as a medium.

The origin of Landscape Urbanism could be traced back to the criticism of modernist architecture and planning during the postmodernist stage in the late 1970s. These criticisms included the inability of modernism to create a "meaningful" and livable public realm, to conceive of the city as a collection of various social histories, and to meet the communication needs of audiences at different levels in the city [15]. Charles Jencks declared in 1977 that, along with the continuous decline of the American industrial economy, the "death of modernist architecture" marked a shift in the market towards diversification and consumer choice[16]. However, the postmodernist architectural movement was unable to address the growing issue of decentralization in the process of industrial transformation, where an increasing number of residents relocated from the city center and urban populations experienced negative growth. Meanwhile, all sectors of society was deeply reflecting on the serious environmental problems brought about by industrial civilization, which while creating a glorious modern civilization, had caused significant damage to the natural ecology and posed a threat to human survival. Consequently, humans turned towards sustainable development, seeking to rationally utilize natural resources and reshape the relationship between humans and nature. Against this cultural background, landscape gradually replaced architecture as the most basic element stimulating development in the new round of urban development and the most critical means of restructuring the spatial development of cities[17]. Finally, landscape has been recognized as a medium that has the unique ability to propose effective solutions to the issues arising from rapid societal developments and urban transformations, offering a model that gradually adapts and evolves, providing open-ended and adaptive strategies for the process of urbanization.

(2) Slow development stage: 1991-2000——Exploring the relationship between landscape and the city

Landscape urbanism underwent a slow development phase from 1991 to 2000, during which designers were exploring the relationship between landscape and the city. In 1994, Lars Lerup highlighted the neglected and abandoned areas in cities in his book "Stim and Dross: Thinking About Urbanism," pointing out that these areas were often overlooked and considered economically

worthless. In 1995, Rem Koolhaas wrote in " What's happening in the city?" that urban development should consider the contextual environmental factors within the city. His team won the competition for the Downsview Park design in 1999 with their "Trees City" proposal, which suggested guiding urban development through an organic and ecological landscape approach. Landscape urbanism initially emerged as a teaching and research topic at the University of Pennsylvania, and later various institutions in North America began to engage in landscape urbanism design research. In 2000, the Architectural Association launched a Landscape Urbanism course to explore the connection between the city and natural landscapes.

Table 2-1 Slow Development Phase

Time	Author	Route	Content
1994	Las Lerup	Stimulation and abandonment, for major cities, Important Thinking for the City Abandoned land is easily overlooked and economically valuable.	The economic value of urban wasteland is easily overlooked
1995	Koolhaas	What's happening in the city	The city had to develop in a new way, considering the context of urban development Environment
1997	Olmsted	Landscape Urbanism Conference	Landscape urbanism was a branch of landscape ecology that emphasizes unused gaps in the city as potential sites.
1999	Koolhaas	Downsview Park Design Competition	A deconstructive approach to design inspires scenic possibilities for view control design.
2000	Architecture Association	Course	Courses on landscape urbanism were offered.

(3) Rapid Development Phase: 2001 to Present——Clarification of content and expansion of application areas

Table 2-2 Relevant Theories of Slow Development Stage

Time	Author	Route	Content
2004	Mohsen Mstafavi	The Landscape Urbanism Reader	Proposed a multi-dimensional interpretation of landscape urbanism
2004	James Corner	Landscraping	Emphasized on landscape urbanism as attitude and way of acting
2006	Charles Waldheim	Landscape Urbanism Reader	Five major themes were proposed: horizontality, infrastructure, process, translational techniques, and ecology
2009	David Fletcher	Landscape Urbanism and the Los Angeles River	Analyzed the relationship between place and environmental ambience and explored a series of waterfront space renewal strategies for urban open space traffic flow Water restoration
2016	Charles Waldheim	Landscape as Urbanism Origins and Evolution	Proposed landscape as a theoretical framework for thinking about urban form

In 2004, Mohsen Mostafavi published "Landscape Urbanism: A Manual for the Machinic Landscape," in which he pointed out that landscape urbanism is composed of different dimensions, and that the sites within cities exhibit unpredictability. In the same year, James Corner summarized landscape urbanism as consisting of four main themes: temporal processes, sectional surfaces,

operative or working methods, and imagination, in his book "Landscraping" [18] . In 2006, Charles Waldheim published the book "Landscape Urbanism," which collected 14 essays from scholars in various fields. The book encompassed the origin, essence, related concepts, and practical cases of landscape urbanism, consolidating the core ideas behind this concept.[19]. In 2009, David Fletcher published "Landscape Urbanism and the Los Angeles River," a book that analyzed the connection between place and environmental ambiance. The book emphasized the undeniable emotional value that urban environments hold for people. Drawing upon landscape urbanism theory, it explored a range of strategies for revitalizing urban waterfront spaces, including considerations of transportation networks, waterway restoration, and the impact on urban development. The specific focus of the book was on the Los Angeles River, using it as a case study to illustrate these measures.[20] In 2016, Charles Waldheim published the book "Landscape Urbanism: From Theory to Praxis," which proposed landscape as a theoretical framework for considering urban form. The book expounded upon how landscape can be utilized as a medium through interdisciplinary perspectives and the perspectives of various professionals. Landscape urbanism fills gaps in urban planning that overlook cultural and design considerations, while embracing the advantages offered by social science[21].

2.1.2 Overview of Domestic Research on Landscape Urbanism

The domestic research on landscape urbanism in China started relatively later compared to overseas. Currently, landscape urbanism theory is considered a cutting-edge design theory in China, reflecting interdisciplinary thinking and collaboration. Professor Yu Kongjian's Turenscape team, as a leading figure in the domestic landscape industry, has been influenced by landscape urbanism in their design practices for various park spaces in recent years. Professor Zhu Jie from Chongqing University was one of the early scholars in China to propose the application of landscape urbanism in actual engineering projects [22] . Professor Zhai Jun, a student of James Corner who is one of the founders of landscape urbanism, has been researching landscape urbanism since the early 1990s. In his book "Theory and Methods of Landscape Urbanism," he provided a comprehensive analysis of the theory from several aspects, including its context, definition, new worldview and methodology, pattern strategies of holistic form and ecosystem, and the future of landscape cities[23].

The theory of landscape urbanism has been mainly applied in various fields in China, including the transformation of industrial sites, urban design, urban open spaces, comprehensive parks, and

waterfront landscapes. For example, there are research works such as "Exploration of Urban Design Procedures in New Districts based on Landscape Urbanism" by Song Qiuming from Chongqing University (2011), "Preliminary Exploration of Constructing Urban Open Space System based on Landscape Urbanism" by Shen Ya (2012), "Research on Urban Waterfront Landscape Design based on Landscape Urbanism" by Li Xiaoyi from Beijing Forestry University (2017), "Research on Urban Comprehensive Park Planning and Design based on Landscape Urbanism" by Liu Feng from Sichuan Agricultural University (2018), and "Research on Industrial Park Planning and Design based on Landscape Urbanism" by Li Xuxin from Xi'an University of Architecture and Technology (2013), to name a few.

Li Boxie's "An Initial Exploration of Architectural Design Principles under the Perspective of Landscape Urbanism" (2013) and Li Mingjuan's "Analysis of Landscape Architecture Form Syntax based on Landscape Urbanism" (2015) integrate landscape urbanism with architectural design. Hu Chuanzhe from Huazhong University of Science and Technology, in his research "Study on Modern CBD Planning Strategies based on the Concept of Landscape Urbanism" (2013), proposes concepts such as layering, openness, plasticity, publicness, and human-centeredness. These articles explore and propose relevant guiding principles and integration strategies.

In conclusion, there is a scarcity of research in existing literature that combines the concept of landscape urbanism with specific types of industrial relics. This thesis contributes to the expansion of the application areas of landscape urbanism theory. Building upon this foundation, the paper will then delve into the core principles of landscape urbanism and examine the points of convergence that are applicable to this particular context.。

2.2 The Core Principles of Landscape Urbanism.

2.2.1 Landscape Infrastructure

Landscape infrastructure, first proposed by Garry Strang in 1996, inherits the fundamental principles of green infrastructure.

The coordinated integration and comprehensive construction of necessary "gray infrastructure" in urban areas, such as transportation facilities and municipal facilities, with objects in the field of "green infrastructure" like ecological corridors, greenways, river networks, and park green spaces,

to form a more efficient, economical, and sustainable optimized state, is referred to as landscape infrastructure. It explores the possibility of integrating landscape facilities and infrastructure from multiple perspectives, emphasizing the intrinsic relationship and potential synergy between landscape facilities and infrastructure[23]. Landscape infrastructure can take the form of green elements or be represented by the manifestation of natural processes in concrete. It can be linear or vary based on site-specific characteristics, going beyond the scope covered by "green" or "sustainability".

One of the explorations of landscape urbanism is to view infrastructure as the most important public landscape. Since the 20th century, infrastructure has become increasingly standardized for higher technical efficiency. However, they have been considered more from a technical standpoint, and relatively less from social, ecological, and aesthetic considerations. Nevertheless, various spatial values in cities are not singular, and they carry specific meanings for human habitation. Infrastructure is an essential support structure for cities to recover from disasters or destruction, serving as an important urban habitat. Landscape urbanism proposes to achieve the above goals by combining ecological processes, infrastructure operations, and social-cultural needs. This functional combination with ecological processes is different from pure natural phenomena and processes. It seeks to incorporate unavoidable human influences as necessary components of urban landscape construction and generation[24].

2.2.2 Integrity

The city is a complex system that encompasses the integration of various elements such as road networks, architectural structures, environmental spaces, ecological systems, and cultural heritage on the urban surface. Landscape urbanism theory views them as a unified body. The interaction between parts and the whole within this system is also one of the main characteristics of landscape urbanism. Landscape urbanism advocates for a landscape-led approach, integrating planning, architecture, and landscape design at a macro level. It overturns the traditional dominance of architecture in planning and the biased view towards landscape as a discipline. Instead, it elevates landscape to a comprehensive understanding of the constituent elements of urban systems, establishing closer connections between the whole and its parts, and fostering a mutually beneficial and healthy development of the city as a macrocosm [27].

The theory suggests that everything is interconnected. The site, the surrounding environment, the relationship between space and time should be integrated into a whole. The functional spaces and entities should be interconnected organisms, and the units composed of these interconnections should be the basic elements of urban space.

Landscape urbanism comprehensively considers the relationship between nature and the city, constructing a landscape-oriented city, integrating nature into the city, designing according to the characteristics of the city, and transforming the city into a landscape, making it more visually appealing.

2.2.3 Dynamic

Landscape urbanism emphasizes the changes and dynamic processes of things, including the transformation and alteration of space and time. As a vibrant and dynamic system, landscape can be served as a highly participatory medium, interacting with human beings, behaviors, spaces, and the environment, presenting a dynamic and elastic development trend. Since its inception, one of its characteristics is that landscape has always been undergoing continuous change and renewal in a complex process, while constantly considering the interactive relationship between time and human experience [25].

Time is another important dimension considered in landscape urbanism. It emphasizes that the landscape of a site changes over time instead of specific forms. It highlights that space dynamically evolves and transforms with the passage of time, and these spatial changes also impact time. As participants in events, landscapes simultaneously embody the life of the city and the occurrence of events, becoming dynamic urban landscapes [26]. From the perspective of designers, design should rely on this dynamic characteristic and strive to provide a convenient and adaptable stage for various random activities. Designers should make predictions and changes for future development, forming elastic adaptive strategies.

In general, from the perspective of landscape urbanism, a city can be seen as a continuously expanding and ever-changing landscape system. It consists of an open framework and various infrastructure networks, was able to carry diverse urban activities that constantly evolve over time. These activities could be planned or unplanned, envisioned, or unforeseen. As plans continue to change and adjust, the spatial system undergoes a constant process of revision. The uncertainty of planning is a fundamental principle, serving as the basis for conceptual forms that allow for

transformations, modifications, substitutions, or replacements without compromising the initial premises. More themes emerge from the concept of "no theme," and "no theme" accommodates even more themes.

2.2.4 Horizontality

Horizontality， means to integrate overall landscape form. The continuous ground structure is the focus of this form integration and is considered the foundation of organizational structures. Instead of emphasizing isolated architectural forms, it emphasizes a continuous public space that is connected to the surrounding urban surface, creating a multidimensional system that integrates landscape, transportation, and functions in a complex overlapping landscape field. The "landscape transportation" and "functions" here correspond to the three elements of "landscape-ecology, transportation-infrastructure, human activities" in "landscape infrastructure." The horizontal connections between these elements will play a significant role[21].

2.2.5 Ecology

The core of ecology of landscape urbanism is to construct a "soft system" – a dynamic, flexible, adaptive, and evolving field. This "soft system" can absorb, transform, and exchange information with its surrounding environment. Its stability and health come from its dynamism and its capacity to comprehend and handle movement, differences, and changes [27] .

In the process of conceiving a more organic and fluid concept of urbanism, ecology itself can be seen as a useful tool. We can use it to analyze and understand the diverse choices for the future of cities. The theory of ecology aims to demonstrate how all life on Earth is interdependent in a dynamic relationship. However, the complexity of interactions between elements within ecosystems cannot be described by linear mechanical models. Furthermore, ecology recognizes that the cumulative effects of individual factors in a broad system continuously influence the generation of the environment over time. Therefore, ecological thinking emphasizes the dynamic relationships and factors manifested in the process. It also explains that the apparent disorder or complexity, which may initially be mistaken as random or chaotic, is in fact composed of highly ordered entities governed by specific geometric and spatial orders. Thus, cities and infrastructure, like forests and rivers, are essentially "ecological".

Landscape designers have been enthusiastic about developing various ecological technologies for

site planning and design. However, ecology has often been applied only to environments with natural features, excluding urban areas. Additionally, we frequently incorporate cultural, social, economic, and other factors into the natural environment, that means we regard them as opposing forces of nature. The goal of landscape urbanism is to develop a spatiotemporal ecology that comprehensively considers all forces and factors within the urban realm and treats them as a continuous network formed by interconnected relationships.

2.2.6 Cultural Landscape.

In landscape urbanism，landscape was seen as a model for understanding and operating the city, and interpret the city as an ecological system. From the perspective of landscape urbanism, the advantages of landscape urbanism in describing and interpreting the urbanization process and constructing urban structures was necessary be emphasized. Landscape is not an independent and abstract existence but must be combined with the culture of the city to create public spaces with regional characteristics and cultural connotations. The open space system formed by superimposing human activities on natural elements becomes a cultural landscape of the city, reflecting the cultural characteristics of the urban system and the geographical features of a region. With rapid economic growth, many people have migrated to cities, and the phenomenon of rapid urbanization has been rapidly changing the appearance and characteristics of old towns in China. Therefore, it is of great significance for domestic urban construction to use landscape as a medium to continue the urban context and shape the urban cultural landscape.[28]

2.2.7 Human Vitality

From the perspective of landscape pleasure and meeting people's leisure, the most important for landscape urbanism is creating public spaces for human activities and making the city full of vitality. Human behavior is an important component of urban ecology and systems. Over time, people's behavior become a part of the collective memory of urban life and form a unique urban image. Some practices in the transformation of old cities only focus on urban beautification and green renovation, which leads to the disappearance of the once-vibrant urban space in our lives.

Landscape urbanism is aimed at addressing the current criticisms of urban planning and construction, with a particular focus on the development of urban humanistic vitality, creating possibilities for communication and cultural interaction among different user groups. It considers factors such

as urban environment, context, density, etc., and strives to create a rich and vibrant place that complements the vitality of the city's life, full of various spatial experiences. A place with humanistic vitality is not simply about placing facilities but requires the translation and expression of local cultural history with specific landscape and architectural forms of expression, which is a refinement and expression of the cultural essence of the place itself.

2.3 The Fit Point between Landscape Urbanism and the Regeneration of Urban Waterfront Industrial Relics.

2.3.1 Organize Structures of Open Space

W Shen Ya, in "A preliminary study on the construction of urban open space system based on landscape urbanism" (2012), proposed that the open space system was an important part of the urban system, and argued that the landscape was a good medium capable of organizing the open space and other system elements [25]; in "Research on the planning and design of industrial parks based on landscape urbanism" (2013), the landscape infrastructure was used by Li Xuxin as an urban transportation system's constructive elements [29]. The object "open space" mentioned by both fits the concept of open space mentioned in the chapter. However, the landscape mentioned in the former was a natural landscape concept, focusing on the macro level of the city's urban structure; the latter was more focused on the scale, emphasizing the structural transformation of the road infrastructure.

The organization of open space architecture involves the remodeling of industrial relics and urban boundaries as well as their internal spatial structure, which is in line with the holistic and landscape infrastructure theories emphasized in the above theories. Therefore, the functional zoning, open space framework and their interrelationships must be analyzed and reorganized. If the theory of landscape urbanism could be appropriately applied, the spatial morphology of traditional waterfront industrial relics could be improved, its environmental quality and vitality of the place could be upgraded. Besides, more attractive urban waterfront spaces could be constructed.

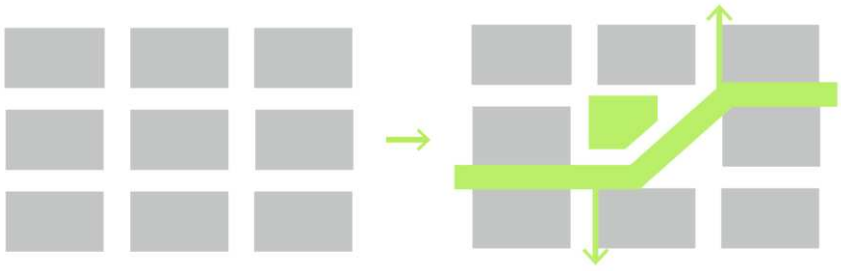


Figure 2-1 Organize Structures of Open Space

（Source：Author）

2.3.2 Enhancement of Waterfront Open Space Quality

Designs that incorporate landscape urbanism can change the stereotype of industrial relic spaces with isolated industrial buildings and industrial facilities but lacking other places of urban activity or transitional spaces. Kevin Lynch, in image of the city, proposed the five elements of the city: roads, boundaries, nodes, landmarks, and plazas. As a type of urban regeneration, these five elements are also contained in the renewed waterfront industrial relics. The landscape as the operating medium can soften the cold and straight industrial open space and has a strong ability to shape the five elements in different scales of space. These five elements together constitute the waterfront open space, which makes it a strong fit for the improvement of the quality of the waterfront open space.

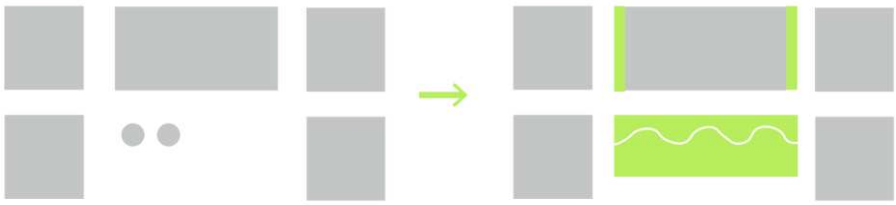


Figure 2-2 Enhancement of Waterfront Open Space Quality

(Source: Author)

2.3.3 Regulation of the Ecosystem

From the beginning, the theory of landscape urbanism by Charles Waldheim responded to two major issues that human civilization had to face, namely ecological degradation and global warming, in terms of the nature of city building. Among the prevalent brownfield redevelopment strategies, several projects focused on restoring or reintroducing natural processes as well as reshaping

their landscape character; some interventions could be brought about by exploiting the characteristics of the site's natural processes. [19] These fits with the principle of ecology.

The constituent elements of waterfront industrial relics themselves include natural water and soils , whose pollution and damage were inevitably caused to a limited extent in the past by the continuation of industrial production activities in the city. The principle of landscape infrastructure advocated by landscape urbanism was committed to solving the pollution problems brought about by industrialized cities, and a progressive, economically as well as environmentally sustainable facility system was designed to reverse these pollutions in order to achieve the goal of regulating the ecological environment, as well as to achieve a balance among grey infrastructure, landscape, and ecology.

Figure 2-3 Regulation of the Ecosystem
(Resource: Author)

2.3.4 Extension of Special Industrial Culture

Zhao Dongqi's "Research on the Living State Design Strategy of Cultural Landscape From the Perspective of Landscape Urbanism " (2020) considered that the shaping of living cultural landscape was the key to maintain the vitality of the city, in addition, it emphasized the interaction mechanism between people and cultural landscape on the surface of the material space, on the one hand, people are the subject of behavioral expression for the protection of the value of cultural landscape and sustainable development [30]; on the other hand, cultural landscape is a good medium to guide the activities; Wang Jingxiang's “A Study on Urban Renewal Strategies of Closed Mine Factory Square under the Concept of Landscape Urbanism--Taking Phoenix Hill as an Example ”(2022) proposed that cultural landscapes in landscape urbanism should focus on the preservation of historical and cultural elements from the perspective of post-industrial land use [31].

Nowadays, the phenomenon of a thousand cities with one side frequently caused social concern,

the absence of regional cultural expression was an important reason for this phenomenon. Urban culture should be diversified, while the industrial relic areas also have their characteristic cultural features; the cultural landscape theory of landscape urbanism would be able to guide the process and result of extracting industrial cultural values from industrial products, activate the landscape potential of industrial structures to a maximum extent, and infiltrate them into the waterfront public space so as to activate the vitality of the urban waterfront industrial relics.

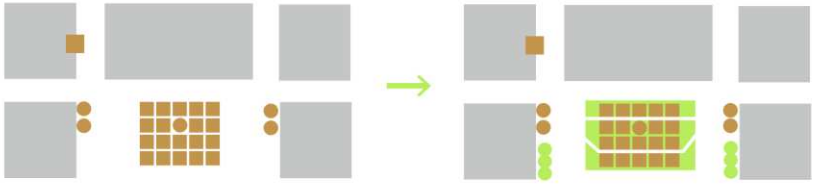


Figure 2-4 Extension of Special Industrial Culture

(Resource: Author)

2.3.5 Ability to Deal with Complex Terrain

Embracing and harmonizing complex topography are some of the most important capabilities of the landscape. Rather than being "anti-architecture" or "anti-infrastructure", landscape urbanism has emphasized how to integrate architecture and infrastructure into public space [23] .With the guidance of landscape urbanism, design can macro-integrate landscape infrastructure that organizes the landscape and culture. Instead, it emphasizes how to integrate architecture and infrastructure into public space[23]. With the guidance of landscape urbanism, it is possible to design landscape infrastructures that macro-integrate and organize landscapes and cultures, and to composite green spaces with functional amenities in order to avoid the lack of iconicity or homogenization of waterfronts. The site facilities, which tend to grow horizontally, are superimposed on the landscape elements of the horizontal interface to construct vertical space and reflect the theoretical requirements of horizontality.

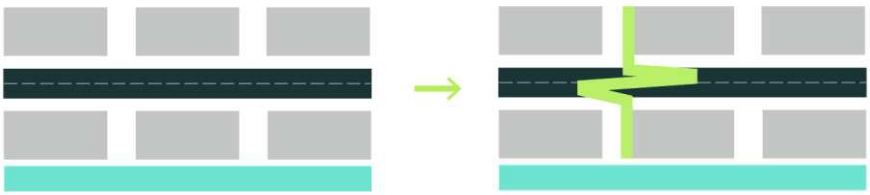


Figure2-5 Ability to Deal with Complex Terrain

(Resource: Author)

2.4 The Guiding Significance of Landscape Urbanism for Regeneration of Urban Waterfront Industrial Relics

Landscape urbanism is an ideology proposed to address a series of urban issues that emerged in the post-industrial era of the late 20th century, such as severe pollution and lack of vitality. Integration of natural landscape systems with gray infrastructure such as buildings and roads are advocated to replace the dominance of gray infrastructure and becoming the primary elements in urban development. However, in the traditional design process of regeneration urban waterfront industrial relics, there is a focus on individual building restoration and renovation, which is followed by the placement of green spaces in the remaining areas. This is predominantly building-oriented approach with little consideration for their connection to the city.

2.4.1 Transformation in Design Concept

Renewal of urban industrial relics from the perspective of landscape urbanism emphasizes transformation in planning and design philosophy and values. The strategic value of landscape urbanism is higher than specific design forms, which advocates in long run to envision the long-term development and space model of waterfront industrial relics. The goal is to combine the evolution of natural landscapes with human historical processes and create a harmonious、sustainable ecological and cultural vitality system. A landscape infrastructure network that integrates industrial relics' spatial structures and green spaces should be established to provide public spaces for various urban activities and enhancing the overall cultural vitality of the waterfront area. The concept of landscape infrastructure should also be actively promoted to facilitate the renewal of industrial relics. Reconstructing the spatial structure of industrial relics would be attempted from the perspective of landscape urbanism, as well as proposing a more adaptive design strategy to create a landscaped post-industrial form.

2.4.2 Transformation in Design Methodology

At the beginning of the project, it is essential to prioritize landscape strategies to connect and organize the open spaces of the waterfront area with industrial relics. This ensures the sufficient radiative to accommodate a wide range of activities on the site and offers the possibility of future expansion. Simultaneously, in terms of spatial detailing, it is important to reject the absolute separation between landscape and industrial cultural elements. Instead, they should be organically integrated into open spaces to create amenities, change the monotonous image of industrial buildings, and enhance their vitality and attractiveness. Instead, they should organically integrate within the open spaces, creating recreational facilities that transform the monotonous and lifeless image of industrial structures to make them more vibrant and appealing. The aim is to create visually rich and relaxed post-industrial waterfront spaces.

2.5 Chapter Summary

The chapter takes the theory of landscape urbanism as the research object, starting from the theoretical development and practical exploration history in the West and China to recognize the research gaps; then the core contents of landscape urbanism, including landscape infrastructure, spatial-temporal processes and other seven core ideas are summarized; finally, the five points of convergence between the theory of landscape urbanism and the regeneration of waterfront industrial relics are analyzed and its guiding significance is summarized

Chapte3 Landscape Urbanism Case Study

3.1 Shenzhen Qianhai City Planning

3.1.1 Overview and Issues of the Project

Qianhai is situated on the western side of Shenzhen and holds a significant position at the Pearl River Estuary within the Guangdong-Hong Kong-Macao Greater Bay Area. Optimal conditions are provided by its exceptional geographical location for Qianhai to emerge as a contemporary, sustainable, and vibrant urban center in the 21st century. Covering a vast expanse of 18 square kilometers, the site was once a waterfront industrial region characterized by bustling docks and numerous remnants of industrial facilities. The 2030 Urban Development Plan introduced by the Shenzhen municipal government aims to transform Qianhai into a new type of service and logistics center for the city. three major challenges have been identified for the project by analyzing of the current situation.

(1) Scale: The first challenge is enormous scale of the site: with an area of approximately 1,800 hectares, it's equivalent to half the size of Manhattan Island. At such a large scale, it's very hard to provide a dynamic and flexible strategy to accommodate urban development for any planning.

(2) Intensive Grey Infrastructure: The second challenge is how to transform the scattered grey infrastructure within the site, including the under-construction Qianhai vehicle depot, existing sewage treatment plants, and enclosed bonded port area. It's necessary to avoid these existing infrastructure elements becoming negative factors for the new urban area in a sound planning.

(3) Ecological Environment - Water Quality: The final challenge is how to address the extremely poor water quality in the site, as it will directly determine the material environment of the new urban area. The cause of this situation is the construction of Dachan Bay, which blocks the circulation of water within Qianhai Bay. The continuous discharge of polluted wastewater from upstream exacerbated the deterioration of water quality. How to treat, filter, and circulate the water within the bay would be a crucial factor in determining the success of the overall planning.

Figure 3-1 Three Major Challenges - Scale, Intensive Infrastructure, and Water Quality.
(Source: International Consulting Proposal Text for Qianhai Conceptual Planning)

3.1.2 Strategy.

(1) Building a Landscape Infrastructure Network:

For structure: In the proposal, James Corner introduced five water corridors, which added a waterfront corridor to the original composition of Qianhai, consisting of the coastal public spaces and urban development zones. Waterfront corridor directly connects the internal urban development zones with the waterfront public areas and the bay and divided the area into several sub-areas. The biggest advantage is activating the land potential in the internal area, allowing the internal region to have possibilities to develop as the coastal areas in terms of geography (Figure 3-2).

Figure 3-2 Constructing Landscape Infrastructure Network
(Source: Text of the International Consultation Program on Planning for Qianhai Area)

For water ecology: on the one hand, James Corner changed the cross-section structure of the watercourse and integrated it into a water filtration system with landscaped grey infrastructures, buildings, urban greenspaces, and other urban amenities. The system incorporates natural ecological filtration in the catchment process to alleviate wastewater pollution. This approach ensures the quality of the water flowing into Marina Bay; Meantime, it improves the urban water while providing habitat for flora and fauna to promote harmonious between humans and nature (Figure 3-3, left).

On the other hand, dredging the bottom of Da Chan Bay restores the natural flow of seawater and carries away wastewater generated by long-term industrial activities in the former bay by the action of scouring flow.

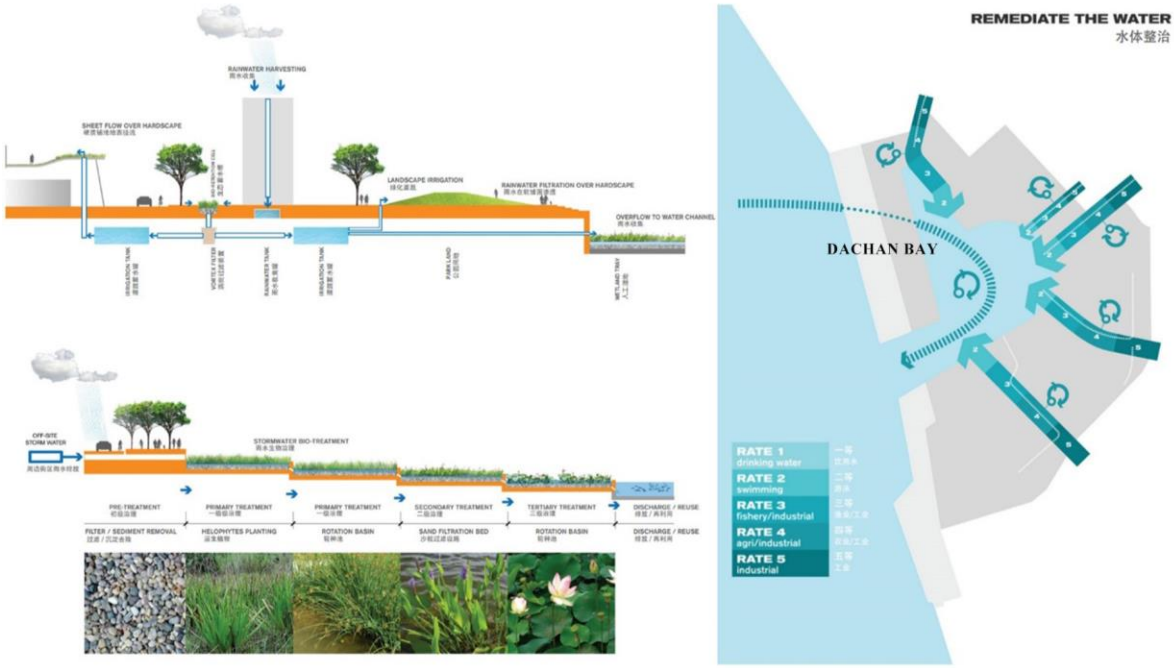


Figure 3-3 Landscape as Infrastructure

(Source: Text of the International Consultation Program on Planning for Qianhai Area)

For development： The introduction of the linear waterfront corridor divided the large Qianhai area into five distinct sub-districts. The industries between the districts complement each other to form a perfect regional industrial chain. A dominant function and a mixed function configuration that meets the needs of city were given to each sub-district. Characteristics was given to each sub-district by different dominant functions, and it's very clear to recognize every sub-districts. Due to

the geographical environment and functional composition of each area, the building height limit and specific functional layout are further defined.

With the huge scale comes the pressure of huge development funds, and the division of the five sub-areas also brings flexibility in construction work. James Corner plans the construction time of the five sub-areas from clockwise direction, which effectively prevented the impact of the financial chain breakage during the construction process. These operations reflect considerations for dynamic changes.

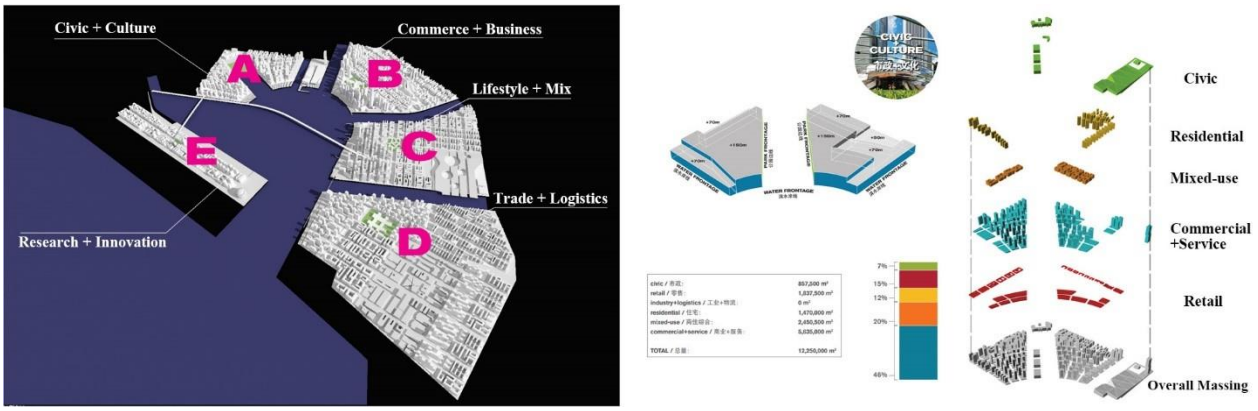


Figure 3-4 Responding to Urban Development

(Source: Redrawn by the author based on the information)

(2) Landscape Mediation Integrates Open Spaces:

In the proposal, the coastal space together with waterfront corridor become the most energetic public spaces in the new Qianhai city. The hundred-meter waterfront corridor that provides excellent urban open spaces for the internal area, and becomes linear landscape medium that integrates social life, public health, and public entertainment for the 21st century new city.

Figure 3-5 Integrating Landscape Medium and Waterfront Open Space
(Source: International Consulting Proposal Text for Qianhai Planning)

(3) Completing Transportation Structure:

In urban road planning, to maintain the continuity within Qianhai and its effective connection with other areas of Shenzhen, including even more distant areas, the five sub-districts of Qianhai Water City were arranged along three radial boulevards to form a hierarchical and interconnected road network. Each sub-district is traversed by two main roads, which ensures the fluent connection between urban spaces beyond the site and the waterfront. To provide convenience for pedestrians and establish a more continuous urban framework (rather than super-sized blocks), a tertiary road network - a system of local roads - is introduced. Secondary roads and side streets are interspersed and intersected, ultimately creating neighborhoods that are similar in scale to Hong Kong or New York.

In slow-moving system planning: The small-scale urban texture was advocated in each subarea has several advantages: On one hand, it reduces the citizen's dependence on motor vehicles and transforms street life into vibrant which allows 24-hour urban environment. On the other hand, it shapes a dense urban greenway system that connects the city to the waterfront to encourage green and healthy walking (Figure 3-4).

Figure 3-6: Completing Transportation Network

(Source: Qianhai Concept Planning International Consultation Proposal Text)）

3.1.3 Summary

In the Qianhai City Planning, the multi-functional and cross-scale attributes of the landscape were exercised to positively interevent urban development mainly from the structural level. On the level of urban structure, firstly, Corner has constructed five water systems to form a completed framework to guide the regional development, and maximize the ecological benefits of the waterfront space to the inner city while delineating the functional areas of the city; Secondly, the water system is used to integrate the open space and promote harmonious coexistence of human and nature; Thirdly, the three-tier municipal road network were delineated according to the landscape alignment, which connected the area and the surrounding.

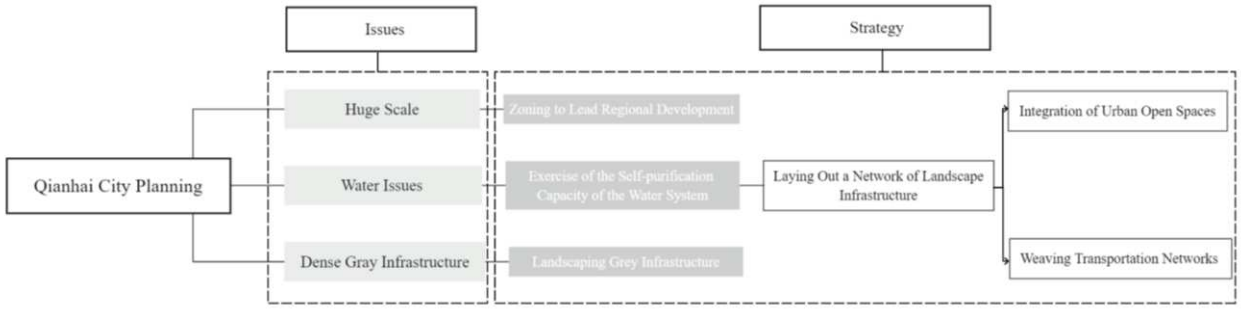


Figure3-7 Summary of Issues and Strategies for Qianhai City Planning, Shenzhen
(Source: Author)

3.2 Urban Design of Seattle's Central Waterfront Area

3.2.1 Overview and Issues of the Project

Seattle's central waterfront area was originally a pier with many industrial facilities. The main contradictions in its renewal are concentrated in the following aspects:

(1) Gray infrastructure divides the city and the waterfront: the Alaskan Way Viaduct has fragmented the areas nearby of the waterfront field and separated urban life from the bay and pier.

(2) Ecological issues: Due to industrial pollution, the aquatic and mountain environments in the region was degraded, which resulted some impact on the habitats and migration activities of organisms. With the removal of the Alaskan Way Viaduct and the reconstruction of the Elliott Bay seawall, the government of Seattle prepared to redevelop the central waterfront area and reconnect with Elliott Bay. To create an inclusive, ecologically sustainable, and vibrant waterfront for all is aim. The governmental commitment to developing a guiding code will put the shoreline and innovative, sustainable design at the forefront. The aim is to provide people with a positive ecological experience at the water's edge, as well as to improve shoreline ecology.

(3) Open Space Creation: Another issue is how to design the site to maximize the value of the waterfront industrial relics after the industrial facilities at the wharf have been relocated.

Figure 3-8 Waterfront Seattle

(Source: https://waterfrontparkseattle.org)

3.2.2 Strategy

(1) Integration of Urban Space with Landscape Infrastructure Networks

The Seattle Center Waterfront is in a transition zone between two ecological communities - the aquatic community of Elliott Bay and the mountainous community of urban neighborhoods adjacent to the waterfront. These communities that suffered pollution several years need restoration. It is also difficult for people to connect with the ocean, and the intertidal zone plays an important role in connecting the food web between upland and aquatic areas as while providing rich educational opportunities. The creation of strategic upland habitat corridors, extensions from the watershed to the uplands, and connections to existing and proposed habitats will ensure the integration of the central waterfront with the existing urban open space network. The framework therefore focuses on improving the ecology and strengthening the connections between the two neighborhoods through the overall layout of the landscape infrastructure network.

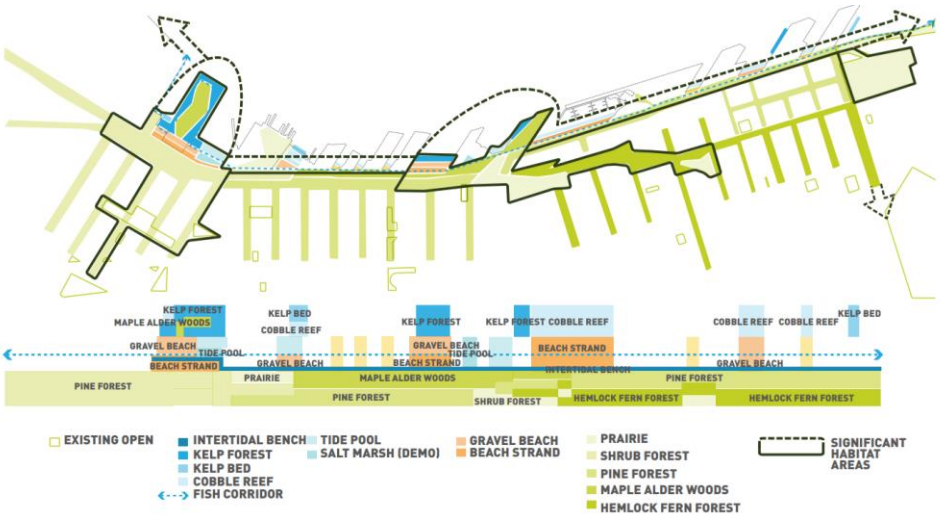


Figure 3-9 Landscape Infrastructure Network

(Source: https://waterfrontparkseattle.org)

(2) Embedded Slow-Moving System

In design for the renewal of Seattle's waterfront, Corner emphasized the creation of an urban slow-moving system. He set aside a generous space (4.8 meters) to integrate with the landscape space, thus connecting the waterfront dock space with the urban living area to create a comfortable and pleasant travel environment. This operation guides the public to green and healthy traveling and enhances the accessibility of the waterfront area.

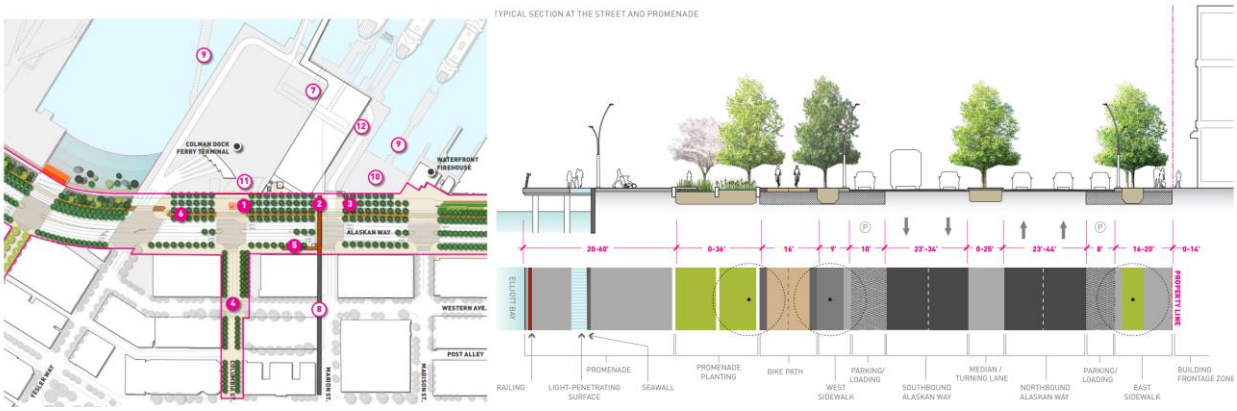


Figure3-10 Embedded Slow-moving System

(Source: https://waterfrontparkseattle.org)

(3) Landscaping Infrastructure

James Corner believed that managing the quality and quantity of stormwater runoff was the key to

improving urban ecosystems along waterfronts. Completing restoration of polluted streams, wetlands, and shorelines was impossible, while some functions of these elements could be restored to some extent by stormwater management techniques.

Ecological: Infiltration, evapotranspiration, and stormwater recycling can be achieved by urban infrastructures that integrate greening systems with drainage controls. And well-designed rain gardens help to prevent or minimize the generation and transport of common stormwater pollutants and watershed-specific pollutants. On this basis they are conveyed to receiving waters, including the marine environment, surface water and groundwater, through combined sewer or stormwater systems. Environmentally: This operation also improves the comfort and aesthetics of the street.

In addition, to solve the problem of tidal change and site drop, designer hoped to create a "pleated" form instead of a levee, to dissolve the uninteresting edge of tidal change. The folds unite natural and artificial forms, on the one hand, by forming a stepped ecological restoration chain by landscape to repair the original ecology of the site；On the other hand, that integrated the corresponding activities and leisure facilities in the center of the city's commercial area.

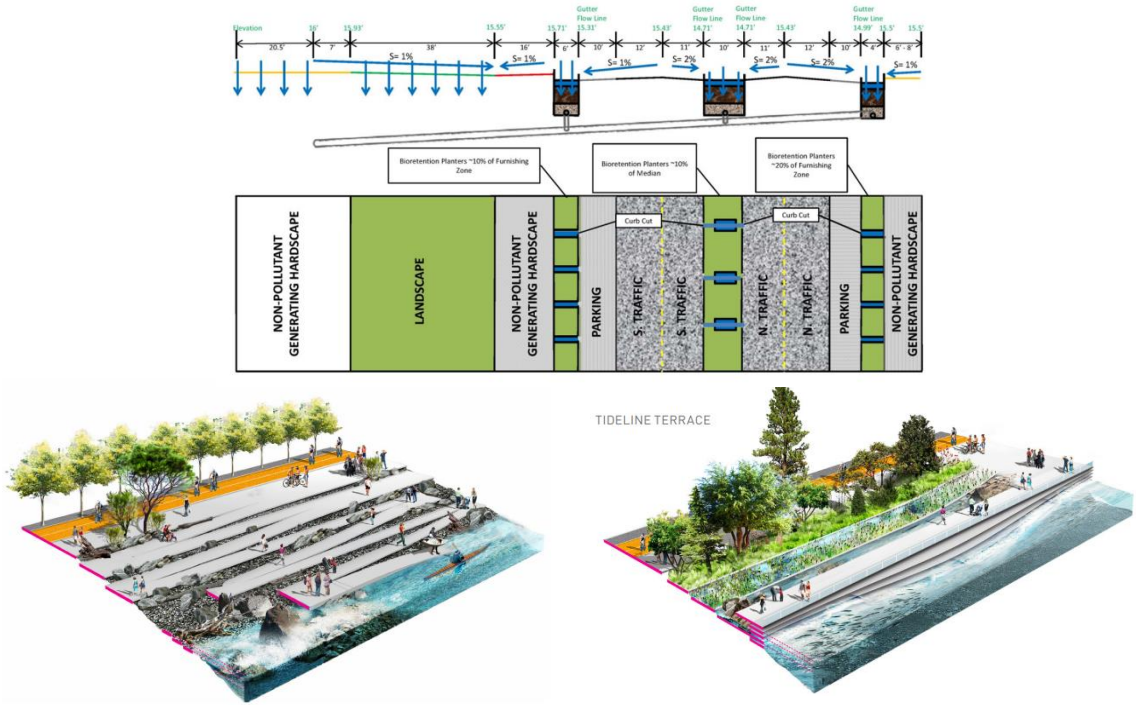


Figure3-11 Landscaping Infrastructure

(Source: https://waterfrontparkseattle.org)

(4) Thickening of Urban Surfaces

The Aterillo Bay community are elevated above the shoreline area, compact in the lots shown (Figure 3-11), so where people live in require a transportation system to help them reach the beach. Under the framework of the cityscape network, the designer creates this transportation system with a composite of landscapes, buildings, and transportation infrastructures, manifesting a thickening of the urban surface form. This three-dimensional folding strategy on the one hand directly sews up the urban space on both sides of the gray infrastructure; on the other hand, it gives the continuation of the urban surface the possibility to guide the urban events and improves the potentially negative urban space into a green and pleasant environment.

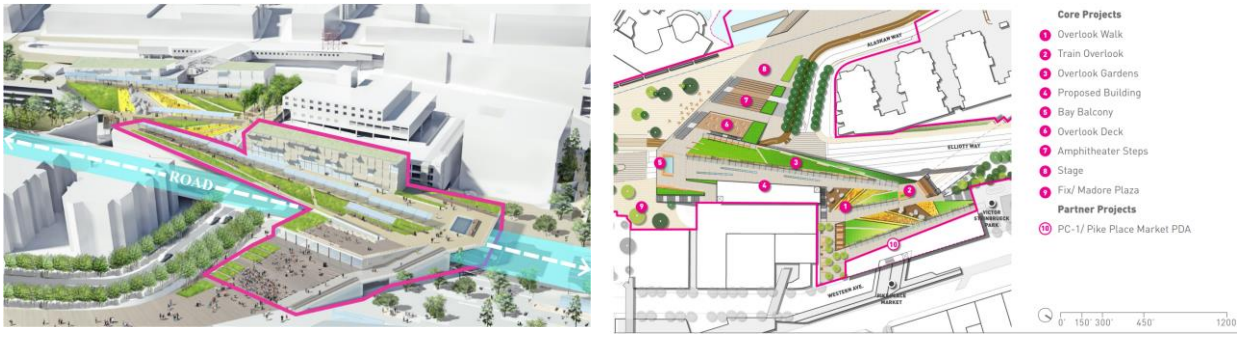


Figure 3-12 Thicken of Urban Surfaces

(Source: https://waterfrontparkseattle.org)

(5) Public Participation and Multicultural Placement

Public participation issues mainly include the re-planning of former industrial facility areas and venues for accommodating events, many of which involve cultural activities rooted in Seattle. Rather than reconstructing new buildings, many existing pier spaces were remained as open spaces, providing flexibility to accommodate a wide range of public activities and events. Additionally, to enhance event-based activities and sustainability, facilities were strategically located to seamlessly integrate with existing destinations, such as walking, jogging, cycling, and parking. In waterfront area, diverse open activities and projects that were able to evolve and adapt over time can meet the needs and desires of all visitors.

Figure 3-13 Public Participation and Multicultural Placement

(Source: https://waterfrontparkseattle.org)

3.2.3 Summary

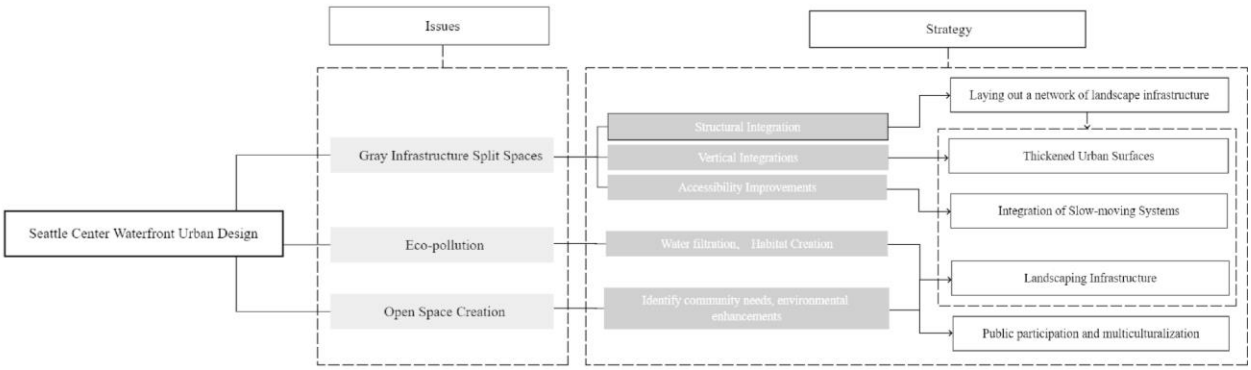


Figure 3-14 Urban Design Issues and Strategy Summary for Seattle Central Waterfront

(Source: Author)

Due to the removal of the viaduct, the three key challenge for the urban design of Seattle's waterfront were reestablishing spatial structure, addressing regional ecological issues, and meeting the demand for a vibrant waterfront space that is shared by all. The proposed plan established a series of ecological landscape belts that reconnect the spatial structure of the community and waterfront. Based on this, the plan integrates vertical spaces by thickening the ground surface to mitigate height differences. The enhancement of the pedestrian accessibility was achieved by landscape integration,

and the ecological environment was improved by micro-operations that transform gray infrastructure into landscape infrastructure. Public participation was encouraged in open space, with the inclusion of multicultural activities to enhance the vitality of the waterfront space.

3.3 Regeneration of Brooklyn Domino Sugar Factory

3.3.1 Overview and Issues of the Project

Domino's Sugar Factory, located in Brooklyn, produced more than 90 % of the U.S. total candy year-round. However, in 2004, the Domino Sugar Factory in New York was forced to close due to high property taxes and a 20-month-long strike. It suffered a series of disputes, but the historic value of the factory's building was eventually preserved. In 2008, due to financial issues, the project was transferred to a new company with the aim of creating an open urban waterfront space. The challenges of its renewal are as follows:

(1) Deactivation of the waterfront: The closed production activities of the sugar mill resulted in the severance of the waterfront from the urban space and turned the site into an unattended scar that isolated the surrounding community from the east river shoreline.

(2) Ecological distress: Before the project, the site was hit by Hurricane Sandy, and the water often rose and flooded the site. How to deal with these force majeure natural factors was also an important issue to be talked.

(3) How to continue the culture: as a symbol of Brooklyn's waterfront industrial zone, the site's industrial architecture is prominent in the city's urban image, and how to preserve this industrial culture and integrate it into the culture of the Williamsburg community was another important issue.

Figure 3-15 Regeneration Domino Sugar Factory

(Source: Archdaily)

3.3.2 Strategy

(1) Completing Transportation Structure:

The ground floor of the plant is opened to allow space for residents to access the waterfront; Meanwhile, the designers set back the building to expand the waterfront space to accommodate more activities. Then a new municipal road was introduced between the park and the buildings, which connects several of the previous cul-de-sacs and increases accessibility to the waterfront area (Figure 3-15).

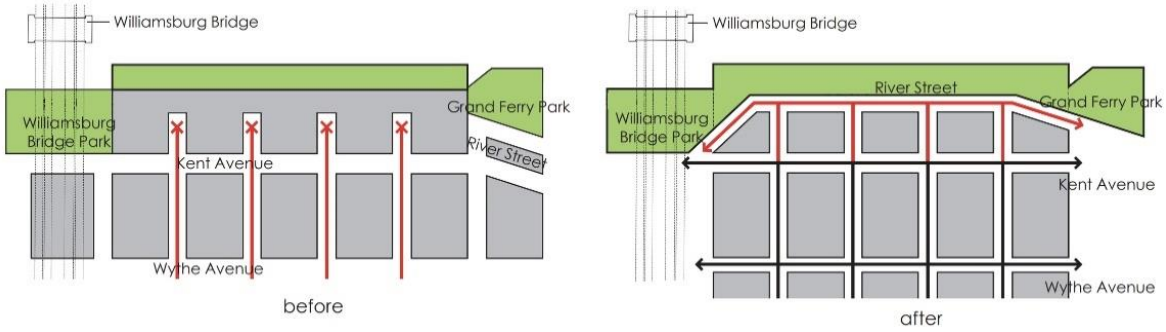


Figure3-16 Completing Transportation Structure:

(Source: Redrawn by author from information)

(2) Landscaping Infrastructure

In response to hurricane flooding, the entire waterfront park is half outcropped into the city's east river and half inland. The designers raised the shoreline pile foundation to elevate the site's grade and prevent the waterline from crossing the site. Meanwhile, a single pile underwater would provide ample organic matter to complete the aquatic habitat in the nearshore area.

Landscaped infrastructure improves the resilience of the waterfront shoreline; in terms of shoreline landscape creation, highly resilient and salt spray and saline tolerant riparian plant species were planted, including multiflora basket fruit tree Nyssa sylvatica 'Red Rage, Quercus bicolor, and so on. These plants could resist rainfall and provide both resistance and resilience even when there is a sudden and unanticipated flooding. A mix of native herbs perennials and trees contribute to the overall spatial sequence of the park.

Figure 3-17 Landscaping Infrastructure

(Source: Redrawn by author from information)

(3) Continuation of industrial culture

①**Creating a dynamic memory scene:** In this project, the design team moved the hard-to-see machinery of the sugar factory to the outside of the factory so that people could physically touch the equipment and learn about the workflow of the sugar industry. Therefore, JCFO designed a corridor called the industrial relic trail, which consists of more than 30 large-scale machine elements with different functions. The corridor runs through the park to connect three different design zones - a dynamic recreational space, a central gathering space (the Water Plaza), and a static recreational space. As a result of this design, the factory was no longer just an isolated landmark, but expanded into an entire waterfront space that extended the character of the Domino Sugar Factory to the entire neighborhood. So, a sugar factory once in the minds of the locals became this park itself. The original factory was essentially a complex of multiple structures connected by a series of elevated corridors. Walking on this aerial walkway just like a dialog between the present and the past.； Overall it creates a dynamic landscape that moves from step to step (Figure 3-17).

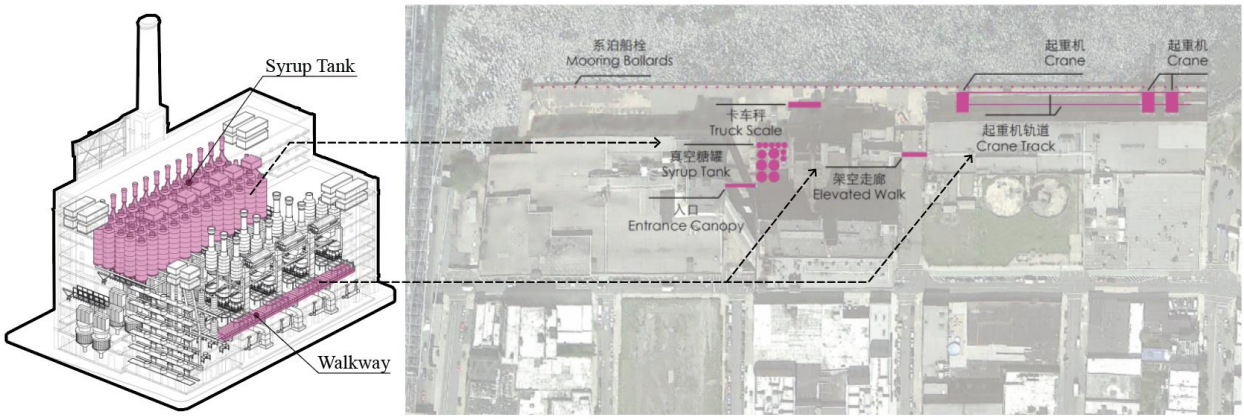


Figure 3-18 Creating a Dynamic Memory Scene - Process Flow Display

(Source: Redrawn by author from information)

On the other hand, to allow visitors to experience the daily vision of the sugar factory workers, including the process of unloading, transferring, storing syrup, vacuum heating and packaging, the designers transplanted four tin cans, which represented the state-of-the-art of the vacuum sugar production method at that time, onto the site. To recreate the vacuum sugar production, the team designed a spraying device to simulate the process of removing water from the semi-finished sugar. Not only the visual, but also the sense of smell and touch reproduced the industrial manufacturing atmosphere of the time (Figure 3-18).

Figure 3-19 Creating a Dynamic Memory Scene - Vacuum Sugar Canisters and Elevated Walk-way

(Source: Archdaily)

②Adaptability of the structure, flexible use of space: The main part of the Sugar Factory was replaced with a commercial office complex; a gap of 10 to 12 feet was left between the old and the

new buildings. So, a certain sun-shading effect can be provided; While the new building is a high-rise with ranges in height from 3.6M to 4.2M, which corresponds to the original window openings on the walls.

With the partial ventilation space on the ground floor of the building, exhibitions, lectures, screenings, and other functions can be provided, which is highly adaptable to urban events; Meanwhile, the partial space on the ground floor relates to the original building wall, so that the users can feel the atmosphere of the original sugar factory in proximity (Fig. 3-19).

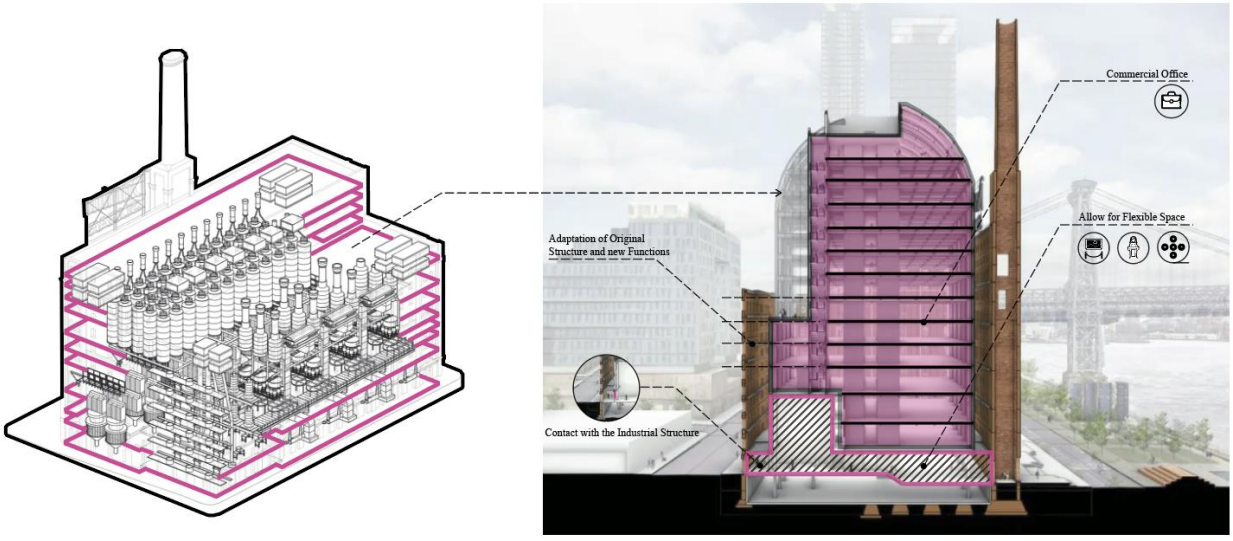


Figure 3-20 Adaptive Utilization of Structures
(Source: Redrawn by author based on information)

③Continuation of style of building facade : The façade of the Sugar Factory building has been preserved after the replacement of its function, while the new glass barrel arch will tower above the historical building. The overall style echoes the American round arch style and unique shape of the original sugar refinery. The cupola is the most iconic element of the sugar refinery façade, and the designers chose to complete the new body with alternative materials to convey the sensory message of the historical landmarks and the original sugar refinery. The contrasting textures of glass and brick create a dialog just like the past and the present, emphasizing the original formal style.

Figure 3-21 Facade texture analysis

(Source: Redrawn by the author based on information)

④ **Reinforcement of industrial component in visual :** The design team has treated the industrial relics with color by artistic expression. To make these industrial remnants fully recognizable, the preserved industrial facilities were painted with a special blue color extracted from the Domino Sugar Factory equipment.

Figure 3-22 Reinforcement of industrial component in visual

(Source: Redrawn by the author based on information)

⑤ **Reuse of site materials:** In the renovation of industrial landscapes, original industrial materials and materials with similar textures are fully utilized in the site design, including large equipment accessories and smaller original materials. This acts visually, tactilely, and olfactorily on the public involved in the site's activities, fully conveying historical information; it also fully utilizes the principles of ecology and reduces the consumption of non-renewable resources.

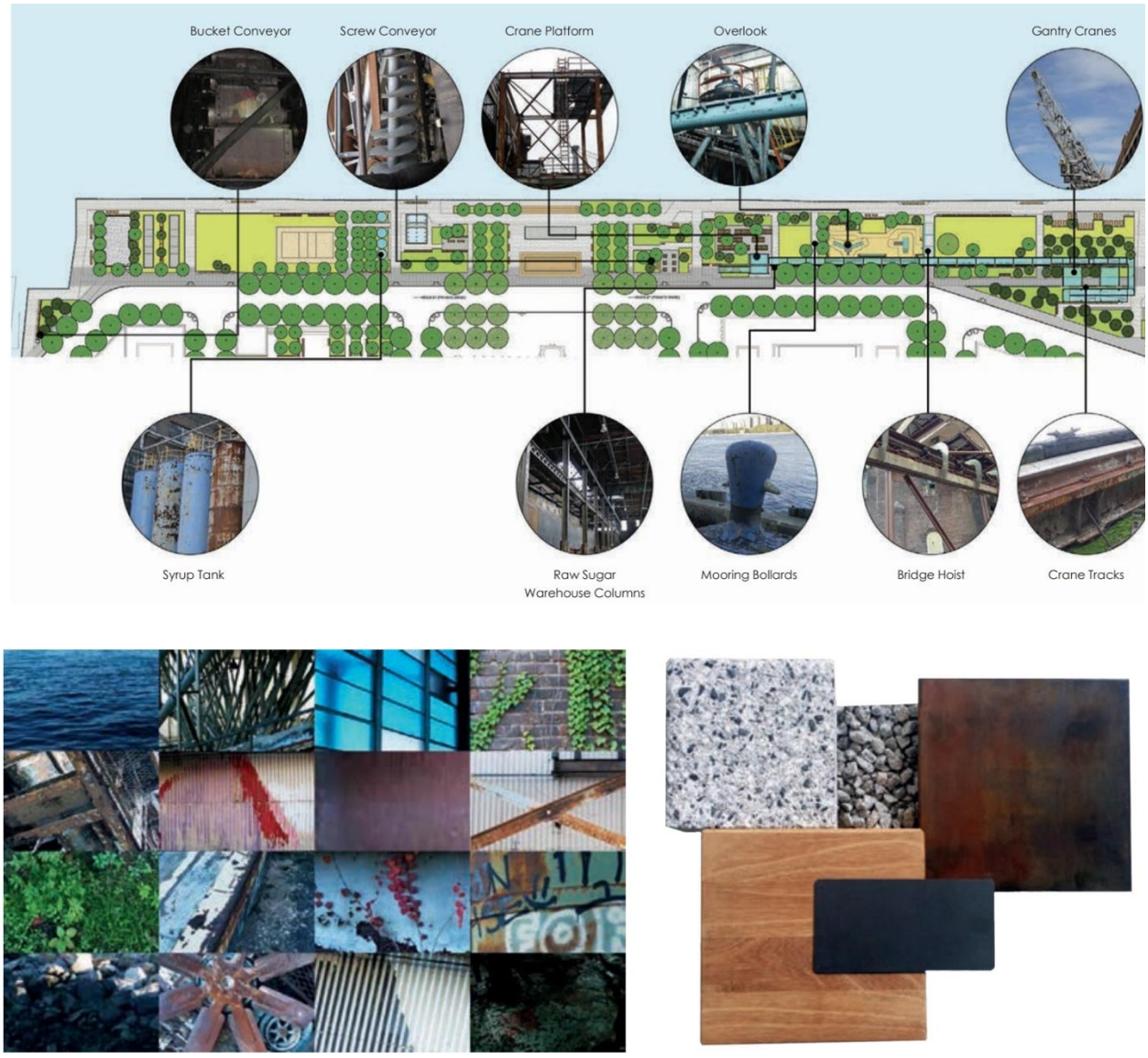


Figure 3-23 Reuse of Site Materials

(Source: Redrawn by the author based on information)

(4) Public participation in design

Domino Park is the first waterfront park in the Williamsburg community in 160 years. As a culturally diverse neighborhood, groups of residents from different backgrounds were looking for a park that would meet their needs for a variety of activities and allow them to show their community's culture. The design team opened online and offline channels to get the public's needs.

To balance the needs of different residents, these activities were categorized into two groups: one of them was specific venue activity, such as beach volleyball, coffee outings, children's

playgrounds, dog parks, etc.; and another could happen flexibly, such as family dinners, running walks, etc. Although the second type of activities are relatively routine, based on the uncertainty of the future, the design team reserved more space for these activity venues. The Reason for that was such venues are more adaptable to the needs of citizens with different socio-economic conditions.

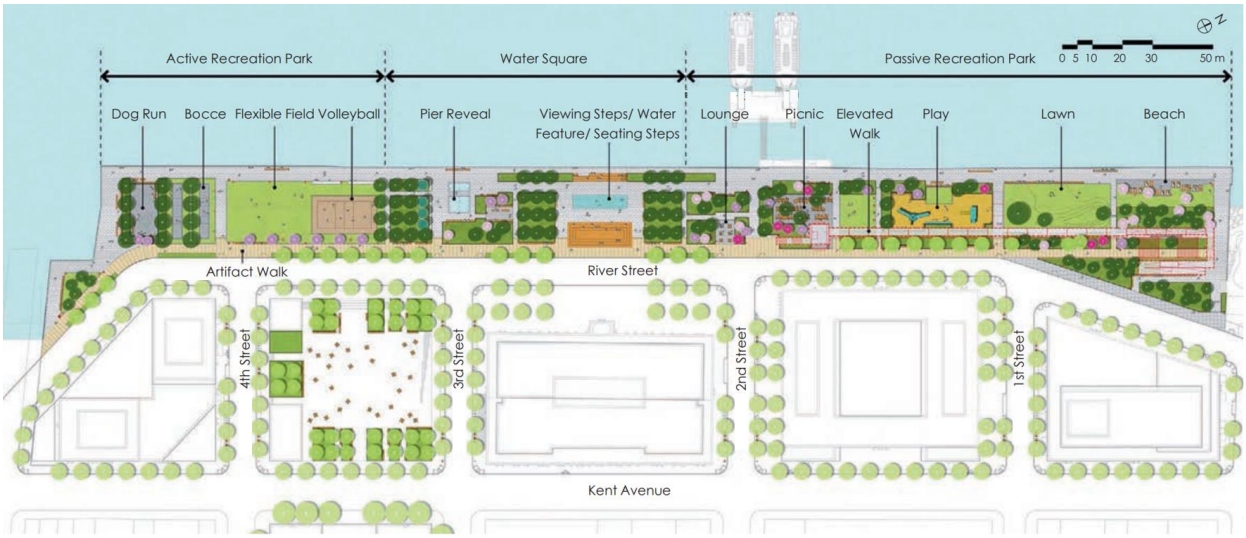


Figure3-24 Public participation in design

(Source: Redrawn by the author based on information)

3.3.3 Summary

Because the Domino Sugar Factory transformed to park, the urban road network was dredged to improve regional accessibility; For enhancing the humanistic vitality, the functions were deployed by civic participation to satisfy community activities. For ecological adaptation, the site responds to the problem by landscaping infrastructure; On the one hand, raising the elevation of piles and planting alkali water-resistant plants was able to adapt rainfall and flooding. On the other hand, integrating the facilities needed for community life. In terms of industrial culture, the importance of industrial culture is emphasized through a variety of design approaches.

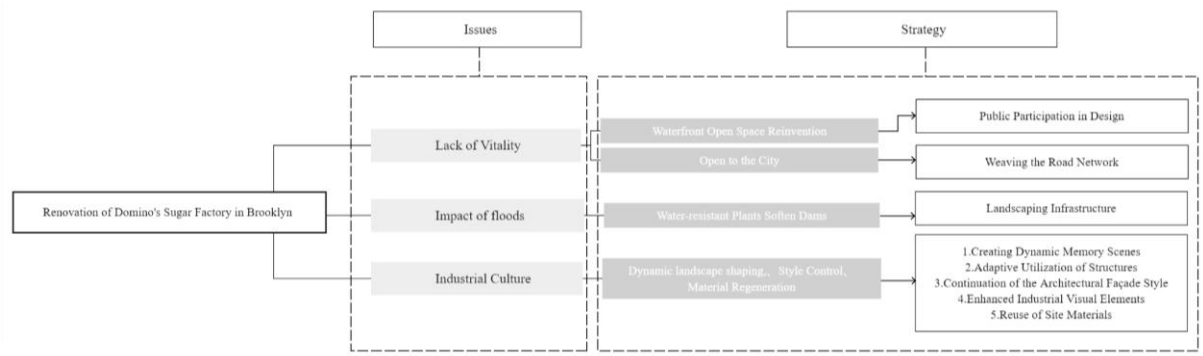


Figure 3-25 Domino Sugar Factory Regeneration Issue-Strategy Summary
(Source: Author)

3.4 Summary of Cases

The cases referred to in this chapter are different renewal design cases of waterfront industrial relics with different scales in domestic and foreign cities, from which some design purpose and strategies under the perspective of landscape urbanism can be extracted from the applicable scales to achieve the goals. The operation targets and their applicable scales are clarified (Table 3-1), which is of reference significance for analysis and strategy generation of waterfront industrial relics in Guangzhou.

Table 3-1 Summary of Cases

Target	Method	Operational Objects	Applicable Scale
Optimizing Spatial Structure	Building landscape infrastructure networks	Linear cityscape	Urban Scale
	Integrate open space with landscape media	Site open space; landscape	Regional Scale
	Weaving the transportation structure	Transportation system	Urban scale
Improvement of Waterfront Open Space	Guiding public participation in design	Waterfront open space	Regional Scale
Responding to the			

Ecological Environment	Landscaping infrastructure	Infrastructure, landscape	Multi-scale
	Landscape as infrastructure	Landscape elements	Multi-scale
	Reuse of site materials	Site remaining materials	Regional Scale; Micro Scale
Continuing Industrial Culture	Creating dynamic memory scenes	Architecture, Landscape	Regional scale
	Reinforcement of industrial component in visual	Industrial structure	Micro-scale
	Introduction of multicultural activities	Architectural Space	Microscale
	Adaptive use of structures	Architectural Space	Micro-scale
Dissolve Complex Topography	Vertical space integration (Thickening of the ground surface)	Architecture, landscape, infrastructure	Regional scale

Chapte4 Research on the Waterfront Industries Relics in Guangzhou

4.1 An Overview of the Renewal of Guangzhou's Waterfront Industrial Relics

In general, the practice of renewing waterfront industrial relics in Guangzhou has been ahead of theory and policy. Around 2000, the enlightened concept of waterfront industrial relics' preservation and re-utilization has been created. Besides, practical cases of waterfront industrial relics' preservation and renewal for other functions have appeared. The development of waterfront industrial relics' renewal can be categorized into four stages, as shown in the following table (Table 5-1):

Table 4-1 Relevant theories in embryonic stage

Period	Renewal Process	Renewal Model	Representative Cases	Main Influence
Pre-2008	Trial and Evaluation Stage	Large-scale Demolition and Construction - Inventory Renewal	Xinyi-International Club; Guangzhou Lime Factory	The privatization of many waterfront spaces and the government's perception of the waterfront industrial heritage began to transform
2008-2010	"Suppress the Second Industry and Develop the Third Industry" Renovation stage	The Rise of the Cultural and Creative Park Model	Taikoo Cang Fashion Park	Optimizing the industrial structure； Promoting economic recovery; Single form of renewal；

2010-2015	"Three Olds" Re transformation Stage	Diversified Exploration	Guangzhou Southern Flour Mill	The types of renewal were diversified, and the inheritance and development of culture were emphasized
2015-Present	Sustainable Development Stage	Comprehensive Benefit Oriented	Chenganwei Shipyard	Pursuit for sustainable urban development

4.1.1 Prior to 2008 - Early Renewal Practices

After 1990s in Guangzhou, a plenty of industries began to move out due to the system of paid land use, the reform of the tax system, environmental protection, and urban assumptions. As a result, many vacant and abandoned industrial buildings appeared in the center of the city. In this renewal phase, estate-oriented urban renewal model became the dominant force in the market, the renewal of old urban areas and decaying areas was transformed into large-scale real estate development [32]. Urban waterfront space was replaced by many buildings, and the riverfront shoreline was privatized by the real estate industry just after it was taken out of industrial production. It was not until the government announced in 1999 that developers would be prohibited from carrying out renovation projects within the boundaries of the old city that the government began to experiment with gradual and organic regeneration methods. the concept of preserving and reusing waterfront industrial relics can be traced back as far as the early 2000s. In the early economic-driven urban construction context, the government and society did not have a strong awareness of the value of industrial relics and their reuse. The characteristic of development of waterfront spaces was mainly economically oriented, and waterfront industrial buildings that had lost their original functions were usually demolished and turned into real estate development projects to maximize economic benefits.

The earliest enlightenment concept for the protection and reuse of waterfront industrial heritage came from the redevelopment planning of the Pearl River Post-Navigation Waterfront Area. In the early 2000s, a ring road was planned along the Pearl River Post-Navigation Waterfront in the western part of Haizhu District. This route, which directly bordered the waterfront, resulted in problems

such as mixed traffic and a separation between people and the water. It also faced the dilemma of having to demolish the Taikoo Warehouse, Osaka Warehouse, and Chengzhi Warehouse. In 2004, the team from South China University of Technology formulated the "Development Plan and Urban Design of the Pearl River Post-Navigation Waterfront Area in Guangzhou" Planning that proposed an alternative route for the ring road to preserve the Taikoo Warehouse and Osaka Warehouse. This plan had a significant impact on the planning of Haizhu District, as it transformed the originally intended secondary road-level ring road into a scenic branch road, allowing for the possibility of creating waterfront public spaces along the original 40-meter-wide waterfront ring road. It also preserved historically valuable buildings such as the Taikoo Warehouse, Osaka Warehouse, and Chengzhi Warehouse. Inspired by this planning, the government gradually developed the concept of regeneration of industrial relics and began to recognize the important opportunity of transforming waterfront industrial relics into public spaces with social value.

During this period, several iconic cases emerged in Guangzhou, with the most representative one being the Xinyi-International Hall. This hall was transformed from the Guangdong Water Conservancy and Hydroelectric Power Plant, which was the first waterfront industrial relics' renewal project in Guangzhou with regional influence. The Liwan District government facilitated the cooperation between the property rights holders and developers. They decided to develop by commercial model. Based on market research, the functions of the power plant were replaced, allowing for adaptive transformation. It successfully rebirthed as a masterpiece of waterfront industrial relics and sit a benchmark for the subsequent development of cultural and creative industry parks.

However, there were cases of trial and error during this period as well. Another example was the Guangzhou Lime Factory, which was one of the earliest cases of the reuse of old industrial areas in Guangzhou and was transformed into Zengpu Park in 2005. However, due to the low recognition of value of industrial relics at that time, only two tower buildings (kilns) were preserved as symbols. Additionally, because of lack of consideration for the adaptive use of the preserved tower buildings, they were isolated in the park. The disconnect between the surrounding environment improvement and park construction resulted in a lack of attractiveness for the park.

4.1.2 2008 to 2010——Initiation of "Suppress the Second Industry and Develop the Third Industry"

In 2008, influenced by the global financial crisis, urban managers in Guangzhou proposed a transformation from "Guangzhou manufacturing" to "Guangzhou creation". As a result, a series of policies were formulated to promote the development of the service industry[33] . The planning and construction document that emphasis applying functional replacement and spatial reorganization on those industrial enterprises with severe pollution, high energy consumption and low efficiency in a hierarchical and regional manner maxed the influence by policy of "Suppress the Second Industry". In 2009, the Guangzhou Cultural and Creative Industry Association was established with the aim of promoting the sustained and healthy development of Guangzhou's cultural and creative industry, then the city's creative spaces were named "cultural and creative industry parks".

The series of policy actions at that time were all aimed at strengthening the development of the cultural and creative industry. Early success practices, the Guangdong Water Conservancy and Power Plant was transformed into the Xinyi International Conference Center, was served as a policy demonstration project that led the subsequent renovation movements of many cultural and creative industry parks. These cultural and creative industry parks include Taikoo Warehouse Fashion Park, Redtory Art and Design Factory, 1850 Creative Park, 922 Hongxin Creative Park, and others, were transformed from waterfront industrial relics.

Under the context of the " Suppress the Second Industry and Develop the Third Industry " policy, the waterfront industrial relics have been transformed while achieved goals such as saving and intensively utilizing land, improving land use efficiency, and optimizing industrial structure. The financial crisis during this period prompted industrial transformation, and a series of policies and actions focused on the cultural and creative industry. Many waterfronts industrial relics were transformed into cultural and creative industry parks. as the type of upgrading, leading to rapid development and significant effects, resulting in the creation of several influential cultural and creative industry parks with strong cultural influence.

4.1.3 2010 to 2015 - "Three Olds" Transformation Phase

In February 2010, Guangzhou set up the "Three Olds" transformation office and officially launched the "Three Olds" transformation work. During this period, the form of transformation was mainly

based on individual projects, with excessive focus on incremental demolition and redevelopment to promote domestic demand growth. Over-emphasis on demolition and redevelopment centered on economic indicators caused irreversible damage to the waterfront industrial sites with historical information about industrialization; and for the waterfront space, the dense “urban landscape” constructed of steel and concrete not only harmed the ecological environment, but also deprived citizens of space for public activities.

In June 2012, to further improve the "Three Olds" transformation policy, the Guangzhou Municipal Government issued the "Supplementary Opinions on Accelerating the Work of the "Three Olds" Transformation", which put forward the following principles: "Government-led, planning first, piecemeal transformation, supporting priority, categorization and treatment". At the same time, there is also a trend towards diversification in project renewal types. During this period, the Guangzhou Southern Flour Factory was planned to be transformed into the Red Boat Dock for Cantonese Opera; the Changgang Oil Depot was planned to be transformed into the Guangzhou Industrial Museum; and the Wu Xian Men Power Plant was planned to be transformed into the Guangzhou Overseas Chinese Museum. The significant increasing in the types of museums and exhibition halls reflected the importance that Guangzhou attaches to the inheritance and display of industrial culture and traditional local culture.

An important contribution was made by the "Three Olds" transformation to explore the methods of urban renewal. by continuous attempts and revisions, Guangzhou's urban renewal work has achieved initial results. However, at this stage, the economic-centered "development and renovation" approach neglected the comprehensive efficiency of the built environment, which should also include social equity, cultural heritage, environmental ecology, and other factors. The overly single-minded goal and approach have led to less than significant results.

4.1.4 2015 to Present——Sustainable Development Stage

The former office in charge of the "three olds" transformation work in Guangzhou was merged into the Guangzhou Urban Renewal Bureau. On the basis of the work of the original "Three Olds" Office, the Guangzhou Urban Renewal Bureau has added another requirements of improving the public construction for urban infrastructure, improving the living environment and upgrading urban functions. The purpose of the establishment of this organization was to improve the efficiency of

intensive and economical utilization of land. Unlike the past when it relied solely on incremental redevelopment as its only approach, the renewal bureau began to shift to encourage to connotatively regenerate and to pursuit the sustainable development of the comprehensive efficiency of the built environment. As a result, Guangzhou's urban renewal has officially entered a stage of sustainable development in normal.

In response to the limitations that existed in the actual process of the "three olds" transformation, such as the single objective of transformation, the duplication of approaches and the neglect of connotative development, a comprehensive benefit-oriented development model has been adopted. This new model focused more on improving human environment, urban vitality, protecting historical deposits, and fostering industrial innovation.

A good example in this new model is the Guangzhou Qidi Zhonghai Science and Technology Park, which was transformed from the former site of the Cheng'anwei Shipyard. The Cheng'anwei Shipyard was a heavy industry that produced serious pollution and consumed large amounts of energy, belonging to the type of waterfront industry that is prioritized for relocation and transfer in the central area of the city. The district government provided a micro-remodeling program to regenerate the old shipyard and turned it into a comprehensive marine science and technology innovation park with the theme of "marine science and technology, green ecology and coastal style". As urban renewal shifts from quantity and speed to pursuit of quality, such a proposal not only enhances the vitality of streets, preserving urban memory, and reducing the cost of demolition and relocation, but also explores a variety of renewal modes that are adapted to the needs of urban society. Such renewal modes are conducive to the preservation of urban landscape culture as well as the unification of architectural style and urban form.

In 2015, the concept of "dual urban restoration" was proposed for the first time at the Central Urban Work Conference, providing new opportunities and challenges for the theory and practice of current urban renewal paths. The concept of "dual urban restoration" includes both "ecological restoration" and "urban restoration". The former refers to the use of ecological concepts to restore the damaged natural environment of the city to improve the quality of the city's ecological environment; the latter refers to the use of renewal and mending concepts to demolish unauthorized buildings and repair urban facilities, spatial environment and landscape style in order to enhance the city's characteristics and vitality. As a new initiative to address urban diseases and improve the

living environment, "urban dual restoration" has clarified the values and provided a new direction for the renewal of old waterfront industrial zones in cities, emphasizing that ecological restoration and urban repair should be carried out in parallel to further promote urban renewal towards the goal of building sustainable development with comprehensive environmental efficiency.

4.2 Characteristics of Existing Waterfront Industrial Relics in Guang-Zhou

4.2.1 Heavy Industry Predominates

The waterfront industrial relics in the urban area of Guangzhou are mainly concentrated in the Baietan area, with an overall belt-like distribution along the Pearl River. There are also sporadic distribution. Because of the water depth conditions. of the former channel of the Pearl River and the Huangpu channel. the type of industry is mainly shipbuilding and transportation, and the industrial belt of Huangpu and Yuancun is formed along the coast, which is an important external port of Guangzhou; the back channel of the Pearl River with a long shoreline is the main internal port of Guangzhou, of which Baietan is the earliest gathering of wharves and warehouses, and Luoxi area was formed relatively late; the west channel is at the windy downstream of Guangzhou, and the Xicun area has become a planned industrial area in the Republic of China with basic industries as the core (Fig. 4-1).

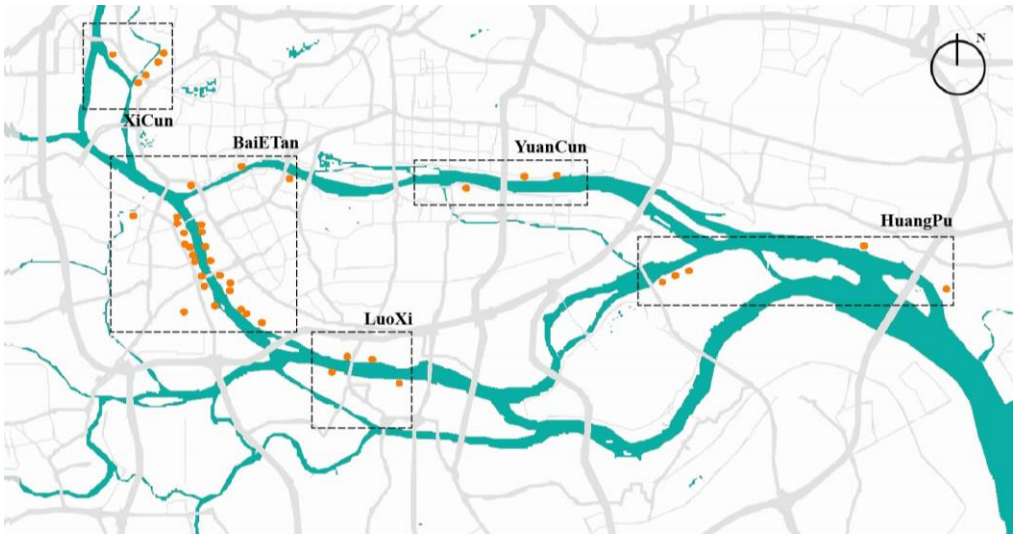


Figure4-1 Overview of the distribution of waterfront industrial relics in GuangZhou (Resource: Author)

Based on the waterfront industrial relics in the urban area of Guangzhou, the number of industrial zones in the heavy industry category accounts for nearly half of the total number of light and heavy industries (Figure 4-2). The pollution of land and water quality of waterfront space exists in several of these types of industries; the production activities of heavy industry types are prone to pollute the surrounding soil and groundwater due to the existence of wastewater discharges and leakage in the production process; and the flow of heavy metals to the soil caused by rainfall during the storage of raw materials, products, and waste residues. Most of the ecological environment of the remaining waterfront industrial relics is in a relatively fragile state. To ensure the safety of their reuse and the enhancement of their comprehensive value, priority should be given to the treatment of the environment and the improvement of water quality before carrying out renewal and reconstruction.

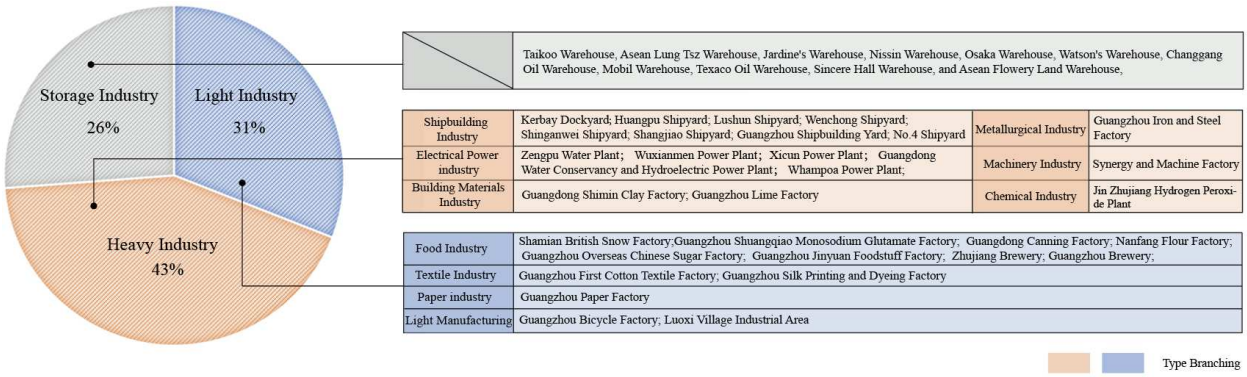


Figure 4-2 Types and Percentage of Waterfront Industrial Relics in Guangzhou
(Resource: Author)

4.2.2 Large Differences in Spatial Depth

Waterfront industrial relics are of various types and scales, and the depth from the waterfront space to the urban hinterland is not only affected by its scale, but also by the layout of the relics' industrial spaces, which has a certain impact on the perception of the depth of the waterfront space. Overall, the layout of the remaining area can be categorized into three types: arrayed, enclosed, and a mixture of the two. The size of the area spans from the Sheung Kau Shipyard, which is about 4,200 square meters, to the Kebai Shipyard, which is nearly 250 hectares in size.

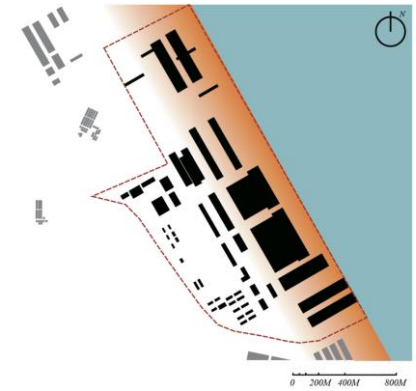
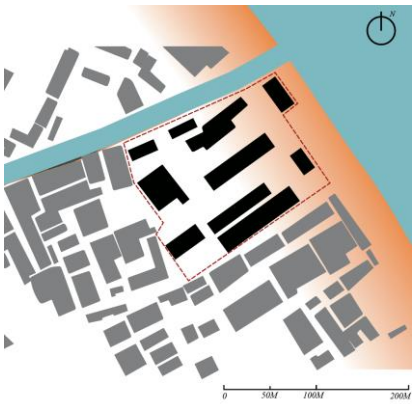
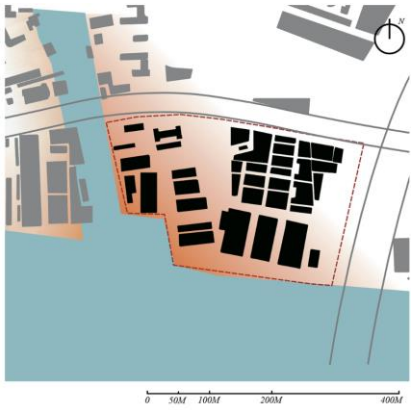
The internal composition of the arrayed industrial relic zones is relatively homogeneous, with warehouses and wharves as the main type. Most of the surviving buildings are arranged perpendicularly or parallel to the waterfront, with relatively weak correlation of each single unit and the formation

of parallel corridors between the buildings. Crossing space of this type of zone is relatively good, without changes in the plan layout, and the external public space is characterized by linearity. Enclosed type of industrial relic zone is richer in composition, generally due to the specific industrial flow line and zoning. The roads and courtyards of different scales are formed between the buildings of the groups, and the accessibility of each area is affected by the scale of the zone, so that there are more possibilities of shaping the renewed public space. It is a combination of the two characteristics - the overall form of an array of local enclosure, which is caused by the complexity of the process or technology required for some of the processes.

The penetration perception of waterfront space is inversely related to the depth level of the zone. In smaller-scale industrial areas, the array layout is simpler than the enclosed layout, and the perception of waterfront space in the urban hinterland is relatively high; while in larger-scale industrial areas, there are more heavy industries, which involve complex processes and often have more depth levels. However, regardless of the layout, the perception of waterfront space in the urban hinterland is relatively limited.

Table 4-2 Spatial Hierarchy Analysis of Waterfront Industrial Relics

Layout Types	Name	Industry Type	Aerial View of the Current Situation	Waterfront Perceptiveness Analysis
Array	Taikoo Warehouse	Warehousing		

	Kebai Shipyard	Heavy Industry - Shipbuilding Industry		
Enclosed	Guangzhou Brewery	Light Industry-Food		
	Guangdong Water Conservancy and Hydroelectric Power Plant	Heavy Industry-Electricity		
Mixed	Chenganwei Shipyard	Heavy Industry - Shipbuilding Industry		

	Synergy and Machine Factory	Heavy Indus-try-Ma-chinery		
Waterfront Space Perceptions			Weak	Strong

4.2.3 Good Landscape Conditions

The landscape conditions are mainly reflected in the relics' own open waterfront view and the outstanding surrounding landscape conditions. The Pearl River waterway is the horizontal axis of Guangzhou's urban development, linking the old city, the center of the city and the new development area. The industrial waterfront relics located in different sections of the waterfront space can be viewed with different regional landscapes. The design scheme of the core section of the Pearl River in Guangzhou (2018) planned three major thematic sections in the west and east of the former waterway—the west section starting from the Baietan area, focusing on reflecting the European style of blending the East and the West; the middle section encompassing the Yuancun area, focusing on displaying the image of Guangzhou's modern and internationalized metropolis; and the Huangpu area in the eastern section of the construction scope, with the theme of nature and ecology[34]. the Pearl River channel, the back channel and the Huangpu channel would be integrated with greenway for planning whose them is "City Center Combined Line" in Guangzhou [35]. In the future, the ornamental and tourist attractions of each waterfront section along the Pearl River will be greatly enhanced. Therefore, although the layout of waterfront industrial relics in Guangzhou is dispersed, there is diversity potential in the presentation of the city's image as the waterfront spaces with open viewing horizons (Figure 4-3).

Figure4-3 Waterfront Spatial Viewsheds in Different Zones

(Resource: Author)

In addition, the landscape conditions surrounding numerous Guangzhou waterfront industrial relic sites are outstanding, with more than one waterfront interface. Numerous waterfront industrial relics are surrounded by urban green space and Pearl River tributaries (Figure 4-4).

Figure 4-4 Outstanding Landscape Conditions for Waterfront Industrial Relics in GuangZhou

(Resource: Author)

4.2.4 Mixed Values of Surviving Structures

At present, the census and value determination of waterfront industrial relics in Guangzhou is still in progress. The value of the existing waterfront industrial relics varies greatly among them, whose historical value relates positively to the duration of their existence, and whose period characteristics are easier to distinguish and recognize. For example, the Kebai Shipyard was listed as a Guangzhou cultural relics protection unit in 1999 as the first ship enterprise in modern China, and was selected for China's industrial heritage protection list in 2017[36].

There are also numerous waterfront industrial relics in Guangzhou that are difficult to obtain

statutory protection status, such as the Pearl River Brewery and the Guangzhou Zinc Flake Factory, etc. They are not without heritage value, but to resistance in the evaluation process, they thus have to face the fate of dismantling and destruction under the impetus of urban regeneration; there are also some there are also a number of waterfront industrial relics which, due to the tall architectural space and convenient location, have been adapted and utilized by the design units to be developed into creative parks, of which Guangzhou Water Conservancy and Hydroelectric Power Plant and Eagle Gold Cannery are the most successful examples, transformed into Xinyi Hall and Red Brick Factory Creative Park, respectively, but the future is still uncertain due to the lack of government-recognized heritage status[6]. The number of industrial relics is also positively correlated with the degree of industrial development, and the new modern light industrial relic parks built after the founding of the People's Republic of China account for a relatively large proportion of Guangzhou's waterfront industrial relics. With the further optimization and adjustment of the industrial structure, there is a sizable stock of waterfront industrial relics that have the potential for updating and reuse. Although the heritage value is relatively low, these parks reflect the development history of modern industry in Guangzhou and are the records and witnesses of the collective memory of contemporary residents, whose characteristics and value of the industrial relics have yet to be further screened and excavated.

4.3 Trends in Renewal of Waterfront Industrial Relics

4.3.1 Transformation in Renewal Approach from Single Point Project to Holistic System

The stage of laissez-faire market development was characterized by the independent operation of individual regeneration projects, with the main focus on individual projects, and the overall regeneration and coordination of the functional areas of the city was not taken into account. Those practices that focused on the immediate without looking at the overall picture were unable to meet the overall needs. After the national strategy shifted from incremental to stock, the "Three Olds" transformation turned into a phase of policy improvement. The character of the renewal project has changed from a single renovation to a continuous, comprehensive, and systematic renewal and renovation of the whole city. Guanggang New City, International Financial City and other district-level renewal and reconstruction projects have become key targets. It provides intelligent planning solutions from the perspective of area development, comprehensively upgrades the city and systematically solves the comprehensive problems of urban renewal ideas pay more attention to the

holistic and systematic.

4.3.2 Renewal Mode changes from Repetition of a Single form to a Variety of Forms

Early urban renewal pursued short-term economic benefits, and thus renewal projects were mostly dominated by real estate development. Subsequently, in the stage of various policies with development of cultural and creative industries, the model of cultural and creative parks following the trend gradually appeared to be duplicated in function, a single type, and serious homogenization and other problems. With the diversification of social needs, the content of waterfront industrial relics renewal form is also gradually richer, such as industrial culture waterfront park that built by Guanggang, Guangshang, Guangpaper、the landmark hotels with good river view and so on; regenertaion type is becoming more and more richer.

4.3.3 Waterfront Space Transforms from Private Occupation to Public

In the early days, due to the high yield of real estate and the prominent economic value of the waterfront, the renewal of the waterfront industrial relics was mainly based on real estate development. The waterfront space that should have been shared by the city was divided by each new development, and the waterfront of the city was just freed from the occupation of the industrial area and privately occupied by each development. However, with the increasing awareness of the public nature of urban waterfront space, the planning and utilization of waterfront space not only pursues economic benefits, but also pays more and more attention to the balance of social equity and spatial justice. As one of the important public spaces in the city, urban waterfront space has gradually been released and returned to public use.

In the early days, the planning of many waterfront driveways isolated the original waterfront old industrial area from the waterfront side, making the public space along the waterfront line compressed into a single-function waterfront green belt, unable to form a spatial node. However, there are also positive practices, such as road underpasses or bypasses to connect the site directly to the waterfront, improving the accessibility of the river view. In recent years, more and more waterfront renewal projects have actively made use of waterfront docks in their design, for example, reusing the old harbor to introduce more passenger flow to the renewed and renovated waterfront hotel; while boutique hotels converted from old shipyards transformed the original inner harbor docks

into hotel swimming pools, which transformed the waterfront space from isolated and insulated from the outside world into an interactive one between people and the water.

In the early days, a number of old waterfront industrial relics were separated from the waterfront by planned lanes, which reduced the public space along the waterfront to a single-function waterfront greenbelt rather than a continuous spatial node. However, there were positive approaches, such as roadway underpasses or bypasses, to connect the site directly to the waterfront to improve access to the river view. In recent years, more and more waterfront docks have been actively utilized in design, for example, to bring in more traffic to the renewed riverfront hotels; while some old shipyards converted into boutique hotels have transformed the docks into hotel swimming pools. These practices have transformed the waterfront space from isolation with outside world to interaction between people and water.

4.4 Renewal Deficiencies in Waterfront Industrial Relics

4.4.1 Integral spatial structure of industrial relics

Waterfront industrial relics are the most problematic areas in the city. Because of the lack of holistic control over the previous development of waterfront areas in China, problems such as fragmentation of the whole continuous area, over-design, fragmentation of the urban open space system by gray infrastructure, and a single functional nature of the land have arisen. In this context, the waterfront industrial relics renewal movement was unable to balance cultural connotation and urban development, and thus the original continuous waterfront industrial relic space was interrupted by municipal roads, and the original sense of site history and waterfront space perception was weakened.

In addition, although the Guangzhou Municipal Planning and Natural Resources Bureau took the planning as the lead, to create "industrial show belt", some scholars still believe that the protection of industrial heritage along the riverfront in Guangzhou, the utilization rate is relatively low, and the level of uneven, the lack of contiguous integration and overall construction[37].

Figure 4-5 Red Brick Art and Design Factory and Urban Waterfront Spatial Severance
(Source: Redrawn by author from Google earth image)

4.4.2 Deficiency of Waterfront Open Space Creation

The main problem focuses on the lack of refined design of open spaces with superior landscape conditions, which leads to unattended. In the creation of open space, social public value is usually the dominant value, while economic development value and artistic and aesthetic value are the subordinate values. The open space of the site is an important area for generating various activities as it connects the entire site architecture, playing an important role in linking the waterfront, as well as the existence of spaces with rich and varied forms and scales. In the past, the development mode of commercial and entrepreneurial parks was often top-down, so the design of the activity area was often neglected, and the corresponding public space needs were not clearly defined - which resulted in the site functions and facilities not being able to serve the target group well. On the other hand, the spatial environment is not created to a good level. By creating comfortable and varied external spaces in terms of scale as well as planning rich and interesting public activities, it is possible to enhance the public vitality of the renewed space and realize the public value of the society; the quality of the open space can be improved through the operation of landscaping.

Figure 4-6 BIG Haizhu Bay Cultural and Creative Arts Park - lack of open space facilities (Source: Archdaily)

4.4.3 Ecological and Environmental issues

The ecological environment and social public value are the leading values that need to be restored and created in the shaping of the waterfront natural environment. With the guidance of urban "double restoration" work, the task of ecological restoration has been gradually put on the agenda of urban renewal, especially in the ecologically sensitive area of waterfront space, where more and more attention has been paid to the treatment of water and the improvement of environmental quality in order to reflect its ecological and environmental value. Existing major problems are as follows: 1. The existing water pollution situation of the Guangzhou section of the Pearl River is grim [38] . And most of the existing waterfront industrial relics are in the form of artificial single-line rigid barges, which failed to actively make use of the valuable waterfront resources, and at the meantime blocked the biological chain between water ecosystems and terrestrial ecosystems [39]. 2. Some projects are highly impacted by storm surges and flooding which lack sustainable responses. 3. Landscaping is fragmented out of scale and lacks concentrated vegetation as well as trees that can be used for shade.

Figure 4-7 Single flat shoreline (left) & waterfront space occupied and squeezed by trolley (right)

(Source: BaiDu Image)

4.4.4 Insufficient Display of Culture

The waterfront old industrial relics built in different stages of history contain the production technology level and architectural features of different stages of China's industrial development, whose architectural relics represent the characteristics of the times and regional cultures, which are an important part of the historical and cultural value[40] . The intangible cultural heritage of industrial technology and production processes reflected in equipment and structures is an important part of the value of science and technology. The renovation of industrial buildings needs to continue the spirit of industrial culture, new functions need to be integrated to make full use of the original space to create economic development value, and additional parts need to promote the integration of the old and the new. However, over-commercialized cultural parks will squeeze the living space of creative culture; the renewal of the museum mode is characterized by overly singular business forms and insufficient attraction; while the display of industrial culture floats on the surface and lacks deep excavation and interpretation[41].

Figure 4-8 Red Brick Factory Interfaces Occupied by Restaurants and Businesses (left) & Lack of Corresponding Introduction of Industrial Facilities (right)

(Source: Author)

4.4.5 Compact local space

In Guangzhou, where the population is highly concentrated and there are many constraints on development and construction, many waterfronts industrial zones lack sufficient ground space for urban expansion. Therefore, it is difficult to meet the needs of urban function, ecological environment, transportation demand and other aspects at the same time.

Figure 4-9 Zhujiang Party Pier Beer Culture & Art Zone

（Source：WeChat）

4.5 Analysis of the Applicability of Landscape Urbanism

4.5.1 Trend Analysis of Renewals

On the one hand, one of the most concerned practice types of urban renewal in Guangzhou is waterfront industrial relics, and there are numerous waterfront industrial relics in Guangzhou with cultural value, favorable site landscape resources and in need of renovation.

On the other hand, the city is regarded as a huge ecosystem from the perspective of landscape urbanism. Post-industrial sites have been widely used worldwide as the focus of urban regeneration in the stock of abandoned cities, thus Guangzhou's waterfront industrial relic regeneration is a suitable target for the practice of landscape urbanism.

4.5.2 Purpose Value Analysis

The shift in the renewal goals of Guangzhou's waterfront industrial relics is embedded in the entire

urban regeneration effort, which has changed from a single goal-oriented approach in the early days to the pursuit of multiple and comprehensive purposes, which fits with the goals of landscape urbanism theory. The transformation of the renewal objectives of Guangzhou's waterfront industrial relics involves the entire urban renewal work, which has changed from the single objective orientation in the early days to the pursuit of diversified and comprehensive purposes. The transformation goals of the waterfront industrial relics in the Guangzhou have been incorporated into the overall urban renewal efforts, transitioning from a single-target orientation to the pursuit of diverse and comprehensive objectives. In the early stages, urban renewal in Guangzhou was primarily focused on meeting a single demand, which prioritized short-term economic benefits by real estate development, such as revitalizing dilapidated buildings on existing construction land, or superficial urban beautification projects. In policies and actual operations, it is very unfavorable to focus too much on the value orientation of incremental growth and neglect other needs. With the development of society and economy, the concept of sustainable development has gradually taken root in people's hearts. The connotation of urban renewal is constantly enriched, and the goal of urban renewal has gradually shifted to the diversified and comprehensive goals of restoring the ecological environment, practicing cultural preservation, optimizing the spatial pattern, improving the living environment, and strengthening public service facilities (Figures 4-6).

(1) For ecological environment restoration: The ecological concept of landscape urbanism is more scientific and effective in guiding the development and construction of urban waterfront industrial relics. On the one hand, the waterfront is an ecologically sensitive area in the city, whose ecosystem will affect the whole urban ecosystem once it is destroyed; On the other hand, harmful substances produced by industrial activities will also affect the urban environment to a certain extent. Therefore, how to build a harmonious coexistence of human and nature is the focus of the design.

(2) For preserving history and culture: The cultural landscape principle emphasized by landscape urbanism is concerned with the continuation of the historical lineage and the consideration of the current situation of the site. Refining the cultural resources and connotations of the site, taking advantage of the industrial heritage of the site to carry out planning to preserve the original historical memory, and highlighting the industrial cultural connotations of the site are the keys to revitalizing the urban waterfront with the charm and vitality of a new era.

(3) For optimizing the spatial pattern: From the perspective of optimizing spatial patterns, landscape urbanism focuses on the construction of urban open space systems. By utilizing the medium of landscape, it integrates the "empty" areas of the city into the open space system of the city. The open space system of waterfront industrial relics could be served as the basic framework for organizing the urban structure. By applying the theory of landscape urbanism, the spatial environment of urban waterfront can be improved, the spatial quality of the whole city can be upgraded.

(4) For improving the living environment and **enhancement of public service facilities：** the principle of humanistic vitality of landscape urbanism focuses on the behavioral patterns and activities of different groups of people, as well as emphasizing the implementation of human care in planning and design. The urban waterfront has always been a place for all kinds of people to interact and move around. Many life-related activities are carried out at the water's edge, so the site design should not only satisfy the diversity of activities of various groups of people, but also reflect their respective behavioral patterns as well as shape the distinctive waterfront space.

4.5.3 Analysis of Operating Conditions

Policy conditions perspective: There are a large number of government documents such as the existing "Construction Plan for High-Quality Development along the Pearl River in Guangzhou" and the "Guangzhou City Master Plan (2017-2035)" that clearly emphasize greening and high-quality development, which aims to promote ecology and conservation and cultural connotation inheritance; Meanwhile, the support of the policy implies that the renewal of the waterfront industrial relics in the form of Landscape Urbanism is able to receive a certain amount of funding from the government.

Material conditions perspective： Physical conditions: Combined with the case summarized in Chapter 3, there are corresponding objective physical conditions; in terms of landscape, there are excellent landscape resources for waterfront industrial relics in Guangzhou, on the one hand, there is the Pearl River passing through the city, without a lack of tributaries converging into the Pearl River, and the conditions of green space around the site are also relatively excellent. From the cultural aspect, not a few industrial relic parks with outstanding cultural value, a large number of industrial structures to be renewed and a great sense of history of the site materials; from the ecological aspect, the section of the Pearl River in the city with several large and small tributaries of

the Pearl River exist water pollution, which is particularly evident in the heavy industry type of factory In terms of open space, waterfront industrial relics with large depths are prone to conflicts with urban development. At the present, the industrial relics waterfront space with compact land conditions that lacks facilities is not lacking.

Combined with the Guangzhou waterfront from the perspective of operational conditions to summarize, landscape urbanism theory is particularly suitable for heavy industrial types, depth, landscape resources and has a certain historical value of Guangzhou waterfront industrial relic types, to meet the conditions of this type of waterfront industrial relics outstanding problems, operability.

4.6 Chapter Summary

This chapter focuses on the development history, types, characteristics, renewal trends and problems of waterfront industrial relics in Guangzhou in recent years, as well as the renewal deficiencies of existing waterfront industrial relics. In this chapter, the overview of Guangzhou's industrial relics was firstly sorted out in recent years for understanding the influence of policy documents on the development of waterfront industrial relics in various periods; and the trend of the development was then summarized from the history of its renewal. After that, types of waterfront industrial relics in Guangzhou, spatial levels, and landscape features are summarized to clarify the characteristics of waterfront industrial relics in Guangzhou to which landscape urbanism is applicable; and the shortcomings of its renewal are summarized for analyzing the applicability of landscape urbanism to the renewal of waterfront industrial relics in Guangzhou. Thus, the applicability of landscape urbanism to the renewal of waterfront industrial relics in Guangzhou was to conclude.

By researching, a more comprehensive understanding of the development trends and realities of Guangzhou's waterfront industrial relics can be achieved. This will help to provide more targeted local regeneration strategies

Chapte5 Guangzhou Waterfront Industrial Renewal Strategies Based on Landscape Urbanism

The renewal strategy for waterfront industrial relics under the perspective of landscape urbanism was defined as a comprehensive strategy based on the core theory of landscape urbanism as a guiding principle, which was proposed in accordance with the elements and components that need to be renewed and integrated in the waterfront industrial relic area (Table 5-1).

Table5-1 Renewal strategy and its corresponding elements and components

Strategies	Optimization of Spatial Structure	Reflecting Behavioral Patterns	Adaption to Dynamic Changes	Thicken the Urban Surface	Continuing of Site Culture
Objects of Operation	Areas at the Planning level	Waterfront Open Space	Landscape; Infrastructure	Architecture, Landscape, Complex terrain,	Industrial buildings; Industrial facilities, Materials
Content	Structural Renewal	Functional Planning	Renewal and Integration of Elements	Spatial Integration	Dynamic Landscape Shaping; Surface and Spatial Transformation

5.1 Optimization of Spatial Structure

5.1.1 Integration of regional landscape resources

The ecological and holistic principles of landscape urbanism are reflected in the strategy. The combination of waterfront industrial relics and urban natural landscape resources forms an interconnected system; it integrates other urban sub-systems by means of landscape media and weaves the spatial texture of the "landscaped city".

Therefore, in the design investigation stage, it is necessary to systematically recognize the ecological and landscape resource information around the site, including but not limited to the macro-scale urban ecological pattern to the medium and micro-scale site landscape elements. To make a balance between the surrounding landscape texture and the spatial texture of the industrial heritage

according to the local conditions, the open space system integrated with the landscape should be used as the basic framework for organizing the urban structure, linking up all the relatively independent urban clusters in the city, so that the city would be wrapped up in a huge park, and the spatial texture of the city would be presented in a kind of organic form, i.e., the "landscaped city".

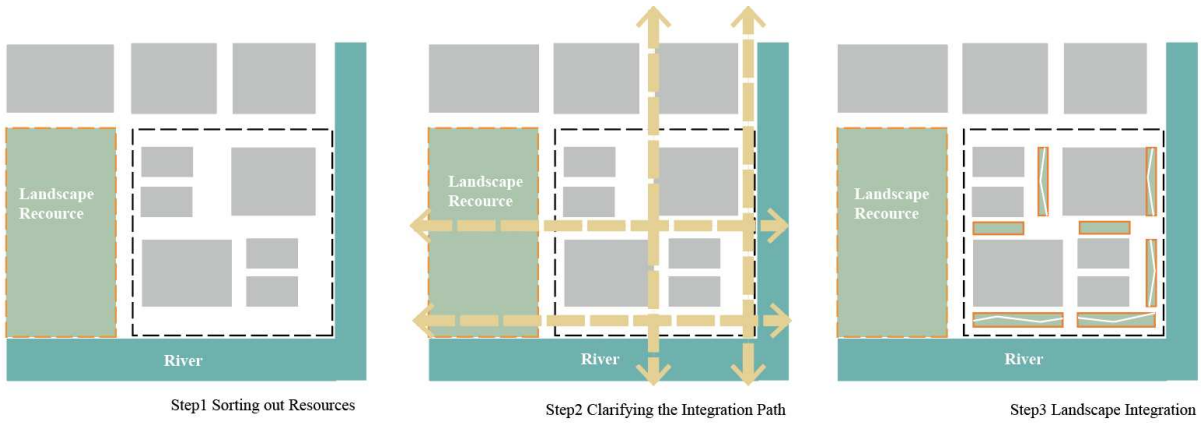


Figure 5-1 Integrating Regional Landscape Resources

（Source：Author）

5.1.2 Creating a Waterfront Activity Interface

This strategy focuses on the structural arrangement of the waterfront activity interface. Usually, the highest value of open space in waterfront industrial relics is inevitably the space on the waterfront side. Due to its special location, excellent landscape, and cultural benefits, as well as the inherent hydrophilic nature of human beings, it is essential to create an active waterfront space interface. (a) Integrate the activity space with the waterfront to emphasize the location of the activity site; it should be closely adjacent to the water system to maximize landscape benefits of the river; (b) The second is to open up the sightline relationship between industrial remains and the river, and to strengthen the users' spatial perception of water; (c) Integrating waterfront activity space with landscape media, the open space system of waterfront industrial relics includes remains of industrial structures.

In the perspective of landscape urbanism, industrial structures are regarded as an important cultural landscape resource, whose unique cultural spirit shapes the region's unique identity and spirit of place. It should be integrated with the natural ecological landscape to form a distinctive landscape zone, thus realizing the pattern of interpenetration of nature and culture.

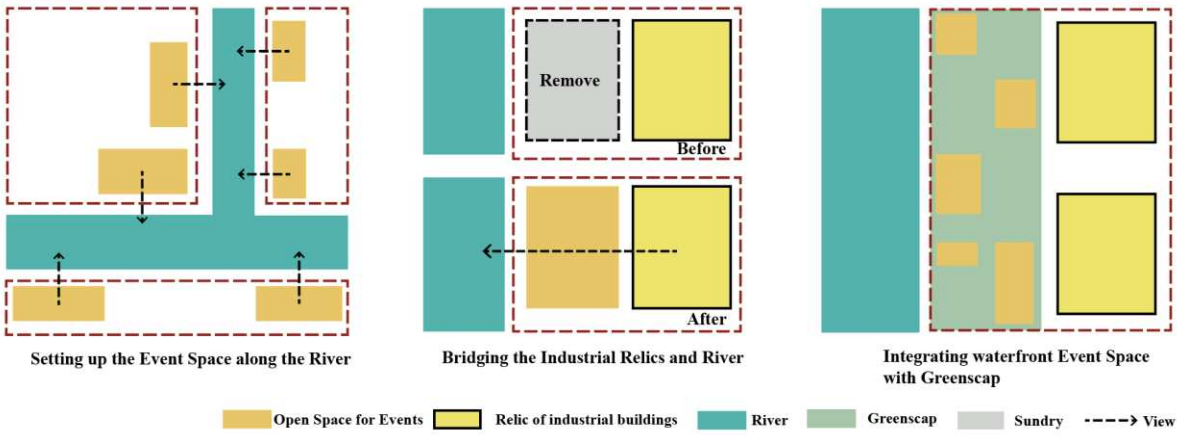


Figure5-2 Creating a Waterfront Activity Interface

（Source：Author）

5.1.3 Weaving the Transportation Structure

The strategy reflects the holistic and ecological principles of landscape urbanism, with the rapid transportation system and the slow system.

(1) Rapid transportation system: Waterfront industrial relics, as a kind of space for production activities, is characterized by independent closure, thus its renewal is accompanied by the process of turning from closure to openness; No longer subject to strict management constraints in the process of transforming from production activities to living activities, thus it is necessary to rebuild the traffic between the city and the site by opening up the borders, to effectively improve the efficiency of material and information exchanges, as well as provide access to future development of the industrial relics. During the renewal process, the spatial integrity of the industrial relics should be protected, and the convenience of traveling should be oriented. On this basis, it is important to link the border entrances with the existing urban road network, to adjust the overall density of the road network. If permitted, a marina should be replaced to improve waterway transportation (Figure 5-3).

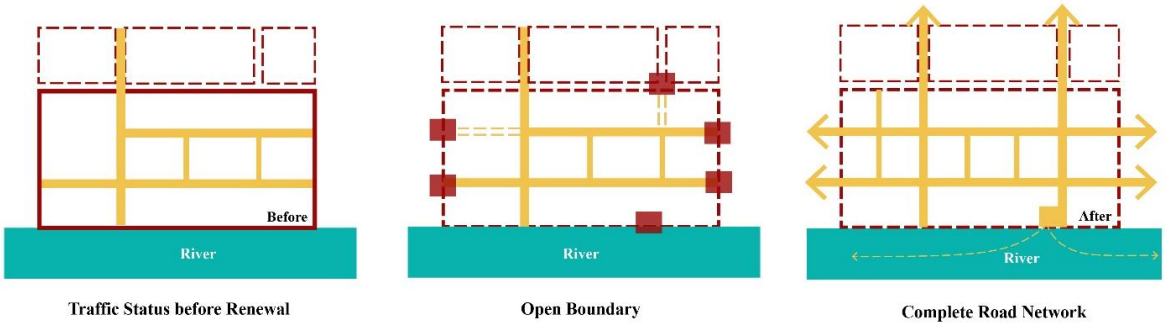


Figure 5-3 Weaving Traffic Structure

（Source：Author）

（2）Integration of Slow Systems

Guangzhou is now vigorously promoting the construction of urban greenways. Basing on the theory of landscape urbanism, links between industrial relic zones and the city's waterfront walkways should be established to enhance the continuity of the pedestrian spatial structure and to guide citizens to travel healthy.

In addition, the slow system should be placed to go through the park, while emphasizing the connection with the nodes of the shoreline space to improve the travers ability of the park. The strategy will strengthen the connection between the streets and alleys in the zone, the flexibility and randomness of path selection, to form a path system, with the softening of the external interface and the urban articulation.

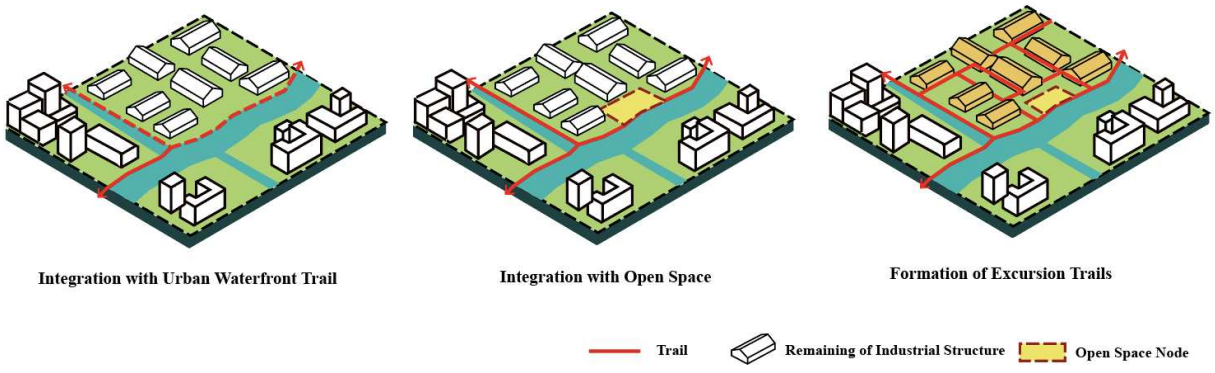


Figure5-4 Integration of Slow System

(Source：Author)

5.2 Reflecting Behavioral Patterns

The refractive behavior model responds to the principle of humanistic vitality of landscape urbanism. According to the different site properties of each section of the waterfront industrial relic, the activities of the relevant people within the service radius should be investigated and the relevant activity sites should be implanted (Figure 5-5).

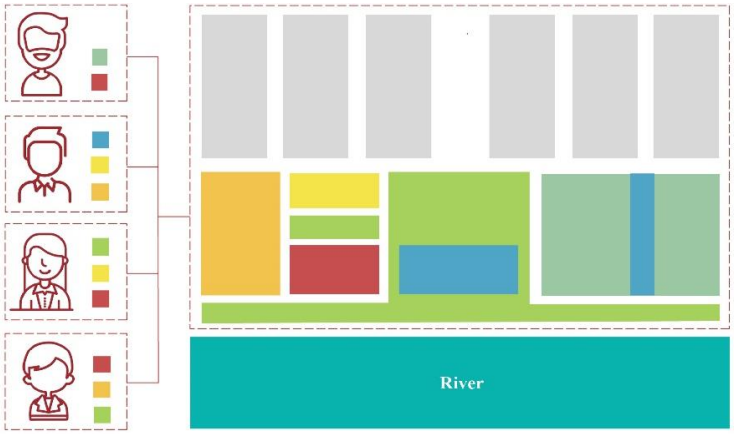


Figure 5-5 Relationship of Site Functions with the City

(Source：Author)

As the most important external space of the waterfront industrial relics, its sharing and diversity of activities should be maximized. Nature of the surrounding in design of the potential open space of waterfront industrial relics from the perspective of landscape urbanism should be considered to meet the user groups for activities. For example, for the surrounding residential plots, the user groups are mostly residents, and the types of behavioral activities are mainly based on recreation of fitness, community activities, children's recreation, and strolling along the riverfront; If the surrounding is a business plot, the user groups are mostly white-collar workers with moderate capitals, and the types of behavioral activities are mainly based on business gatherings, sports and fitness, and scenic vistas.

Different sites for different types of activities can be disassembled into site-specific and non-site-specific activities. Special materials and related equipment should be considered to assist the activities, such as basketball, fitness and so on； while the latter involves flexibility in the space. From the perspective of landscape urbanism, green space, as an extremely flexible landscape type, can be adapted to a variety of types of non-site-specific activities. Reserving green flexible space

reflects the dynamic principles of landscape urbanism and is characterized by the ability to adapt to the changing needs of the city's waterfront industrial relics in its long-term planning. Therefore, designers need to be moderately forward-looking in their site planning and design.

Renewal of waterfront industrial relics results in significant shifts in the primary activity groups on the site as productive functions are iterated. The specific needs of future site users cannot be accurately predicted in pre-construction；Moreover, after a project completes one renewal, the crowd's use demand remains unclear throughout its life cycle. Therefore, reserving flexible development space in the form of green space should be taken into account for temporary use；This maximizes flexibility for future construction (Figure 5-6).

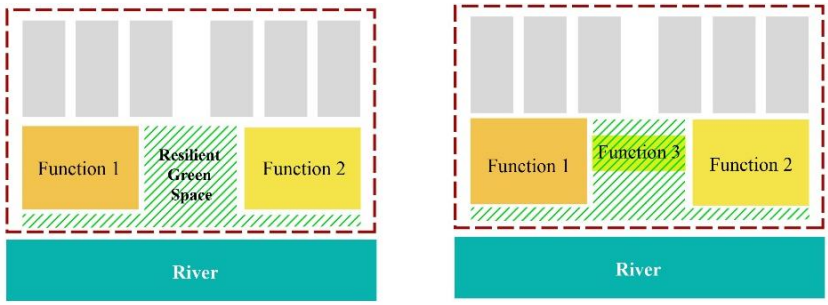


Figure 5-6 Specific Activity Sites and Flexible Activity Sites Juxtaposed
(Source：Author)

5.3 Adaption to Dynamic Change

"Adaption to dynamic change" reflects the landscape urbanist principles of landscape infrastructure, dynamics, and ecology.

5.3.1 Landscaping Infrastructure

Infrastructure is an important component of urban development, and monofunctional gray infrastructure, including basic utilities, drainage, etc., is of particular interest to landscape urbanism. This strategy focuses on exploring the possibility of empowering facility space and promoting synergy between gray and green facilities at regional scale. A variety of ecological problems always happen in waterfront industrial relics face due to their "waterfront" geographic characteristics, such as flooding, sea level rise, and other water issues. In addition, the desire for waterfront space for

urban life needs to be considered. Thus, linking the infrastructure with the public's urgent needs, integrating the single-function municipal "grey infrastructure" with the ecological "landscape", and generating and coordinating multifunctional spaces through open-space oriented design are the goals of the regeneration, which are more efficient, economical, and sustainable. A more efficient, economical, and sustainable optimization is the goal of the renewal. Typical types of open space that can be applied by landscape infrastructure in the renewal of waterfront industrial relics are plazas, roads, and waterfront spaces (Figure 5-6):

(1) Plaza: As the most common type of industrial plaza space, it can be flexible by sinking operation. In the dry season it can be used as a monumental space or general recreational space, and when it encounters heavy rainfall can be used as a facility for temporary storage of rainwater, which becomes another kind of cityscape; otherwise, by adding rain gardens, planting ponds combined with recreational facilities, the plaza space will be resilient to rainfall and equipped with recreational attributes.

(2)Roads： Linear spaces such as roadways within the site can be designed to promote green stormwater management by introducing green infrastructure such as ecological grassed swales or hybrid bioretention basins, and planting of stormwater trees. While such a composite facility is capable of distilling water, intercepting precipitation, and improving water quality; in addition, spatial shelters, landscaping roads can be provided by green vegetation.

(3) Waterfront space: The waterfront is the core space of waterfront industrial relics as well as the infrastructure gathering site. It should be chosen regenerated to local conditions by. Later It allows for growth and adaptability. Such forms can also be adapted to the tide to present a dynamic landscape effect; Or by planting water-resistant plants to soften the shoreline, their growth and spreading of the developed root system was able to stabilize the embankment and to improve the environment. It is also possible to improve the water environment by means of biological processes, as well as to improve the habitat of living organisms.

Landscaping infrastructure not only plays the role of infrastructure, but also integrates visual, cultural, and ecological values into urban life, which is an effective complement to various types of urban infrastructure. In this way, public spaces are extended into the municipal facilities system, so that a variety of places for recreation and relaxation was offered.

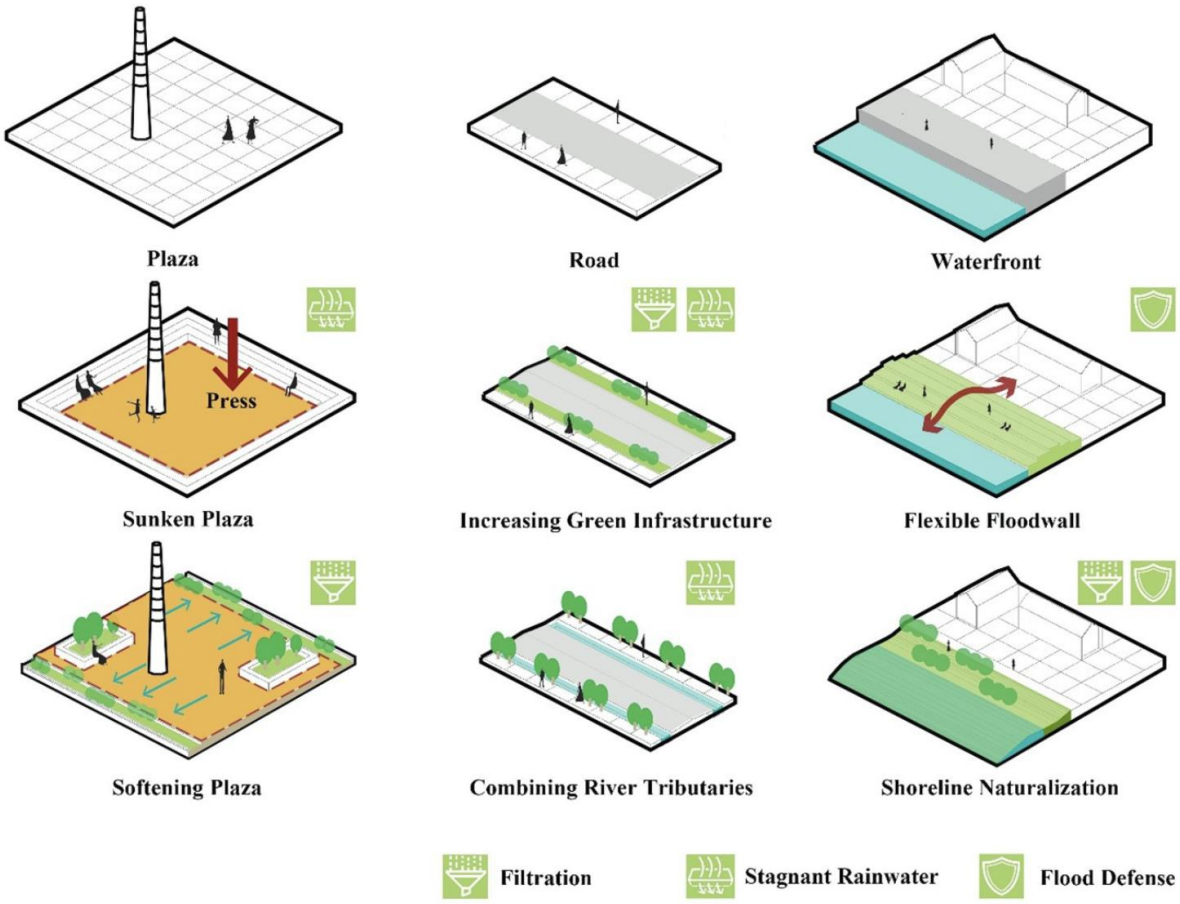


Figure 5-7 Landscaping Infrastructure

(Source: Author)

5.3.2 Landscape as Infrastructure

"Landscape as Infrastructure " exemplifies the landscape infrastructure and dynamic change principles of landscape urbanism. The strategy of landscape as infrastructure emphasizes the important role that landscape plays in the process of transformation - i.e., by improving the natural landscape proper to take advantage of its natural regulating attributes. This can be adapted to the complex ecological environment of the city.

Specifically, the first is to make morphological changes to the river (if it exists) within the site, such as extending the river alignment to strengthen the scouring effect of the water to enhance the self-purification ability of the water flow; The second is to assist in the purification of the water flow by bio-landscape techniques to improve water quality.

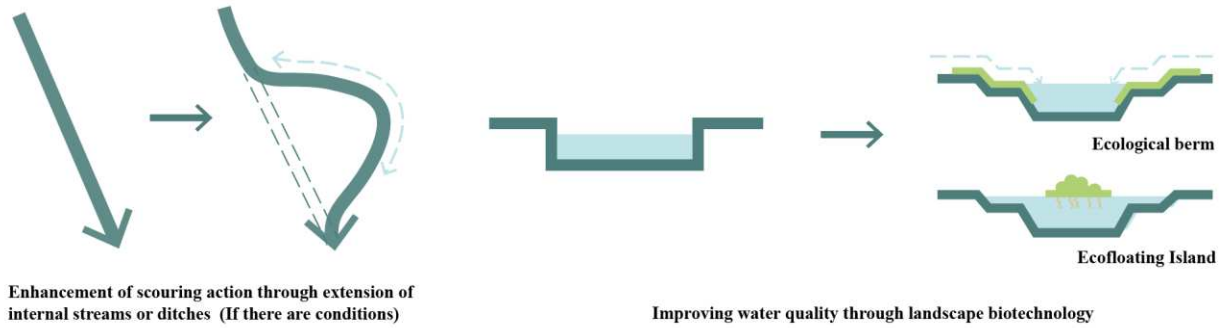


Figure5-8 Landscape as Infrastructure

(Source: Author)

5.4 Continuation of Industrial Culture

The continuation of industrial culture reflects the cultural landscape principle of landscape urbanism. It is very important to sort out the characteristics of local industrial relics according to local conditions. Translating these special elements and assigning them to landscapes and buildings helps to create local distinctive culture.

5.4.1 Creating Dynamic Memory Scenes

Cultural expression is not only a mapping of the physical environment of the city, but also a continuation of the non-material elements of the spiritual dimension, such as the cultural atmosphere and the spirit of the place, which are hidden in the city. Therefore, the continuation of the industrial culture of the site should not only remain on the surface. Landscape urbanism theory emphasizes a comprehensive investigation, which requires the designer to understand the immaterial culture of the site, such as the important historical points in the development of the site, the industrial production process, and so on. The preservation of key buildings, structures, facilities and equipment in the process should be regarded as part of the overall landscape of the industrial relics, so as to protect the integrity of the industrial production process and to continue the succession the plant, without pursuing the intentional preservation of the entire area. Retained key elements of the process can be linked via production processes, industrial tourism routes, slow-moving systems, or green corridors. In this way, users can be mobilized to interact with the space, so that they can feel the memory permeating the space in the physical space to achieve the continuation of industrial memory (Figure 5-10).

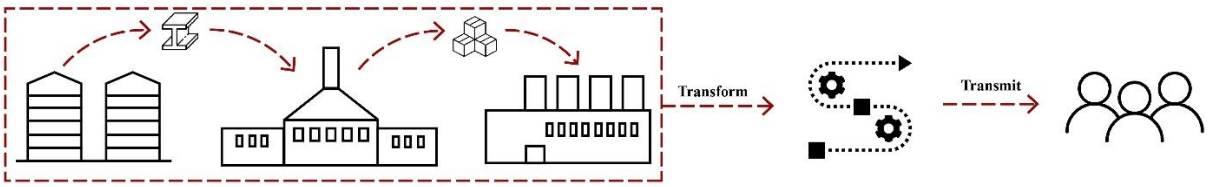


Figure 5-9 Creating Dynamic Memory Scenes

(Source: Author)

5.4.2 Reinforcement of Industrial Component in Visual

(1) Highlighting iconic industrial structures

The various signs of the city form are symbols for people to recognize the city. By observing these symbols, they gradually recognize the essence of the city. Industrial buildings are the first impression of the public on industrial culture due to their prominent volume. Through artistic treatments such as color painting to strengthen the visual sensation or creating a uniform green landscape to make it stand out from the homogeneous building outline by contrast, leaving a deep visual impression.

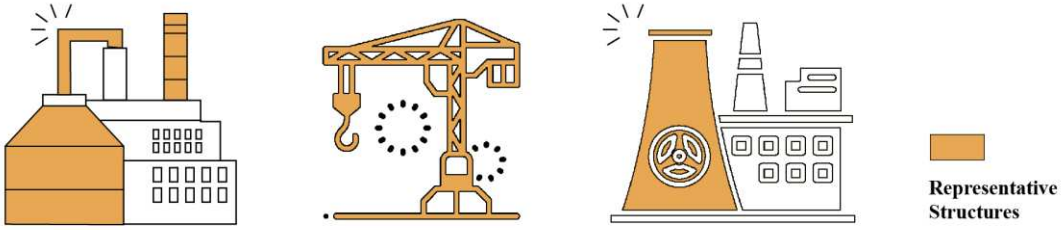


Figure5-10 Highlighting Iconic Industrial Structures.

(Source: Author)

(2) Continuation of building facade texture

The continuation of the façade texture is seen as a strategy to strengthen the identity of the remains. In the process of industrial relics renewal, the interface form of industrial buildings should be adjusted when the functions are replaced. Designers should pay attention to extracting the interface texture or morphology of the original building, and continue it as a means of renewing the building; When the façade of the building has been seriously damaged or the form fails to be representative, new elements and materials are often used to replace the original in façade reconstruction, so that the original building walls can be replaced and the users can be left with the original industrial

impression.

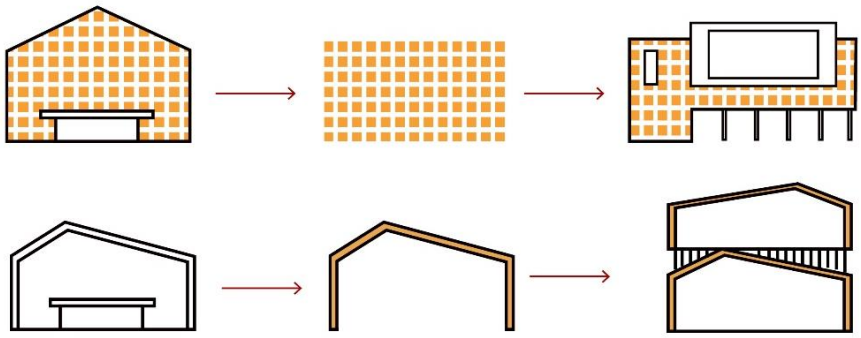


Figure5-11 Continuation of Building Facade Texture

(Source: Author)

5.4.3 Diversified Space Utilization

Diverse spatial utilization reflects the human vitality principle of landscape urbanism. The strategy aims to make use of space in a variety of ways to increase the frequency of public contact with industrial buildings and to enhance the opportunities for users to interact with industrial spaces. This requires designers to focus on matching function and structure to rationally integrate new functions, such as large-span structure of industrial relics can be matched with sports, theater to maximize the structural effect; at the same time, designer should consider of spatial elasticity to meet the needs of different activities. in the process of the activities, the public in the industrial relics would experience the history through the action of watching, touching and so on.

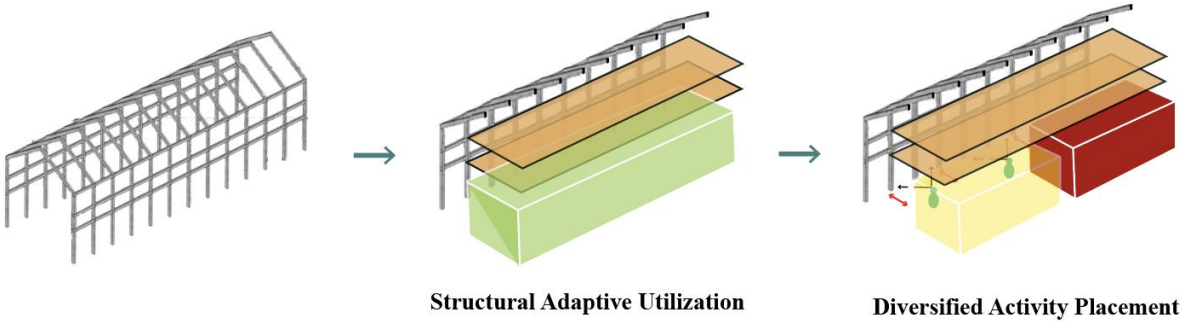


Figure5-12 Diversified Space Utilization

(Figure: Author)

5.4.4 Reuse of Site Materials

Material reuse of the site reflects the ecological principles of landscape urbanism. Original materials are transformed from one usage into another in a dynamic process of change, while saving urban resources and achieving an ecological effect throughout the construction process. In the renewal of industrial relics, such materials can be either natural elements of the site such as flowers, soil and grass, or artificial elements such as industrial materials. Three practices are summarized here to provide reference：

(1) As a landscape component: This method can be used to build a site landscape that matches the overall environment

(2) Masonry materials for facilities: Waste materials that can be reused without laborious processing are generally construction materials left over from the site, such as wood, tiles, red bricks, and so on. Large quantities lead to the removal of large costs of this type of industrial waste, such as slag can be processed by physical means, the waste and cement composite concrete, as a building material, can also be processed by chemical means, and the reaction of silicate, made of ceramics and so on.

(3) Processed as a guide sign: waste metal materials, waste machinery and equipment or its parts, etc. After adding can be turned into industrial landscape sketches, sculpture and art works of materials, components.

Figure5-13 Reuse of Site Materials

(Source: Author)

5.5 Thicken the Urban Surface

"Thicken the urban surface" reflects the horizontality and holistic principles of landscape urbanism. The strategy answers the problems of spatial fragmentation and compact space in a landscape manner. Horizontally, Thickening the Urban Surface aims to continue the urban matrix and create an earthy landscape form that is connected to the surrounding surface; Holistically, Thickening the Urban Surface emphasizes the cascading of vertical space, i.e., the construction of a three-dimensional urban space - integrating buildings, landscapes, and infrastructures. As a type of urban space for stock renewal, the form of "Thickened Surface" is conducive to the stitching of urban space, the enhancement of land capacity, and the integration of landscape and ecological benefits.

The "thickened urban surface" corresponds to the following three spatial types (Figure 5-9):

5.5.1 Response to Gray Infrastructure

Grey infrastructure is traditionally defined as "the network of roads, bridges, railroads and other public facilities necessary to ensure the proper functioning of an industrialized economy"[42] . Traditional gray municipal infrastructure tends to sever the city from its waterfront industrial relics. This disrupts the continuity of urban open space. "Thickened surfaces" based on gray infrastructure is the creation of a sustainable urban landscape complex by integrating mono-functional municipal gray infrastructure such as bridges, highways, railroads, or water mains with landscapes and buildings through the means of landscaping in a vertically synergistic manner.

5.5.2 Integrating Building Surfaces

"Thickened urban surface" for integrating building surfaces refers to the strategy of multi-level and three-dimensional integration of open space with the remains of industrial buildings or new centralized building with large volumes for compact conditions. Integrating the open space in multiple directions within the building substrate, this intensive use of space makes the open space and the building space penetrate and integrate with each other, which also serves to improve the regional ecological environment by integrating green landscape elements into the waterfront space.

5.5.3 Dealing with Complex Terrain

The complex terrain here refers to the intricate topography of height difference in the project. In order to dissolve the urban height difference by changing and plastic landscape， along with the integration of certain urban functional space to organize and create a multi-dimensional and three-dimensional open space system, and to realize the systematic integration with other horizontal elements.

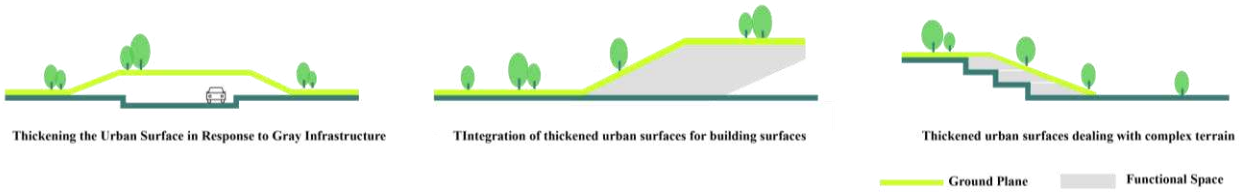


Figure 5-14 Thickened Urban Surface Strategies

(Source: Author)

5.6 Chapter Summary

In this chapter, the five strategies of optimizing spatial structure, refracting behavioral patterns, adapting to dynamic changes, thickening the urban surface, and perpetuating the industrial culture are put forward with the aim of creating an urban waterfront space that is shared by all people, characterized by a superior ecological and landscape environment, and with outstanding cultural connotations.

Chapte6 Research on Wenchong Shipyard

6.1 Historical Background of Wenchong Shipyard

Guangzhou Wenchong Shipyard Limited Liability Company, one of the large enterprises of China Shipbuilding Industry Corporation, was founded in 1955. 15,000-ton ship dry dock for repairing (i.e., Dock No. 1) constructed from 1963 to 1965 was the first 10,000-ton ship dry dock for repairing in South China designed by China [8, 43]. By 1978, the No.2 dock and 419-meter berthing quay were built, and the engine workshop was expanded. During this period Wenchong Shipyard produced several business ships with superior performance and became the construction center for business ships in China. In 2000, the renovation project of 25,000-ton dock was completed; and in 2008, Wenchong Shipyard grew to become a leading international construction base for feeder container ships and dredgers. At the end of April 2019, CSIC Defense announced that agreeing to sign the agreement on the first phase of the Department's Wenchong Shipyard's relocation[43] .

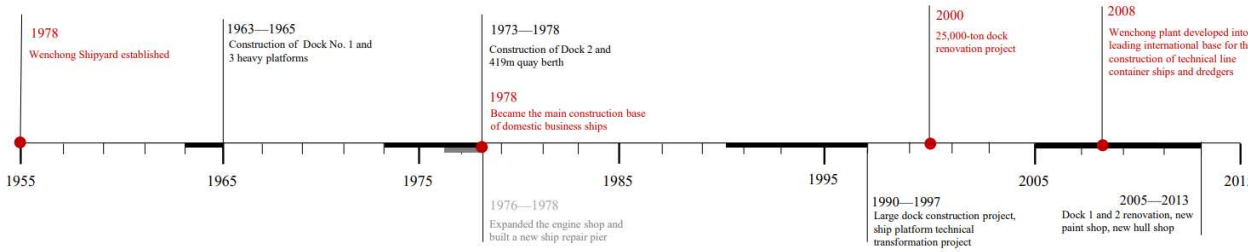


Figure 6-1 Historical Lineage of Wenchong Shipyard

(Source: Author)

6.2 Master Planning

6.2.1 Location Analysis

Wenchong Shipyard is in the southernmost part of Huangpu District, Guangzhou City, Guangdong Province, adjacent to the Pearl River, about 15km away from the city center, Zhujiang New City, and is situated in Guangzhou's second CBD, which consists of two major cores, namely, the International Financial Center (IFC) and the Huangpu Harbor Economic Zone (HEPZ). The core area covers 18.1km² (minus the water area) and the eastern part of the development zone along the river covers 59.4km² (minus the water area), which is also known as Guangzhou International Financial Center - Huangpu Lingang Economic Zone Central Business District. Relying on the Pearl River

water system, the Huangpu riverfront area, together with Baietan, Luoxi and other areas, has developed waterfront industries in modern times; Along with the expansion of the city, more and more industrial land has begun to move out of the main urban area of Guangzhou.。

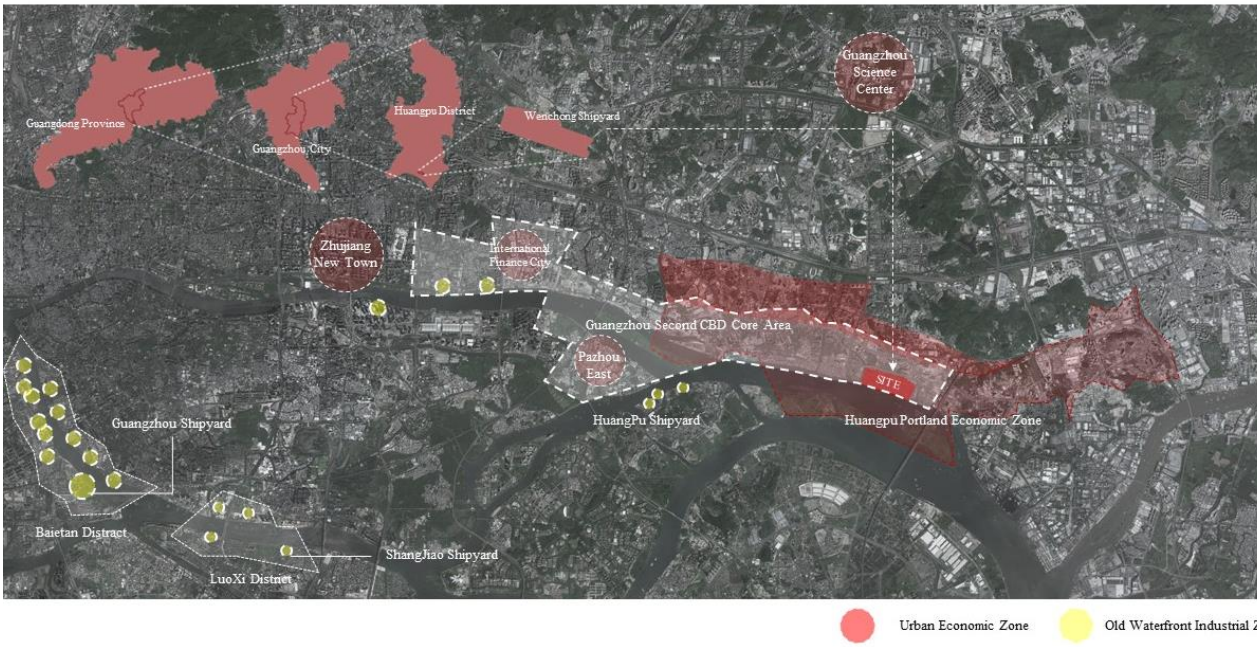


Figure 6-2 Location Analysis of Wenchong Shipyard

(Resource: Author)

6.2.2 Industrial Positioning

According to (Figure 6-3), at the General Urban Planning level, Wenchong Shipyard is located at the edge of the main urban area of Guangzhou, which is still some distance away from several major financial core areas. Overall, it is in the modern core service area within the development of the innovation belt along the Pearl River. In terms of regional development, the southern part of Huangpu is committed to the development of a modern port economy and artificial intelligence digital ocean economy.2022 Since then, Guangzhou has issued the "Guangzhou Ocean Economy Development" 14th Five-Year Plan, which introduces the strategy of comprehensively constructing a strong city of the ocean. The plan proposes to complete the goal of creating a capital of marine innovation and development by 2025, in addition to the construction of the Southern Marine Science and Technology Innovation Center [8] . Due to the unique geographical location near the river, Huangpu would develop based on ocean industry.

Servicing Marine Economy Industry-led: In the Master Plan for the Construction of Guangzhou Artificial Intelligence and Digital Economy Pilot Zone (Figure 6-4), the Lingang Economic Core Yuzhu Area develops the industries of 5G communication and IC core parts, AI+ software, Xinchuang+ blockchain, digital trade, and develops digital factories and unmanned factories. Yuzhu Area is planned as a national advanced intelligent equipment industry base, industrial Internet demonstration base, high-end service industry base, Xinchuang industry base and basic software strategic base. And it has been planned with the Guangzhou Yuzhu Industry City Complex with core status. Marine science and technology industry has been regarded as main industry, the plot contains super A-grade office buildings, high-end apartments, technological five-star hotels and large-scale retail business of large urban complex, the function comprehensively covers the headquarters office, science and technology exhibitions, intelligent entertainment, business consumption and so on. In contrast, there is no location advantage of Wenchong Shipyard, so it is not suitable to against with Yuzhu; So Wenchong was seen as a regional sub-center to lead the future economic development of Wenchong Shipyard with the service-oriented marine economy industry. Service-oriented marine industry mainly includes marine education, marine environmental protection industry, marine scientific research, marine geological survey industry, marine administration, marine insurance and social security, marine social groups, and international organizations, etc., which involves the front-end work of marine industry. The complementary pattern of industries formed by Wenchong and Yuzhu in the Lingang Economic Zone would be able to drive the development of Huangpu District; meanwhile, the introduction of science and education industries could activate the waterfront industrial relics to a certain extent (Figure 6-5).

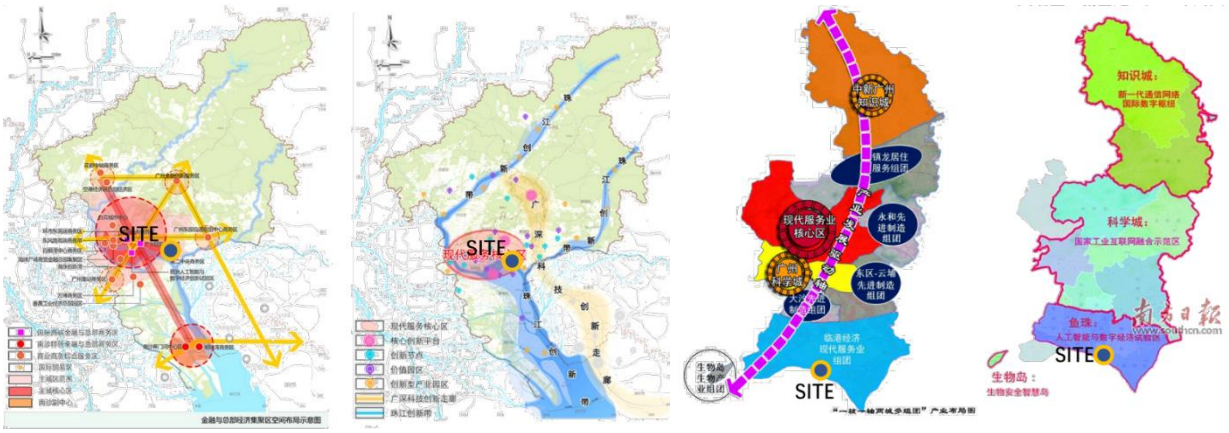


Figure 6-3 Guangzhou Territorial Spatial Master Plan (Left 1) Guangzhou Urban Master Plan (Left 2) Huangpu District 13th Five-Year Industrial Development Plan (Left 3, Left 4)

(Source: WeChat)

Figure 6-4 Master Plan for the Construction of Guangzhou Artificial Intelligence and Digital Economy Pilot Zone

(Source: WeChat)

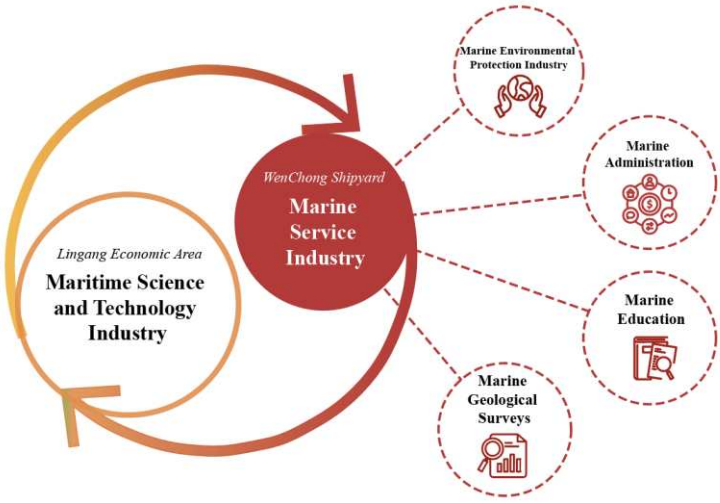


Figure 6-5 Industrial Pattern of Wenchong Shipyard - Lingang Economic Area

(Source: Drawn by the author based on information)

6.2.3 Ecological Pattern

The site is located in the central water wave restoration area in the overall water system, i.e. the former channel area of the Pearl River. To the east of the site is the axis of Longshou Mountain, and to the south of the site is adjacent to the Pearl River. It is generally located at the intersection of land and water in the city's ecological corridor. Its strategic ecological significance and potential for ecological development is due to its location at the intersection of land and water in the urban ecological corridor [44]. In addition, because the site is surrounded by regional ecological corridors to the southeast, the landscape strategy is in good condition. Meanwhile, the plan advocated that the construction of the corridor should rely on ecological and natural integrity and continuity to ensure the stability of the area with a more fragile ecological environment (Figure6-6).

The ecological corridors along the outer edge act as green barriers between the exterior and interior of the city, with effectively mitigating external influences and maintaining a relatively stable level of atmospheric environmental quality in the urban area. The system of forested green spaces within the city reduces the heat island effect, because of the forest' ability of influencing air currents, increasing atmospheric humidity and improving the microclimate and geothermal environmental conditions of the city.

The Urban Design and Landscape Detailed Planning Guidelines for the Key Sections of the Pearl River Landscape Belt (Three Ten-Kilometer Sections), released in 2018, explained that a 60-kilometer route through the Pearl River public space would be planned in the near future, and in the long term, it would be extended to both sides. At that time, the existing construction enclosures, river surge partitions and bridge underpass partitions along the coast will be opened. This would result in a 60-kilometer continuous waterfront open riverfront greenway on both sides of the river for linking neighboring parks, street green spaces and riverfront spaces.[45](Figure6-7) This also places demand on the shape of the shoreline.

In summary, the riverfront greenway and bio mobility need both to be considered comprehensively in the regeneration. In the overall layout, reducing the development intensity of the area, widening the width of the waterfront area, and enhancing the connectivity and coverage of the blue-green system of the site should be emphasized. This is of great significance to strengthen the stability of the connection of the entire eastern ecological corridor and improve the systematic nature

of the regional ecological corridor.

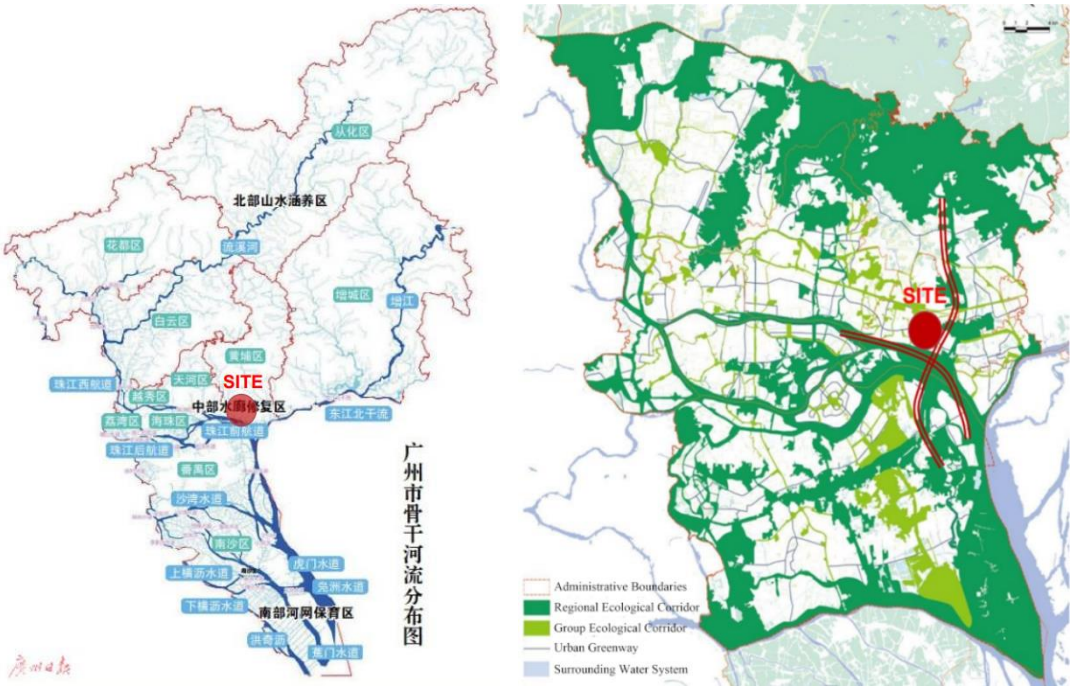


Figure 6-6 Distribution Map of Backbone Rivers in Guangzhou (left) and Regional Ecological Corridor Plan (right)

(Source: WeChat)

Figure6-7 Riverfront Greenway Planning

(Source: Construction plan for high-quality development along the Pearl River in Guangzhou)

6.3 Analysis of Current Status

6.3.1 Transportation Analysis

Wenchong Shipyard and the surrounding riverfront sites are currently occupied by industrial production. As a result, none of the waterfront shoreline is accessible to public, and only the east and west sides of the river are connected to the Pearl Riverbank by extremely hidden pedestrian passages. There are two intersections on the north side of the factory adjacent to the carriageway, both of which are gated.

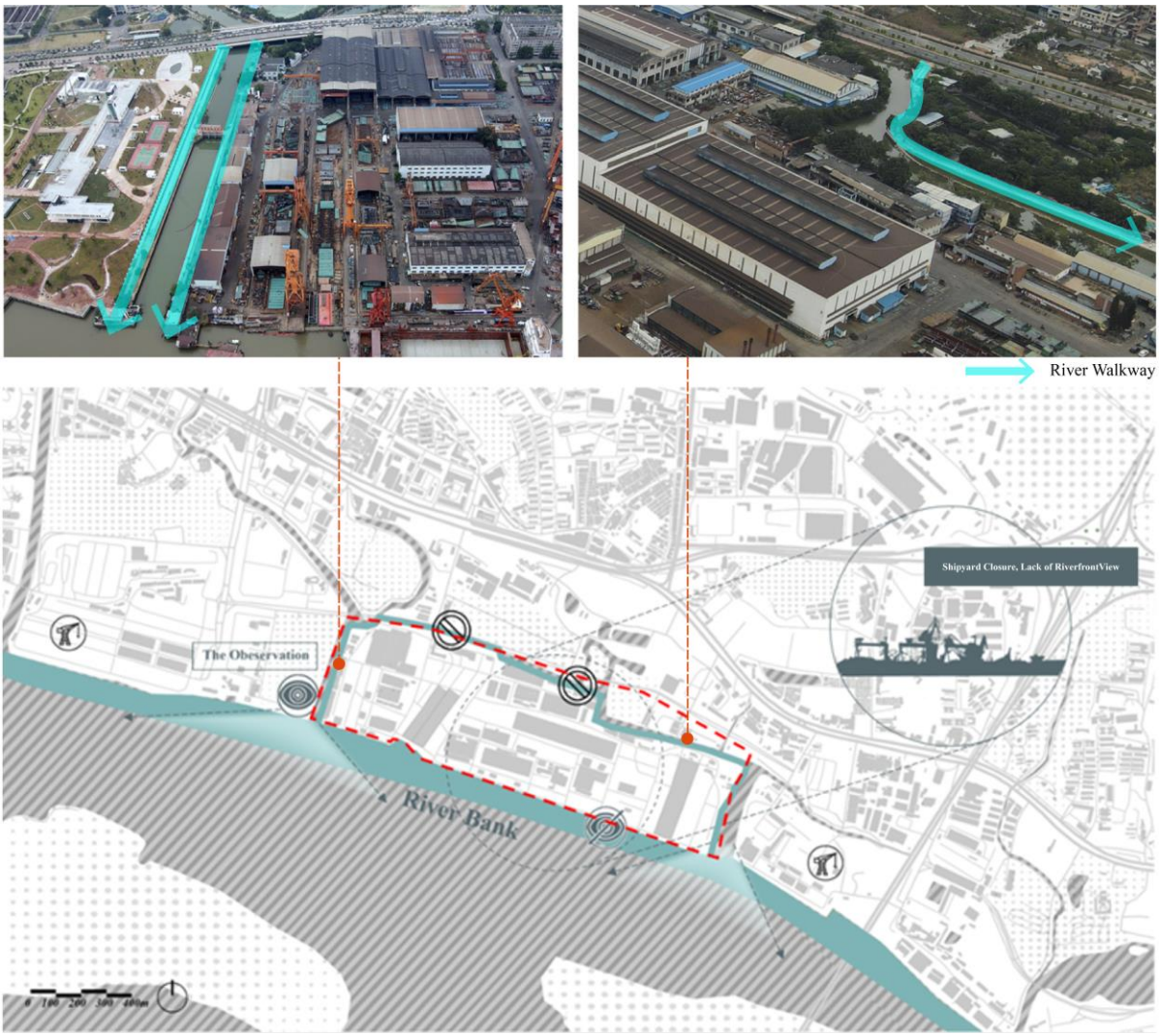


Figure 6-8 Plant Management

(Source: Author)

The current situation of the city road network is not perfect, mainly through the Wenfeng Road and

external links, external transportation capacity is weak, field project site north side of the city trunk road and urban expressway connection. Metro Shuanggang Station is about 500m away from the site, and there are no other transportation to reach the site directly except for shared bicycles. The urban secondary road from west to east is currently occupied by a large number of freight vehicles, causing some traffic congestion on the site. In the future, it is proposed to plan the light rail line 8 to connect the city and the site, the richness of land transportation options can be enhanced in the future. In addition, the site is surrounded by Wu Chung, Sang Yu Chau, Miaotou with small passenger terminal facilities, which are still in operation.

It is foreseeable that after the renewal of Wenchong Shipyard, the density of the current transportation road network and the number of transportation facilities will be difficult to meet the needs of the area, and it is necessary to make a amount of additions to the road network; the types of transportation facilities need to be further improved in order to enhance the accessibility of the area.

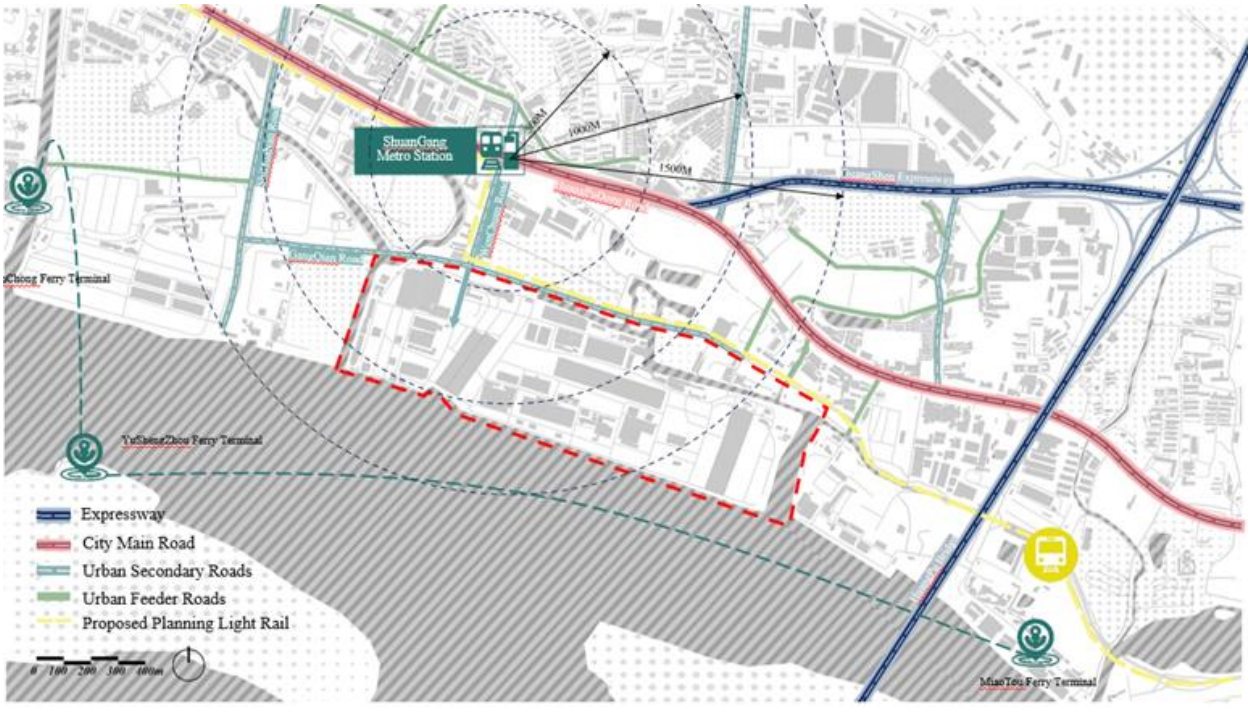


Figure 6-9 Traffic Analysis

（Source：Author）

6.3.2 Analysis for Point of Interest

The business analysis is mainly based on the accessibility of the population, with the 15-minute

living circle as the reference standard. The main commercial areas around the site are concentrated on both sides of Huangpu East Road, and the number of small-scale and old facilities are unable to cover the site; schools are concentrated around Shuanggang Village (the intersection of Shapu East Road and Huangpu East Road), and their service capacity has already reached the threshold. Besides, their radius is not able to cover the site; There is only one hospital, which is located at the east side of the intersection of Shapu East Road and Huangpu East Road, and is far away from the Wenchong Shipyard; Moreover, two historic buildings are located in Shuanggang Village, which is located at the east side of the intersection of Shapu East Road and Huangpu East Road, and is far away from Wenchong Shipyard.

In general, the density of commercial service outlets is insufficient, as well as the lack of comprehensive commercial outlets and cultural service facility points, such as gymnasiums and arts centers; The school capacity is relatively saturated, and the number of schools would correspondingly to be increased in the event of additional residential; in addition, the number of medical facilities would need to be supplemented.

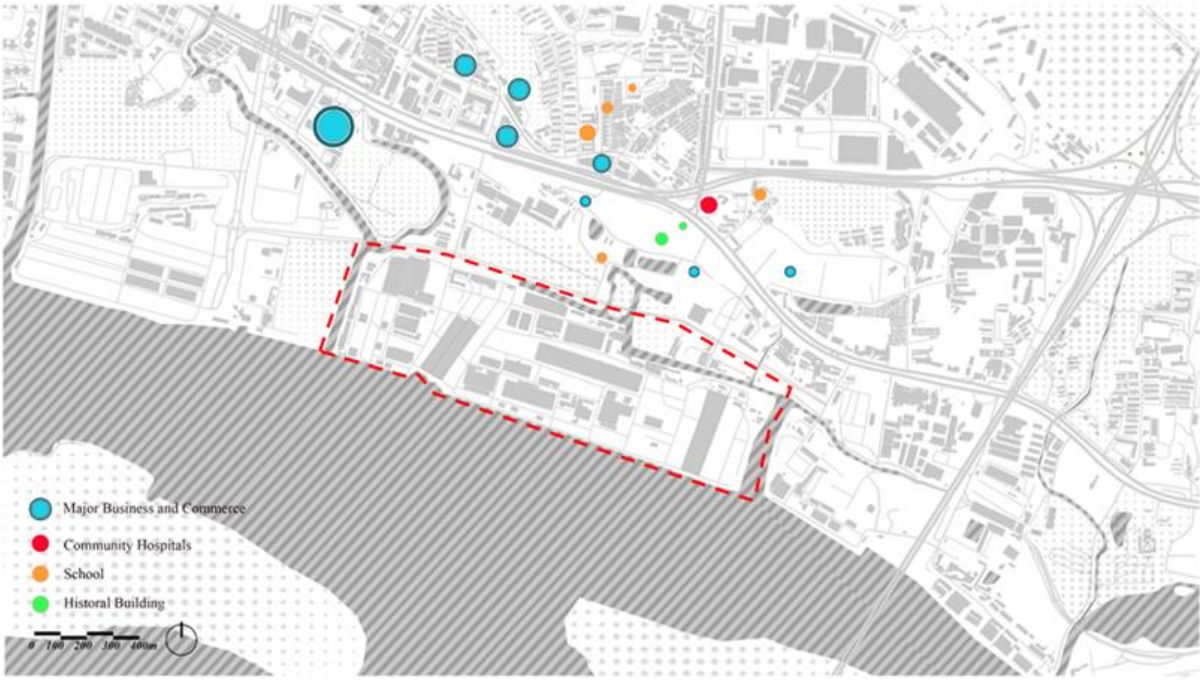


Figure 6-10 Distribution of Points of Interest in the Neighborhood

(Source: Author)

6.3.3 Demographic Needs Analysis

By conducting a survey on the willingness of community people within the 15-minute living circle around Wenchong Shipyard to engage in waterfront open space activities, it can be seen that most groups have a strong willingness and demand for waterfront activities.

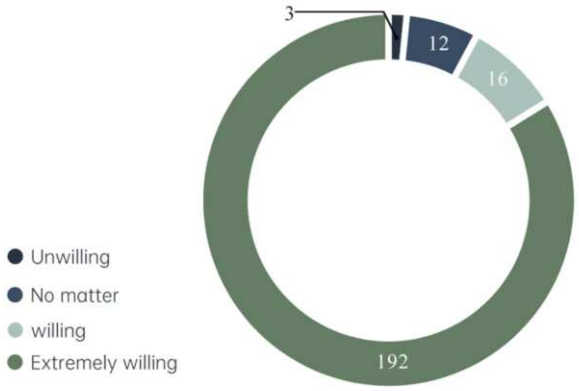


Figure 6-11 Waterfront Open Space Activity Intentions Survey
(Source: Author)

Based on the activity willingness survey, the author categorized the population into four groups: the elderly, middle-aged people, teenagers, and children. For each category, 50 questionnaires were distributed, totaling 200, and 192 valid questionnaires were recovered; The type of activity can be categorized into site-specific activities and non-site-specific activities; For the former, it refers the activities with specific facilities, including basketball, volleyball, and other sports; The latter does not have a strict limited for site facilities, including camping, jogging, talking, and so on. The following conclusions can be drawn from the 192 questionnaires returned:

1. the frequency of non-site-specific activities is significantly higher than that of site-specific activities, thus it can be concluded that the demand for waterfront activities in this area is dominated by non-site-specific activities.

2. the frequency of non-site-specific activities in specific activity types is highest in conversation, jogging and walking activities; site-specific types are dominated by basketball, badminton and children's activity facilities.

To summarize, the functional planning of Wenchong Shipyard open space is based on non-specific

types of activity venues supplemented by site-specific types of activity venues in order to adapt to the needs of urban outdoor activities.

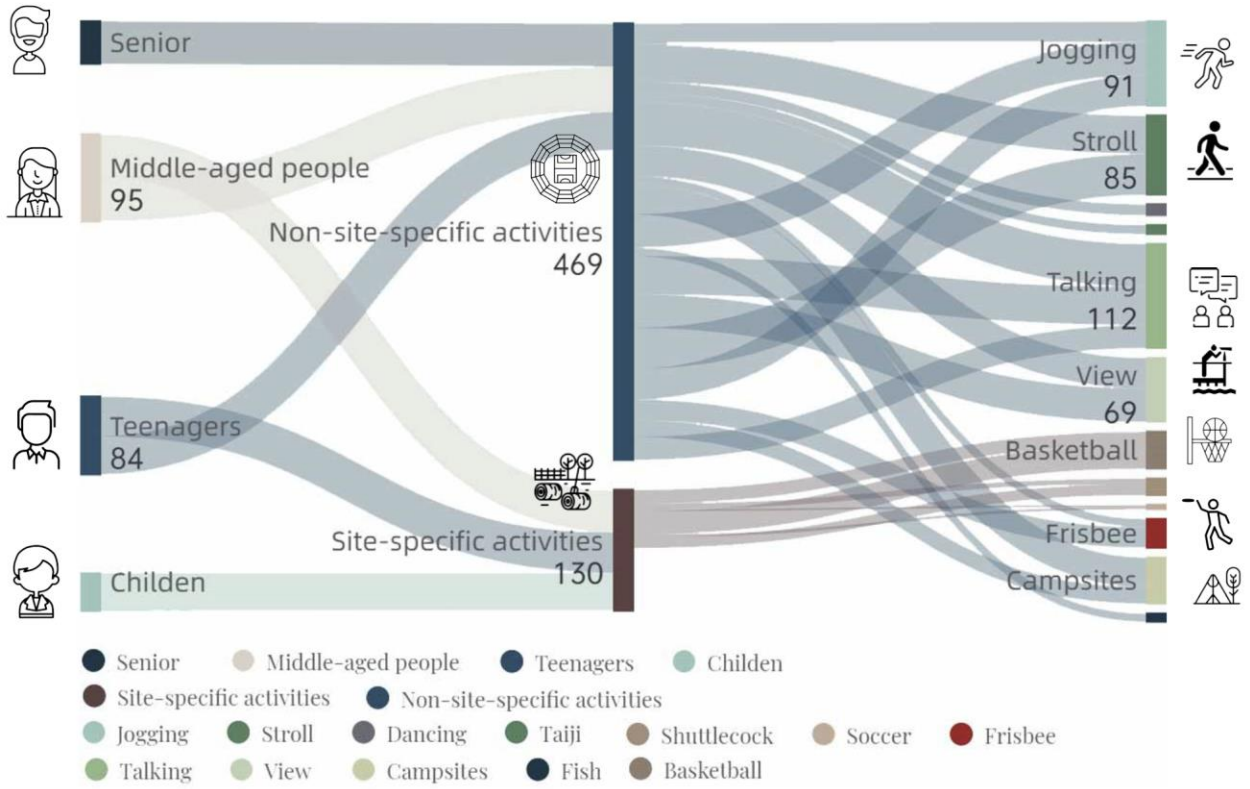


Figure 6-12 Analysis of Demand for Crowd Activities

(Source: Author's own drawing based on research data)

In addition to the above questionnaire survey, the author randomly selected 30 people for interviews, including the shipyard's retired employees, living around the office workers, students, etc., talking about the Wenchong Shipyard, they expressed themselves.

Table6-1 Content of the interviews.

Respondent Group	Interview Topics	Interview Content
Middle-aged people	Business	"I feel that there are fewer types of businesses in the neighborhood, excluding individual stores and food markets, which makes it inconvenient to take the subway to go out sometimes to buy something else."
Elderly people	Industrial Culture	"The production of ships is the memory of many people in the original factory, but now the demolition and construction

		of the city is rampant, so disappearance of culture of the past industry in many sites makes me feel more regrettable."
Teenager	Facility Creation	"I like running at night very much, the windy river is very pleasant to run, but the riverfront has been occupied by these factories for decades, I have no choice but else open space."

6.3.4 Climatic and Hydrological Conditions Analysis

(1) Climate and Temperatures

With a marine climate and an annual difference in temperature of less than 15℃, Guangzhou enjoys long summers with no winter, warmth and abundant sunshine. The average temperature in January is 14.2℃ and the minimum temperature is 4℃, while the average temperature in July is 28.5℃ and the maximum temperature is 36.6℃, and the frost-free period is up to 11 and a half months. According to relevant data, the average, maximum and minimum temperatures in Guangzhou in the past ten years have shown a clear upward trend compared with the past decades (Figure 6-14).

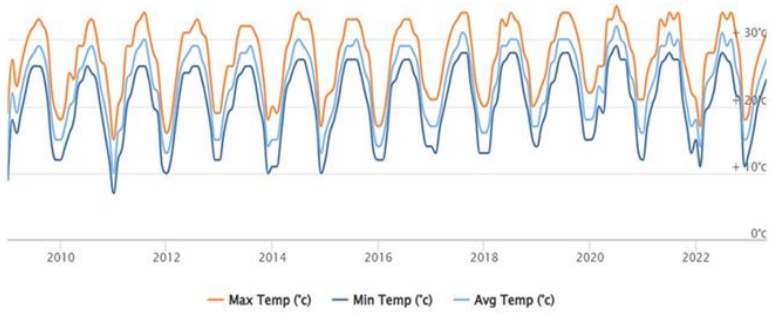


Figure 6-13 Graph of Temperature Statistics

(Source: Author's compilation based on data)

(2) Precipitation situation

According to relevant data, the annual precipitation from 2010 to 2017 showed an overall increasing trend, with an average annual precipitation of 1,739 mm. in 2018 and 2019, the annual precipitation in Guangzhou was lower, with 1,685 mm and 1,606 mm, respectively. However, some high-impact extreme precipitation events also occurred during this period, such as the subway flooding event in July 2018 and Typhoon Mangosteen in 2019, which had different degrees of impact on urban life and transportation in the Huangpu area.

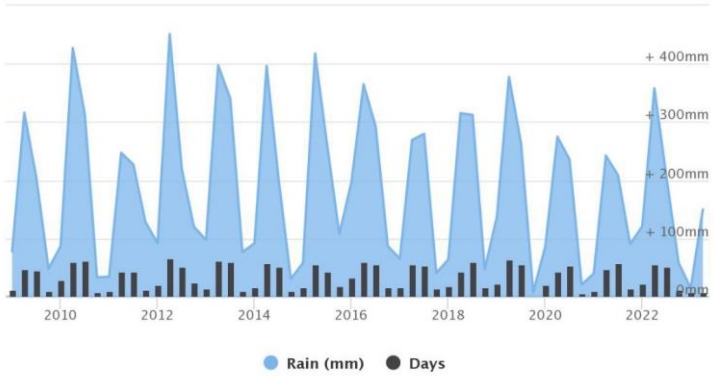


Figure 6-14 Precipitation and Days of Precipitation Statistical Map

(Source: Self-drawn by the author based on information)

(3) Flood Risk

The north side of Huangpu District is home to many mountain ranges, with the urbanization process accelerating, buildings rising above the ground, and the ground being hardened. However, the underground drainage system is lagging behind the above ground construction; coupled with the influence of the "heat island effect" and "rain island effect", the urban water cycle has become extremely fragile, and whenever there is a slight change in the climate, it is easy to be out of balance.

Wenchong shipyard is located in the old Huangpu River area, the overall terrain is low-lying. in this environment, Wenchong shipyard has also become a part of the flood-prone areas in Huangpu city; from the following figure (Figure 6-16), the Wenchong Shipyard is prone to flooding in the potential risk area and surrounded by high-risk area.

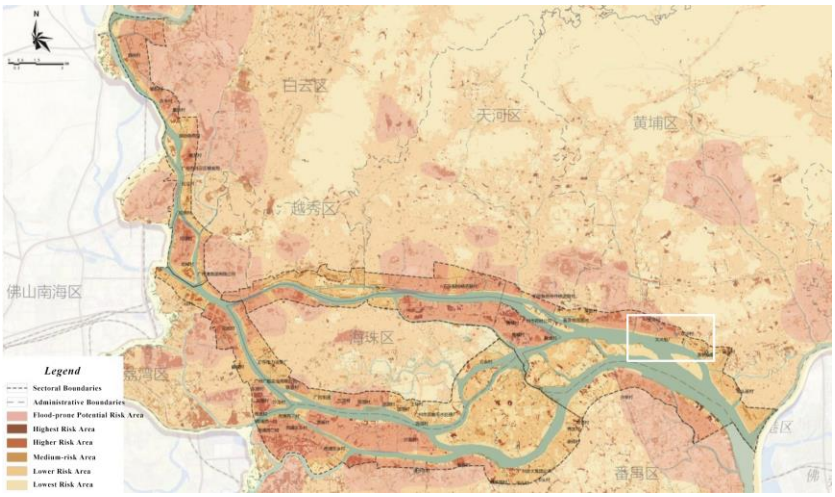


Figure 6-15 Flood Risk Map of Guangzhou City

(Source: Construction plan for high-quality development along the Pearl River in Guangzhou)

Currently, sea level is rising due to global warming. When the global warming again 1 ° by sea level rise caused by the annual flood level will be higher than the daily average tidal line, then the shipyard coastal part of the horizontal elevation will be lower than the flood level. IPCC Sixth Assessment Report pointed out that the 2011-2020 average temperature compared to the pre-industrial increase of 1.09, the global average temperature has risen by at least 1 °, and the warming of the increase in the land is much greater than the ocean.

To further study the extent of the impact of flooding on shipyards due to sea level rise and global warming, the author conducted the following flood simulation:

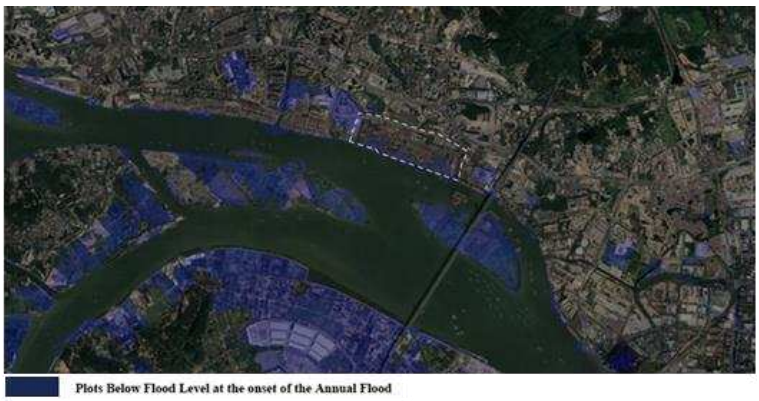


Figure 6-16 Flood risk map for global warming above 1°.

(Source: Author's simulations via Climate Central)

When estimating the average annual sea level rise of 3.1 mm over the last 30 years (sea level projection source from IPCC 2021 projection model), the area of the shipyard and entire waterfront of the city that is below the flood level during the annual flood is increasing annually, and in 2080 it is predicted that the elevation of the entire site of the Wenchong Shipyard will be below the level of the annual flood, which implies that this site will be exposed to severe flooding during the annual flood（Figure6-18）.

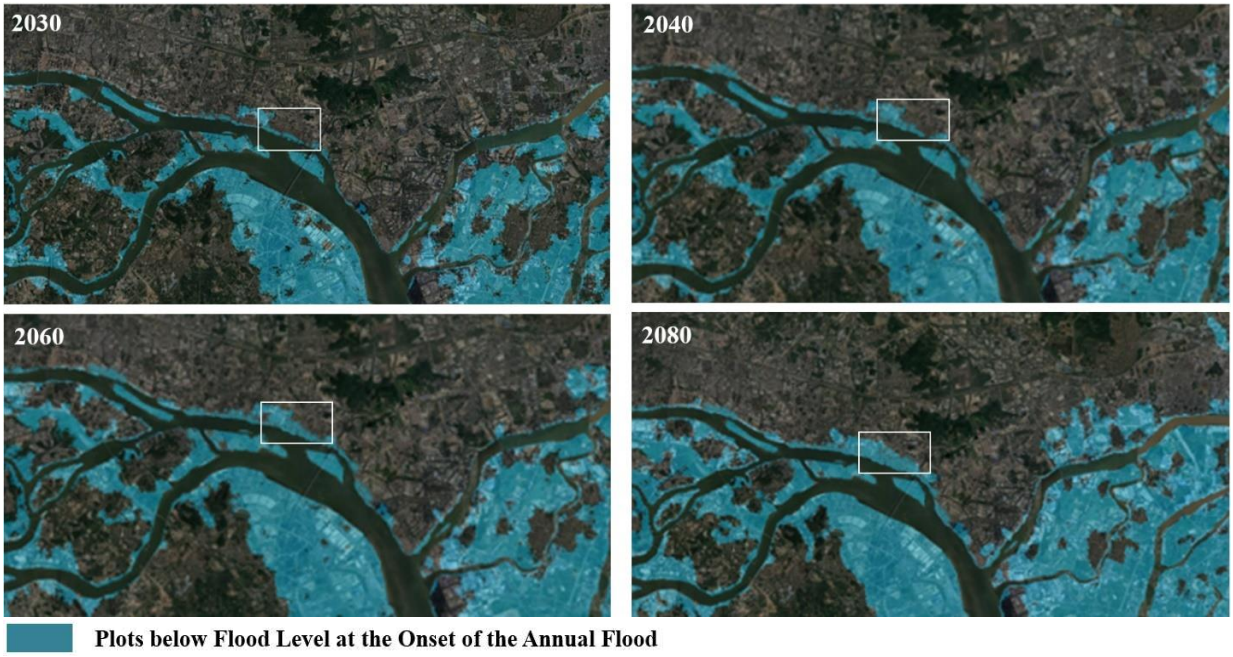


Figure 6-17 Flooding Simulation Based on Sea Level Rise
(Source: Author's simulation via Climate Central)

Refer to the following information regarding the design flood protection elevation at Wenchong Shipyard. According to the "Design Code for Embankment Engineering", the top of embankment elevation shall be the design flood (tide) level plus the top of embankment over-height, which is the sum of the design wave height, the design wind and congestion water increasing height and the safety height. ① In the "Guangzhou City Pearl River Embankment Improvement Planning" (2008), the design flood tide level of the front channel of the Pearl River at Ersha Island section location for one in 200 years is 7.68m (Guangzhou Elevation, the same below), the top of the embankment of the Member Village, the former Haixinsha embankment, and the top of the embankment of the Huangpu (Harbor) are valued at 1.14m, 1.27m, and 0.85m, respectively [46] . ② In order to cope

with the problem of flooding and inundation of low-lying areas near the river in Guangzhou due to insufficient embankment elevation that was uncovered by Typhoon "Tiange" in 2017 and Typhoon "Shanzhu" in 2018, the Guangzhou Municipal Government considered and approved the "Overall Plan for Upgrading to the Standard of Pearl River Embankments in Guangzhou" in 2019, which put forward the goal of achieving the flood level equivalent to that of typhoon "Shanzhu" after improvement of Pearl River embankments.③ In 2019, a research team from the University of California, Berkeley, based on the highest tidal level of Typhoon “Shanzhu” and the commonly used value of 0.9m for elevation of levees from the highest tidal level in the United States, proposed to raise the protection height of levees to 9.50m or more. ④ Kang Lei et al. (2015), Chinese Academy of Sciences, hypothesized that the future inundation elevation of the Pearl River Delta due to the superposition of sea level rise and storm surge water augmentation would be about 8.24m to 9.50m in 2030, 8.30m to 9.58m in 2050, and 8.45m to 9.79m in 2100. [47] Summarizing the above points, the future flood protection elevation of Wenchong Shipyard should be raised to at least 8.50m and preferably above 9.50m（Figure6-19）.

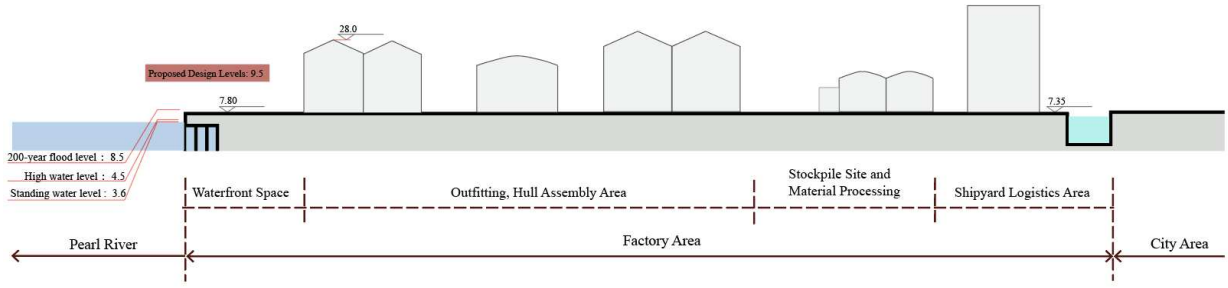


Figure 6-18 Site Vertical and Flood Level Analysis

（Source：Author）

Due to the hydrophilic nature of shipyards and the need for spatial space, only simple temporary protection was provided to the living areas of the personnel when flooding occurred. However, as shipyards become more functional, they need to respond to flooding and sea level rise in order to ensure urban water safety and avoid economic losses.

(4) Status of water

Shipbuilding industry belongs to heavy industry, the emissions from the production process contain certain harmful substances, such as carbon dioxide and nitrogen oxides, etc.; once improperly handled, which will adversely affect the surrounding water environment, the author found that the hydrological characteristics of the shipyard near the plant is not good, the water body shows a

yellowish-green color, and there are a certain number of animal carcasses floating on the surface of the water, accompanied by a slight pungent odor (Figure 6-19).

Figure 6-19 Status of Water

(Source：Author)

Table6-2 Investigation of eutrophication status of the Guangzhou River section of the Pearl River during the dry water period

Nutritional Indicators	Total mean value	W_j	*TLI*	*TLI*(Σ)	Evaluation results
Chla	73.18//mg/m^3	0.267	71.59	81.81	*TLI*(Σ)>70,
TP	1.87//mg/L	0.188	104.59		Heavy eutrophication
TN	4.10//mg/L	0.179	78.42		
SD	0.27//mg/L	0.183	78.34		
COD_{Mn}	19.57//m	0.183	80.12		

（Source：Reference[38]）

As can be seen from the table (Table 6-2), the Guangzhou section of the Pearl River is in a state of heavy eutrophication. Eutrophication of the water body makes algae and other plankton bloom. On the one hand, it causes the water transparency to decrease, and the sunlight is difficult to penetrate the water layer. This affects the photosynthesis of plants in the water and the release of oxygen: On the other hand, plankton consume a lot of oxygen in the water, making the dissolved oxygen in the water seriously insufficient, resulting in the death of a large number of fish. Ultimately, this often leads to disorganization of aquatic ecosystems, destruction of diversity, and a decline or even loss of the self-purification capacity of water bodies[38].

Then the author investigated the water quality conditions in the area; from the data of the Duntouji

water section located near the Wenchong Shipyard, the water dissolved oxygen and ammonia nitrogen as the decisive two indicators in the evaluation index of surface water, high dissolved oxygen is conducive to the degradation of various types of pollutants in the water body, so that the water body could be purified more quickly; On the contrary, low dissolved oxygen makes the pollutants in the water degrade more slowly. Aquatic organisms are more sensitive to ammonia nitrogen in water, when the ammonia nitrogen content is high, it will lead to the death of fish. The two decisive indicators compared with the same period of value showed a downward trend, according to the "Environmental Quality Assessment Technical Specification for Surface Water" GB 3838 (Table 5-1), the value of dissolved oxygen indicators are located in the III (mildly polluted) and IV (heavily polluted) between the water quality; Ammonia nitrogen is between the value of class II (good) and class III (mildly polluted) [48]. Its water quality status is mildly polluted with a general downward trend.

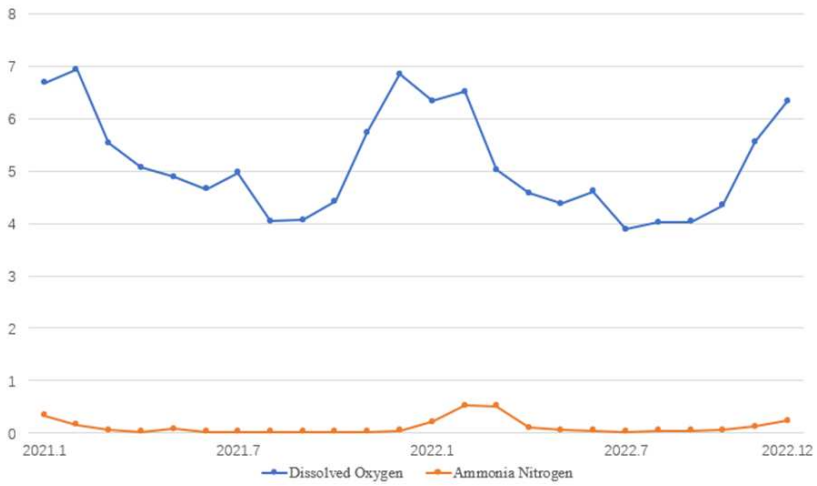


Figure 6-20 Trends in Water Oxygen and Ammonia Nitrogen Values from 2021 to 2022
(Image source: Author's compilation based on information)

Table6-3 Standard Limits of Water Quality Evaluation Indicators

	Level V	Level IV	Level III	Level II	Level I
Dissolved Oxygen ⩾	2	3	5	6	7.5
Ammonia Nitrogen⩽	2.0	1.5	1.0	0.5	0.015

In addition, according to the "Evaluation Criteria of Habitat Parameters" (Figure 6-21), Author evaluated the biological environment of the water, and the total score was 57.5 Due to long-term heavy industrial production and other reasons, the biological environment of the water has been heavily disturbed, which will lead to the decline of biodiversity. aquatic biodiversity is the core of the water ecosystem, and it plays a regulating role in the structure and function of the water ecosystem. When the aquatic biological environment is polluted and damaged, the variety and number of aquatic organisms will decrease and thus affect the quality of the water.

Index Score	1-5	6-10	11-15	16-20
Special Eco-environment	5 points will be given if special habitats such as carved river channel, natural apron, shallow swamp, groundwater outlet, sandbar and secondary river channel occur			
Bank Stability	More than 60% of the river banks within the observation range are eroded	30%~60% of the river banks within the observation range are eroded	Relatively stable, less than 30% of the river banks with erosion within 100m	The river bank is stable without erosion trace, and less than 5% of the lake bank is damaged within the observation range (100m)
Shoreline Form (100m)	Artificial river bank, dam and slope protection account for more than 75% of the length of the lake bank, which has a serious impact on aquatic organisms	Artificial river bank, embankment and slope protection account for 10%~40% of the length of the lake bank, which has a certain impact on aquatic organisms	Artificial river bank, embankment and slope protection are less than 10% of the length of the lake bank, and have little impact on aquatic organisms	Maintain normal mode, without artificial river bank, embankment, slope protection, etc
Macrophyte	Almost no large aquatic plants	There are fewer kinds of large aquatic plants with small area and less than 25% coverage	There are many kinds of large aquatic plants, covering 50%~25% of the total area	There are many kinds of large aquatic plants, covering a large area of more than 50%
Sediment Composition	Basically silt and clay, almost no fine sand, and the niche type is single-	There is a small amount of fine sand, more than 75% of which is silt and clay, and there are few niches with uneven distribution	More than 50% are fine sand and gravel, a small amount of gravel and cobbles, and the rest are silt and clay. There are many types of niches	More than 50% are gravels, pebbles and boulders, and the rest are fine sand, clay, silt and other sediments, with rich types of niches
Water Volume	The water volume is very small, and the descending height or area exceeds 75%	The water volume is average, and the descending height or area is about 25%~75%	The water volume is relatively large, and the descending height or area is less than 25%	The water volume is large, and the river bank is submerged, or there is no exposed river bank
Land Use Status	The river bank is exposed weathered soil layer abandoned by farming, with little nutrients	River bank farming soil accounts for more than 50%, which requires a lot of chemical fertilizers and pesticides	The riverside cultivated soil accounts for less than 50%, and a certain amount of chemical fertilizer and pesticide need to be applied	There is no cultivated soil on the lakeshore, which is rich in nutrients
Water Surface Condition	The water body is turbid, with a lot of garbage and a strong pungent smell	The water body is turbid, with more garbage and strong pungent odor	The water body is relatively clear, with less garbage and slight odor	The water is clear, garbage free and odorless
Riparian Vegetation	There are few vegetation types around the coastal zone, and the coverage area is less than 10%	There are few vegetation types around the coastal zone, covering 10%~40%	There are many kinds of vegetation around the coastal zone, covering 40%~75% of the area	There are many kinds of vegetation around the coastal zone, covering more than 75%
Human Activity Intensity	Intensive human activities, traffic arteries and serious pollution	Various human activities have a great impact on the waters, but the pollution is not serious	Human activities are general, and the number of vehicles passing by is small. Occasionally, pedestrians or bicycles pass by	No or few human activities

Meaning it fits this description. (Note: For the sake of fairness, the single score is taken as the average of the interval, with 2.5 points for 1-5)

[0 , 60] Heavy Interference [60 , 90] Moderate Interference [90,120] Light Interference [120,150] Slight Interference [150,180] No Interference

Figure 6-21 Criteria for the Evaluation of Aquatic Habitat Parameters[49]

(Source:Author's own drawing based on information)

Overall, the water quality conditions and aquatic environment around Wenchong Shipyard are poor, with an overall downward trend.

6.3.5 Landscape Element Analysis

The area is bordered by the Pearl River to the south, and the two green islands of Daxueisha and Dajisha across the river are outstanding landscape resources. On the east side, there are Longtoushan Forest Park, Spurious Hill Forest Park, and the South Sea Temple, and on the north side, it is adjacent to agricultural woodlands and pocket parks, etc. From the perspective of ecological integration, the density of the urban green space system is high, and there are abundant green ecological resources, so site design should take into account the connectivity and integration relationship with the urban landscape resources (Figure 6-13). From the perspective of flood response, the relative fragmentation of the blue-green network makes it difficult for each blue-green module to synergistically play the roles of flexible adjustment of water level and runoff channeling when heavy rain comes, which is not conducive to the buffering of floods.

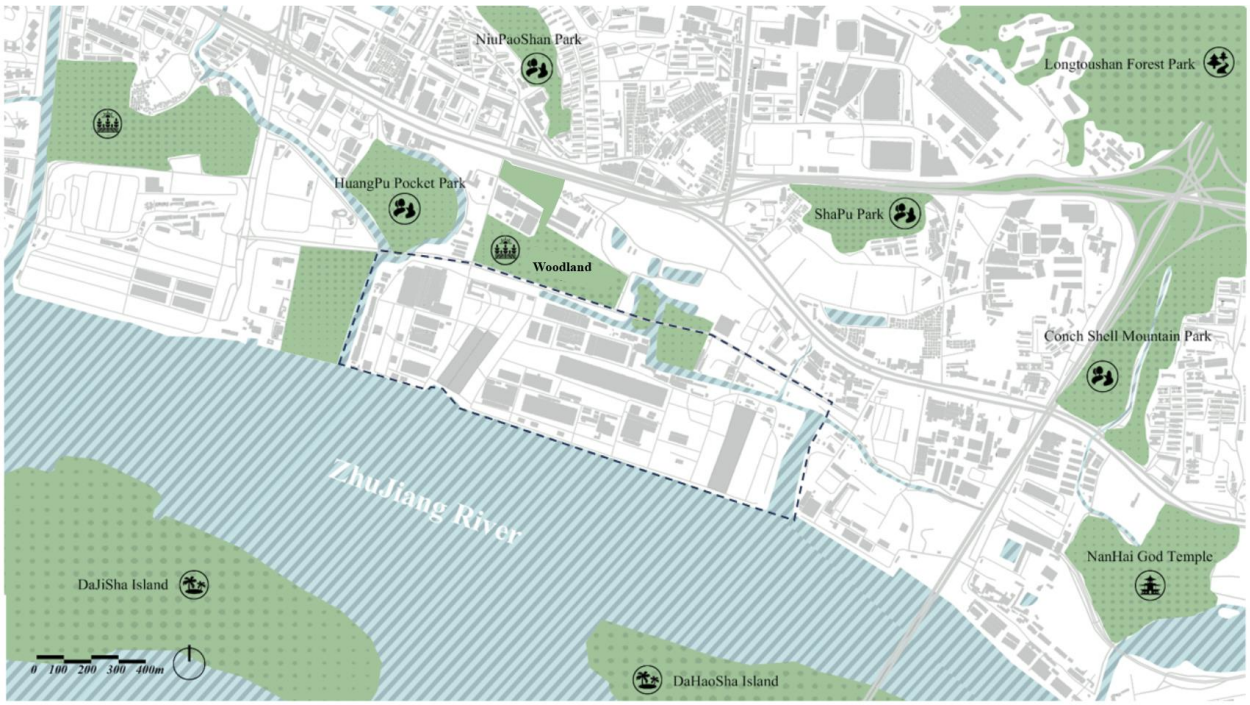


Figure 6-22 Landscape Resource Analysis

(Source: Author)

6.3.6 Functional Partitioning and Process Flows

(1) Functional Partitioning

The site can be broadly divided into five areas, with the following locations and functions: 1. The material stowage site is located near the entrance to the site; 2. The security department site is also near the entrance with a function of providing daily life convenience to the shipyard staff; 3. The security department is also located at the entrance area; 4. The remaining two functional areas are the heavy industry site and the shipbuilding site, which are located at the south side of the site and are involved in the entire production process from material processing to hull compositing and outfitting.

Figure 6-23 Functional Partitioning of Shipyard

(Source: Author)

(2) Process flow lines

Ship processing can be broadly divided into two production lines, one for hull construction and another for outfitting operations. Ship processing can be broadly divided into two production lines, one for hull construction and another for outfitting operations.

The hull manufacturing area is further divided into two main areas, including the hull construction area and the platform area. The hull construction area consists of steel yard, steel pre-treatment room, steel cutting and processing room, component manufacturing, parts supporting yard, segment welding, segment painting, etc. The hull segments produced in this area are sent to the

building berth area to continue to complete the shipbuilding, so it is desirable to be close to the building berth; The production nature in the building berth requires it to be close to the water, so the building berth is roughly perpendicular to the shoreline.

The outfitting operation includes outfitting area and outfitting quay area. The outfitting area includes engine workshop, assembly and distribution center,, raw material factory, etc. Because of the need of assembling parts, it is close to the hull segment welding workshop, slipway area, and outfitting quay in the hull fabrication area; the outfitting quay area is arranged according to the factors of the design depth of the quay, the conditions of the ship dock, the investment, and the relationship with the building berth. The overall process flow is as follows (Figure 6-24):

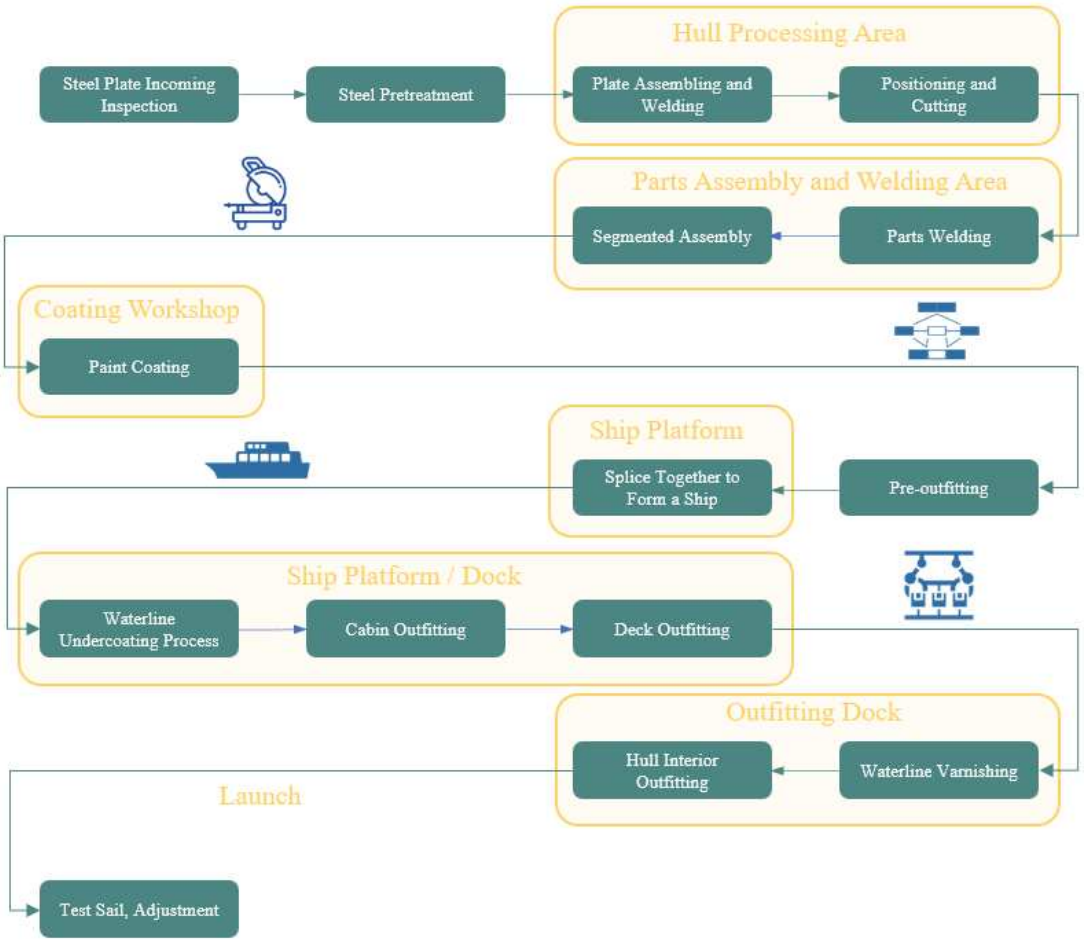


Figure 6-24 Hull Production and Processing Process Flow Diagram

(Source: Author)

In the planning layout of shipyard master plan, the conventional shipyard layout combination form

mainly consists of four types: I-type, T-type, L-type and U-type, and the planning layout combination form of Wenchong Shipyard is U-type and L-type. Its specific functional distribution and flow line are shown in the following figure (Figure 6-25).

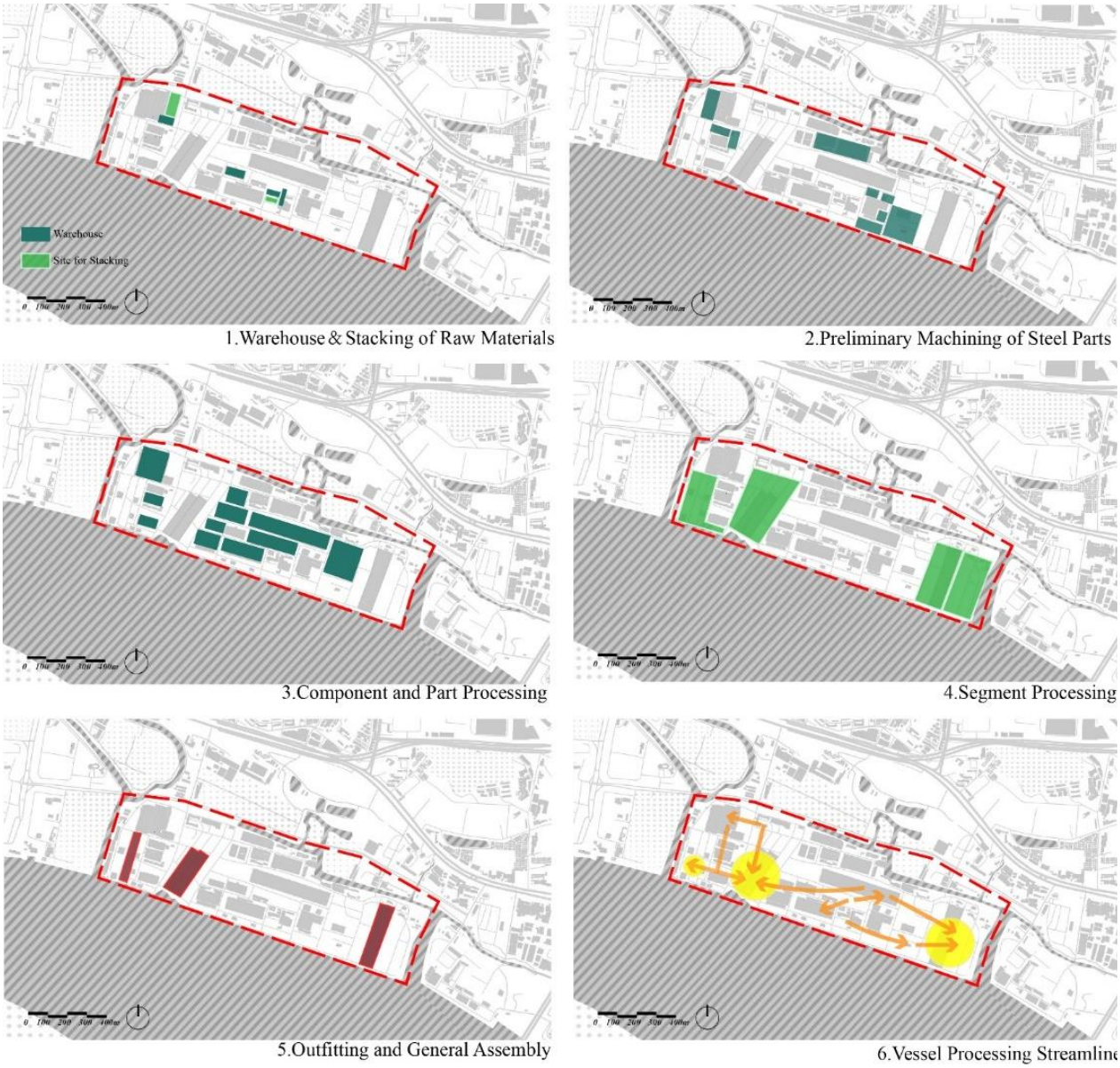


Figure 6-25 Wenchong Shipyard Distribution of Functions and Analysis of Production Flow (Source: Author)

Although Wenchong Shipyard was built early, the factory is well planned and laid out, and the production flow is relatively efficient. The shipbuilding process as an intangible cultural heritage in the factory process can be a major element in shaping the spirit of the industrial place.

6.3.7 Overview of Industrial Structures

(1)Industrial Buildings：

At present, there are still several ship production buildings in Wenchong Shipyard, whose names, time of completion and function are shown in the figure below; overall the structure of the workshop is well-preserved, the internal space is tall and spatially adaptable, and there are a large number of production facilities; Besides, the complete preservation of the dockyard is still in operation.

Figure 6-26 Overview of industrial relics

(Source: Author)

(2) Industrial Facilities

In addition, there are several industrial facilities, such as gantries and cranes, which are in a good state of preservation.

Figure 6-27 Status of Tower Crane & Gantry Crane

(Source: Author)

6.3.8 Recognition of the Value of Industrial Relics

The industrial buildings in the Wenchong Shipyard are still in the process of being assessed, but the planning department's ratings provide a reference for us to make value judgments. The ratings of the participating industrial relics can be categorized into the following three grades:

Category I: Dockyard No. 1 and No. 2 are the earliest shipyards built in South China, with outstanding historical, scientific, technological, artistic and social values, have been listed as outstanding industrial relics， as well the building berth, No. 3 dock and the distribution warehouse. These structures need to be preserved as a group, not to be dismantled arbitrarily, and should be reasonably repaired and utilized for display in the context of overall protection; **Category II:** such as the Dehuai Workshop, Lunan Workshop, etc., which hold a better industrial production value but a more general historical value. Therefore, they are recognized as more important industrial relics. So, their external appearance, structure, and components of the industrial relics, such as buildings, facilities, and equipment, should be preserved. They were requested to emphasize the presentation of the original industrial culture. **The rest** are general industrial relics, which can be demolished in consideration of their low historical value[50].

Industrial Relics' Class	Number Industrial Relics	Name of Industrial Relics
Excellent Industrial Relics	WCG103	Dock No. 1
	WCG102	Dock No. 2
	WCG104	Dock No. 3
	WCG101	Ship Platform
	WCJ204	Old Warehouse
	WCJ205	Grading Warehouse
Senior Industrial Relics	WCJ106	Hull Workshop 1
	WCJ107	Hull Workshop 2
	WCJ110	De'hui Workshop
	WCJ111	Lun'An Workshop
	WCJ123	Forging Workshop
	WCJ112	Machining Workshop
	WCJ113	Electrician Workshop
	General Industrial Remains	

Figure6-28 Industrial Relic Assessment of Wenchong Shipyard

(Source: Author's compilation based on "Planning of 15-km Industrial Relic Park at Huangpu Lingang - Industrial Heritage Assessment of Wenchong Shipyard (in progress)")

6.3.9 Analysis of Potential Renewal Difficulties in Space

The outstanding contradiction point in the renewal of Wenchong Shipyard is the large depth of the dock space and the east-west road, as shown in Fig. (6-29), the dock No.1 and No.2 cut the site in the north-south direction space.1. If we choose to underpass the dock, from the ecological point of view, it will generate a huge volume of earthworks, following up the treatment. Therefore, this operation is not cost-effective; For value of the relics, the operation of under passing is easy to break the wholeness of the dockyard; For technology, the larger depth of the dockyard space will lead to the long slope release, which is difficult to operate; For economy, even if it is possible to realize it, the consumption of funds is undoubtedly huge, so this practice is not recommended. 2. If the choice of the direct paving of the road in the north side, there is a compact space in front of the dockyard, and it is difficult to ensure the spatial continuity for dockyard space and the city; however, the advantage for that it is less technically difficult to guarantee, as well as the overall protection of the industrial relic space.

Figure 6-29 Site Space Issue 1

(Source: Author)

Another important spatial issue comes from the large depth space of No. 3 Dockyard that squeezes the east side of the site, resulting in a narrow and isolated site condition (Figure 6-30). on one hand, it's necessity to form spatial interactions with No. 3 Dockyard, which has a certain historical value. So, it's necessary for the space to interact with the dock in some way. On the other hand - e.g. how to relate to the waterfront space and maximize the communal value of the building and the site space is also an issue that should be taken into consideration.

Figure 6-30 Site Space Issue 2

(Source: Author)

6.3.10 Chapter Summary

After the preliminary analysis, it can be seen that the overall industrial development direction of Wenchong Shipyard is relatively clear, but it is still troubled by the intricate site problems, which are as follows:

(1) Overall spatial structure: on the one hand, the excellent ecological landscape resources around the factory are closely related to Wenchong Shipyard, and the above planning has also put forward the requirements; On the other hand, the existing transportation conditions between Wenchong Shipyard and the surrounding areas are not good, and the accessibility of the site is poor. Wenchong Shipyard is a closed industrial area, which is subject to management constraints, resulting in poor continuity of transportation with the outside. How to sort out the overall spatial structure has become a problem that must be responded to.

(2) Demand for urban life: The urban residents in the surrounding area have put forward requirements for the use of waterfront open space, which needs to be responded to.

(3) Ecological problems: there is a trend of deterioration in the water quality of the watershed around the Wenchong Shipyard, and the aquatic environment is not good； The Wenchong Shipyard area is situated on low ground and is inherently susceptible to flooding. The threat of flooding will increase because of sea level rising. The occurrence of flooding will lead to a decrease in the drainage capacity of the low-lying areas, which will cause a large amount of flood water to be retained during the flood season, seriously affecting the flooding of the estuarine area and exacerbating the threat of flooding.

(4) Cultural continuity problem: the industrial relics and industrial facilities of Wenchong Shipyard are well preserved, together with some outstanding cultural values; how to transform these industrial relics will become an important issue for renewal.

(5) Difficulties in spatial treatment: some industrial relics have posed challenges to the spatial renewal of the site because of their great depth; how to deal with these site conflicts harmoniously is of utmost importance.

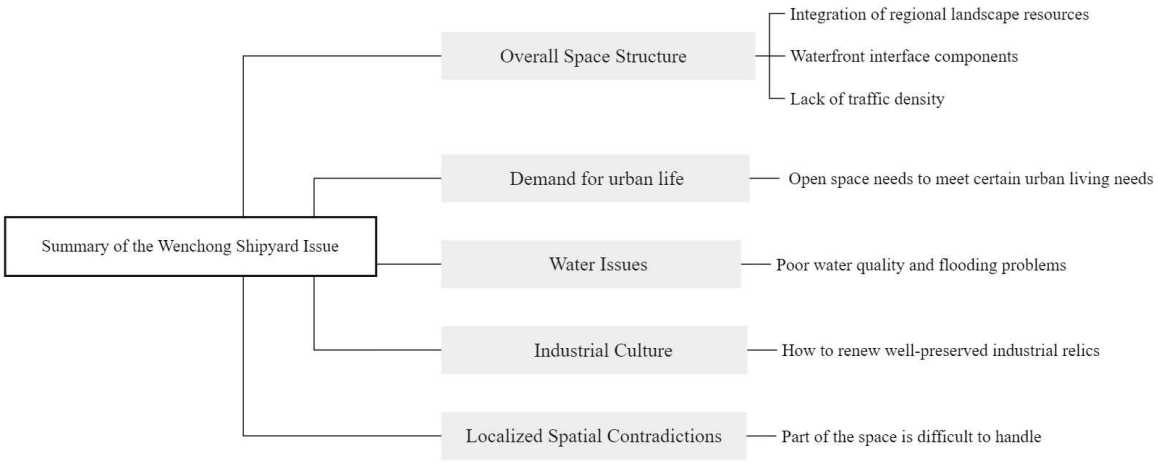


Figure 6-31 Summary of Current Issues at Wenchong Shipyard
(Source: Author)

Chapte7 Design Applications for Wenchong Shipyard

The dilemma of Wenchong Shipyard when it comes to regeneration is clarified through the results of the research; This chapter aims to validate the feasibility of the strategies in Chapter 5 through programmatic practice. An overview of the design is as follows:

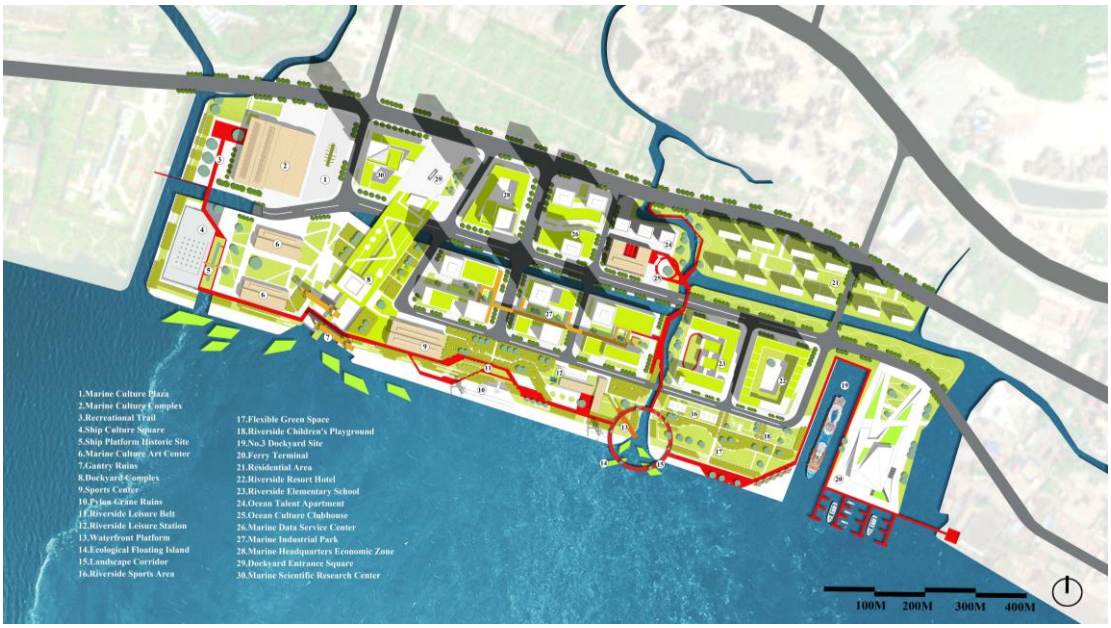


Figure 7-1 Master Plan

(Source: Author)

Figure 7-2 Aerial view

(Source: Author)

7.1 Optimization of Spatial Structure

7.1.1 Integration of regional landscape resources

From the previous chapter of the upper plan, it is clear that Wenchong and the surrounding land were serves as a strategic point for the intersection of urban green corridors and water ecological corridors (Figure 7-3), and the area needs to assume more ecological functions; Therefore, it is necessary to strengthen the connection among the city's major river networks, the Pearl River, and the man-made green areas. Besides, Sufficient natural ecological space should be reserved; and the intensity of land development should be appropriately lowered to give a better biological environment and a greener and more organic urban environment.

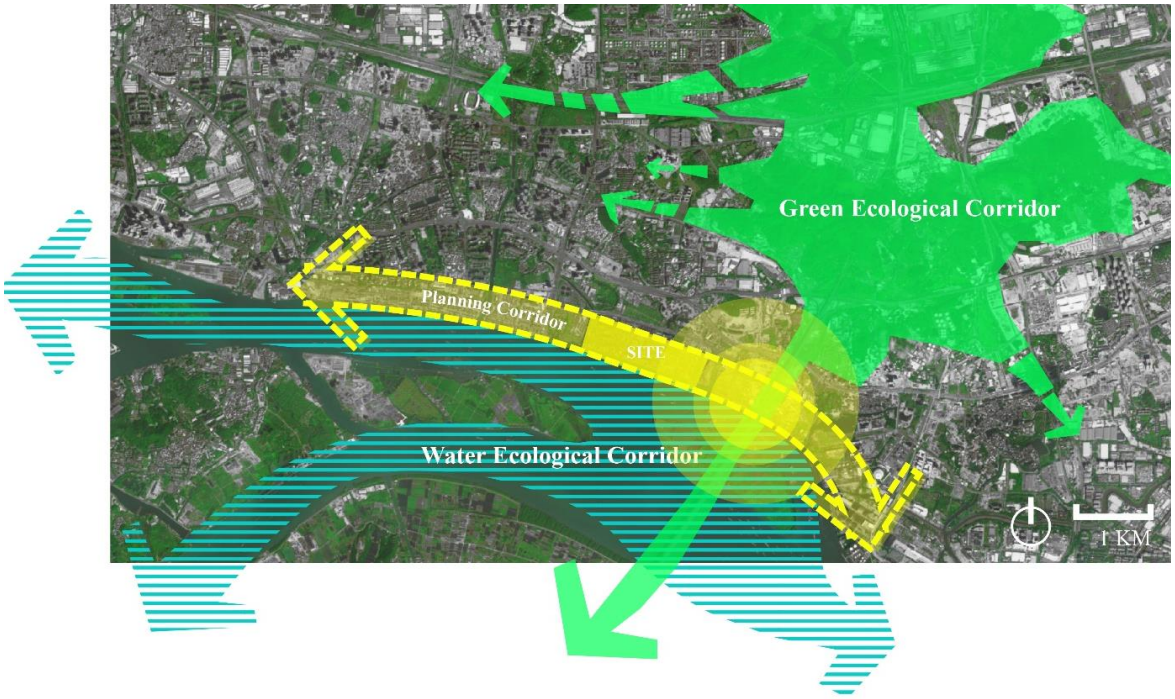


Figure 7-3 Landscape Structure at the Urban Scale

(Source: Author)

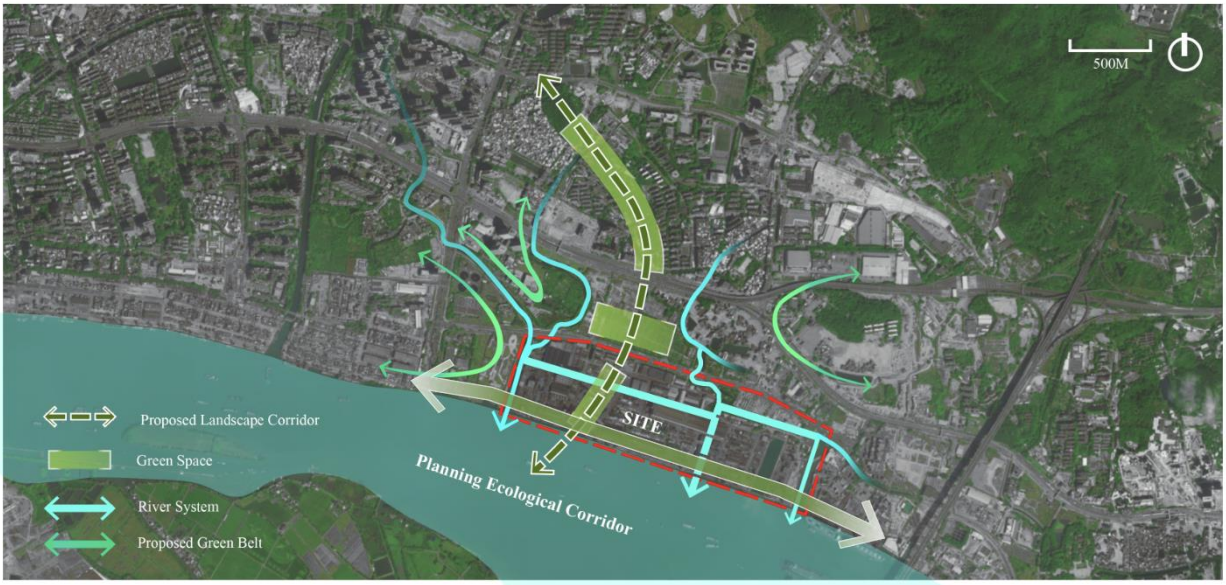


Figure 7-4 Landscape Structure at the Regional Scale

(Source: Author)

The two rivers on the east and west sides of the site present an organic form from the Longtou Mountain Range on the north side into the Pearl River. The landscape texture around the site will be extend through Wenchong on the establishment of ecological corridor in the future, In addition, Wuchong river on the west side of the site and Shuanghechong river on the east side of the site are connected to strengthen the urban water circulation effect with sufficient environment for animals to migrate; on the north side of the site, the linear Niutoushan Forest Park, the urban green space and the No.1 and No.2 Dockyards are integrated to form the continuous green landscape axis to guide the urban life, while forming the urban visual corridors and the ventilation corridors. The overall landscape network covering Wenchong Shipyard, divides different urban groups. It also creates good habitats for animal and plant habitats, improves the existing urban ecosystem, and provides a strong ecological base for the future development of the city.

7.1.2 Creating a waterfront activity interface

Based on the above macroscopic landscape structure, in addition, creating waterfront activity interfaces, arranging open activity spaces along the landscape system, opening up the sightline between architectural relics and the waterfront are all conducive to stimulating landscape and humanistic vitality;It also divides the groups according to the surrounding land form, and ensures the exchange of information, energy and material between each group through the medium of

landscape (Figure 7-5).

Figure 7-5 Integration of regional open space through the medium of landscape (Source: Author)

7.1.3 Weaving the Transportation Structure

In response to the poor traffic accessibility of the previously insufficiently dense road network on the site, the program largely retains the vehicular traffic structure within the shipyard. On the north, east and west sides of the site, new roads are added. so that the accessibility of the city can be enhanced by establishing municipal roads to connect with the city

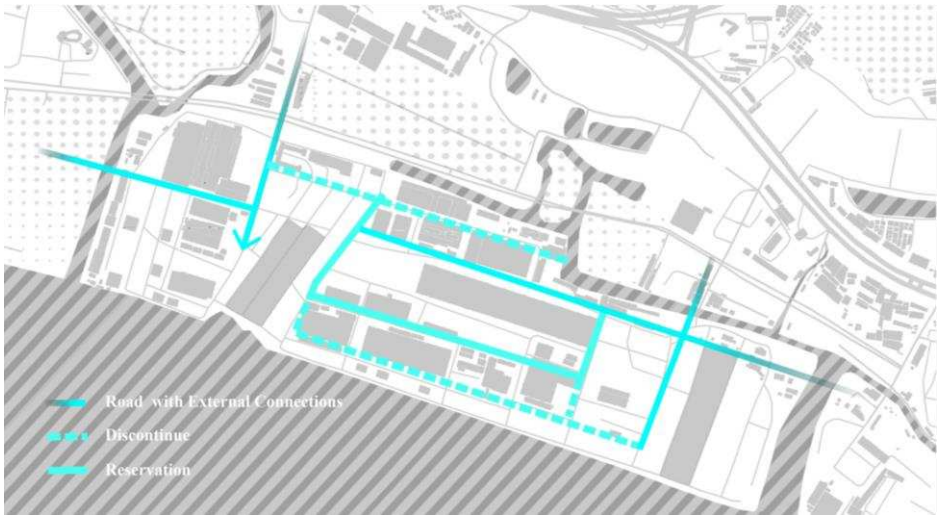


Figure 7-6 Sorting out transportation structure

(Source: Author)

(1) Road structure: As an intermediary system of material exchange with the city, the layout of municipal roads is still based on the principle of holistic; The riverfront road was created on the basis of ensuring the integrity of the outstanding industrial relics. The road passes among Dockyards No. 1 and 2 together with the hull workshop; at the same time, it slopes slightly to the northeast to avoid Dockyard No. 3. In the future, traffic restrictions of speed can be enforced to ensure the safety of the road; a city park will be built on the west side of the site, so the road goes underneath. In addition, the supplementation of the municipal dock will enhance the water accessibility of the area. (Figure 7-7, left)

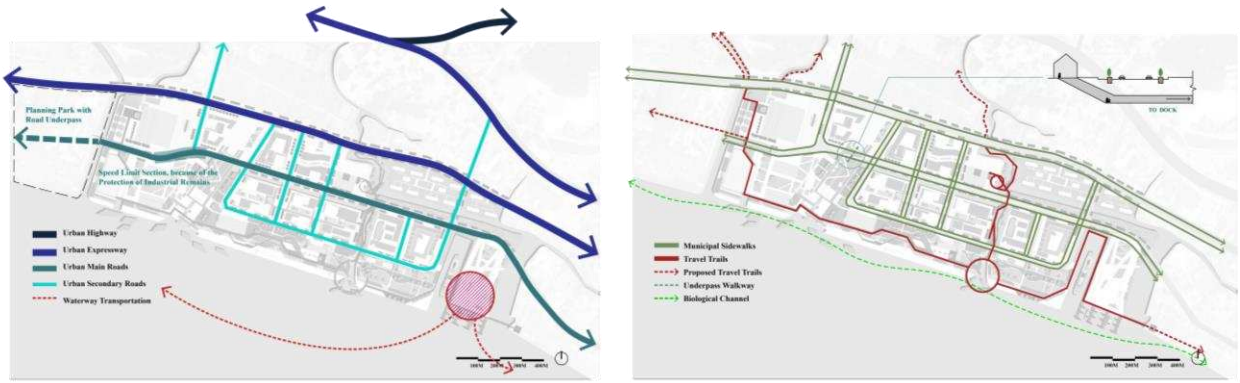


Figure7-7 Weaving the Transportation Structure

（Source：Author）

(2)Slow system： In addition to creating efficient municipal roads, the slow-system is integrated with the blue-green system to complement the accessibility of the site as a green and healthy way of traveling. Taking the walking path on the west side of the site as an example, the slow walking path is arranged along the river, extending westward to the planned city park, and the north side connects the waterfront walkway on both sides of the river, so that the slow system forms an integral part of the waterfront landscape; from citizen, the good landscape environment can be the motivation for their travel, and secondly, in the process of walking, good audio-visual feelings would be provided by the excellent landscape environment . For ecological, such a natural water system can make its eco-friendly to provide living space for waterway amphibians and birds.

7.1.4 Supplement for Urban Form and Function

As mentioned in 6.2.2, Wenchong shipyard industry and Yuzhu complement each other to develop synergistically; its service-oriented marine industry includes marine education, marine environmental protection industry, marine scientific research, marine geological survey industry, marine administration, marine insurance and social security, marine social groups and international organizations.

As analyzed in 6.3.2, to address the shortage of living service facilities, the service radius of 15-minute living circle (about 800-1000 meters) is taken as the benchmark; As analyzed in 6.3.2, for the insufficient living service facilities, the service radius of 15-minute living circle (about 800-1000 meters) is taken as the benchmark; comprehensive commercial service outlets, community hospitals, supporting elementary school, and cultural and sports venues are supplemented, and the specific distribution of functions is shown below (Figure 7-8).

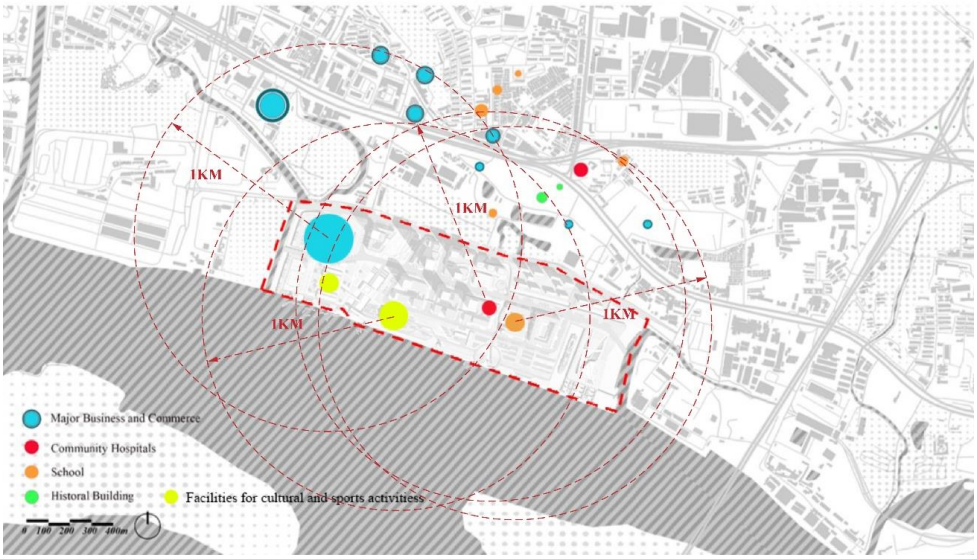


Figure7-8 Analysis of Regional Function

(Source: Author)

According to the needs of the industry, the office area will be configured and supplemented with supporting business hotels, residences, clubs and other lifestyle functions, the land use planning and functional distribution is shown below (Figure 7-9).

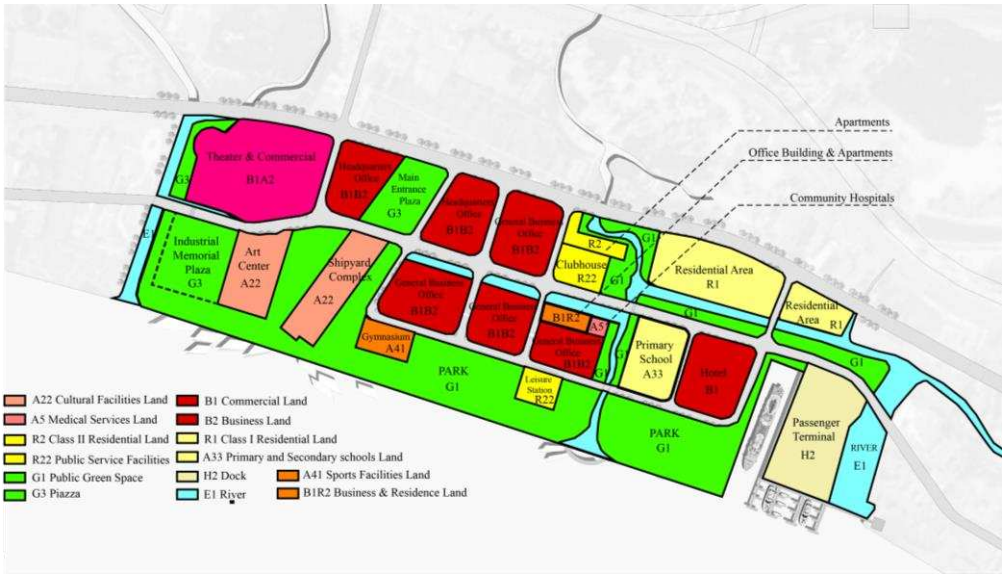


Figure 7-9 Land Utilization Planning and Functional Distribution

(Source: Author)

Comprehensive planning described above its regional ecological impact, Wenchong shipyard should be appropriate to reduce the overall amount of land development, especially should be avoided homogeneous high-intensity development and utilization. A more intensive and prioritized approach to block development is more appropriate - overall development intensity is lower where waterfront and industrial relics are clustered, and higher the further towards north.

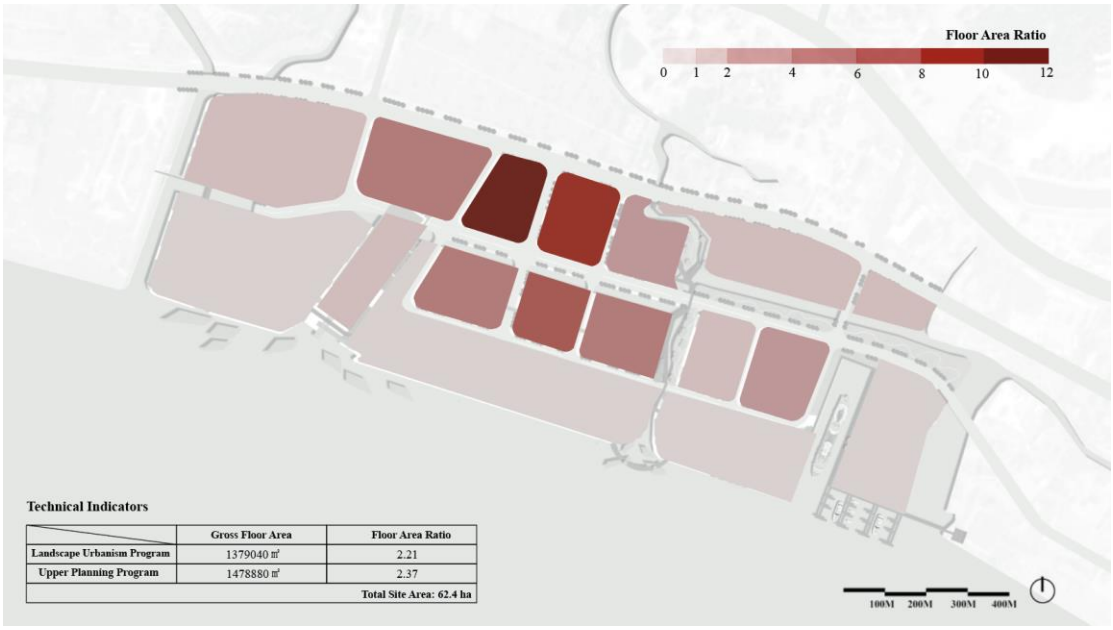


Figure7-10 Land Development Intensity

(Source: Author)

The skyline of Wenchong Shipyard reaches up to 380 meters, which meets its urban positioning. Together with other sites in the city, it forms a staggered riverfront city skyline with urban identity.

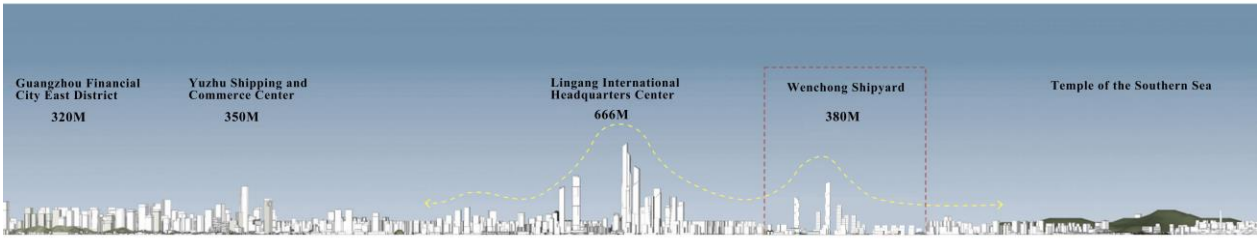


Figure7-11 City Skyline Analysis

(Source: Author)

7.2 Reflecting Behavioral Patterns

According to the needs of the crowd, the activity venues should be closely integrated with the landscape layout of the site. Specific types of activities such as basketball, children's activities parks are arranged in the overall space more open on the east side of the plant, combined some elastic green space; Non-specific activities like as running, walking and other dynamic linear activities are interspersed in the waterfront industrial structures and landscape system integration, point activities such as tai chi, dance are organized in the plaza, green space, etc., with its own activity elasticity space.

In general, in the process of transformation from closed industrial production function to open urban life, the first line of waterfront should meet the demand for appropriate urban activities.

Figure 7-12 Planning for Open Space Activity Sites

(Source: Author)

7.3 Adaption to Dynamic Change

7.3.1 Landscaping Infrastructure

In response to the climate and hydrological analyses, it was concluded that there is a risk of flooding in the area, sea level rise, and mild pollution and deterioration of water quality; combined with the facilities needed for urban life, the landscape infrastructure methodology can be applied to the open space of the city's waterfront industrial relics, which is designed as follows:

Overall, the landscape flood wall was set up in the waterfront area to resist rising tides; The sunken plaza and landscaped green space were designed to stagnate rainwater and delay the water infiltration; The natural drainage and green space network drainage design was designed to quickly channel daily rainwater to avoid the accumulation of water in the urban space. Meanwhile, rainwater filtration would be carried out in the three parts through landscape to purify water quality (Figure 7-13).

Figure 7-13 Landscape Infrastructure Network

(Resource: Author)

(1) Landscaped flood wall

The flood wall is built by means of earth balance: Firstly, investment can be reduced. It ensures that the cost of filling and excavation is minimized, and there are no excess transportation costs due to the generation of abandoned soil. Secondly, transporting materials will be constrained by site, weather and other conditions, and the construction period will be easily prolonged. Third, it can play a role in protecting the environment and reducing environmental pressure. Engineering construction, earthwork has a great impact on the environment, a large amount of abandoned soil needs to be transported and piled up, which all cause a lot of pressure on the environment, so reaching the earth balance in situ will not produce a large amount of abandoned soil, there will be no transportation process of dust and falling soil, it will not cause environmental pollution and impact (Figure 7-14).

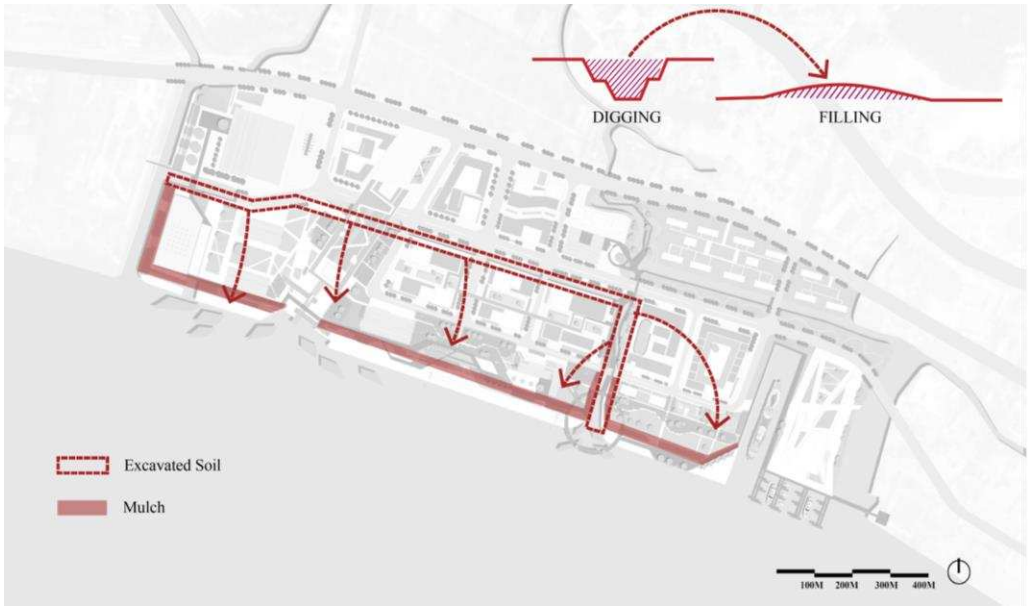


Figure7-14 Landscape Floodwall Generation

(Resource: Author)

From the perspective of flood prevention, in order to cope with the potential risk, the waterfront space level is raised as a whole, and three flood prevention elevations are set: the first wall of defense was made by concrete of the waterfront space, whose pile was sit up in water for elevating ground level; the second wall of defense and the third wall (according to the standard of flood prevention of one in 200 years) were formed by iterating soil with native water-tolerant plants of Guangzhou (Figure7-15).

From the perspective of spatial utilization, the concrete is locally hardened and integrated with the industrial landscape along with the related facilities to meet the needs of urban life, as illustrated in the following node design (Figure 7-16): the entire landscape flood wall system incorporates recreational trails, and pedestrian entrances are set up in the appropriate areas to satisfy the hydrophilic needs for public. By utilizing the difference in height to form a stone step pool falling in layers, a water landscape axis connects the river and the back lot. The falling step space is used to set up rest facilities; appropriate historical clues are incorporated to create a green-based, interesting, and playful space, adding a relaxing and soft texture to the industrial rust belt; interactive simulated yarn shaking machines are placed by the pool at the lowest elevation for children's amusement. The height of the fountain can be controlled, and the waterwheel amusement device is designed based on the prototype of the textile machine parts inside the pool. Rich thematic and

interactive touring experiences would be offered to the public.

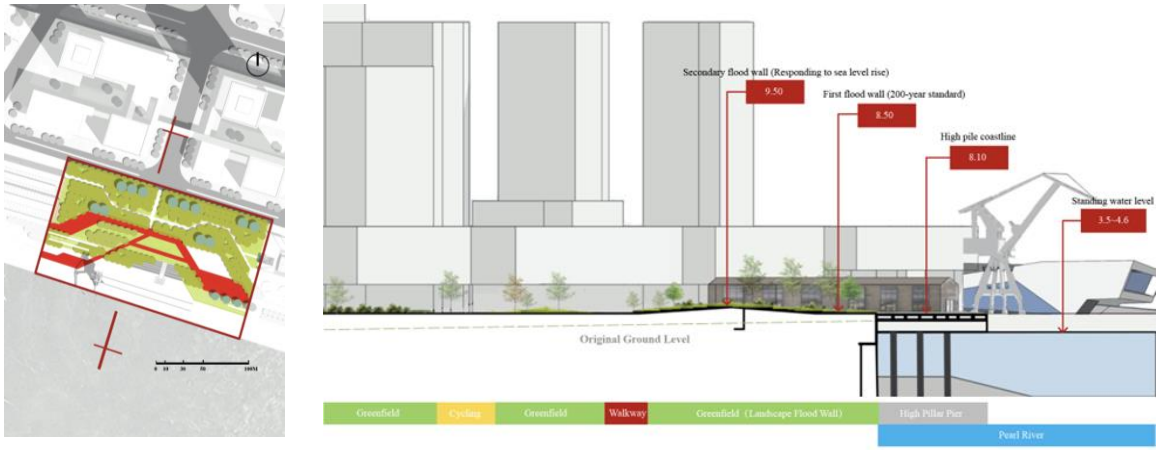


Figure 7-15 Landscaped Flood Wall Section

(Source: Author)

Figure 7-16 Landscaped Flood Wall

(Source: Author)

Figure 7-17 Sunken Plaza - Sunny (top) and Rainy (bottom)

(Source: Author)

(2) Plaza

Sinking the plaza provides a means of coping with flooding, reflecting the unity of safety, landscape and public nature. In terms of coping with rain and flood, the sunken plaza is used as a landscape carrier, with "water storage" as the core, to slow down the infiltration of rainwater and reduce the pressure on the regional municipal pipeline network, thus effectively accomplishing a resilient response to the impacts of rain and flood in the city. From the perspective of publicity, it is also a carrier of industrial culture as a place where multiple public spaces take place in sunny days (Figure

7-17).

(3) Roads

Landscaping infrastructure in urban streets complements traditional piped drainage systems. In terms of responding to stormwater flooding and water pollution: The natural processes of vegetation, earth capture and Infiltration or evapotranspiration water before it enters the piped system and help reduce flooding and water pollution by absorbing and filtering stormwater; Infiltration basins convey water like pipes are designed as shallow, open, planted swales to convey runoff and remove pollutants. They are an alternative to piped drainage systems where space and grades are available. Water moves horizontally along the surface or subsurface. Infiltration basins slow the flow of water and trap sediment to improve water quality; rain gardens with a special soil filtration medium that removes pollutants from roadway runoff. Plants and soil filtration systems are configured as planter beds or street tree pits for use in treating stormwater runoff Rain gardens are also known as bioretention systems or pervious strips. Some allow water to infiltrate into the soil below, while others collect treated water and convey clean water downstream. Pervious pavers on sidewalks allow rainwater to move through the pavement to the soil below and provide water to neighborhood landscaped areas. Replacing the ground with permeable pavers to reduce stormwater runoff and replenish the water table.

From a spatial perspective, replacing sewage channels with watercourses provides a comfortable street environment for urban life, and the preparation increases the opportunity for residents to meet "green", which helps to increase the greening rate and green space, as well as to provide a livable environment that strengthens the public's awareness of the environment.

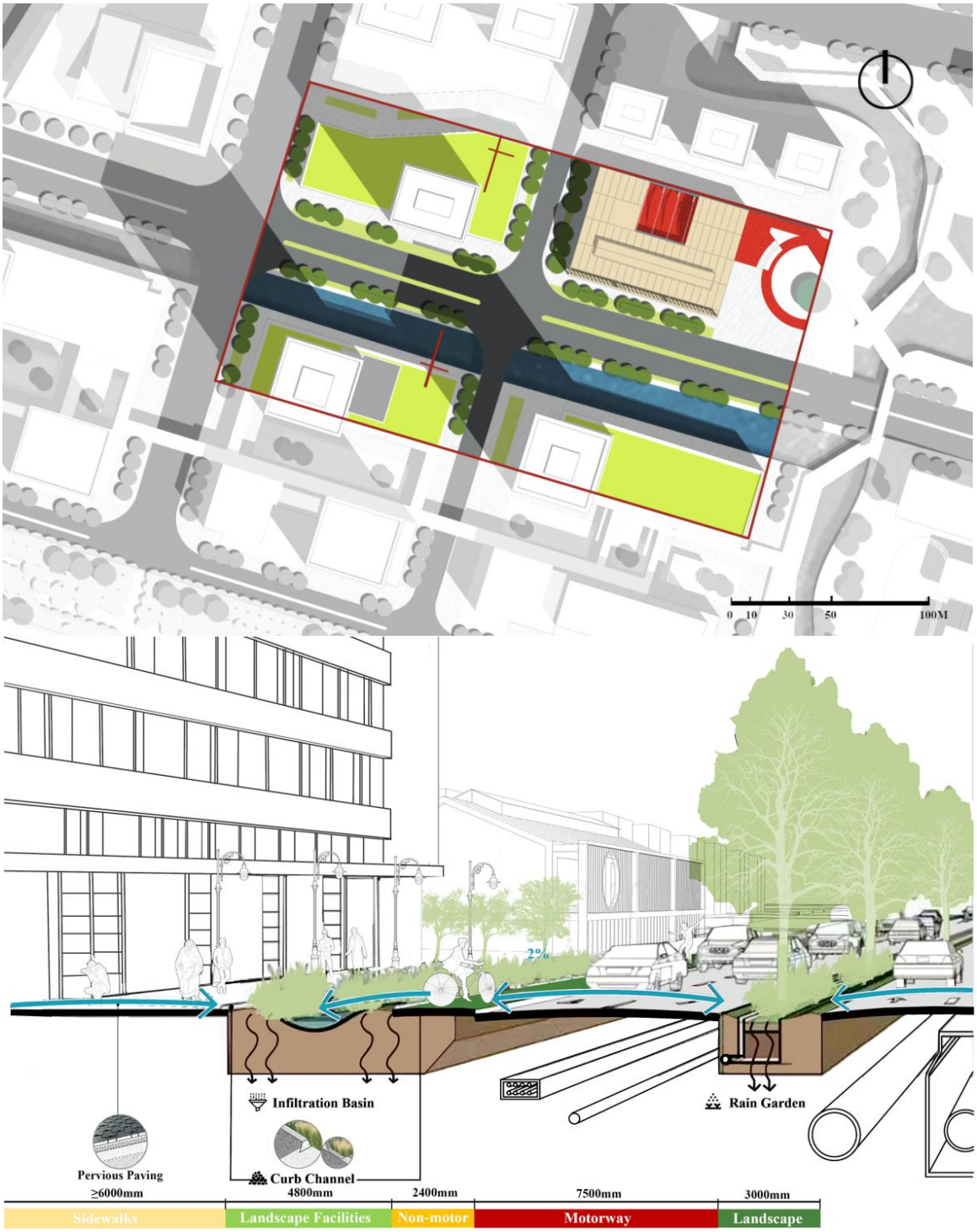


Figure 7-18 Road Node

(Source: Author

7.3.2 Landscape as Infrastructure

(1) Riverbank

The renovation is located on the west side of the shipyard. A landscaped flood wall was erected on the east bank; the waterfront adjacent to the park was renewed to a natural shoreline pattern that would be inundated during flooding but with natural restorative features such as water-tolerant plants that help to maintain the soil and water and are able to self-heal after extreme conditions; A water-friendly environment was offered by the cobblestone to change the monotonous concrete waterfront space. besides， some facilities for sitting and strolling are provided in east bank(Figure 7-19).

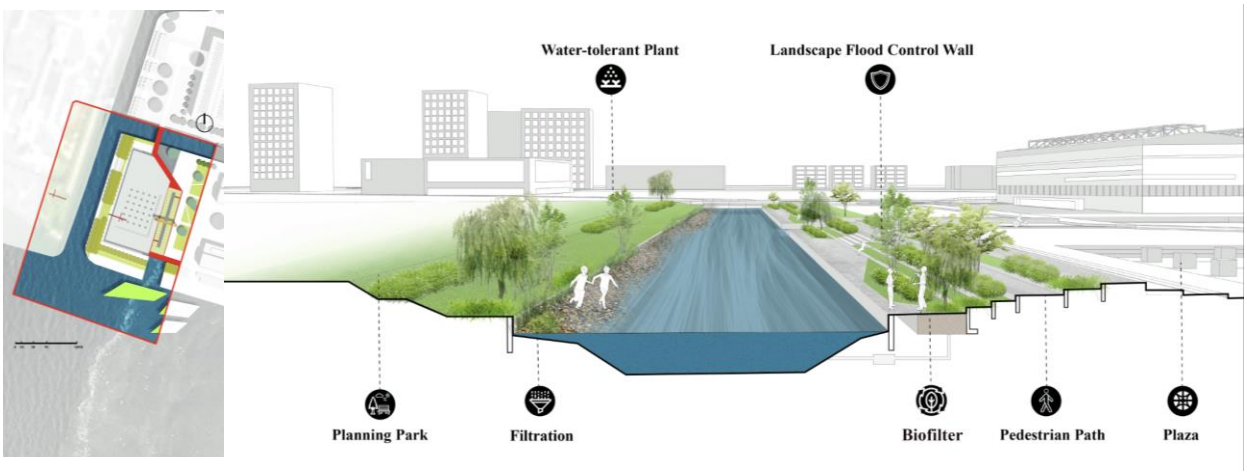


Figure 7-19 Riverbank Renewal

(Source: Author)

(2) River

An appropriate number of ecological floating islands, equipped with integrated functions, can be placed along the riverbanks.

For water purification：On the one hand, part of the nutrients in the water are absorbed by the root system of plants to reduce the eutrophication, On the other hand, the root network provides the space for microorganisms to attach, Besides, increasing of microorganisms in the upper layer of the water will prevent the occurrence of water bloom; The whole ecological floating island through the various parts of the composition of a local stable ecosystem, by accelerating the cycle between the material and energy to achieve the purpose of purifying water quality. The whole ecological

floating island is a partially stable ecosystem, and the circulation of material and energy can purify water.

For creating biological space, the ecological floating island can be used as a nesting point or temporary resting point for birds; Terrestrial insects can survive on the floating island plants; under the plants, the ecological floating island itself will provide habitat fish as well as other aquatic organisms by shadow.

For improving the landscape, combining landscape design and water restoration, the plants on the ecological floating island can be matched according to the plants' seasonal performance to create a landscape effect with ornamental value in all seasons.

Figure 7-20 Landscape as Infrastructure

(Source: Author)

7.4 Thicken the Urban Surface

(1) Dock No.1 And No.2

Thickening the urban surface - a three-dimensional operation is used to harmonize spatial contradictions. A three-dimensional urban space is created in response to the contradiction between the dockyard and the road development. On a macro level, the continuous earth surface is used to articulate the urban green landscape; On a micro level, the two pedestrian entrance spaces of the dock are bordered by the plaza space. People could be lead directly through underground passage to dock's interior space; Walking upwards, there is an urban green axis that could accommodate the activity space of people from outside; Motor vehicle drop-off area connects to the interior of the dock through steps; The interior of the dock is also a complex of commercial streets, museums, restaurants, bookstores, cafes and other rich business forms from the bottom to the top.

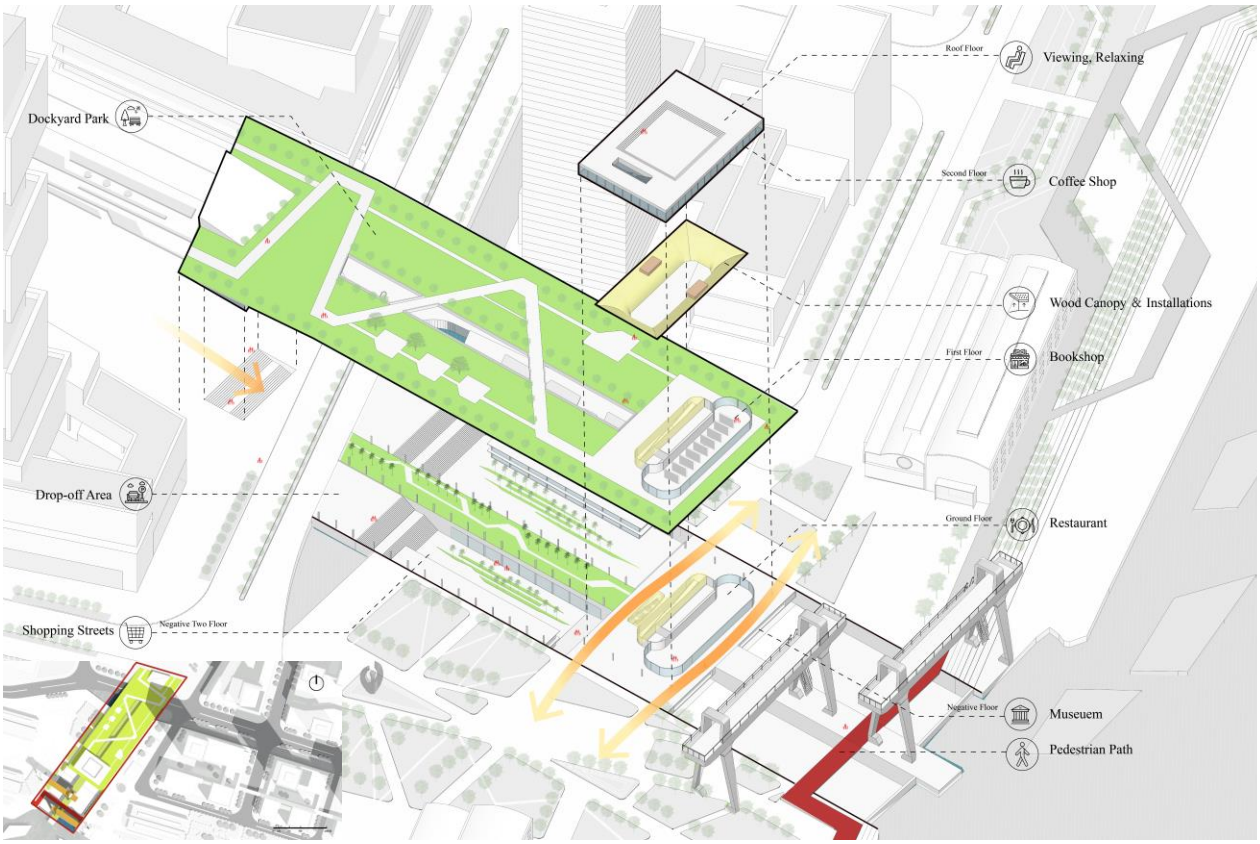


Figure 7-21 Thickened City Surface - Dock No.1 and No.2

(Source: Author)

(1) Dock No.3

As the largest shipyard in South China, Dockyard No. 3 is preserved as a whole for adaptive utilization, and a passenger terminal is planned for the east side of the dockyard. As an isolated site within the shipyard, on the one hand, it combines with the surrounding urban green space to form

a continuous landscape that is undisturbed and can be accessed at any time, which can maximize the guidance of the activities to take place, thus the chances of the urban citizens to stay will increasing，Besides, a good sightline interaction between people and industrial relics will happen to activate the historical and cultural value of the dockyard. On the other hand, the formation of the landscape substrate can effectively digest the non-business hours of the dock and maximize the land space and landscape value.

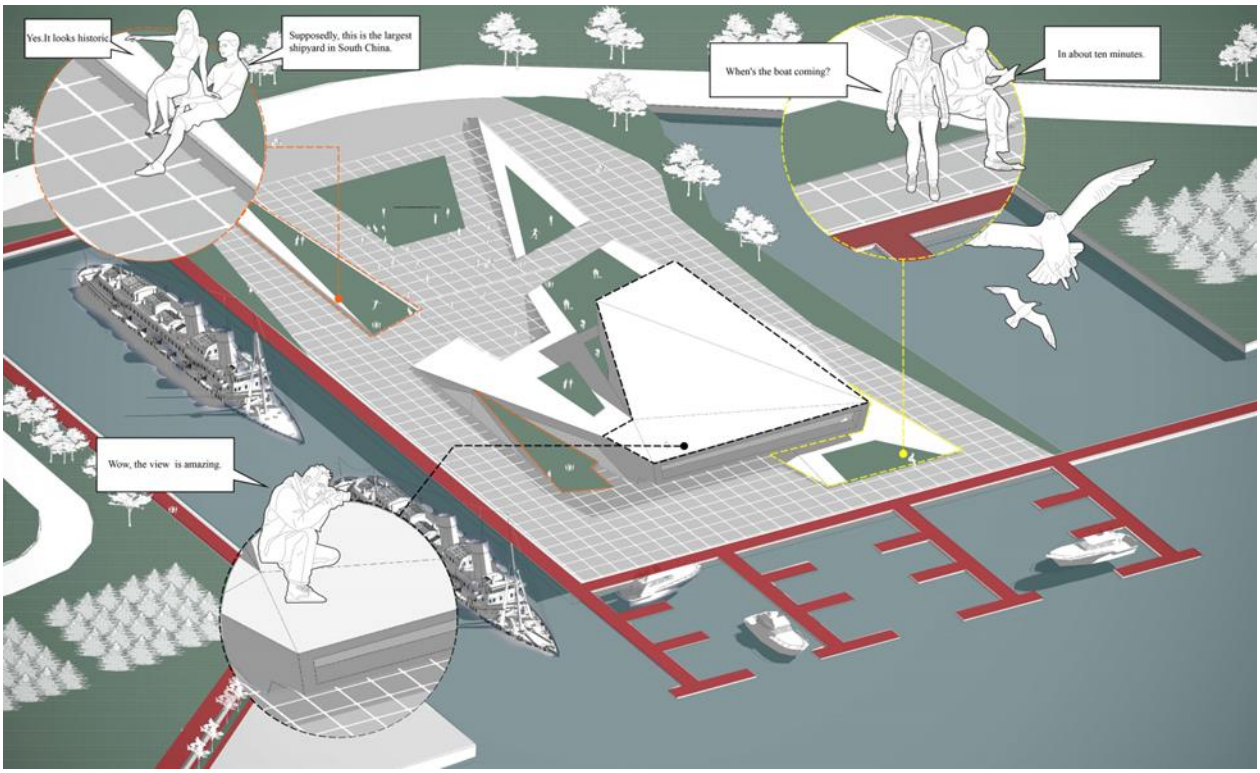


Figure 7-22 Thickened Urban Surface - Dock No. 3

(Source: Author)

7.5 Continuation of Industrial Culture

(1) Process flow lines in series: The industrial relics with historical value are preserved, and the preserved industrial relics buildings and industrial facilities are regarded as sculptural exhibits linked together to become a whole recreational route, which comprehensively demonstrates to the public the organization of the ship processing process sequence, flow, industrial scale, technical characteristics, related facilities and comprehensive image, while also mapping the history of the shipyard's development.

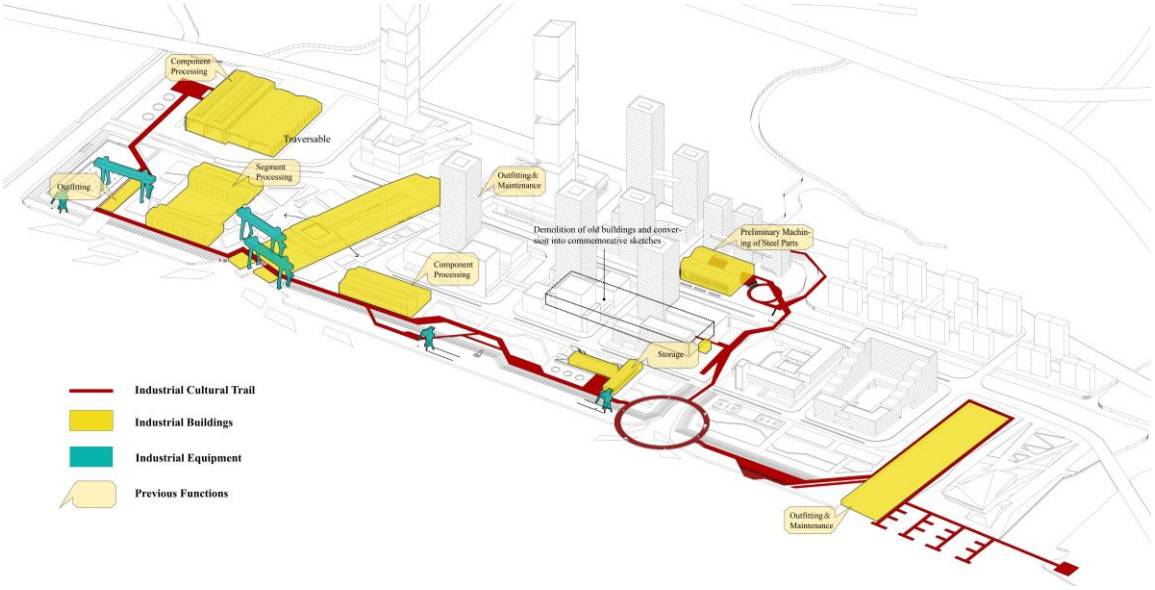


Figure 7-23 Process Flow Line - Excursion System

(Source: Author)

(2) Building berth node: the building berth is characterized by the tracked mechanical device used to drive the ship; it can be made to rotate slowly in a specified time through timing, thus becoming a kind of living landscape. The public can walk on the tracks through the pedals on the side of the building berth to feel the launching process of the ship gradually moving forward after completion of the assembly; in addition, the building berth tracks, gantry cranes and tower cranes are also whitewashed through the painting to strengthen the visual effect.

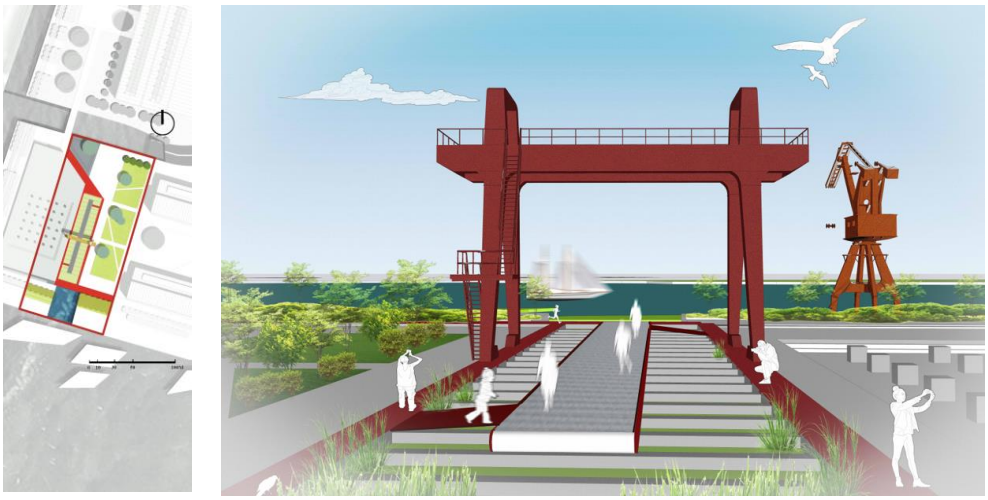
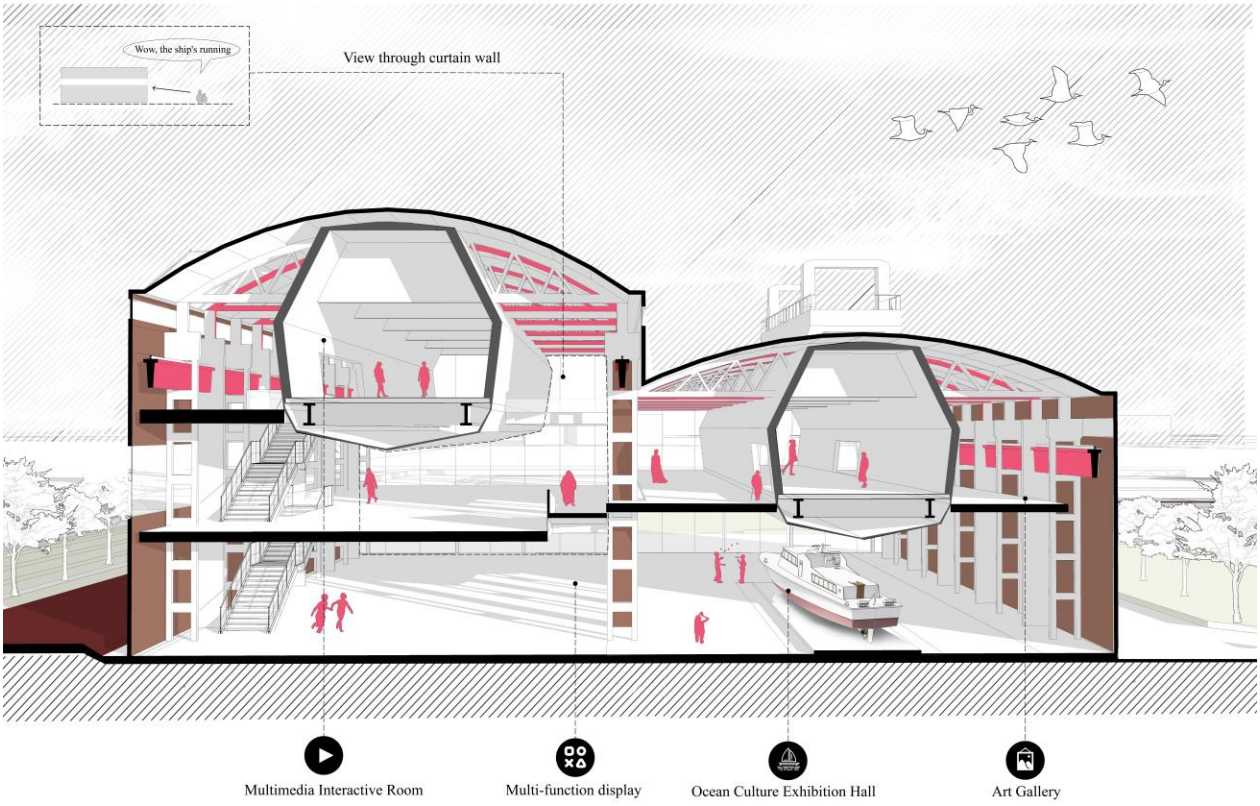


Figure7-24 Dynamic Memory Scenes——Building berth

(Source: Author)

(3) Lunan Workshop: Originally designed for hull pre-outfitting, the workshop was designed to a ship art gallery with "assembling" as the theme. The first floor is a flexible exhibition space where visitors can interact with the preserved workshop structure. The core space is constructed with the spatial intention of the ship's cabin to create a multimedia room, where visitors can experience the sense of confined space of a ship's cabin. The east and west façade of the workshop is glass curtain wall, which allows visitors to see the dynamic sound effect of the cabin and vr projection and experience the charm of ship craftsmanship.



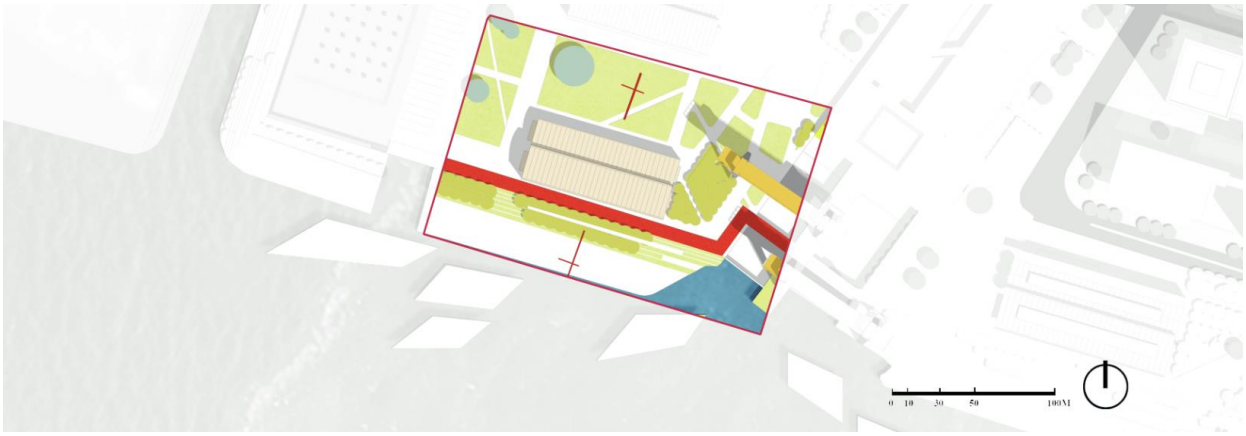


Figure 7-25 Dynamic Memory Scene – Lun'an Workshop

(Source: Author)

(4) Visual enhancement of gantry cranes: From this viewpoint, two gantry cranes are preserved on the south side of Dockyards 1 and 2. The preservation of the intact dockyard equipment creates the spirit of an industrial place, and secondly, as a visual guide for the pedestrian entrance plaza, it is painted in red to create a sharp color contrast with the green space and blue sky. The red paint is used to create a color contrast with the green space and blue sky, which detaches it from the background and reinforces the first impression of the real industrial scale to the urban public.

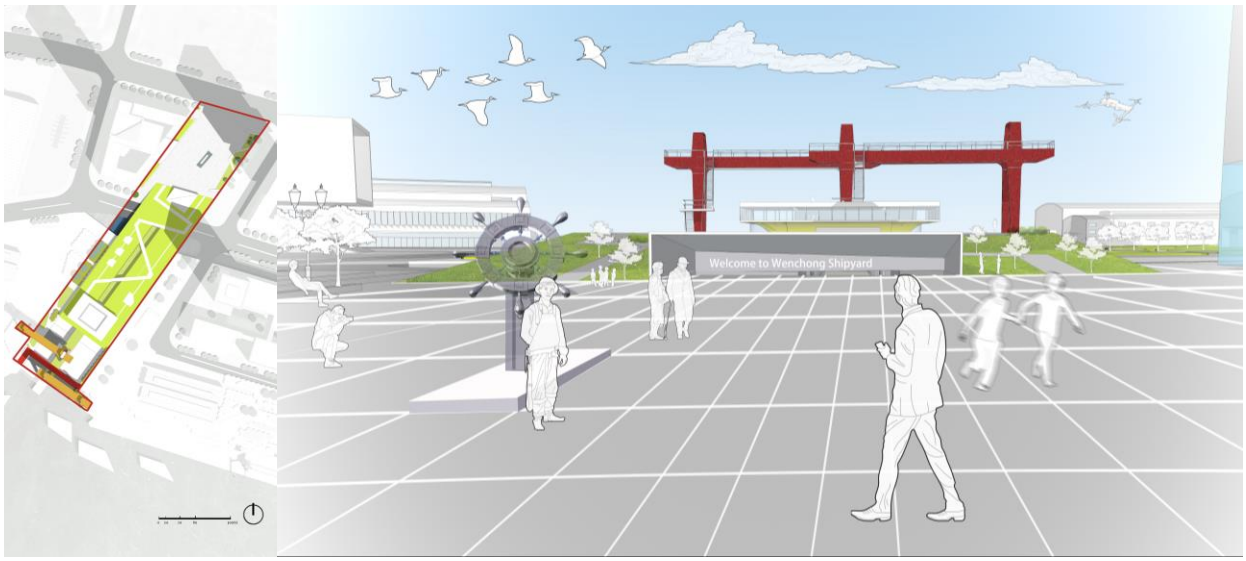


Figure7-26 Enhanced Industrial Visual Elements - Entrance Plaza Node

(Source: Author)

(5) Hull Workshop No.1 & No.2: Hull Workshops No.1 and No.2 are the largest fabrication workshops in Wenchong Shipyard, and they have been renewed into a mixed-use complex. The east side of the first floor is a multi-functional space, which can be used as a large-scale merchandise display or can be flexibly exchanged for a retail store on the west side. Because of its structural span of 28 meters, the second and third floors are arranged with a certain number of cinema theaters, which can be adapted to the space of the large-span workshop. On the workshop façade, the original long windows are used as the main theme for the layout of the building façade. A ship structure sculpture was built in the entrance plaza by utilizing the abandoned steel materials to create a certain industrial atmosphere.

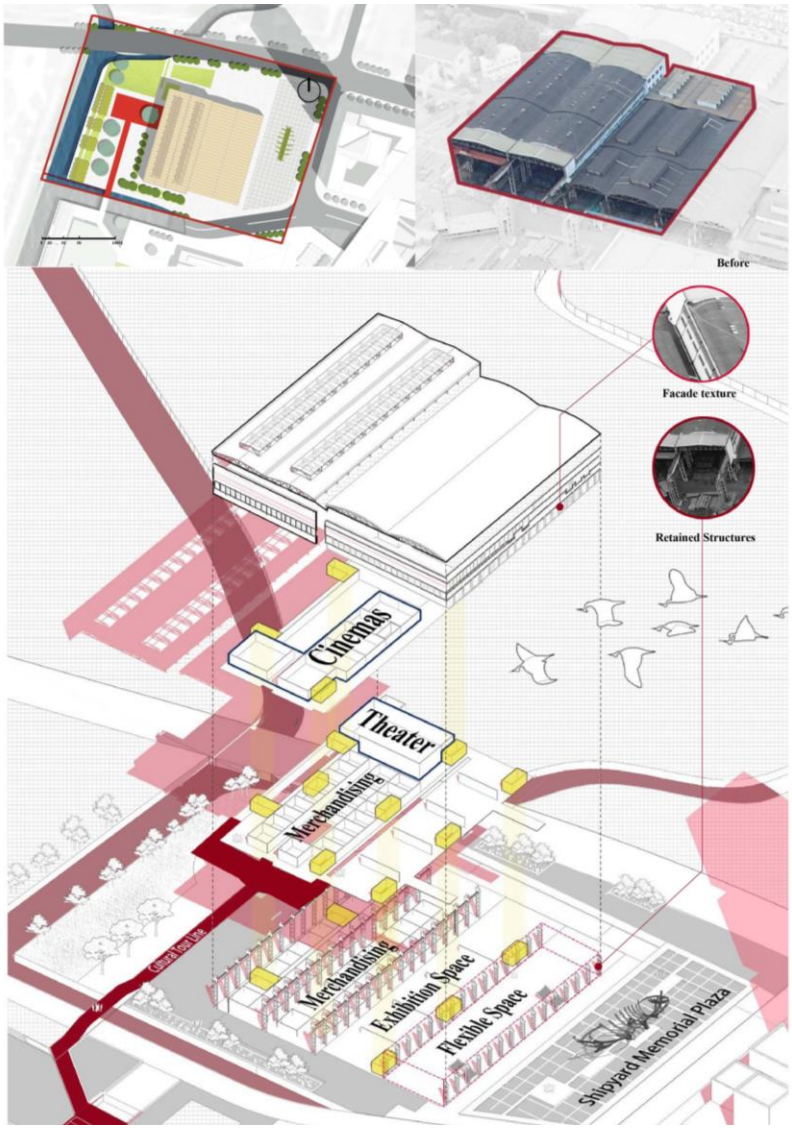
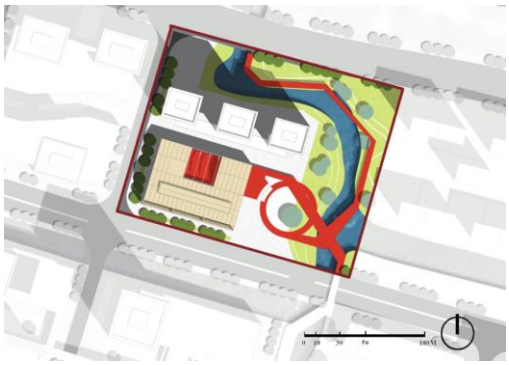
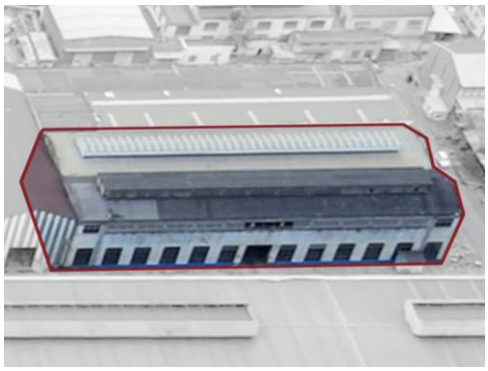


Figure 7-27 Node of Hull Shop No.1 and No.2

(Source: Author)

(6)Hull Workshop： Hull workshop was originally a steel processing workshop in the shipyard, consisting of two workshop volumes. Now it is renewed as a supporting club to meet the daily life needs of the employees and residents of the neighboring enterprises; the southern part is mainly for leisure, and the ground floor of the northern side is arranged for retail. In the façade renewal, the original sloping roof form was continued, but due to the change in the nature of the building's function, the texture of the original façade conflicted with the new function, so the original façade form was retained, and based on this, a new piece of wall was added to create a rich light and shadow effect in order to fit in with the new function of the building.





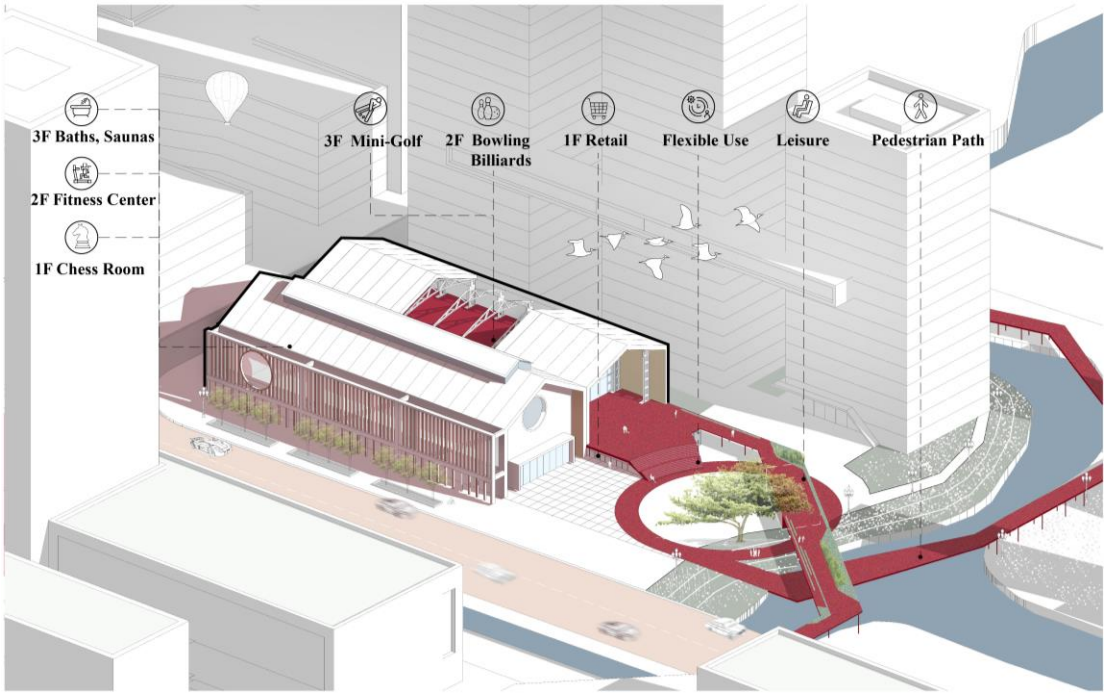
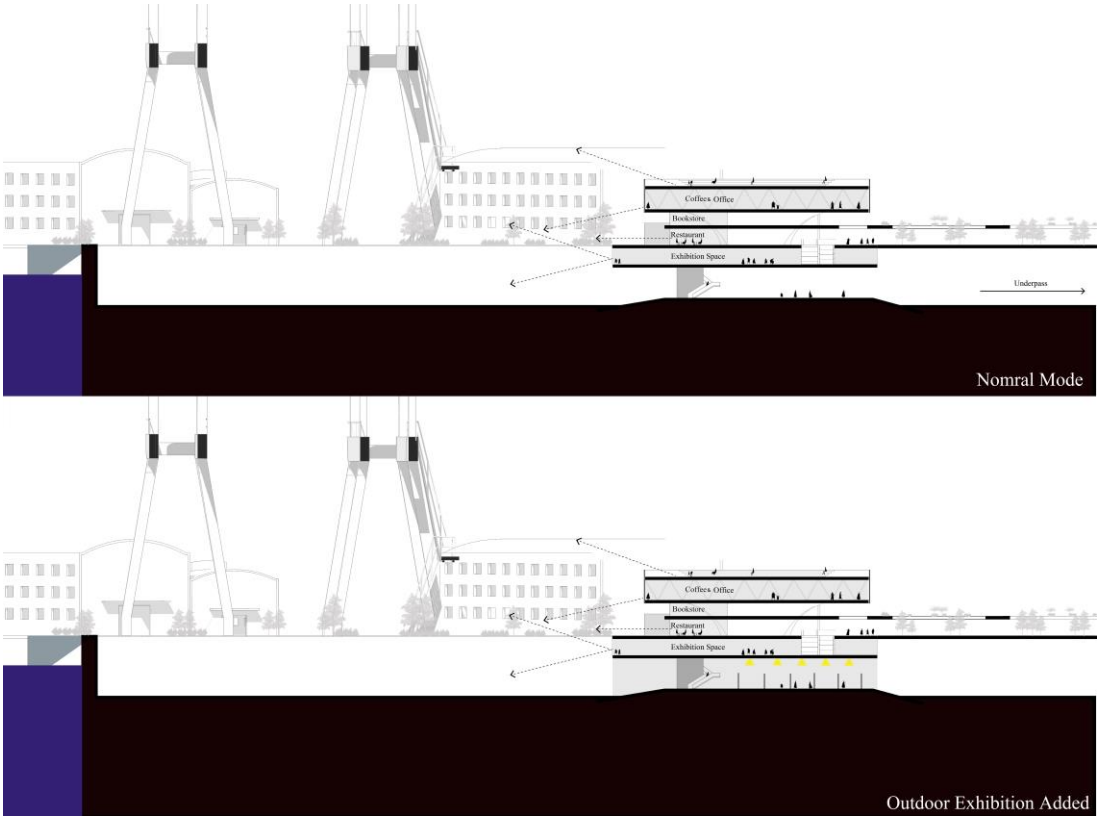


Figure7-28 Node of Hull Workshop

(Source: Author)

(7) No.1 and No.2 Dockyard Node - Diversified Space Utilization: The two dock spaces are completely preserved, and a sunken dock museum is built by placing steel trusses in the middle of the dock, and the slope in the middle of the dock strengthens the spatial division: the northern part is placed into a commercial pedestrian street to guide the flow of people, and the southern part retains the original texture of the dock wall, so that the public still has the opportunity to feel the scale of the dock space and the texture of the materials; at the same time, the huge scale of the dock space has given it an excellent spatial elasticity that makes it able to At the same time, the large scale of the dock space gives it excellent spatial flexibility, enabling it to adapt to diversified activity needs - it is normally purely an experience space for sightseeing, but can be expanded into an outdoor exhibition space for museums, an outdoor lecture space, or a stage for fashion shows, etc., or even unexpected urban activities, when needed. On the one hand, it provides ample space for urban activities, and on the other hand, it allows the public to participate in the scale and sensory experience of the industrial space at the same time.



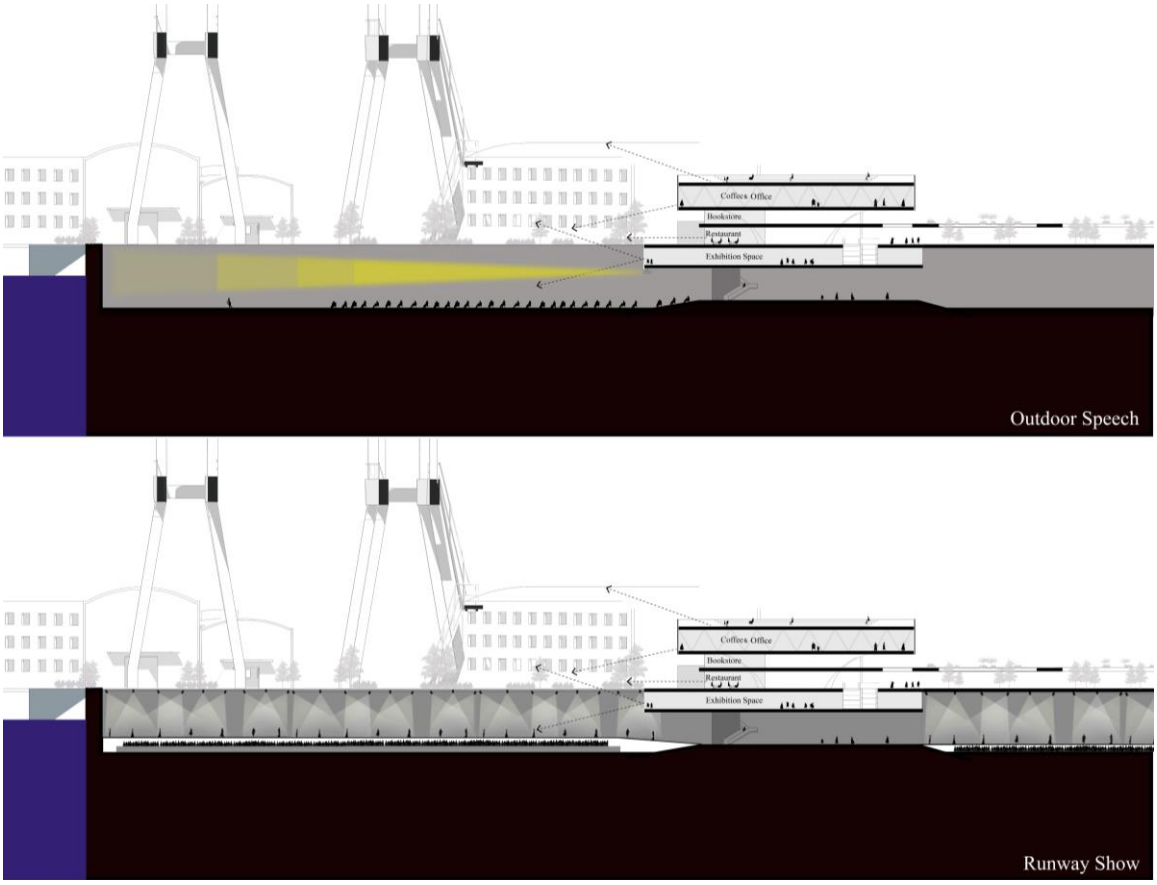


Figure 7-29 No.1 and No.2 Dockyard Node - Diversified Space Utilization

(Source: Author)

Reuse of Site Materials

By collecting the residual industrial materials from the site and the dismantled industrial buildings and processing them into a variety of guide signs, such as industrial relics guide map, industrial relics historical and cultural display boards, QR code historical information access platforms, and related service facilities guide map. On the one hand, it reduces the burden of waste recycling, and on the other hand, it is a continuation of the thick historical atmosphere of the shipyard, which is in line with the theoretical requirements of landscape urbanism.

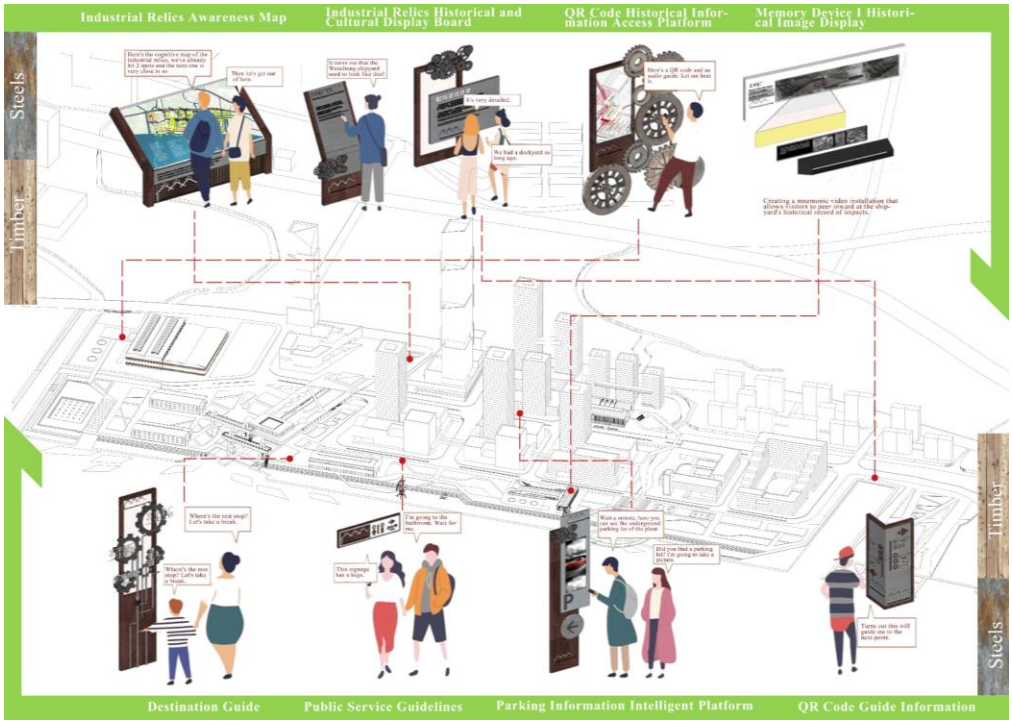


Figure7-30 Reuse of Site Materials

(Source: Author)

Conclusion and Outlook

1. Research Conclusion

As the most important stock resources in the city, waterfront industrial relics are of great significance to the city. It is an ecologically sensitive area in the city, a window to show the city's style and image, a complex where various activities of the city converge, and the connotation of the city's industrial culture. The change of waterfront industrial relics will directly affect the environment, culture, and life of the city.

This thesis aims to explore the methodology of Guangzhou waterfront industrial relics renewal from the perspective of landscape urbanism, and to research on the current characteristics of Guangzhou's waterfront industrial relics as well as the defects of the renewal, so as to provide a more systematic methodology for the renewal of its waterfront industrial relics:

First, in terms of theoretical research, we analyze the scope and main contents of previous research on landscape urbanism and clarify the fit and guiding significance of the application of landscape urbanism to the renewal of waterfront industrial relics.

Secondly, the cases were analyzed from several dimensions of the renewal fit points, and the optimization goals, operable objects, methods and applicable scales of waterfront industrial relics renewal from the perspective of landscape urbanism were clarified.

Furthermore, the development of waterfront industrial relics in Guangzhou was systematically analyzed, which summarized the development history, renewal trends, and identified the characteristics of the existing waterfront industrial relics in Guangzhou as well as their renewal deficiencies. the operation above was to lay a good foundation for the renewal methodology. then the adaptability of waterfront industrial relics was analyzed in Guangzhou to the theory.

Finally, five renewal strategies were proposed to address the shortcomings of waterfront industrial relics in Guangzhou.

In summary, the methodologies of waterfront industrial relics renewal design from perspective of landscape urbanism focus on the challenges of complex urban problems. These methodologies were expected to enhance the quality of waterfront open space, promote the efficient utilization of

industrial stock resources, and contribute to the sustainable development of Guangzhou.

2.Innovations of the Research

(1) Expansion of the Scope of Theoretical Application

Waterfront industrial relics could be regarded as an important category of products under the background of China's rapid industrial development, which carried the historical imprint of China's waterfront industry. However, in the current literature and research on landscape urbanism, the discussion on post-industrial land use has mostly focused on post-industrial brownfield sites and industrial park planning. Yet, waterfront industrial relics as a special industrial type were less considered to be the object of research, but in fact, due to the special geographic location, it is characterized by distinctive spatial structure, and therefore, there is a unique character and value in selecting it as the object of the research.

(2) Complementary to the Shortcomings of Local Industrial Relics Renewal

Based on the theory of landscape urbanism, combining the research methods of literature study and fieldwork, by sorting out the development overview, characteristics and updating trend of the existing waterfront industrial relics in Guangzhou, which summarizes the five major problems of poor spatial structure continuity, deficiency of open space creation, prominent ecological environment problems, insufficient cultural display, and compactness of the local land use.

(3) Strategy Innovation

By analyzing the cases, the optimization goal, operation object and operation scale of industrial relics from the perspective of landscape urbanism were clarified in this thesis, and local renewal strategies were proposed to address the shortcomings of waterfront industrial relics in Guangzhou in accordance with the theoretical principles. Based on the theory of landscape urbanism, the systematic renewal strategies, and operation strategies for the renewal of urban industrial relics are formulated in this thesis. Finally, the Wenchong Shipyard was used as an example for empirical demonstration, which provided a new way of thought for solving the problems of the renewal of urban waterfront industrial relics, as well as examining the feasibility and applicability of the theory for urban waterfront industrial relics.。

3.Research Deficiencies and Outlook:

At present, the theory of landscape urbanism is still under development, and has not yet formed a

set of systematic and perfect theoretical system, On the other hand, because the main research areas and research theories of this concept were mostly based on the background of urban construction and urban space development in western countries, moreover, a lot of cases focused on the land crisis, ecological restoration, rainwater management and other problems that have emerged in the post-industrial era in western countries. Therefore, numerous practical difficulties exist in our country in understanding, researching, and applying it to solve the problems arising in the process of urbanization in China. The author's study of landscape urbanism theory for waterfront industrial relics was just a bold attempt, and due to limitations in my experience and ability, it was not possible to conduct more in-depth research and validation of the theory's implementation, so this thesis could only be aspirational research in many aspects.

In addition, the renewal of Guangzhou's waterfront industrial relics has been a complex and difficult task, which required a lot of coordination and control ability of urban planning and urban construction disciplines in synthesizing urban elements, which the author's current knowledge and ability were still far away from, Meanwhile, landscape urbanism emphasizes on the frequent crossover between multiple disciplines, which requires balancing the actual situation of all aspects of the society in order to achieve the highest comprehensive benefits. So, it was difficult to achieve the goal by someone.

Therefore, the following aspects can be studied more carefully by scholars in the future:

(1) Comparative Study of Waterfront Industrial Relics in Other Regions

By comparing and analyzing the spatial characteristics and architectural features of waterfront industrial relics in different cities and regions in China, a more comprehensive understanding of waterfront industrial relics could be formed. A comparative analysis of waterfront industrial relics in different cities and regions could be carried out to deeply understand the influence of different factors on waterfront industrial relics.

(2) Research on Implementation and Management Mechanisms

There was no discussion on the implementation and promotion of landscape urbanism in the research. An important feature of the renewal of industrial-type sites has been the change in the users, and even though the future functions of the site can be predicted, designers will not have any way of knowing their real site needs. Consequently, it is the author's opinion that further discussion can

be made on the implementation and management mechanism based on the time dimension to truly maximize the social and landscape value brought by the waterfront space.

Finally, I hope that I could continue to research the theory of landscape urbanism in my future study and work to enrich my knowledge. landscape urbanism which has now become a hot topic in academia and industry by more and more scholars and designers, it is believed that in near future, with the revitalization and rise of landscape, it will be glowing in the process of urban development and construction, which would provide more possibilities for the development and construction of the city and creating a new path.

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